

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

Working Draft Environmental Statement

Volume 2: Community Area report

LA11: Staveley to Aston

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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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Contents

Preface	vi
Structure of the HS2 Phase 2b working draft Environmental Statement	vii
1 Introduction	1
1.1 Introduction to HS2	1
1.2 Purpose of this report	3
1.3 Structure of this report	3
2 Overview of the area and description of the Proposed Scheme	6
2.1 Overview of the area	6
2.2 Description of the Proposed Scheme	12
2.3 Construction of the Proposed Scheme	33
2.4 Operation of the Proposed Scheme	73
2.5 Route section alternatives	74
3 Stakeholder engagement and consultation	76
3.1 Introduction	76
3.2 Key stages of Phase 2a engagement and consultation	76
3.3 Informing the Proposed Scheme	77
3.4 Engagement and consultation with stakeholder groups	78
4 Agriculture, forestry and soils	86
4.1 Introduction	86
4.2 Scope, assumptions and limitations	86
4.3 Environmental baseline	87
4.4 Effects arising during construction	95
4.5 Effects arising from operation	105
5 Air quality	107
5.1 Introduction	107
5.2 Scope, assumptions and limitations	107
5.3 Environmental baseline	108
5.4 Effects arising during construction	109

High Speed Rail (Crewe to Manchester and West Midlands to Leeds)
Working Draft Environmental Statement Volume 2: LA11

	5.5	Effects arising from operation	111
6		Community	113
	6.1	Introduction	113
	6.2	Scope, assumptions and limitations	113
	6.3	Environmental baseline	114
	6.4	Effects arising during construction	116
	6.5	Effects arising from operation	123
7		Ecology and biodiversity	124
	7.1	Introduction	124
	7.2	Scope, assumptions and limitations	124
	7.3	Environmental baseline	124
	7.4	Effects arising during construction	133
	7.5	Effects arising during operation	143
8		Health	145
	8.1	Introduction	145
	8.2	Scope, assumptions and limitations	145
	8.3	Environmental baseline	146
	8.4	Effects arising during construction	149
	8.5	Effects arising from operation	155
9		Historic environment	157
	9.1	Introduction	157
	9.2	Scope, assumptions and limitations	157
	9.3	Environmental baseline	159
	9.4	Effects arising during construction	165
	9.5	Effects arising from operation	168
10		Land quality	170
	10.1	Introduction	170
	10.2	Scope, assumptions and limitations	170
	10.3	Environmental baseline	171
	10.4	Effects arising during construction	185
	10.5	Effects arising from operation	195
11		Landscape and visual	197
	11.1	Introduction	197
	11.2	Scope, assumptions and limitations	197
	11.3	Environmental baseline	198
	11.4	Temporary effects arising during construction	211
	11.5	Permanent effects arising from operation	221
12		Socio-economics	231
	12.1	Introduction	231
	12.2	Scope, assumptions and limitations	231

High Speed Rail (Crewe to Manchester and West Midlands to Leeds)
Working Draft Environmental Statement Volume 2: LA11

12.3	Environmental baseline	231
12.4	Effects arising during construction	234
12.5	Effects arising from operation	237
13	Sound, noise and vibration	239
13.1	Introduction	239
13.2	Scope, assumptions and limitations	240
13.3	Environmental baseline	240
13.4	Effects arising during construction	241
13.5	Effects arising from operation	245
14	Traffic and transport	250
14.1	Introduction	250
14.2	Scope, assumptions and limitations	250
14.3	Environmental baseline	251
14.4	Effects arising during construction	254
14.5	Effects arising from operation	261
15	Water resources and flood risk	267
15.1	Introduction	267
15.2	Scope, assumptions and limitations	267
15.3	Environmental baseline	268
15.4	Effects arising during construction	282
15.5	Effects arising from operation	291
16	References	293

List of figures

Figure 1: Structure of the working draft Environmental Statement	x
Figure 2: The HS2 Phase 2b route and community areas	2
Figure 3: Community area context map	7
Figure 4: Key permanent features of route of the Proposed Scheme (main line) in the Staveley to Aston area (not to scale)	14
Figure 5: Key permanent features of route of the Proposed Scheme (Staveley spur) in the Staveley to Aston area (not to scale)	15
Figure 6: Location of construction compounds in the Staveley to Aston area	38
Figure 7: Construction compounds for civil engineering works	41
Figure 8: Construction compounds for railway systems works	42
Figure 9: Indicative construction programme between 2023 and 2033	63
Figure 10: Business sector composition in the RMBC, BDC and CBC areas and the Yorkshire and the Humber region	232
Figure 11: Employment by industrial sector in the RMBC, BDC and CBC areas and the Yorkshire and the Humber region	233

List of tables

Table 1: Demolitions required as a result of the works to be managed from the Wales South cutting main compound	43
Table 2: Demolitions required as a result of the works to be managed from the M1 motorway North viaduct satellite compound	45
Table 3: Demolitions required as a result of the works to be managed from the Mastin Moor cutting satellite compound	45
Table 4: Demolitions required as a result of the works to be managed from the Barlborough cutting satellite compound	47
Table 5: Demolitions required as a result of the works to be managed from the Woodall Common cutting satellite compound	49
Table 6: Demolitions required as a result of the works to be managed from the Nicker Wood embankment satellite compound	51
Table 7: Demolitions required as a result of the works to be managed from the Aston South embankment satellite compound	52
Table 8: Demolitions required as a result of the works to be managed from the Staveley East embankment satellite compound	54
Table 9: Demolitions required as a result of the works to be managed from the A619 Lowgates Road overbridge satellite compound	56
Table 10: Demolitions required as a result of the works to be managed from the Staveley West cutting satellite compound	56
Table 11: Demolitions required as a result of the works to be managed from the Staveley IMD South chord satellite compound	58
Table 12: Demolitions required as a result of the works to be managed from the Staveley IMD satellite compound	58
Table 13: Mechanisms and timeline of stakeholder engagement since route announcement	76
Table 14: Engagement to date with community stakeholders	79
Table 15: Engagement to date with local authorities and parish councils	80
Table 16: Summary of characteristics of holdings	94
Table 17: Summary of temporary effects on holdings from construction	99
Table 18: Summary of permanent effects on holdings from construction	102
Table 19: Species potentially relevant to the assessment within the Staveley to Aston area	131
Table 20: Residual significant effects on ecological resources/features during construction	141
Table 21: Residual significant effects on ecological resources/features during operation	144
Table 22: Summary of the geology underlying the land quality study area	172
Table 23: Current and historical landfill sites located in the study area	178
Table 24: Current and historical mining, mineral sites and colliery spoil sites located in the study area	178
Table 25: Current and historical industrial/commercial sites located within the study area	181
Table 26: Summary of sensitive receptors	184
Table 27: Summary of baseline CSM for sites which may pose a contaminative risk for the Proposed Scheme	187
Table 28: Summary of construction CSM effects	191
Table 29: Summary of permanent (post-construction) effects	192
Table 30: Summary of effects for mining and mineral resources	195

High Speed Rail (Crewe to Manchester and West Midlands to Leeds)
Working Draft Environmental Statement Volume 2: LA11

Table 31: Summary of significantly affected LCAs	201
Table 32: Summary description and assessment of effects on LCAs	212
Table 33: Construction phase potentially significant visual effects	216
Table 34: Operational phase significant landscape effects	222
Table 35: Operation phase significant visual effects	224
Table 36: Surface water body receptors	269
Table 37: Summary of geology and hydrogeology in the study area	274
Table 38: River flood risk sources and receptors	279
Table 39: Surface water flood risk sources and receptors	280

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.

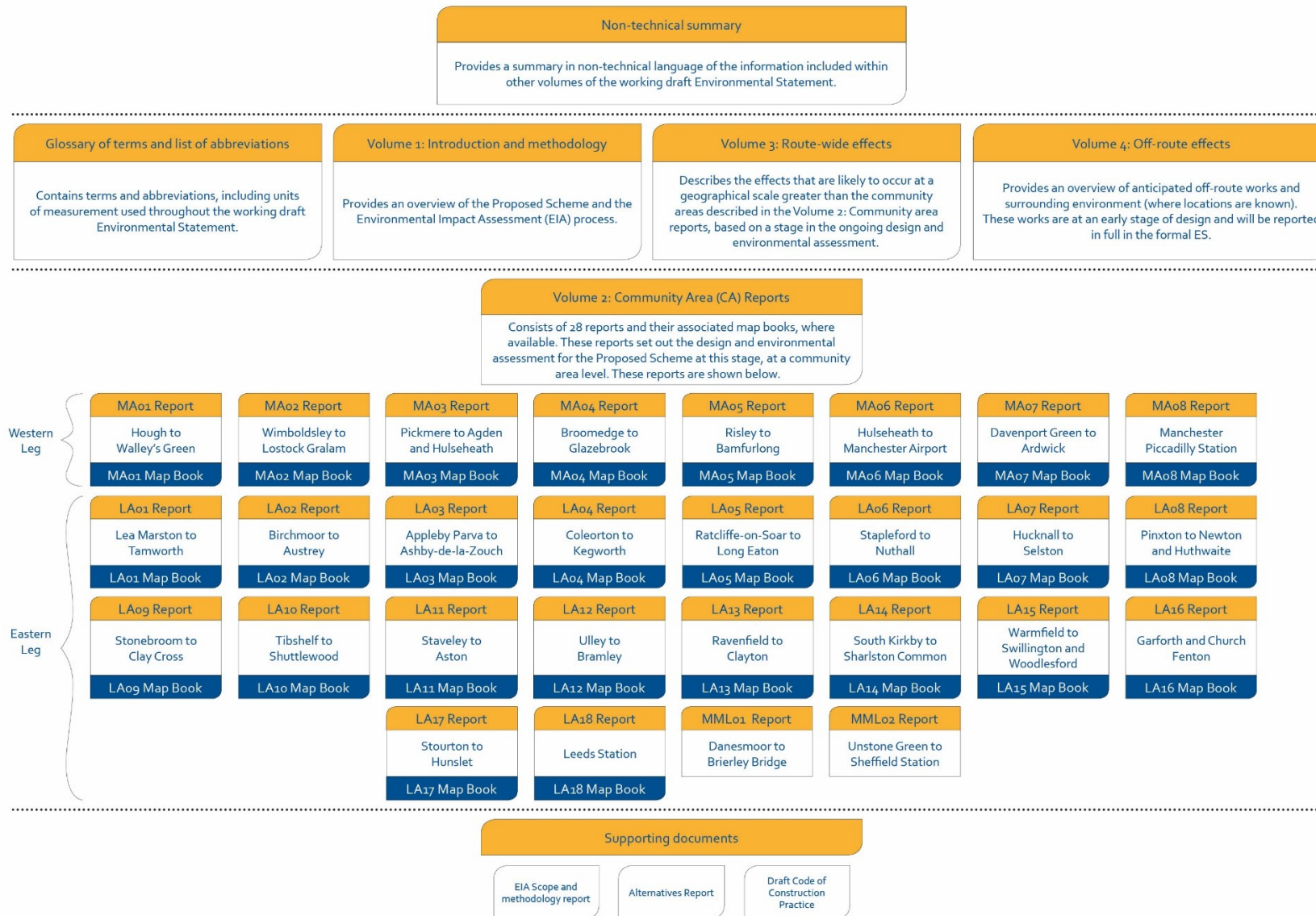
Volume 4: Off-route effects

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

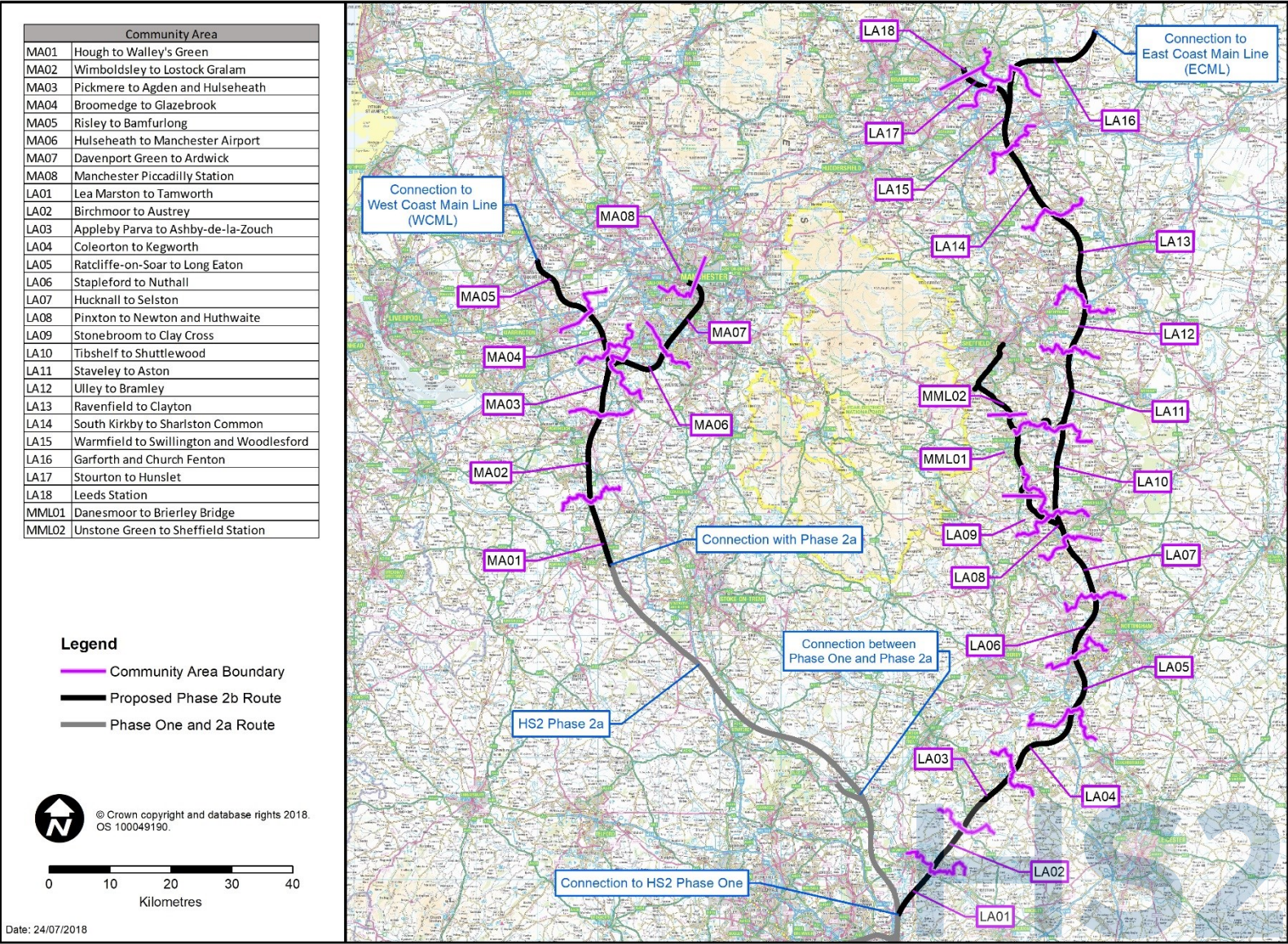


1 Introduction

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 225 miles per hour (mph) (360 kilometres per hour (kph)).
- 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 Staveley to Aston area (CA number LA11) 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 Staveley to Aston area. The report also describes the proposed mitigation measures that have been identified, at this stage, to avoid, reduce or manage the likely significant adverse effects of the Proposed Scheme on the environment within the area, along with proposed monitoring measures.
- 1.2.2 The design development and environmental assessment process is ongoing. Consultation on the working draft ES is being carried out to assist early engagement with those potentially affected by the Proposed Scheme and to help inform the design and assessment of the Proposed Scheme. Parliamentary Standing Orders do not require a working draft ES. Developing a working draft ES and consulting on it in advance of the formal ES means that consultees have the opportunity to comment on the Proposed Scheme earlier in the process.
- 1.2.3 As this is a working draft ES, where information is not available at this time, professional judgement and reasonable worst-case assumptions have been used to provide an indication of the likely impact to inform the consultation.
- 1.2.4 The likely significant environmental effects of the Proposed Scheme will be described in the formal ES to be deposited in accordance with the requirements of Parliamentary Standing Order 27A (SO27A)^{1,2}. It is possible that the effects and mitigation described in the formal ES may differ from those presented in this working draft ES, due to the provisional nature of the environmental and design information that is currently available and as a result of consultation on the Proposed Scheme, as appropriate.
- 1.2.5 The working draft ES has been undertaken on the assumption that the policies adopted for Phase One and Phase 2a will also apply to Phase 2b. The assessment also assumes that any general mitigation measures required as a result of those policies are implemented appropriately in the delivery and operation of the Proposed Scheme. Where policies are referred to in this working draft ES it is on this basis.

1.3 Structure of this report

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

¹ Standing Order 27A of the Standing Orders of the House of Commons relating to private business (environmental assessment), House of Commons

² House of Lords, 2005, Standing Orders of the House of Lords - Private Business, The Stationery Office

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

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

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

1.3.3 Environmental effects have been assessed in accordance with the methodology set out in Volume 1 and the EIA Scope and Methodology Report (SMR³).

1.3.4 The maps relevant to the Staveley to Aston area are provided in a separate corresponding document entitled Volume 2: LA11 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: LA11 Map Book). There is some flexibility during detailed design to alter the horizontal and vertical alignments and

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

other details within the limits shown on the plans and sections submitted to Parliament and as set out in the Bill, and this flexibility is included within the scope of the environmental assessment. Further explanation is provided in Volume 1, Section 1.

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

2 Overview of the area and description of the Proposed Scheme

2.1 Overview of the area

General

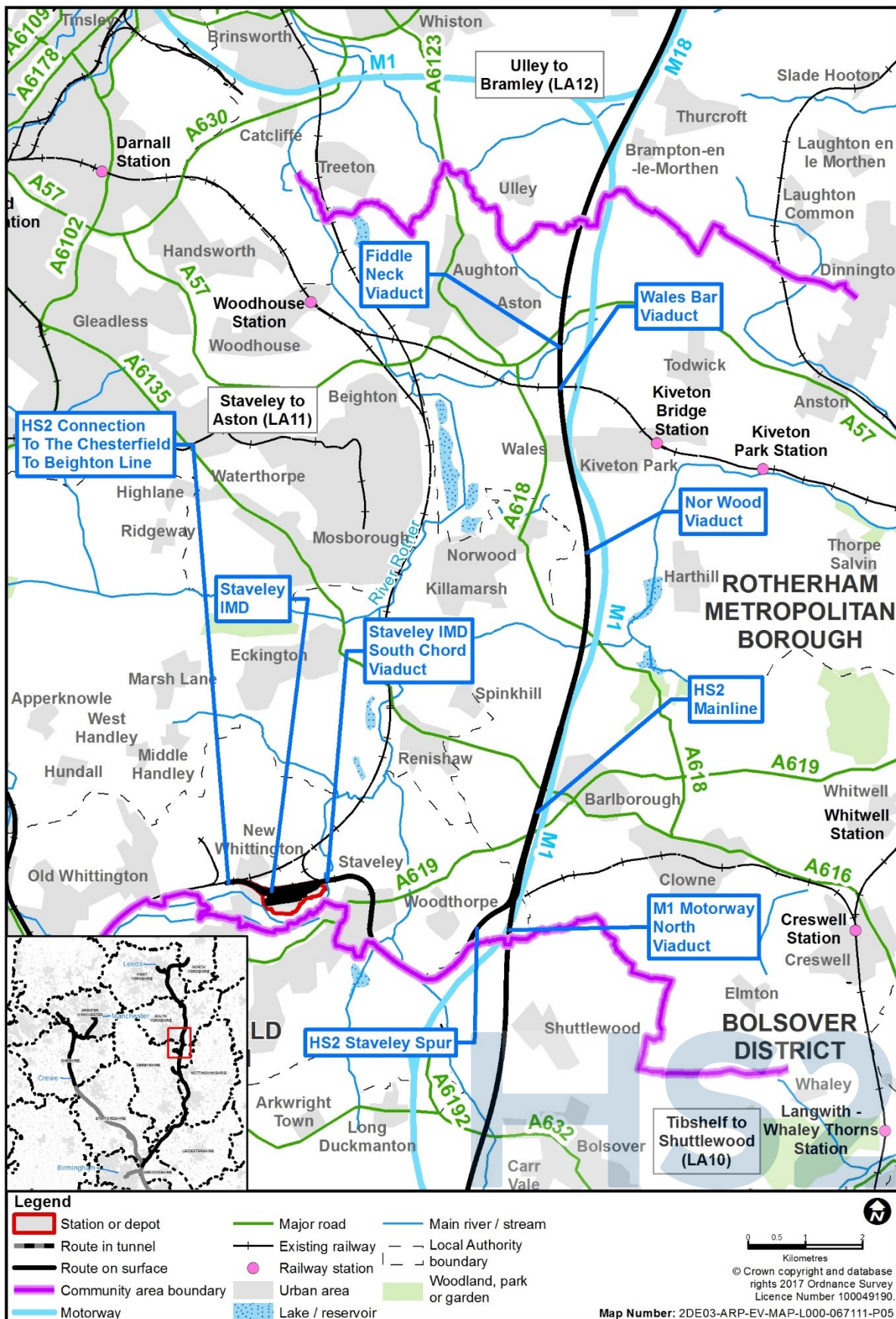
- 2.1.1 The Proposed Scheme through the Staveley to Aston area (LA11) would be within the local authority areas of Rotherham Metropolitan Borough Council (RMBC), Bolsover District Council (BDC), Chesterfield Borough Council (CBC) and North East Derbyshire District Council (NEDDC). The Proposed Scheme would pass through the parishes of Staveley, Bolsover, Clowne, Barlborough, Eckington, Harthill with Woodall, Killamarsh, Wales, Todwick, and Aston-cum-Aughton.
- 2.1.2 The route of the Proposed Scheme would diverge at Staveley East cutting, immediately south of the A619 Chesterfield Road, to form two separate routes. The HS2 main line, which would be 13.1km in length in this area, would continue northwards past Wales and Aston into the Ulley to Bramley area (LA12). The Staveley spur would be 8.5km in length and would travel in a western direction through the town of Staveley to the Staveley Infrastructure Maintenance Depot (IMD).
- 2.1.3 The boundary between Bolsover and Staveley parishes forms the southern boundary of this section. The boundary between Aston-cum-Aughton and Ulley parish forms the northern boundary of this section.
- 2.1.4 As shown in Figure 3, the Tibshelf to Shuttlewood area (LA10) lies to the south, and the Ulley to Bramley area (LA12), lies to the north of this area.

Settlement, land use and topography

- 2.1.5 The Staveley to Aston area is predominantly rural in character, with agriculture being the main land use. This is interspersed with areas of open moorland, woodland and areas of industrial or commercial land use.
- 2.1.6 Settlements along the route of the Proposed Scheme include the town of Staveley and the villages of Barlborough, Wales and Aston.
- 2.1.7 Key features of the area include the woodlands of Robinson's Lumb, High Wood, Nor Wood and Nicker Wood. The area around the Staveley spur includes the Markham Vale North industrial site and land associated with the former Staveley Chemical Works and landfills.
- 2.1.8 The topography of the Staveley to Aston area is undulating with the highest point located at Barlborough 142m above Ordnance Datum (AOD).

High Speed Rail (Crewe to Manchester and West Midlands to Leeds) Working Draft Environmental Statement Volume 2: LA11

Figure 3: Community area context map



Key transport infrastructure

- 2.1.9 The M1 passes through the Staveley to Aston area in a south to north direction. The A619 Chesterfield Road runs from south-west to north-east, providing links between Worksop and Chesterfield. The A6135 Sheffield Road runs from south-east to north-west, providing links between Barlborough and Sheffield. The A618 Rotherham Road/Mansfield Road runs from south-east to north-west, providing links between Barlborough and Rotherham. The A57 Aston Way runs south-east to west, providing links between Worksop and Aston, and the A619 Lowgates Road, runs north-east to south-west, providing links between Worksop and Chesterfield.
- 2.1.10 Local roads include Woodthorpe Road, Sheffield Road/Westfield Lane, Killamarsh Lane, the B6059 School Road, the B6067 Worksop Road, the B6419 Bolsover Road, the B6053 Eckington Road, Hall Lane, Works Road and Seymour Link Road.
- 2.1.11 Other transport routes within the Staveley to Aston area include the Chesterfield Canal, the Chesterfield to Beighton Railway and the Sheffield to Worksop Railway.
- 2.1.12 Public rights of way (PRoW), including local access roads and public footpaths, provide links between scattered dwellings and surrounding villages. Some of these PRoW form part of four local walking routes: the Fox and Magpie Heritage Trail, the Millennium Walk Heritage Trail, the Miners Way Trail and the Chaffinch Trail. The Clowne Branch Greenway, the Trans Pennine Trail and the Cuckoo Way also provide access to a network of long distance footpaths.

Socio-economic profile

- 2.1.13 Within the RMBC area, the local authority that covers the largest geographic extent of the area, construction accounts for the largest proportion of businesses (14%) alongside the retail (11%) and professional, scientific and technical (10%) sectors. In the adjacent BDC area, construction accounts for the largest proportion of businesses (12%) alongside the professional, scientific and technical (12%) and business administration and support services (11%) sectors. 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%). In the CBC area, retail accounts for the largest proportion of businesses (12%) with the professional, scientific and technical (11%) and construction (11%) sectors also accounting for relatively large proportions.
- 2.1.14 According to the Annual Population Survey (2016)⁴, the employment rate⁵ was 67% (105,500 people) in the RMBC area, 75% (36,600 people) in the BDC area, 77% (45,100) in the NEDDC area and 73% (46,900) in the CBC area. In 2016, the unemployment rate⁶ was 7% in the RMBC area, 4% in the BDC and NEDDC area and 5% in the CBC area.

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 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. (contd.)

- 2.1.15 According to the Annual Population Survey (2016)⁷ residents aged 16-64 qualified to National Vocational Qualification Level 4 (NVQ4) or above, was 25% in the RMBC area whilst 12% of residents had no qualifications, 22% in the BDC area whilst 8% of residents had no qualifications, 32% in the NEDDC area whilst 5% of residents had no qualifications, and 31% in the CBC area whilst 6% of residents had no qualifications.

Notable community facilities

- 2.1.16 The main concentrations of community facilities in the Staveley to Aston area are in the settlements of Staveley, Barlborough, Wales and Aston.
- 2.1.17 Community facilities within the town of Staveley include: a police station; a fire station; a library; and places of worship, including Staveley Methodist Church and St John the Baptist Church. Francis House is a care facility located in the area. Netherthorpe and Lowgates are adjoining settlements that together include one high school and the Netherthorpe School Science College.
- 2.1.18 Barlborough is a village located east of the M1 junction 30. Notable community facilities include the Dusty Miller Inn, Barlborough Primary School, Barlborough Heritage Centre, Barlborough Methodist Church, Barlborough NHS Treatment Centre and Barlborough Hall School.
- 2.1.19 Wales is a village located approximately 1km to the south of junction 31 of the M1. Community facilities include Wales Kiveton Methodist Church, Wales Primary School and recreation area, Kiveton Park and Wales Village Hall, Stockwell Lane Cemetery, and St John the Baptist Church and Cemetery.
- 2.1.20 Aston is a village located to the west of junction 31 of the M1. The village includes a number of local services and community facilities including Aston Fisheries, Aston Park, Aston Hall Junior and Infant School, All Saints Church and Cemetery, Aston Hall Cricket Club, Aston Park Fire Station, William Layne Reading Room (Aston Reading Room/library) and the Yellow Lion Public House.

Recreation, leisure and open space

- 2.1.21 The Staveley to Aston area is predominantly rural with open space, farmland and woodland. It is crossed by several PRoW including the Cuckoo Way and Trans Pennine Trail (Sheffield to Chesterfield). The Chesterfield Canal also provides opportunities for boating, canoeing and other recreational activities.
- 2.1.22 Recreational facilities in Staveley include Poolsbrook Country Park, Netherthorpe School Playing Fields. There are also a number of allotments located in the area.
- 2.1.23 Recreational facilities in Barlborough include Barlborough Hall, which lies immediately north of the village of Barlborough, with the M1 running alongside the west side of the park associated with the Hall. Barlborough Spring Fisheries is located adjacent to Barlborough Hall. In Barlborough itself, there are a number of areas of amenity green

(contd.) 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.

⁷ Office for National Statistics, (2016), Annual Population Survey 2016, NOMIS. Available online at <https://www.nomisweb.co.uk>.

spaces. To the north-west of Barlborough, High Wood provides access to woodland and open space.

- 2.1.24 Recreational facilities in Wales include Waleswood Sports Cricket Club and Wales Jubilee Sports and Social Club. To the south of Wales, Nor Wood and Killamarsh ponds provide access to woodland and open space. Rother Valley Country Park is located to the west of Wales. There are a range of recreational facilities in Aston, including Parklands Equestrian Centre, Aston Hall Cricket Club, Aston Park, Engine House Plantation, Aston Fisheries and the Yellow Lion public house. The smaller communities of Barrow Hill, Poolsbrook, Mastin Moor and Wales Bar also include a limited number of local facilities.

Policy and planning context

Planning framework

- 2.1.25 Volume 1 provides an overview of the policy case for HS2. Relevant development plan documents and policies have been considered in relation to environmental topics, as part of considering the Proposed Scheme in the local context.
- 2.1.26 The following local policy documents have been considered and referred to where appropriate to the assessment:
- Chesterfield Borough Council Local Plan: Core Strategy (2013)⁸;
 - Chesterfield Borough Council Local Plan Proposals Map (2013)⁹;
 - Saved policies of the Replacement Chesterfield Borough Local Plan (2006)¹⁰;
 - Saved policies of the Bolsover District Local Plan (2000)¹¹;
 - Saved policies of North East Derbyshire Local Plan (November 2005)¹²;
 - Rotherham Core Strategy (2014)¹³;
 - Barnsley, Doncaster and Rotherham Joint Waste Core Strategy (2012)¹⁴;
 - Saved Policies of the Rotherham Unitary Development Plan: Written Statement and Proposals Map (1999)¹⁵;

⁸ 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>

⁹ 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>

¹⁰ . 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>

¹¹ Bolsover District Council, (2000), Saved policies of the Bolsover District Local Plan. Available online at:

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

¹² North East Derbyshire District Council (2005), Saved policies of North East Derbyshire Local Plan. Available online at: <http://www.ne-derbyslocplan.net/>

¹³ Rotherham Metropolitan Borough Council, (2014), Rotherham Core Strategy. Available online at:

http://www.rotherham.gov.uk/downloads/200074/planning_and_regeneration

¹⁴ Barnsley Metropolitan Borough Council, Rotherham Metropolitan Borough Council, and Doncaster Metropolitan Borough Council (2012) Barnsley, Doncaster and Rotherham Joint Waste Core Strategy. Available online at:

http://www.rotherham.gov.uk/downloads/200074/planning_and_regeneration

¹⁵ Rotherham Metropolitan Borough Council, (1999), Saved Policies of the Rotherham Unitary Development Plan. Available online at:

http://www.rotherham.gov.uk/corestrategyexamination/info/2/core_strategy_examination/6/unitary_development_plan

- Saved policies of the Derby and Derbyshire Minerals Local Plan (April 2000) and First Alteration to the Plan (November 2002)¹⁶;
- Saved policies of the Derby and Derbyshire Waste Local Plan (March 2005)¹⁷;
- Sheffield Core Strategy (2009)¹⁸;
- Saved policies of the Sheffield Unitary Development Plan (1998)¹⁹; and
- Sheffield City Region (SCR) Transport Strategy and Implementation Plan (2011-2026).²⁰

2.1.27 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 Barnsley Local Plan²¹, which was submitted to the Secretary of State on 23 December 2016.

Committed development

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

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

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

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

Ongoing design development

2.1.32 Design development continues on this section of route as further engineering and environmental baseline is collated, including from field surveys, and as part of ongoing consultation and stakeholder engagement. Any further changes resulting

¹⁶ 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

¹⁷ 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

¹⁸ Sheffield City Council, (2009), Sheffield Core Strategy. Available online at: <https://www.sheffield.gov.uk/content/dam/sheffield/docs/planning-and-development/core-strategy/Core-Strategy---adopted-March-2009--pdf--6-55-MB-.pdf>

¹⁹ Sheffield City Council, (1998), Saved policies of the Sheffield Unitary Development Plan. Available online at: <https://www.sheffield.gov.uk/content/sheffield/home/planning-development/sheffield-plan.html>

²⁰ Sheffield City Region (2011), Sheffield City Region Transport Strategy (2011-2026). Available online at: <http://www.syltp.org.uk/strategy.aspx>

²¹ Barnsley Metropolitan Borough Council, (2016), Barnsley Local Plan Publication Draft. Available online at: <https://www.barnsley.gov.uk/services/planning-and-buildings/local-planning-and-development/our-new-local-plan/barnsleys-local-plan/>

from this will be reported in the formal ES. The main areas of design development being considered include:

- refinement of the Staveley IMD design, including size of the depot;
- review of the proposed lengths and heights of viaducts and other river crossing structures and associated replacement floodplain storage areas;
- temporary and permanent utility diversions;
- refinement of the realignment of roads and PRoW crossing the Proposed Scheme;
- refinement of drainage features and highway modifications required for the Proposed Scheme;
- refinement of maintenance access routes and access to balancing ponds;
- additional environmental features required to mitigate likely significant environmental effects;
- accommodation works and crossings of the route to provide for private means of access;
- refinement of construction methods, 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 Staveley to Aston 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-o6. Land also required for construction is described in Section 2.3 and shown on Volume 2: Map Series CT-o5.
- 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.
- 2.2.4 All dimensions in the sections below are approximate.

Overview

- 2.2.5 The Proposed Scheme within the Staveley to Aston area has three main components (as illustrated on Figure 4 and Figure 5):
- the HS2 main line (13.1km in length): continuing from the northern boundary of the Tibshelf to Shuttlewood area (LA10) northwards towards Aston and the boundary with the Ulley to Bramley area (LA12);

- the Staveley spur (8.5km in length): the northern end of the Staveley East cutting, the Staveley spur would diverge from the HS2 main line and continue westwards through the town of Staveley to the Staveley IMD from where it would continue south-westwards to join the Chesterfield to Beighton Railway at Barrow Hill; and
- the Staveley IMD: a maintenance facility and storage area for maintenance equipment and materials such as ballast or rail tracks, located on the former Staveley Chemical Works site.

2.2.6 Each of these components and their key features are set out in the following sections. Where key features are associated with more than one component of the Proposed Scheme, they are described within the section they are first associated with. Where reference is made to the Proposed Scheme, this includes the three components collectively.

2.2.7 This section of route is illustrated on maps CT-o6-631 to CT-o6-643 in the Volume 2: LA11 Map Book.

HS2 main line

2.2.8 In the Staveley to Aston area, the HS2 main line would be carried on the following features:

- viaducts for a total length of 1.9km (M1 motorway North, Nor Wood, Wales Bar and Fiddle Neck viaducts);
- cuttings for a total length of 5km (Mastin Moor, Barlborough, High Wood, Woodall Common, Nor Wood, Wales South, Wales Central, Wales North, Wales Bar, Aston and Hardwick cuttings); and
- embankments for a total length of 6.2km (Woodthorpe, Mastin Moor, Barlborough, High Wood, Woodall, Nor Wood, Wales, Wales Bar South, Wales Bar North, Nicker Wood, Aston South, Aston North and Ulley embankments).

2.2.9 The HS2 main line is described in four separate sections below.

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

Working Draft Environmental Statement Volume 2: LA11

Figure 4: Key permanent features of route of the Proposed Scheme (main line) in the Staveley to Aston area (not to scale)

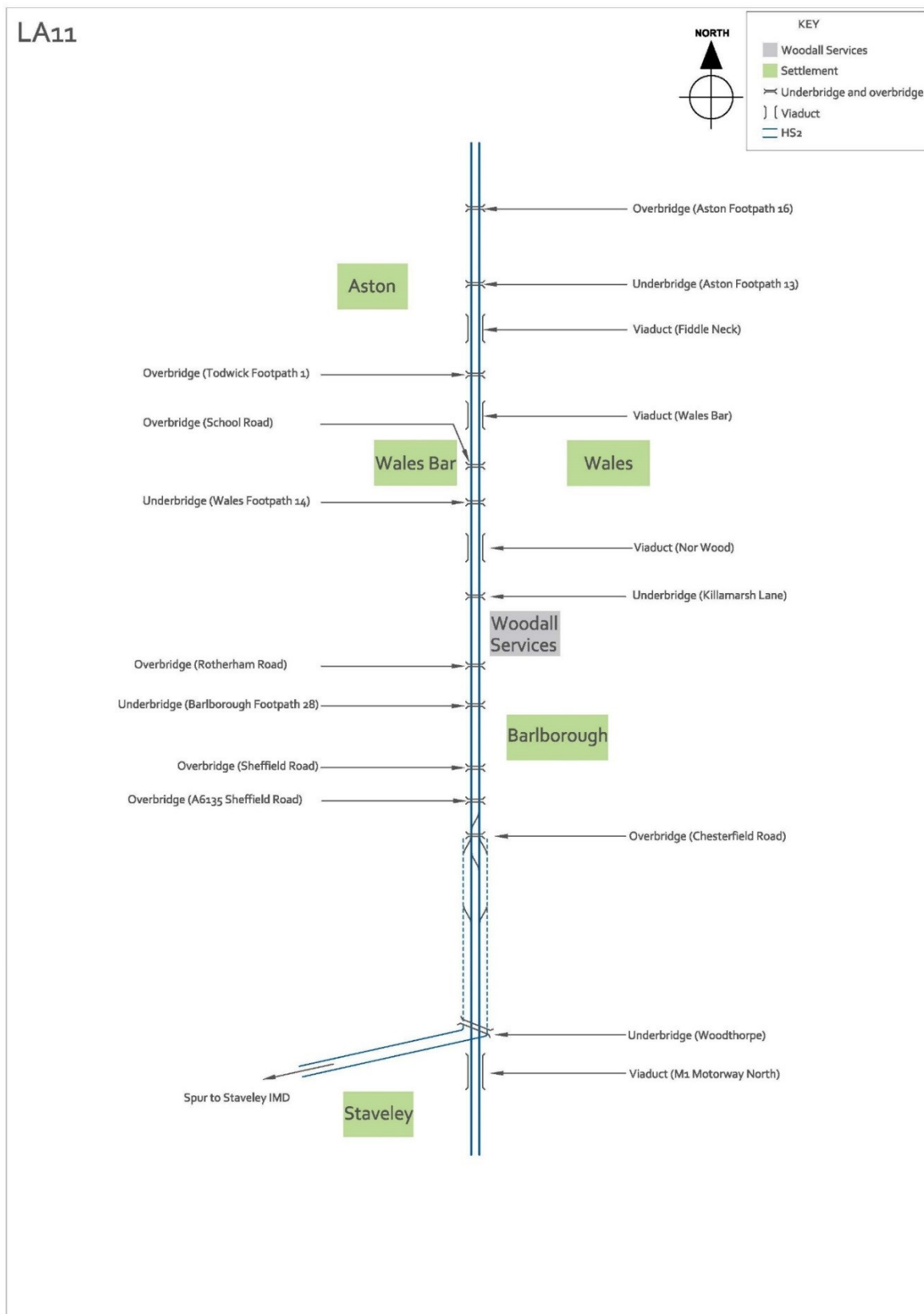
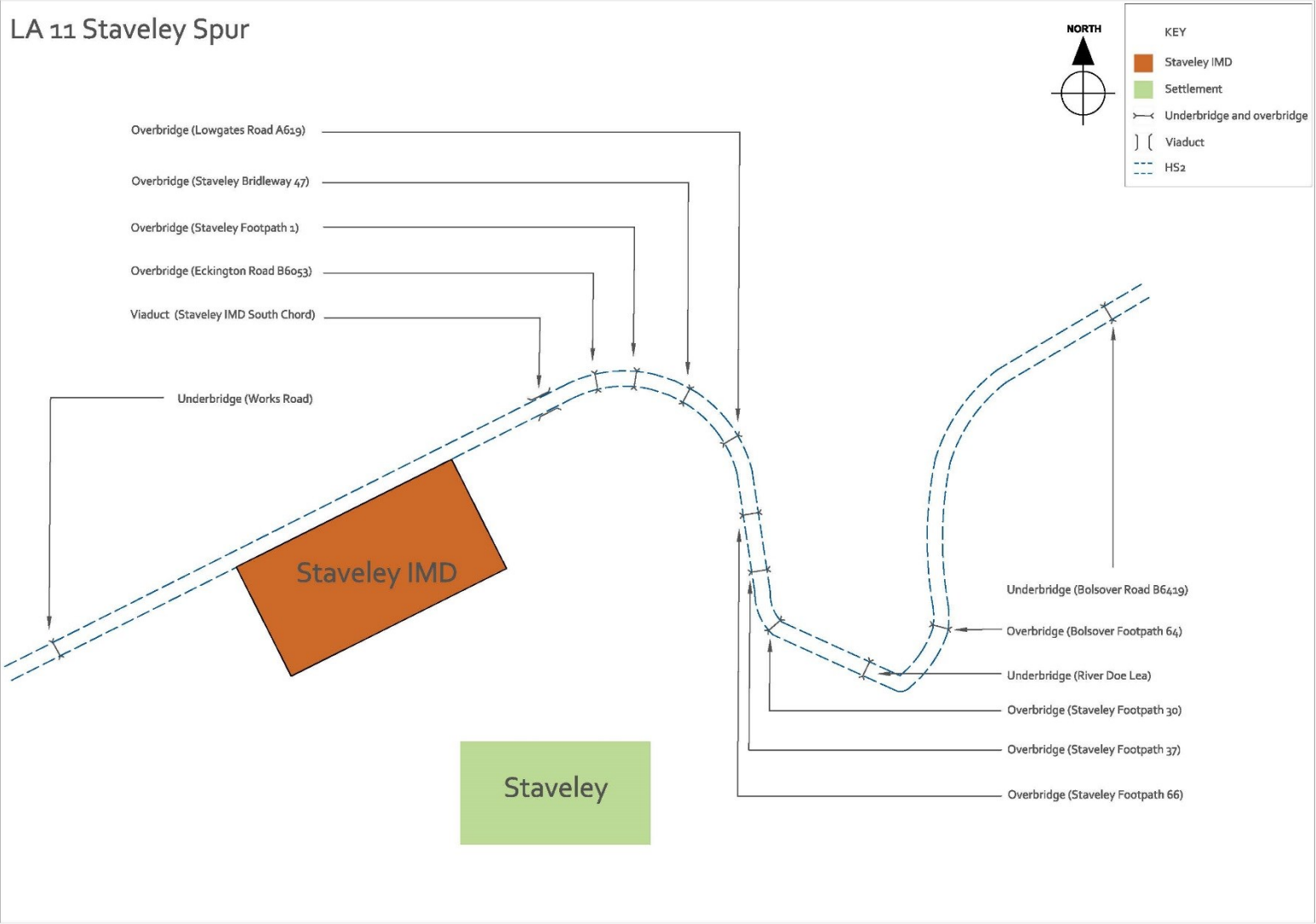


Figure 5: Key permanent features of route of the Proposed Scheme (Staveley spur) in the Staveley to Aston area (not to scale)



M1 motorway North viaduct to High Wood cutting

- 2.2.10 The route of the Proposed Scheme would continue from the Tibshelf to Shuttlewood area (LA10) northwards to the Staveley to Aston area, on the M1 motorway North viaduct, crossing over to the west side of the M1 and continuing north, over Woodthorpe embankment, through Mastin Moor cutting, over Mastin Moor embankment, passing to the west of Barlborough. The route would continue through Barlborough cutting, under the A6135 Sheffield Road overbridge, over Barlborough embankment and through High Wood cutting.
- 2.2.11 This section of route of the Proposed Scheme is illustrated on maps CT-o6-635 to CT-o6-637 in the Volume 2: LA11 Map Book.
- 2.2.12 Key features of this 4.2km section would include:
- M1 motorway North viaduct, 712m in length and up to 40m in height, crossing over the M1, with landscape mitigation planting to the west side of the viaduct to integrate the Proposed Scheme into the surrounding landscape (see Volume 2: Map CT-o6-635, C10 to F8);
 - a replacement floodplain storage area on the east side of the route of the Proposed Scheme with adjacent grassland habitat creation to provide replacement habitat. Following excavation, the area would be re-graded back to tie into existing ground level (see Volume 2: Map CT-o6-635, D9 to E10);
 - realignment of M1 northbound for 500m to accommodate the central pier of the M1 motorway North viaduct (see Volume 2: Map CT-o6-635, D8 to G8);
 - a balancing pond for railway drainage, located 100m east of the route of the Proposed Scheme with access from the Oxcroft Branch disused railway (see Volume 2: Map CT-o6-635, E9 to F10);
 - Woodthorpe embankment, 518m in length and up to 22m in height, with landscape mitigation planting on both sides of the route of the Proposed Scheme, to integrate the Proposed Scheme into the surrounding landscape (see Volume 2: Map CT-o6-635, F8 to G7);
 - Woodthorpe underbridge, 67m in length with a height clearance of 13m with landscape mitigation planting to the west of the route of the Proposed Scheme to integrate the Proposed Scheme into the surrounding landscape (see Volume 2: Map CT-o6-635, G7);
 - Mastin Moor cutting, 1.1km in length, up to 18m in depth and 171m in width with adjacent landscape mitigation planting on the east of the route of the Proposed Scheme, to integrate the Proposed Scheme into the surrounding landscape (see Volume 2: Map CT-o6-635, H7 to CT-o6-636, G6);
 - Staveley no. 1 retaining wall, 1.5km in length and up to 14m above track level on the Staveley spur, to the east of the route of the HS2 main line, to provide structural support to the Woodthorpe embankment (see Volume 2: Map CT-o6-635, H7 to CT-o6-636, G6);

- Staveley no. 2 retaining wall, 1.3km in length and up to 6m above track level on the Staveley spur, to the west of the route of the HS2 main line, to provide structural support to the Woodthorpe embankment (see Volume 2: Map CT-o6-635, H6 to CT-o6-636, G5);
- Romeley Wood inverted siphon, 330m south of the A619 Chesterfield Road for the realignment of a tributary of the River Doe Lea under the route of the Proposed Scheme (see Volume 2: Map CT-o6-636, D6 to D5);
- an area of landscape mitigation planting on the eastern side of the route of the Proposed Scheme to integrate the Proposed Scheme into the surrounding landscape (see Volume 2: Map CT-o6-636, E8 to D7);
- diversion of Barlborough Bridleway 12, 160m west of the existing route of the bridleway, for 110m to the A619 Chesterfield Road, crossing the route of the Proposed Scheme on the Chesterfield Road overbridge (see Volume 2: Map CT-o6-636, E5 to F4);
- Chesterfield Road overbridge, 190m in length, at existing ground level and 14m above track level (see Volume 2: Map CT-o6-636, E5 to F6);
- two areas of woodland habitat creation on the western side of the route of the Proposed Scheme to provide replacement habitat and integrate the Proposed Scheme into the surrounding landscape (see Volume 2: Map CT-o6-636, F5 to J5);
- Mastin Moor embankment, 239m in length and up to 13m in height, with landscape mitigation planting on both sides of the route of the Proposed Scheme to integrate the Proposed Scheme into the surrounding landscape (see Volume 2: Map CT-o6-636, G6 to H6);
- an area of landscape mitigation planting extending westwards from the route of the Proposed Scheme towards Barbers Row, to provide replacement habitat and habitat connectivity (see Volume 2: Map CT-o6-636-L1, H10 to H4);
- Robinson's Lumb culvert, 350m north of Chesterfield Road for the realignment of a tributary of Smithy Brook under the route of the Proposed Scheme (see Volume 2: Map CT-o6-636, H6 to H5);
- Barlborough cutting, 798m in length and up to 16m in depth and 139m in width with adjacent landscape mitigation planting to the east of the route of the Proposed Scheme to integrate the Proposed Scheme into the surrounding landscape. A noise fence barrier, 90m in length and 2m in height, would be installed at the base of the cutting on the eastern side of the Proposed Scheme, extending from 50m north of Sheffield Road continuing onto the Barlborough embankment, to provide acoustic screening to properties in Barlborough (see Volume 2: Map CT-o6-636, H6 to CT-o6-637, D6);

- Barlborough South retaining wall, 58m in length and up to 15m in height above existing ground level, located to the west of the route of the Proposed Scheme to avoid impacts on highways infrastructure from Barlborough cutting (see Volume 2: Map CT-06-637, B6);
- the A6135 Sheffield Road overbridge, 70m in length and up to 16m above track level, and 40m in width (see Volume 2: Map CT-06-637, B6);
- Barlborough North retaining wall, 175m in length and up to 18m in height, located to the east of the route of the Proposed Scheme, to avoid impacts on highways infrastructure from Barlborough cutting (see Volume 2: Map CT-06-637, A6 to C6);
- a balancing pond and associated pumping station for railway drainage, located 100m west of the route of the Proposed Scheme with access from Westfield Lane (see Volume 2: Map CT-06-637, B5 to C4);
- realignment of Westfield Lane in a cutting, 10m to the west of its existing alignment, with landscape mitigation planting to the west of the route of the Proposed Scheme to integrate the Proposed Scheme into the surrounding landscape (see Volume 2: Map CT-06-637, C5 to D5);
- diversion of Barlborough Footpath 36, 100m north-west of the existing alignment for 200m, via the realigned Westfield Lane and crossing the route of the Proposed Scheme on the realigned Sheffield Road overbridge (see Volume 2: Map CT-06-637, C5 to D6);
- Sheffield Road overbridge, 100m in length, at existing ground level and 11m above track level (see Volume 2: Map CT-06-637, D7 to D4);
- realignment of Sheffield Road in a cutting, 50m south of its existing alignment. The realigned Sheffield Road would cross the route of the Proposed Scheme on the Sheffield Road overbridge. The existing Sheffield Road would be closed where it would cross the route of the Proposed Scheme, with access retained to properties on Sheffield Road (see Volume 2: Map CT-06-637, D7 to D3);
- diversion of Barlborough Footpath 6, 350m south-west of its existing alignment, for 400m, which would cross the route of the Proposed Scheme on the Sheffield Road overbridge (see Volume 2: Map CT-06-637, D5 to F4);
- Barlborough embankment, 462m in length and up to 21m in height, with landscape earthworks to the west, and landscape mitigation planting on both sides, of the route of the Proposed Scheme to integrate the Proposed Scheme into the surrounding landscape. Additional woodland habitat would be provided to the west of the route of the Proposed Scheme to provide replacement habitat. A noise fence barrier, 420m in length and 2m in height, would be installed on the eastern side of the embankment to provide acoustic screening to properties in Barlborough (see Volume 2: Map CT-06-637, D6 to G6);

- Ingdale Wood culvert, 400m north of Sheffield Road for the realignment of a tributary of Smithy Brook under the Proposed Scheme (see Volume 2: Map CT-o6-637, F6 to F5); and
- High Wood cutting, 338m in length and up to 16m in depth and 73m in width with adjacent mitigation planting to both sides of the route to integrate the Proposed Scheme into the surrounding landscape and grassland habitat creation to the west to provide replacement habitat (see Volume 2: Map CT-o6-637, G6 to H6).

2.2.13 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.

2.2.14 Construction of this section would be managed from the M1 motorway North viaduct satellite compound, Mastin Moor cutting satellite compound and the Barlborough cutting satellite compound, which are described in Section 2.3, and shown on Maps CT-05-635, CT-05-636 and CT-05-637 in the Volume 2: LA11 Map Book.

High Wood cutting to Killamarsh Lane underbridge

2.2.15 The route of the Proposed Scheme would continue to the west of the M1 from High Wood cutting to the Killamarsh Lane underbridge. The route would then continue north on High Wood embankment, in Woodall Common cutting and on Woodall embankment to Killamarsh Lane underbridge.

2.2.16 This section of route is illustrated on maps CT-o6-637 to CT-o6-639 in the Volume 2: LA11 Map Book.

2.2.17 Key features of this 2.7km section would include:

- High Wood embankment, 1.1km in length and up to 12m in height, with landscape earthworks to the west and landscape mitigation planting on both sides of the route of the Proposed Scheme to integrate the Proposed Scheme into the surrounding landscape. Grassland habitat creation to the west of the route of the Proposed Scheme to provide replacement habitat (see Volume 2: Map CT-o6-637, H6 to CT-o6-638, F5);
- an area of landscape mitigation planting on the eastern side of the route of the Proposed Scheme to integrate the Proposed Scheme into the surrounding landscape (see Volume 2: Map CT-o6-637, I8 to I6);
- Thompson's Holt culvert, 1km north of Sheffield Road for the realignment of a tributary of Smithy Brook under the route of the Proposed Scheme (see Volume 2: Map CT-o6-637, I6 to I5);
- an area of woodland habitat creation, on the western side of the route of the Proposed Scheme, extending from the southern extent of High Wood, to provide replacement habitat and to integrate the Proposed Scheme into the surrounding landscape (see Volume 2: Map CT-o6-637, I5 to J5);

- an area of woodland habitat creation, on the western side of the route of the Proposed Scheme, extending from the northern extent of High Wood, to provide replacement habitat and habitat connectivity, and integrate the Proposed Scheme into the surrounding landscape (see Volume 2: Map CT-o6-638, B1 to E5);
- Hawke Wood culvert, 910m south of the A618 Rotherham Road, for the realignment of a tributary of Smithy Brook under the Proposed Scheme (see Volume 2: Map CT-o6-638, D6 to D5);
- Barlborough auto-transformer station, 49m by 24m, on the eastern side of the route of the Proposed Scheme, 700m south of the A618 Rotherham Road. Access would be provided via an access road from the A618 Rotherham Road to the north (see Volume 2: Map CT-o6-638, D6 to E6);
- Barlborough Footpath 28 underbridge and vertical realignment, 8m in length (see Volume 2: Map CT-o6-638, E5 to E6);
- Woodall Common cutting, 920m in length, up to 22m in depth and 150m in width, with adjacent landscape mitigation planting to the east of the route of the Proposed Scheme, to integrate the Proposed Scheme into the surrounding landscape. There would also be grassland habitat creation to the east and woodland habitat creation to the west of the route of the Proposed Scheme, both providing replacement habitat (see Volume 2: Map CT-o6-638, F5 to CT-o6-639, B5);
- diversion of Barlborough Footpath 25, 350m south of its current alignment for 550m. Users would be diverted to the south along Barlborough Footpath 89, crossing the route of the Proposed Scheme using Barlborough Footpath 28 underbridge (see Volume 2: Map CT-o6-638, G6 to G5);
- realignment of Killamarsh Footpath 47, 100m west of its current alignment for 100m (see Volume 2: Map CT-o6-638, G4);
- the A618 Rotherham Road overbridge, 150m in length, at existing ground level and 17m above track level (see Volume 2: Map CT-o6-638, H6 to H4);
- Woodall Bottoms drop inlet culvert²² 517m south of Killamarsh Lane for the realignment of a tributary of County Dike 1 under the Proposed Scheme, with access from Woodall Services on the M1 (see Volume 2: Map CT-o6-639, B5); and
- Woodall embankment, 710m in length and up to 20m in height, with landscape mitigation planting on both sides, and woodland habitat creation to the west, of the route of the Proposed Scheme, to integrate the Proposed Scheme into the surrounding landscape (see Volume 2: Map CT-o6-639, B5 to F5).

²² A drop inlet culvert comprises a circular pipe or rectangular box culvert, usually with an inlet weir and open stepped 'cascade' on the upstream side to dissipate energy. Drop inlet culverts are used when a watercourse (or dry valley) crosses the route or road in cutting or close to existing ground level.

- 2.2.18 This section of the route would not include any maintenance access points for 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 Woodall Common cutting satellite compound and Barlborough cutting satellite compound, which is described in Section 2.3, and shown on Map CT-05-637 and CT-05-638 in Volume 2: LA11 Map Book.

Killamarsh Lane underbridge to Wales Bar viaduct

- 2.2.20 The route of the Proposed Scheme would continue to the west of the M1 from Killamarsh Lane underbridge to the Nor Wood viaduct, passing to the east of Nor Wood. It would then continue north on Nor Wood embankment and in Nor Wood cutting, onto Wales embankment. It would enter the Wales South cutting, Wales Central cutting and Wales North cutting, past the community of Wales Bar to the west and Wales to the east, onto Wales Bar South embankment, through Wales Bar cutting and onto Wales Bar North embankment and Wales Bar viaduct.
- 2.2.21 This section of route is illustrated on maps CT-06-639 to CT-06-641 in the Volume 2: LA11 Map Book.
- 2.2.22 Key features of this 3.1km section would include:
- Killamarsh Lane underbridge, 21m in length with a height clearance of 11m (see Volume 2: Map CT-06-639, E5);
 - a balancing pond for railway drainage, located 50m west of the route of the Proposed Scheme with access from Killamarsh Lane, with wetland habitat creation around the balancing pond to provide replacement habitat. There would also be landscape mitigation planting to the north of the pond to integrate the Proposed Scheme into the surrounding landscape, and woodland habitat creation to the south of the pond to provide replacement habitat (see Volume 2: Map CT-06-639, E4 to F5);
 - Nor Wood viaduct, 492m in length and up to 24m in height, crossing over a local pond and County Dike tributary with landscape mitigation planting to the west of the route of the Proposed Scheme, to integrate the Proposed Scheme into the surrounding landscape (see Volume 2: Map CT-06-639, F5 to H5);
 - a replacement floodplain storage area on the east side of the route of the Proposed Scheme with adjacent wetland habitat creation to provide replacement habitat. Following excavation, the area would be re-graded back to tie into existing ground level (see Volume 2: Map CT-06-639, F6 to G5);

- diversion of Harthill Bridleway 16a, 50m north of the existing alignment for 200m crossing under the route of the Proposed Scheme at Nor Wood viaduct (see Volume 2: Map CT-o6-639, G6 to G5);
- diversion of Harthill Footpath 18, 50m south of the existing route, connecting into Harthill Bridleway 16a, continuing for 150m crossing under the route of the Proposed Scheme under Nor Wood viaduct (see Volume 2: Map CT-o6-639, G6 to G5);
- a balancing pond and associated pumping station for railway drainage from the Proposed Scheme, located 130m east of the route of the Proposed Scheme, with access from Killamarsh Lane, passing under Nor Wood viaduct. There would also be wetland habitat creation to provide replacement habitat, and landscape mitigation planting around the pond to integrate the Proposed Scheme into the surrounding landscape (see Volume 2: Map CT-o6-639, H6 to H7);
- Nor Wood embankment, 217m in length and up to 14m in height, with landscape earthworks to the east, and slopes graded out to integrate the Proposed Scheme into the surrounding landscape, and landscape mitigation planting on both sides. There would also be additional woodland habitat creation to the west of the route of the Proposed Scheme to provide replacement habitat (see Volume 2: Map CT-o6-639, H5 to I5);
- Nor Wood cutting, 67m in length, up to 6m in depth and 40m in width with adjacent landscape mitigation planting on both sides of the route of the Proposed Scheme to integrate the Proposed Scheme into the surrounding landscape (see Volume 2: Map CT-o6-639, I5 to J5);
- Wales embankment, 878m in length and up to 18m in height, with landscape earthworks to the east, and slopes graded out to integrate the Proposed Scheme into the surrounding landscape and landscape mitigation planting on both sides (see Volume 2: Map CT-o6-640, A6 to F5);
- diversion of Wales Footpath 17, 200m north of its existing alignment for 1km via Wales Footpath 15 and the diverted Wales Footpath 14, crossing under the route of the Proposed Scheme via Wales Footpath 14 accommodation underbridge, with landscape mitigation planting to both sides of the diversion (see Volume 2: Map CT-o6-640 C7 to D6);
- Nor Wood South culvert, 980m south of the B6059 School Road for the realignment of a tributary of County Dike 2 under the Proposed Scheme (see Volume 2: Map CT-o6-640, C7 to C5);
- woodland habitat creation to provide replacement habitat and connectivity to Nor Wood, with grassland habitat creation to provide replacement habitat (see Volume 2: Map CT-o6-640, D2 to G5);

- Nor Wood North culvert, 825m south of the B6059 School Road for the realignment of a tributary of County Dike 3 under the Proposed Scheme (see Volume 2: Map CT-06-640, D6 to D5);
- diversion of Wales Footpath 14, 250m south of its existing alignment for 300m, crossing under the Proposed Scheme via Wales Footpath 14 accommodation underbridge (see Volume 2: Map CT-06-640, D6 to E4);
- Wales Footpath 14 accommodation underbridge, also providing agricultural access, 13m in length (see Volume 2: Map CT-06-640, D6 to D5);
- diversion of Wales Footpath 15, 200m north of its existing alignment for 750m via the diverted Wales Footpath 14, crossing under the Proposed Scheme via Wales Footpath 14 accommodation underbridge, with landscape mitigation planting to both sides of the diversion (see Volume 2: Map CT-06-640, D6 to F6);
- Wales South cutting, 228m in length, up to 11m in depth and 46m in width with adjacent landscape mitigation planting on both sides of the route of the Proposed Scheme to integrate the Proposed Scheme into the surrounding landscape and provide visual screening to properties on Cherry Tree Road (see Volume 2: Map CT-06-640, G5 to I5);
- diversion of Wales Footpath 13, 375m west of the existing alignment of the footpath for 550m via the A618 Mansfield Road and the B6059 School Road (see Volume 2: Map CT-06-640, G2 to H4);
- an area of landscape mitigation planting extending westwards from the route of the Proposed Scheme towards Delves Lane, to provide replacement habitat and habitat connectivity (see Volume 2: Map CT-06-640-L1, H8 to I6);
- Wales Central cutting, 500m in length, up to 11m in depth and 52m in width with adjacent landscape mitigation planting, to the west of the route of the Proposed Scheme, to integrate the Proposed Scheme into the surrounding landscape (see Volume 2: Map CT-06-640, F5 to I5);
- the B6059 School Road overbridge, 22m in length, at existing ground level and 11m above track level (see Volume 2: Map CT-06-640, H5);
- diversion of Wales Footpath 12, 150m west of its existing alignment for 500m east of Waleswood sports cricket ground and the B6059 School Road (see Volume 2: Map CT-06-640, H4 to J5);
- Wales North cutting, 282m in length, up to 11m in depth and 65m in width with adjacent landscape mitigation planting on both sides of the route of the Proposed Scheme, to integrate the Proposed Scheme into the surrounding landscape (see Volume 2: Map CT-06-640 I5 to J5 and CT-06-641, A4 to C4);
- Wales Bar South embankment, 336m in length and up to 7m in height, with landscape earthworks on both sides to create a false cutting, and slopes graded out to integrate the Proposed Scheme into the surrounding landscape. There would also be landscape mitigation planting on both sides of the route

of the Proposed Scheme to integrate the Proposed Scheme into the surrounding landscape and provide visual screening to properties on Cricket Field Lane and Waleswood Way (see Volume 2: Map CT-06-641, B5 to D5);

- woodland habitat creation to the north of existing woodland north-east of Waleswood Industrial Estate to provide replacement habitat and connectivity (see Volume 2: Map CT-06-641, C4 to E4);
- Wales Bar cutting, 83m in length, up to 6m in depth and 38m in width, with adjacent landscape mitigation planting on both sides of the route of the Proposed Scheme to integrate the Proposed Scheme into the surrounding landscape (see Volume 2: Map CT-06-641, D5 to E5);
- Wales Bar North embankment, 48m in length and up to 13m in height, with landscape mitigation planting on both sides of the route of the Proposed Scheme to integrate the Proposed Scheme into the surrounding landscape (see Volume 2: Map CT-06-641, E5); and
- a balancing pond for railway drainage from the Proposed Scheme, located 50m west of the route of the Proposed Scheme with access from Waleswood Road, with wetland habitat creation and landscape mitigation planting around the balancing pond to integrate the Proposed Scheme into the surrounding landscape (see Volume 2: Map CT-06-641, E4).

2.2.23 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.

2.2.24 Construction of this section would be managed from the Woodall Common cutting satellite compound, Nor Wood viaduct satellite compound, Wales South cutting main compound and Wales South embankment satellite compound, which are described in Section 2.3, and shown on Maps CT-05-638, CT-05-639, CT-05-640 and CT-05-641 in Volume 2: LA11 Map Book.

Wales Bar viaduct to Ulley embankment

2.2.25 The route of the Proposed Scheme would continue from Wales Bar viaduct to the west of the M1 over the Nicker Wood embankment. The route would continue to the north on Fiddle Neck viaduct into Aston. The route would continue along Aston South embankment, into Aston South cutting and onto Aston North embankment. The route would continue into Hardwick cutting then onto Ulley embankment, entering the Ulley to Bramley area (LA12), north-east of Aston.

2.2.26 This section of route is illustrated on maps CT-06-641 to CT-06-643 in the Volume 2: LA11 Map Book.

2.2.27 Key features of this 3.1km section would include:

- Wales Bar viaduct, 244m in length and up to 18m in height, crossing over the Sheffield to Worksop Railway and Pigeon Bridge Brook (see Volume 2: Map CT-06-641, E5 to F5);
- a replacement floodplain storage area, south of the Sheffield to Worksop Railway, on the east side of the route of the Proposed Scheme, with adjacent wetland habitat creation to provide replacement habitat. Following excavation, the area would be re-graded back to tie into existing ground level (see Volume 2: Map CT-06-641, E7 to E6);
- a replacement floodplain storage area, north of the Sheffield to Worksop Railway, on the east side of the route of the Proposed Scheme. Following excavation, the area would be re-graded back to tie into existing ground level (see Volume 2: Map CT-06-641, F6);
- a balancing pond for railway drainage from the Proposed Scheme, located 75m west of the route of the Proposed Scheme, with access from Fiddle Neck Lane, with wetland habitat creation and landscape mitigation planting around the balancing pond, to integrate the Proposed Scheme into the surrounding landscape (see Volume 2: Map CT-06-641, F4);
- Nicker Wood embankment, 513m in length and up to 21m in height, (including a small section of cutting) with landscape mitigation planting on both sides of the route of the Proposed Scheme, to integrate the Proposed Scheme into the surrounding landscape (see Volume 2: Map CT-06-641, F5 to I5);
- Aston auto-transformer station, 49m by 24m, on the western side of the route of the Proposed Scheme, 600m south of the A57 Aston Way. Access would be provided via Fiddle Neck Lane (see Volume 2: Map CT-06-641, G5 to G4);
- realignment of Todwick Footpath 15, 50m north of its existing alignment for 200m to meet Todwick Footpath 1 (see Volume 2: Map CT-06-641, G4 to H5);
- Todwick Footpath 1 accommodation overbridge, also providing agricultural access, 27m in length (see Volume 2: Map CT-06-641, G5);
- diversion of Todwick Footpath 1, 50m north of its existing alignment, crossing over the route of the Proposed Scheme via Todwick Footpath 1 accommodation overbridge (see Volume 2: Map CT-06-641, G5);
- Fiddle Neck viaduct, 497m in length and up to 28m in height, crossing over Fiddle Neck pond, a tributary of Pigeon Bridge Brook and the A57 Aston Way. A noise fence barrier, 500m in length and 2m in height, would be installed on the western side of the viaduct to provide acoustic screening to properties in Aston (see Volume 2: Map CT-06-641, I5 to CT-06-642, C6);
- a balancing pond for railway drainage from the Proposed Scheme, located 25m west of the route of the Proposed Scheme with access from the A57 Aston Way, with wetland habitat creation, landscape mitigation planting and woodland habitat creation around the balancing pond to integrate the

Proposed Scheme into the surrounding landscape and provide replacement habitat and connectivity (see Volume 2: Map CT-06-642, B5);

- realignment of the A57 Aston Way, 10m south of its existing alignment in a cutting. The realigned A57 Aston Way would cross the route of the Proposed Scheme under the Fiddle Neck viaduct with landscape mitigation planting on both the north and south sides of the realigned A57 Aston Way, to integrate the road realignment into the surrounding landscape (see Volume 2: Map CT-06-642, B4 to D7);
- a replacement floodplain storage area, on the east side of the route of the Proposed Scheme. Following excavation, the area would be re-graded back to tie into existing ground level. Adjacent wetland habitat creation would provide replacement habitat. (see Volume 2: Map CT-06-642, B6 to C7);
- diversion of the B6067 Worksop Road, 600m west of the existing alignment and 175m west of the Proposed Scheme in a cutting, with landscape mitigation planting, on both sides of the diversion to integrate the B6067 Worksop Road diversion into the surrounding landscape. The existing Worksop Road would be closed where it would cross the route of the Proposed Scheme and retained as access to properties on both the eastern and western sides of the route (see Volume 2: Map CT-06-642, B5 to E3);
- a balancing pond for highway drainage from the Proposed Scheme, located at the junction of the realigned A57 Aston Way and Worksop Road diversion, 75m west of the route of the Proposed Scheme. The pond would be within an area of landscape mitigation planting to integrate the Proposed Scheme into the surrounding landscape (see Volume 2: Map CT-06-642, C5 to C4);
- Aston South embankment, 117m in length and up to 8m in height, with landscape mitigation planting on both sides of the route of the Proposed Scheme to integrate the Proposed Scheme into the surrounding landscape. A noise fence barrier, 100m in length and 2m in height, would be installed on the western side of the embankment to provide acoustic screening to properties in Aston (see Volume 2: Map CT-06-642, C6 to D6);
- Aston cutting, 141m in length, up to 2m in depth and 31m in width, with adjacent landscape mitigation planting on both sides of the route to integrate the Proposed Scheme into the surrounding landscape. Noise fence barriers, 400m in length and 3m in height above rail on the western side, and 340m in length and 2m in height above rail on the eastern side, would be installed along on both sides of the base of the cutting and continue on to Aston North embankment, to provide acoustic screening to properties in Aston (see Volume 2: Map CT-06-642, D6 to E6);
- a balancing pond for highway drainage from the Proposed Scheme, located at the junction of the Worksop Road diversion and the existing B6067 Worksop Road, 300m west of the route of the Proposed Scheme, with grassland habitat creation to the north to provide replacement habitat (see Volume 2: Map CT-06-642, E3);

- Aston North embankment, 836m in length and up to 9m in height, with landscape mitigation planting on both sides of the route of the Proposed Scheme to integrate the Proposed Scheme into the surrounding landscape. Noise fence barriers, 290m in length and 3m in height above rail on the western side, and 230m in length and 2m in height above rail on the eastern side, would be installed along on both sides of the embankment, for part of its length, to provide acoustic screening to properties in Aston (see Volume 2: Map CT-06-642, E6 to I6);
- Aston Footpath 13 underbridge, 8m in length (see Volume 2: Map CT-06-642, E6);
- diversion of Aston Footpath 13, 50m south of its existing alignment for 200m, crossing the Proposed Scheme via Aston Footpath 13 underbridge (see Volume 2: Map CT-06-642, E5 to F6);
- Netherthorpe culvert, 90m north of the existing B6067 Worksop Road for the realignment of an unnamed watercourse under the Proposed Scheme (see Volume 2: Map CT-06-642, F6 to F5);
- diversion of a tributary of Ulley Brook, 100m south of its existing alignment for 100m, to join the unnamed watercourse that crosses the Proposed Scheme at Netherthorpe culvert (see Volume 2: Map CT-06-642, H6);
- diversion of Aston Footpath 20 (including single vehicular access track from Piper Lane), 550m north of its existing alignment for 550m, crossing the route of the Proposed Scheme via Aston Footpath 16 accommodation overbridge (see Volume 2: Map CT-06-642, H5 to J5 and CT-06-643, A5 to C5);
- Hardwick cutting, 529m in length, up to 11m in depth and 85m in width with adjacent landscape mitigation planting on both sides of the route of the Proposed Scheme to integrate the Proposed Scheme into the surrounding landscape (see Volume 2: Map CT-06-642, I6 to CT-06-643 D6);
- Aston Footpath 16 accommodation overbridge, also providing agricultural access, 68m in length (see Volume 2: Map CT-06-643, C6);
- diversion of Aston Footpath 16, 80m north of its existing alignment for 300m, crossing the route of the Proposed Scheme via Aston Footpath 16 accommodation overbridge (see Volume 2: Map CT-06-643, C7 to C4); and
- a section of Ulley embankment, 235m in length and up to 6m in height, continuing into the Ulley to Bramley area (LA12), with landscape earthworks on both sides of the route to integrate the Proposed Scheme into the surrounding landscape (see Volume 2: Map CT-06-643, D6 to F5).

2.2.28 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.

- 2.2.29 Construction of this section would be managed from the Wales Bar South embankment satellite compound, Nicker Wood embankment satellite compound and Aston South embankment satellite compound, which are described in Section 2.3, and shown on Maps CT-05-641 and CT-05-642 in Volume 2: LA11 Map Book.

Staveley spur

- 2.2.30 In the Staveley to Aston area, the Staveley spur would be carried on the following features:
- viaducts for a total length of 423m (Staveley IMD South chord viaduct);
 - cuttings for a total length of 2.7km (Staveley West and Staveley East cuttings);
 - embankments for a total length of 3.8km (Staveley West and Staveley East embankments); and
 - at-grade for a total length of 1.6km (through Staveley IMD to connect with the existing Chesterfield to Beighton Railway).
- 2.2.31 The Staveley spur would diverge from the HS2 main line at a point near the A619 Chesterfield Road, Barlborough. The Staveley spur (southbound) would initially run along the east side of the HS2 main line and Staveley spur (northbound) would initially run along the west side. The Staveley spur would then continue towards the west, passing through the community of Staveley, following the route of an existing disused mineral railway, through the Staveley IMD and connecting into the Chesterfield to Beighton Railway.
- 2.2.32 The Staveley spur is illustrated on maps CT-06-631 to CT-06-635 in the Volume 2: LA11 Map Book.
- 2.2.33 Key features of this 8.5km section would include:
- Staveley East cutting, 1.6km in length, up to 19m in depth and 171m in width (see Volume 2: Map CT-06-635, G7 to CT-06-636 G5);
 - Staveley East embankment, 3.5km in length and up to 23m in height, with landscape mitigation planting on both sides of the route of the Staveley spur, and additional landscape planting to the south, to integrate the Proposed Scheme into the surrounding landscape (see Volume 2: Map CT-06-633, D7 to CT-06-635 G7);
 - realignment of the B6419 Bolsover Road, 75m to the north of its existing alignment for 500m, crossing the route of the Staveley spur via the B6419 Bolsover Road underbridge with landscape mitigation planting on both sides of the realigned road to integrate the Proposed Scheme into the surrounding landscape (see Volume 2: Map CT-06-635, D7 to E3);
 - diversion of Staveley Footpath 28, 50m east of its existing alignment for 500m, where it would reconnect to Staveley Footpaths 27 and 29 via the realigned B6419 Bolsover Road, crossing the Staveley spur via the B6419 Bolsover Road underbridge, and passing underneath the M1 motorway North viaduct (see Volume 2: Map CT-06-635, D5 to F8);

- the B6419 Bolsover Road underbridge, 23m in length with a height clearance of 13m (see Volume 2: Map CT-o6-635, D5);
- diversion of Staveley Footpath 29, 125m north of its existing alignment for 425m, crossing the Staveley spur via the B6419 Bolsover Road underbridge (see Volume 2: Map CT-o6-635, D4 to D6);
- an area of landscape mitigation planting and grassland habitat creation to the east of the Staveley spur to provide replacement habitat and integrate the Proposed Scheme into the surrounding landscape (see Volume 2: Map CT-o6-635, B5 to D8);
- Oxcroft North culvert, 375m north-east of the existing Seymour Link Road for the realignment of Hawke Brook under the Staveley spur (see Volume 2: Map CT-o6-634, H4 to I4);
- an area of grassland habitat creation and wetland habitat creation to the north of the route of the Staveley spur to provide replacement habitat (see Volume 2: Map CT-o6-634, E6 to H5);
- diversion of Bolsover Footpath 64, 100m south of its existing alignment for 750m, crossing the Staveley spur via Bolsover Footpath 64 accommodation overbridge (see Volume 2: Map CT-o6-634, G8 to E6);
- Bolsover Footpath 64 accommodation overbridge, also providing industrial estate access, 63m in length (see Volume 2: Map CT-o6-634, G6);
- Oxcroft South culvert, adjacent to the existing Seymour Link Road for the realignment of Hawke Brook under the Staveley spur (see Volume 2: Map CT-o6-634, G6);
- Seymour culvert, 550m north-west of the existing Seymour Link Road for the realignment of Hawke Brook under the Staveley spur (see Volume 2: Map CT-o6-634, D6);
- a balancing pond for railway drainage from the Proposed Scheme, located 50m east of the Staveley spur with access from Seymour Link Road, with wetland habitat creation to provide replacement habitat (see Volume 2: Map CT-o6-634, D4 to D5);
- an area of grassland habitat creation to the north of the route of the Staveley spur to provide replacement habitat (see Volume 2: Map CT-o6-634, B1 to D5);
- River Doe Lea underbridge, 25m in length with a height clearance of 10m (see Volume 2: Map CT-o6-634, C4);
- realignment of the River Doe Lea, for 375m, to enable the river to cross the route of the Staveley spur at a right angle, and reduce the length of River Doe Lea underbridge and subsequent shading of the watercourse (see Volume 2: Map CT-o6-633, H7 to I8);

- diversion of Staveley Footpath 35, 175m north-west of its existing alignment for 325m, crossing the Staveley spur via Staveley Footpath 30 overbridge (see Volume 2: Map CT-o6-633, H9);
- diversion of a National Grid 275kV overhead electricity line, for 165m in length, to pass over the Staveley spur 15m south-east of the Staveley Footpath 30 overbridge (see Volume 2: Map CT-o6-633, G8);
- Staveley Footpath 30 overbridge and vertical realignment, 39m in length (see Volume 2: Map CT-o6-633, G8);
- Pools Brook drop inlet culvert, 650m south of the existing A619 Lowgates Road for the realignment of Pools Brook watercourse under the Staveley spur (see Volume 2: Map CT-o6-633, E8);
- a replacement floodplain storage area, on the south-western side of the route of the Staveley spur. Following excavation, the area would be re-graded back to tie into existing ground level (see Volume 2: Map CT-o6-633, D9 to E8);
- Staveley Footpath 37 overbridge and vertical realignment, 21m in length (see Volume 2: Map CT-o6-633, D6 to D7);
- Staveley Footpath 66 overbridge and vertical realignment, 20m in length (see Volume 2: Map CT-o6-633, D5);
- Staveley West cutting, 1.1km in length, up to 22m in depth and 77m in width with adjacent landscape mitigation planting to the south-west of the route of the Staveley spur to integrate the Proposed Scheme into the surrounding landscape (see Volume 2: Map CT-o6-633, B2 to D7);
- the A619 Lowgates Road overbridge, 20m in length, up to 6m above existing ground level and 9m above track level (see Volume 2: Map CT-o6-633, C3 to C4);
- diversion of a Severn Trent Water main, for 180m in length, to pass under the Staveley spur 180m south-east of the Staveley Bridleway 47 overbridge (see Volume 2: Map CT-o6-632, I6 to H7);
- a balancing pond for railway drainage located 5m south-west of the Staveley spur with access from Ireland Close (see Volume 2: Map CT-o6-632, H5 to H6);
- diversion of a Severn Trent Water main, for 325m in length, to pass under the Staveley spur 80m south-east of the Staveley Bridleway 47 overbridge (see Volume 2: Map CT-o6-632, H5 to H7);
- diversion of a Yorkshire Water combined sewer, for 200m in length, to pass under the Staveley spur 30m south-east of the Staveley Bridleway 47 overbridge (see Volume 2: Map CT-o6-632, H5 to H7);
- Staveley Bridleway 47 (Trans Pennine Trail) overbridge and vertical realignment, 66m in length (see Volume 2: Map CT-o6-632, H5);

- realignment of Staveley Bridleway 48 (Trans Pennine Trail) 10m to the north of its existing route for 200m, crossing the Staveley spur at Staveley Bridleway 47 overbridge (see Volume 2: Map CT-06-632, G4 to H5);
- realignment of Staveley Footpath 50 (Trans Pennine Trail) 5m north-west of the existing route for 5m, crossing the Staveley spur at Staveley Bridleway 47 overbridge (see Volume 2: Map CT-06-632, H5);
- Staveley Footpath 1 (Cuckoo Way) overbridge and vertical realignment, 32m in length (see Volume 2: Map CT-06-632, G4 to G5);
- the B6053 Eckington Road overbridge, 50m in length on its existing alignment, up to 8m above existing ground level and 8m above track level (see Volume 2: Map CT-06-632, G4 to G5);
- creation of three public realm/replacement community facility areas on both sides of B6053 Eckington Road overbridge, to the south of the Staveley spur, to mitigate against the loss of community areas by providing new areas of public realm along the Chesterfield Canal (see Volume 2: Map CT-06-632, E6 to H5);
- Staveley West embankment, 214m in length and up to 9m in height, with landscape mitigation planting on both sides of the route of the Proposed Scheme, to provide visual screening for the residents of Deepland Close and the B6053 Eckington Road, Staveley (see Volume 2: Map CT-06-632, F4 to G4);
- Staveley IMD South chord viaduct, 423m in length and up to 11m in height, crossing over the River Rother and Hall Lane (see Volume 2: Map CT-06-632, D4 to F4);
- a replacement floodplain storage area on the south-eastern side of Staveley IMD. Following excavation, the area would be re-graded back to tie into existing ground level. Adjacent wetland habitat creation to provide replacement habitat (see Volume 2: Map CT-06-632, D7 to E5);
- realignment of Hall Lane, to lower its vertical alignment by 6m, crossing the route of the Staveley spur at the Staveley IMD South chord viaduct (see Volume 2: Map CT-06-632, C3 to E5);
- areas of landscape mitigation planting, woodland habitat creation and wetland habitat creation on all sides of Staveley IMD to integrate the Proposed Scheme into the surrounding landscape and provide replacement habitat (see Volume 2: Map CT-06-632 E5 to CT-06-631 C4);
- diversion of Staveley Footpaths 11, 14 and 38, 350m north of their existing alignments for 500m, crossing the Staveley spur along Hall Lane under Staveley IMD South chord viaduct (see Volume 2: Map CT-06-631, E4 to J5);
- Barrow Hill retaining wall, 70m in length and up to 7m in height, located north-west of Staveley IMD along the Staveley spur to protect property at Cavendish Place (see Volume 2: Map CT-06-631, E5); and

- Works Road underbridge, 20m in length with a height clearance of 3m (see Volume 2: Map CT-06-631, C4).

2.2.34 This section of the route would not include any maintenance access points for 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.

2.2.35 Construction of this section would be managed from the Staveley East embankment satellite compound, A619 Lowgates Road overbridge satellite compound, Staveley West cutting satellite compound, Staveley IMD South chord viaduct satellite compound and Staveley IMD satellite compound, which are described in Section 2.3 and shown on Maps CT-05-635, CT-05-633 and CT-05-632 in Volume 2: LA11 Map Book.

Staveley IMD

2.2.36 Staveley IMD would be the primary location supporting the delivery of infrastructure maintenance and renewal along the eastern leg of Phase 2b. It would also operate as a base for maintenance for the HS2 railway infrastructure.

2.2.37 The Staveley IMD would be located to the north-west of Staveley and the south of Barrow Hill, between Hall Lane and Works Road on the former Staveley Chemical Works site.

2.2.38 The IMD would occupy 37ha of land. The IMD would be 1.1km in length and 440m in width.

2.2.39 Access from the HS2 main line to the IMD would be via the Staveley spur, utilising a dismantled mineral railway that runs through Staveley. A connection to the existing Chesterfield to Bighton Railway would be provided at the western end of the IMD along with a series of sidings.

2.2.40 The IMD would be 5.5km from the M1 junctions 29A (Duckmanton) and 30 (Barlborough), which could be accessed via the A6192 and the A619, respectively. The primary road access to the IMD would be from Hall Lane, which serves Barrow Hill and other settlements north of the site.

2.2.41 Key features of this section would include:

- Staveley IMD no. 1 retaining wall, 316m in length and up to 7m in height, located to the east of Staveley IMD to provide structural support between the River Rother and the IMD (see Volume 2: Map CT-06-631, G9 to H10);
- Staveley IMD no.2 retaining wall, 143m in length and up to 11m in height, located to the east of Staveley IMD to provide structural support between Hall Lane and the IMD (see Volume 2: Map CT-06-632, D5); and
- Staveley IMD, consisting of the following elements (see Volume 2: Map CT-06-632, E5 to CT-06-631 F6):

- an office building with an area of 2,500m² and up to 13m in height, with 300 car park spaces for IMD staff;
- an infrastructure compound area of 10,200m²;
- a covered maintenance shed capable of handling four 140m length maintenance trains up to 13m in height;
- a main workshop building of 2,400m² and up to 13m in height;
- covered and open storage areas;
- a series of sidings to allow the handling and storage of rail infrastructure replacement materials and on-track machines and maintenance trains;
- two sidings 800m in length serving a ballast storage area;
- storage/laydown area with overhead cranes above two sidings;
- five balancing ponds; and
- a small plant/road vehicle and forklift servicing area of 750m².

Modifications to existing conventional railway

- 2.2.42 To facilitate the connection of the Proposed Scheme to the Chesterfield to Beighton Railway, minor modifications would be required to the existing conventional rail infrastructure at the north-west corner of the Staveley IMD and Barrow Hill sidings.
- 2.2.43 This section of the Proposed Scheme is illustrated on Map CT-06-631, A4 to C4.

Demolitions

- 2.2.44 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.
- 2.2.45 At this stage of the design development, it is anticipated that demolition of 21 residential properties, eight commercial/business properties (including outbuildings) and 23 other structures would be required to construct the Proposed Scheme in the Staveley to Aston 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 Staveley to Aston area. The construction arrangements described in this section provide the basis for the assessment presented in this working draft ES.

- 2.3.2 Land used only for construction purposes would be restored as agreed with the owner of the land and the relevant planning authority once the construction works in that area are complete.
- 2.3.3 Land would be required permanently for the key features of the Proposed Scheme described in Section 2.2.
- 2.3.4 During the construction phase, public roads and PRoW routes would remain open for public use wherever reasonably practicable. Where such routes would cross the Proposed Scheme and require diversion, the alternative road or PRoW crossing the Proposed Scheme would be constructed prior to any closure of existing roads or PRoW wherever reasonably practicable. Where they would cross the Proposed Scheme in proximity to their existing alignment, a temporary alternative alignment may be required. In some instances, diverted or realigned roads or PRoW may need to pass through areas required for construction of the Proposed Scheme. Routes through these areas would be provided where it is safe and reasonably practicable to do so.
- 2.3.5 Volume 1, Section 5 and Section 6 provide details of the permanent features of the Proposed Scheme and typical construction techniques. For the purposes of the environmental assessment, standard construction techniques as provided in Volume 1, Section 6 have been assumed.

Code of Construction Practice

- 2.3.6 All contractors will be required to comply with a Code of Construction Practice (CoCP). In addition, Local Environmental Management Plans (LEMPs) will be produced for each local authority area. The CoCP and LEMPs will be the means of controlling the construction works associated with the Proposed Scheme, and set out monitoring requirements, with the objective of ensuring that the effects of the works on people and the natural environment are reduced insofar as reasonably practicable. The CoCP will contain generic control measures and standards to be implemented throughout the construction process. The LEMPs will set out how the project will adapt and deliver the required environmental and community protection measures within each area through the implementation of specific measures required to control dust and other emissions from activities in the area.
- 2.3.7 In addition, HS2 Ltd has produced a Community Engagement 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

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

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. It will remain a draft document through the Parliamentary process and the CoCP will be finalised by Royal Assent. The CoCP sets out measures to be implemented by the appointed construction contractor.

Overview of the construction process

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

- advance works including: site investigations further to those already undertaken; preliminary mitigation works; preliminary enabling works;
- civil engineering works including: establishment of construction compounds; haul routes, 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:
- 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

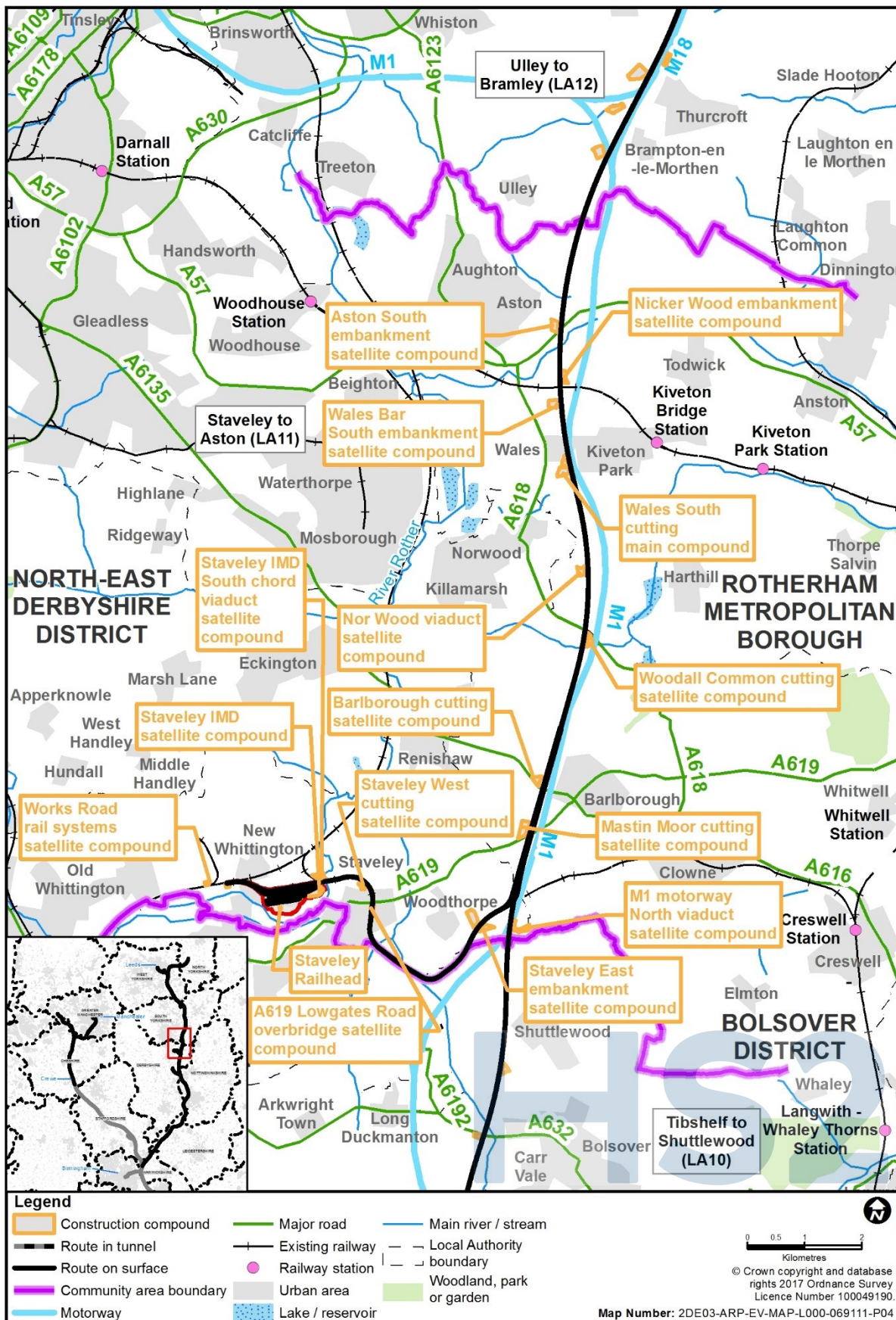
- 2.3.16 Main compounds would be used for core project management staff (i.e. engineering, planning and construction delivery) and commercial and administrative staff. These teams would directly manage some works and coordinate the works at the satellite compounds. In general, a main compound would include:
- 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 Wales South cutting main compound, would be located in the Staveley to Aston area. This would manage 12 civil engineering satellite compounds in the Staveley to Aston area; the M1 motorway North viaduct satellite compound would be managed from the Heath South cutting main compound in the Tibshelf to Shuttlewood area (LA10).
- 2.3.19 Thirteen civil engineering satellite compounds would be located in the Staveley to Aston area. Following the completion of civil engineering works, five of these compounds would continue to be used, along with one additional compound, as railway installation satellite compounds. Staveley railhead would also be used to manage the movement of imported track ballast and railway installation materials, by rail, throughout the eastern leg of the Proposed Scheme. The location of construction compounds in the Staveley to Aston area is shown on Figure 6. Map Series CT-05 (in the Volume 2: LA11 Map Book) show in detail the locations of the construction compounds described below.

High Speed Rail (Crewe to Manchester and West Midlands to Leeds) Working Draft Environmental Statement Volume 2: LA11

Figure 6: Location of construction compounds in the Staveley to Aston area



- 2.3.20 Figure 7 shows the management relationship for civil engineering works compounds and Figure 8 for the railway installation works. Details of the works associated with individual compounds are provided in subsequent sections of this report.
- 2.3.21 In the Staveley to Aston area there would be no worker accommodation required.
- 2.3.22 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-05-201 to CT-05-209, in the Volume 2: LA11 Map Book.
- 2.3.23 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

- 2.3.24 The proposed Staveley railhead would connect with the existing railway network for the delivery of large materials required for the construction of the Proposed Scheme and movement of excavated materials. 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.
- 2.3.25 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 Staveley to Aston area are described in the subsequent sections of this report.
- 2.3.26 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.
- 2.3.27 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-05-631 to CT-05-643 in the Volume 2: LA11 Map Book.

Construction compounds

- 2.3.28 This section provides a summary of the civil engineering works to be managed from the construction compounds in the Staveley to Aston area, as illustrated in Figure 7, and railway systems works as illustrated in Figure 8. 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 7: Construction compounds for civil engineering works

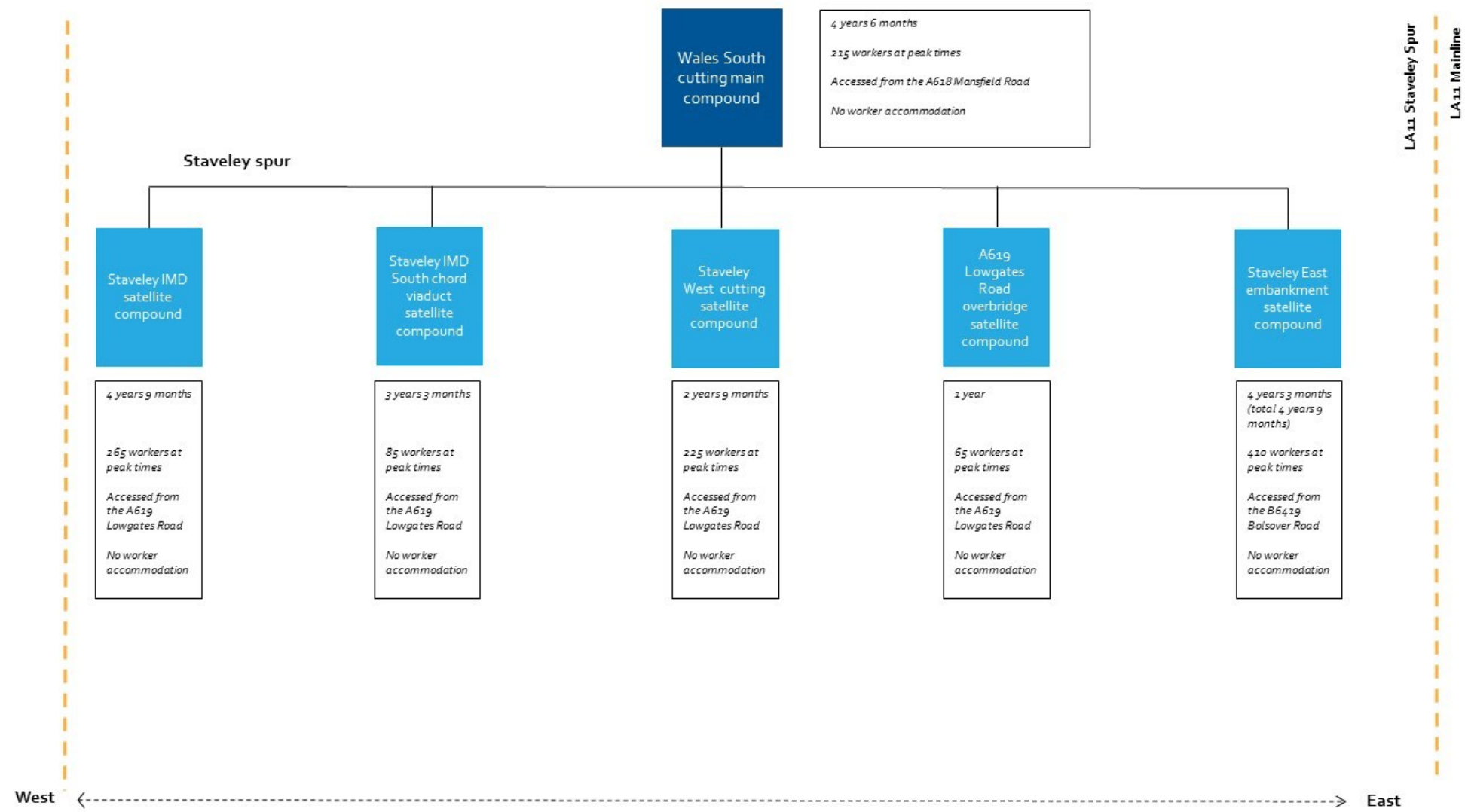
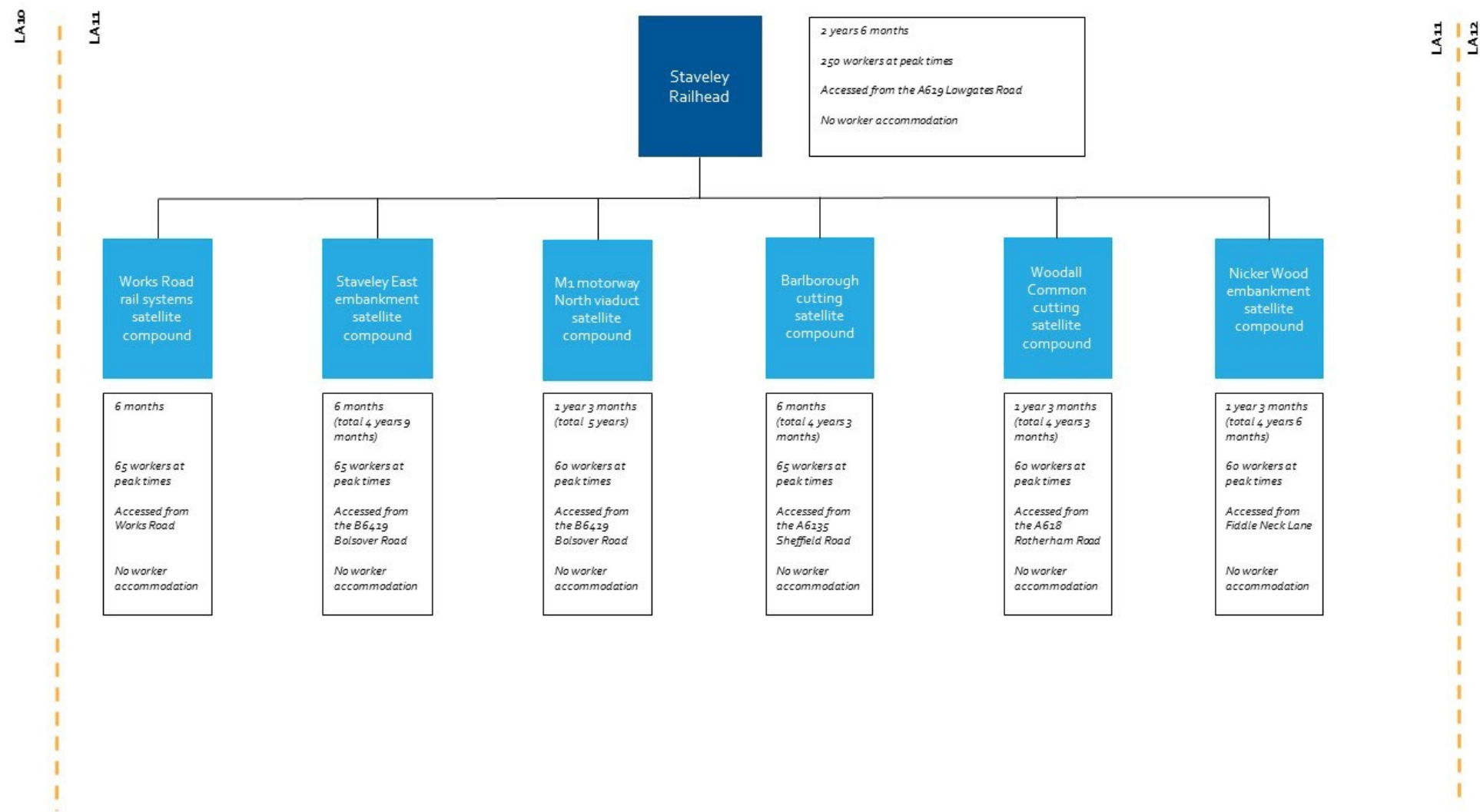


Figure 8: Construction compounds for railway systems works



Wales South cutting main compound

- 2.3.29 This compound would be used to manage civil engineering works and provide main compound support to 12 satellite compounds in the Staveley to Aston area, as illustrated in Figure 7 for the civil engineering works (see Volume 2: Map CT-05-640, F3 to G5) for a period of four years and six months.
- 2.3.30 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 Wales South cutting main compound

Description	Location	Feature resulting in the demolition
Residential		
Three residential properties on School Road	School Road, Wales	Wales Central Cutting

- 2.3.31 The compound would be used to manage the construction of the following bridges and viaducts:
- Nor Wood viaduct and associated earthworks, which would take two years and three months to complete;
 - Wales Footpath 14 accommodation underbridge, which would take six months to complete; and
 - the B6059 School Road overbridge, which would take one year to complete.
- 2.3.32 The compound would be used to manage the construction of the following embankments and cuttings:
- Nor Wood embankment, which would take one year to complete;
 - Nor Wood cutting, which would take three months to complete;
 - Wales embankment, which would take three years to complete;
 - Wales South cutting, which would take three months to complete; and
 - Wales Central cutting, which would take two years to complete.
- 2.3.33 There would be one public highway diversion managed from this compound: the B6059 School Road, is assumed to remain open with traffic controlled single lane working, taking nine months to complete.
- 2.3.34 The works to be managed from this compound would require the following works to PRoW:
- temporary diversion of Harthill Bridleway 16a for a duration of three years, with users diverted 1.6km north, crossing under the route of the Proposed Scheme via Wales Footpath 14 accommodation underbridge. On completion of the works, Harthill Bridleway 16a, would be diverted 50m north of its existing alignment for 200m, crossing the route of the Proposed Scheme under the Nor Wood viaduct;

- temporary diversion of Harthill Footpath 18 for a duration of three years, with users diverted 1.6km north, crossing under the route of the Proposed Scheme via Wales Footpath 14 accommodation underbridge. On completion of the works Harthill Footpath 18, would be diverted 50m south of its existing alignment, connecting into Harthill Bridleway 16a, and continuing for 150m before crossing the route of the Proposed Scheme under the Nor Wood viaduct;
- temporary diversion of Wales Footpath 14 for a period of two years, with users diverted 400m west to connect into Wales Footpath 45. On completion of the works, Wales Footpath 14, would be diverted 250m south of its existing alignment for 300m, crossing under the route of the Proposed Scheme via Wales Footpath 14 accommodation underbridge;
- temporary diversion of Wales Footpath 15 for a duration of three years, with users diverted 300m west to connect into Wales Footpath 45. On completion of the works, Wales Footpath 15, would be diverted 200m north of its existing alignment for 750m, crossing under the route of the Proposed Scheme via Wales Footpath 14 accommodation underbridge;
- temporary diversion of Wales Footpath 17 for a duration of three years, with users diverted 300m west to connect into Wales Footpath 45. On completion of the works, Wales Footpath 17, would be diverted 200m north of its existing alignment for 1km, crossing under the route of the Proposed Scheme via Wales Footpath 14 accommodation underbridge;
- permanent diversion of Wales Footpath 13, 375m west of its existing alignment for 550m crossing over the route of the Proposed Scheme via the A618 Mansfield Road and the B6059 School Road; and
- permanent diversion of Wales Footpath 12, 150m west of its existing alignment for 500m, east of Waleswood sports cricket ground and the B6059 School Road.

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

- Nor Wood South culvert for the diversion of a tributary of County Dike 2, which would take six months to complete; and
- Nor Wood North culvert, for the diversion of a tributary of County Dike 3, which would take six months to complete.

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

M1 motorway North viaduct satellite compound

2.3.37 This compound would be used to manage civil engineering works in the Staveley to Aston area, and in the Tibshelf to Shuttlewood area (LA10), as illustrated in Figure 7 (see Volume 2: Map CT-05-635, E9 to F10), for a period of three years and nine months. On completion of civil engineering works, the compound would remain as a

High Speed Rail (Crewe to Manchester and West Midlands to Leeds)
Working Draft Environmental Statement Volume 2: LA11

satellite compound for railway systems installations works for a period of one year and three months. The works detailed below are those that would be undertaken within the Staveley to Aston area.

- 2.3.38 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 M1 motorway North viaduct satellite compound

Description	Location	Feature resulting in the demolition
Other		
Telecommunications mast and associated infrastructure	Woodthorpe Road, Shuttlewood	M1 motorway North viaduct

- 2.3.39 The compound would be used to manage the construction of the M1 motorway North viaduct, which would take two years to complete.

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

- the M1 Woodthorpe northbound carriageway diversion, for a duration of one year and three months; and
- the B6419 Woodthorpe Road, temporary diversion 50m east of current alignment, for a duration of two years.

- 2.3.41 Key railway systems works to be managed from this compound would include installation of the Shuttlewood auto-transformer station (in the Tibshelf to Shuttlewood area (LA10)), which would take one year and three months to complete.

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

Mastin Moor cutting satellite compound

- 2.3.43 This compound would be used to manage civil engineering works in the Staveley to Aston area, as illustrated in Figure 7 (see Volume 2: Map CT-05-636, E4 to G5).

- 2.3.44 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 Mastin Moor cutting satellite compound

Description	Location	Feature resulting in the demolition
Residential		
Five residential properties on Chesterfield Road	Chesterfield Road, Barlborough	Mastin Moor cutting
Commercial		
Horticultural nursery building	Chesterfield Road, Barlborough	Mastin Moor cutting
Other		
Outbuilding	Chesterfield Road, Barlborough	Mastin Moor cutting

- 2.3.45 The compound would be used to manage the construction of the following bridges and viaducts:
- Woodthorpe underbridge, which would take one year to complete; and
 - the A619 Chesterfield Road overbridge, which would take one year to complete.
- 2.3.46 The compound would be used to manage the construction of the following embankments and cuttings:
- Woodthorpe embankment, which would take three years and three months to complete;
 - Mastin Moor cutting, which would take three years and three months to complete; and
 - Mastin Moor embankment, which would take two years to complete.
- 2.3.47 The compound would manage a 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 B6419 Bolsover Road.
- 2.3.48 There would be five temporary material stockpile areas associated with this compound.
- 2.3.49 There would be one public highway diversion managed from this compound: the A619 Chesterfield Road, temporary diversion of 450m south of existing alignment, for a duration of one year.
- 2.3.50 The works to be managed from this compound would require the following works to PRow:
- permanent diversion of Barlborough Bridleway 12, 160m west of the existing route of the bridleway, for 110m to the A619 Chesterfield Road, crossing the Proposed Scheme over the Chesterfield Road overbridge; and
 - Barlborough Bridleway 12, temporary diversion of 100m south of existing alignment, then using A619 Chesterfield Road to cross the Proposed Scheme, for a duration of three years.
- 2.3.51 The works to be managed from this compound would require the following works to watercourses:
- Romeley Wood inverted siphon, for the diversion of a tributary of the River Doe Lea, which would take six months to complete; and
 - Robinson's Lumb culvert, for the diversion of a tributary of the Smithy Brook, which would take three months to complete.
- 2.3.52 Permanent and temporary utility diversions are anticipated to be required as a result of the works to be managed from this compound.

Barlborough cutting satellite compound

- 2.3.53 This compound would be used to manage civil engineering works in the Staveley to Aston area, as illustrated in Figure 7 (see Volume 2: Map CT-05-637, B5 to C5), for a period of three years and nine months. On completion of civil engineering works, the compound would remain as a satellite compound for railway systems installations works for a period of six months.
- 2.3.54 The works to be managed from this compound would require demolition of the following buildings and structures, as described in Table 4.

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

Description	Location	Feature resulting in the demolition
Residential		
Two residential properties on Westfield Lane	Westfield Lane, Barlborough	Barlborough cutting
Two residential properties on Sheffield Road	Sheffield Road, Barlborough	Barlborough cutting
Commercial		
Haulage depot	A6135 Sheffield Road, Barlborough	Barlborough cutting
Horticultural nursery buildings	Westfield Lane, Barlborough	Barlborough cutting
Other		
Outbuilding	Westfield Lane, Barlborough	Barlborough cutting
Outbuilding	Sheffield Road, Barlborough	Barlborough cutting
Telecommunications mast and associated infrastructure	A6135 Sheffield Road, Barlborough	Barlborough cutting
Telecommunications mast and associated infrastructure	A6135 Sheffield Road, Barlborough	Barlborough cutting

- 2.3.55 The compound would be used to manage the construction of the following bridges and viaducts:
- the A6135 Sheffield Road overbridge, which would take one year and three months to complete; and
 - Sheffield Road overbridge, which would take one year to complete.
- 2.3.56 The compound would be used to manage the construction of the following embankments and cuttings:
- Barlborough cutting, which would take nine months to complete;
 - Barlborough embankment, which would take two years and six months to complete; and
 - High Wood cutting, which would take one year to complete.

- 2.3.57 The compound would manage a 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 A6135 Sheffield Road.
- 2.3.58 There would be two temporary material stockpile areas associated with this compound.
- 2.3.59 The works to be managed from this compound would require the following works to public highways:
- Westfield Lane, permanent diversion 100m west of existing alignment;
 - the A6135 Sheffield Road, temporary localised diversions of varying lengths to accommodate traffic management phasing, for a duration of one year and six months; and
 - Sheffield Road, permanent diversion of 450m south of its existing alignment.
- 2.3.60 The works to be managed from this compound would require the following works to PRow:
- permanent diversion of Barlborough Footpath 36, 100m north-west of its existing alignment for 200m via the realigned Westfield Lane, crossing the route of the Proposed Scheme on the realigned Sheffield Road overbridge;
 - permanent diversion of Barlborough Footpath 6, 350m south-west of its existing alignment for 400m crossing the route of the Proposed Scheme on the Sheffield Road overbridge; and
 - Barlborough Footpath 6, temporary diversion west of the Proposed Scheme, via either Sheffield Road or crossing under the Proposed Scheme at the new Barlborough Footpath 28 underbridge and linking into Barlborough Footpath 20, for a duration of three years.
- 2.3.61 The works to be managed from this compound would require the following works to watercourses:
- Ingdale Wood culvert, for the diversion of a tributary of the Smithy Brook, which would take six months to complete; and
 - Thompson's Holt culvert, for the diversion of a tributary of the Smithy Brook, which would take six months to complete.
- 2.3.62 Key railway systems works to be managed from this compound would include installation of crossovers, which would take six months to complete.
- 2.3.63 Permanent and temporary utility diversions are anticipated to be required as a result of the works to be managed from this compound.

Woodall Common cutting satellite compound

- 2.3.64 This compound would be used to manage civil engineering works in the Staveley to Aston area, as illustrated in Figure 7 (see Volume 2: Map CT-05-638, G6 to H6), for a period of three years. On completion of civil engineering works, the compound would

remain as a satellite compound for railway systems installations works for a period of one year and three months.

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

Table 5: Demolitions required as a result of the works to be managed from the Woodall Common cutting satellite compound

Description	Location	Feature resulting in the demolition
Commercial		
Sewage treatment works and associated infrastructure	Killamarsh Road, Woodall	Woodall embankment
Other		
Telecommunications mast and associated infrastructure	Woodall Common, Mansfield Road, Killamarsh	Woodall Common cutting

- 2.3.66 The compound would be used to manage the construction of the following bridges and viaducts:
- Barlborough Footpath 28 underbridge, which would take six months to complete;
 - the A618 Rotherham Road overbridge, which would take one year to complete; and
 - Killamarsh Lane underbridge, which would take one year to complete.
- 2.3.67 The compound would be used to manage the construction of the following embankments and cuttings:
- High Wood embankment, which would take one year to complete;
 - Woodall Common cutting, which would take one year and three months to complete; and
 - Woodall embankment, which would take one year and three months to complete.
- 2.3.68 There would be four temporary material stockpile areas associated with this compound.
- 2.3.69 There would be one public highway diversion managed from this compound: the A618 Rotherham Road diversion of 550m north of its existing alignment, for a duration of one year.
- 2.3.70 The works to be managed from this compound would require the following works to PRoW:
- permanent vertical realignment of Barlborough Footpath 28 under the Proposed Scheme using Barlborough Footpath 28 underbridge;
 - permanent diversion of Barlborough Footpath 25, 350m south of its current route for 550m. Users would be diverted to the south along Barlborough

Footpath 89 crossing the route of the Proposed Scheme using the underbridge for Barlborough Footpath 28;

- permanent realignment of Killamarsh Footpath 47, 100m west of its current route for 100m;
- Barlborough Footpath 25, temporary diversion of 400m west of the route of the Proposed Scheme using the A618 Rotherham Road to cross the Proposed Scheme, linking into Barlborough Footpath 20 or Barlborough Footpath 24, for a duration of three years;
- Barlborough Footpath 28, temporary diversion of varying length west of the Proposed Scheme using either Sheffield Road or the A618 Rotherham Road to cross the Proposed Scheme, linking into Barlborough Footpath 20 or Barlborough Footpath 24, for a duration of three years; and
- Killamarsh Footpath 47, temporary diversion of 200m west of the Proposed Scheme, for a duration of three years.

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

- Hawke Wood culvert, for the diversion of a tributary of the Smithy Brook, which would take six months to complete; and
- Woodall Bottoms drop inlet culvert, for the diversion of a tributary of the County Dike 1, which would take six months to complete.

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

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

Nor Wood viaduct satellite compound

2.3.74 This compound would be used to manage civil engineering works in the Staveley to Aston area, as illustrated in Figure 7 (see Volume 2: Map CT-05-639, E4 to E5).

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

2.3.76 The compound would be used to manage the construction of Nor Wood viaduct, which would take two years and nine months to complete.

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

Wales Bar South embankment satellite compound

2.3.78 This compound would be used to manage civil engineering works in the Staveley to Aston area, as illustrated in Figure 7 (see Volume 2: Map CT-05-641, D4 to E5).

- 2.3.79 No demolitions would be required as a result of the works to be managed from this compound.
- 2.3.80 The compound would be used to manage the construction of Wales Bar viaduct and associated earthworks, which would take one year and six months to complete.
- 2.3.81 The compound would be used to manage the construction of the following embankments and cuttings:
- Wales North cutting, which would take six months to complete;
 - Wales Bar South embankment, which would take six months to complete;
 - Wales Bar cutting, which would take three months to complete; and
 - Wales Bar North embankment, which would take three months to complete.
- 2.3.82 Permanent and temporary utility diversions are anticipated to be required as a result of the works to be managed from this compound.

Nicker Wood embankment satellite compound

- 2.3.83 This compound would be used to manage civil engineering works in the Staveley to Aston area, as illustrated in Figure 7 (see Volume 2: Map CT-05-641, F6 to G5), for a period of three years and three months. On completion of civil engineering works, the compound would remain as a satellite compound for railway systems installations works for a period of one year and three months.
- 2.3.84 The works to be managed from this compound would require demolition of the following buildings and structures, as described in Table 6.

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

Description	Location	Feature resulting in the demolition
Residential		
Three residential properties on Fiddle Neck Lane	Nicker Wood Farm, Fiddle Neck Lane, Nicker Wood	Nicker Wood embankment

- 2.3.85 The compound would be used to manage the construction of the following bridges and viaducts:
- Wales Bar viaduct and associated earthworks, which would take one year and six months to complete;
 - Todwick Footpath 1 accommodation overbridge, which would take six months to complete; and
 - Fiddle Neck viaduct and associated earthworks, which would take two years and three months to complete.
- 2.3.86 The compound would be used to manage the construction of Nicker Wood embankment, which would take nine months to complete.
- 2.3.87 There would be one public highway diversion managed from this compound: Fiddle Neck Lane, permanent realignment, 50m west of the existing route for 200m.

- 2.3.88 The works to be managed from this compound would require the following works to PRoW:
- permanent diversion of Todwick Footpath 1, 50m north of its existing alignment, crossing over the route of the Proposed Scheme via Todwick Footpath 1 accommodation overbridge;
 - permanent realignment of Todwick Footpath 15, 50m north of its existing alignment, for 200m;
 - Todwick Footpath 1, temporary diversion of 800m north of its existing alignment, for a duration of one year; and
 - Todwick Footpath 15, temporary diversion of 800m north of its existing alignment, for a duration of one year.
- 2.3.89 Key railway systems works to be managed from this compound would include installation of the Aston auto-transformer station, which would take one year and three months to complete.
- 2.3.90 Permanent and temporary utility diversions are anticipated to be required as a result of the works to be managed from this compound.

Aston South embankment satellite compound

- 2.3.91 This compound would be used to manage civil engineering works in the Staveley to Aston area, as illustrated in Figure 7 (see Volume 2: Map CT-05-642, C5 to D4) for a period of three years and six months.
- 2.3.92 The works to be managed from this compound would require demolition of the following buildings and structures, as described in Table 7.

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

Description	Location	Feature resulting in the demolition
Residential		
Two residential properties on Worksop Road	Worksop Road, Aston	Aston North embankment
Commercial		
Equestrian centre on Worksop Road	Worksop Road, Aston	Aston North embankment

- 2.3.93 The compound would be used to manage the construction of the following bridges and viaducts:
- Fiddle Neck viaduct and associated earthworks, which would take two years and three months to complete;
 - Aston Footpath 13 underbridge, which would take nine months to complete; and
 - Aston Footpath 16 accommodation overbridge, which would take nine months to complete.
- 2.3.94 The compound would be used to manage the construction of the following embankments and cuttings:

- Aston South embankment, which would take three months to complete;
- Aston cutting, which would take three months to complete;
- Aston North embankment, which would take one year to complete; and
- Hardwick cutting, which would take nine months to complete.

2.3.95 The compound would manage a 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 A57 Aston Way.

2.3.96 The works to be managed from this compound would require the following works to public highways:

- the A57 Aston Way, permanent realignment 10m south of its existing alignment for 650m;
- the B6067 Worksop Road, permanent diversion 175m west of its existing alignment, for 600m; and
- Piper Lane, permanent realignment, 100m west of its existing alignment for 250m and would be constructed before closing its existing alignment.

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

- permanent diversion of Aston Footpath 13, 50m south of its existing alignment for 200m, crossing the route of the Proposed Scheme via Aston Footpath 13 underbridge;
- permanent diversion of Aston Footpath 20 (including single vehicular access track from Piper Lane), 550m north of its existing alignment for 550m, crossing the route of the Proposed Scheme via Aston Footpath 16 accommodation overbridge; and
- permanent diversion of Aston Footpath 16, 100m north of its existing alignment for 375m, crossing the route of the Proposed Scheme via Aston Footpath 16 accommodation overbridge.

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

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

Staveley East embankment satellite compound

2.3.100 This compound would be used to manage civil engineering works in the Staveley to Aston area, as illustrated in Figure 7 (see Volume 2: Map CT-05-635, C5 to D6 and C4 to E2), for a period of four years and three months. On completion of civil engineering works, the compound would remain as a satellite compound for railway systems installations works for a period of six months.

High Speed Rail (Crewe to Manchester and West Midlands to Leeds)
Working Draft Environmental Statement Volume 2: LA11

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

Table 8: Demolitions required as a result of the works to be managed from the Staveley East embankment satellite compound

Description	Location	Feature resulting in the demolition
Commercial		
Outbuilding associated with automotive recycling business	Milton Place, Staveley	Staveley East embankment
Other		
Underbridge	disused mineral railway, Staveley	Staveley East embankment
Underbridge	Oxcroft Branch Line, Staveley	Staveley East embankment
Pylon	adjacent to Poolsbrook Country Park, Staveley	Staveley East embankment

- 2.3.102 The compound would be used to manage the construction of the following bridges and viaducts:
- the B6419 Bolsover Road underbridge, which would take nine months to complete;
 - Bolsover Footpath 64 accommodation overbridge, which would take nine months to complete;
 - Staveley Footpath 37 overbridge, which would take nine months to complete;
 - River Doe Lea underbridge, which would take one year to complete; and
 - Staveley Footpath 30 overbridge, which would take nine months to complete.
- 2.3.103 The compound would be used to manage the construction of the following embankments and cuttings:
- Staveley East cutting, which would take three months to complete; and
 - Staveley East embankment, which would take two years and six months to complete.
- 2.3.104 There would be two temporary material stockpile areas associated with this compound.
- 2.3.105 There would be one public highway diversion managed from this compound: the B6419 Bolsover Road, permanent realignment of 50m north of its current alignment.
- 2.3.106 The works to be managed from this compound would require the following works to PRoW:
- permanent diversion of Staveley Footpath 28, 50m east of its existing alignment for 500m, where it would reconnect to Staveley Footpaths 27 and 29 via the realigned B6419 Bolsover Road, crossing the route of the Proposed Scheme via the B6419 Bolsover Road underbridge and the M1 motorway North viaduct;

- permanent vertical realignment of Staveley Footpath 37, crossing over the route of the Proposed Scheme via Staveley Footpath 37 overbridge;
- permanent diversion of Staveley Footpath 29, 125m north of its existing alignment for 425m, crossing the route of the Proposed Scheme via the B6419 Bolsover Road underbridge;
- permanent diversion of Bolsover Footpath 64, 100m south of its existing alignment for 750m, crossing the route of the Proposed Scheme via Bolsover Footpath 64 accommodation overbridge;
- permanent vertical realignment of Staveley Footpath 30, crossing over the route of the Proposed Scheme via Staveley Footpath 30 overbridge;
- permanent diversion of Staveley Footpath 35, 175m north-west of its existing alignment for 325m, crossing over the route of the Proposed Scheme via Staveley Footpath 30 overbridge;
- Staveley Footpath 29, temporary diversion of 300m, south of its existing alignment, for a duration of three years; and
- Staveley Footpath 27, temporary diversion of 300m, west of its existing alignment, for a duration of three years.

2.3.107 Bolsover Footpath 64, temporary diversion to the west of its existing alignment for 650m, onto Staveley Footpath 30 to cross the route of the Proposed Scheme into Poolsbrook via Staveley Footpath 30 overbridge, for a duration of three years.

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

- Oxcroft North culvert, for the realignment of Hawke Brook, which would take six months to complete;
- Oxcroft South culvert, for the realignment of Hawke Brook, which would take six months to complete;
- Seymour culvert, for the diversion of Hawke Brook, which would take six months to complete;
- Pools Brook drop inlet culvert, for the diversion of Pools Brook, which would take six months to complete; and
- River Doe Lea realignment would enable the river to run perpendicular to the Staveley spur to reduce the length of the structure and shading of the watercourse.

2.3.109 Key railway systems works to be managed from this compound would include installation of crossovers, which would take six months to complete.

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

A619 Lowgates Road overbridge satellite compound

- 2.3.111 This compound would be used to manage civil engineering works in the Staveley to Aston area, as illustrated in Figure 7 (see Volume 2: Map CT-05-633, C4 to D4).
- 2.3.112 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 A619 Lowgates Road overbridge satellite compound

Description	Location	Feature resulting in the demolition
Commercial		
Sandwich shop	Lowgates Road, Staveley	A619 Lowgates Road overbridge
Other		
Outbuilding	Lowgates Road, Staveley	A619 Lowgates Road overbridge
Outbuilding	Fan Road, Staveley	A619 Lowgates Road overbridge

- 2.3.113 The compound would be used to manage the construction of the following bridges and viaducts:
- the A619 Lowgates Road overbridge, which would take nine months to complete; and
 - Staveley Footpath 66 overbridge, which would take six months to complete.
- 2.3.114 There would be one temporary public highway diversion managed from this compound: the A619 Lowgates Road overbridge, which would take nine months to complete.
- 2.3.115 There would be one PRoW diversion managed from this compound: the permanent vertical realignment of Staveley Footpath 66 over the Proposed Scheme using Staveley Footpath 66 overbridge.
- 2.3.116 Permanent and temporary utility diversions are anticipated to be required as a result of the works to be managed from this compound.

Staveley West cutting satellite compound

- 2.3.117 This compound would be used to manage civil engineering works in the Staveley to Aston area, as illustrated in Figure 7 (see Volume 2: Map CT-05-632, H7 to H5).
- 2.3.118 The works to be managed from this compound would require demolition of the following buildings and structures, as described in Table 10.

Table 10: Demolitions required as a result of the works to be managed from the Staveley West cutting satellite compound

Description	Location	Feature resulting in the demolition
Residential		
Four residential properties on Bellhouse Lane	Bellhouse Lane, Staveley	Staveley West cutting
Other		

High Speed Rail (Crewe to Manchester and West Midlands to Leeds)
Working Draft Environmental Statement Volume 2: LA11

Description	Location	Feature resulting in the demolition
Two outbuildings on Wharf Lane	Wharf Lane, Staveley	Staveley West cutting
Seven outbuildings on Bellhouse Lane	Bellhouse Lane, Staveley	Staveley West cutting

- 2.3.119 The compound would be used to manage the construction of the following bridges and viaducts:
- the B6053 Eckington Road overbridge, which would take nine months to complete;
 - Staveley Bridleway 47 overbridge, which would take nine months to complete; and
 - Staveley Footpath 1 overbridge, which would take nine months to complete.
- 2.3.120 The compound would be used to manage the construction of the following embankments and cuttings:
- Staveley West cutting, which would take one year to complete; and
 - Staveley West embankment, which would take one year and six months to complete.
- 2.3.121 There would be two temporary material stockpile areas associated with this compound.
- 2.3.122 There would be one public highway diversion managed from this compound: the B6053 Eckington Road, with local diversions to suit traffic management phasing, for a duration of three months.
- 2.3.123 The works to be managed from this compound would require the following works to PRoW:
- temporary diversion of Staveley Footpath 1 (Cuckoo Way) for a period of nine months, with users diverted 200m to the east over Staveley Bridleway 47 overbridge. On completion of the Staveley Footpath 1 overbridge, Staveley Footpath 1 (Cuckoo Way) would be reinstated on its current alignment;
 - temporary diversion of Staveley Bridleway 47 (Trans Pennine Trail) for a period of nine months, with users diverted 200m to the west over Staveley Footpath 1 overbridge. On completion of the Staveley Bridleway 47 overbridge, Staveley Bridleway 47 (Trans Pennine Trail) would be reinstated on its current alignment;
 - temporary diversion of Staveley Bridleway 48 (Trans Pennine Trail) for a period of nine months, with users diverted 200m to the west over Staveley Footpath 1 overbridge. On completion of the Staveley Bridleway 47 overbridge, Staveley Bridleway 48 (Trans Pennine Trail) would be reinstated on its current alignment; and
 - temporary diversion of Staveley Footpath 50 (Trans Pennine Trail) for a period of nine months, with users diverted 200m to the west over Staveley Footpath 1 overbridge. On completion of the Staveley Bridleway 47

overbridge, Staveley Footpath 50 (Trans Pennine Trail) would be reinstated on its current alignment.

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

Staveley IMD South chord viaduct satellite compound

- 2.3.125 This compound would be used to manage civil engineering works in the Staveley to Aston area, as illustrated in Figure 7 (see Volume 2: Map CT-05-632, D3 to E4).
- 2.3.126 The works to be managed from this compound would require demolition of the following buildings and structures, as described in Table 11.

Table 11: Demolitions required as a result of the works to be managed from the Staveley IMD South chord satellite compound

Description	Location	Feature resulting in the demolition
Other		
Overbridge	Hall Lane, Staveley	Staveley IMD South chord viaduct

- 2.3.127 The compound would be used to manage the construction of Staveley IMD South chord viaduct and associated earthworks, which would take two years and six months to complete.
- 2.3.128 There would be one public highway diversion managed from this compound; Hall Lane, local diversions to suit traffic management phasing, for a duration of three months.
- 2.3.129 There would be one PRow diversion managed from this compound: Staveley Footpath 4, temporary local diversion, 50m to south of existing, for a duration of one year.
- 2.3.130 Permanent and temporary utility diversions are anticipated to be required as a result of the works to be managed from this compound.

Staveley IMD satellite compound

- 2.3.131 This compound would be used to manage civil engineering works in the Staveley to Aston area, as illustrated in Figure 7 (see Volume 2: Map CT-05-632, C6 to D5).
- 2.3.132 The works to be managed from this compound would require demolition of the following buildings and structures, as described in Table 12.

Table 12: Demolitions required as a result of the works to be managed from the Staveley IMD satellite compound

Description	Location	Feature resulting in the demolition
Commercial		
Building associated with operational railway	Works Road, Staveley	Staveley IMD
Other		
Gantry associated with disused mineral railway	Adjacent to former Staveley Chemical Works, Staveley	Staveley IMD

High Speed Rail (Crewe to Manchester and West Midlands to Leeds)
Working Draft Environmental Statement Volume 2: LA11

Description	Location	Feature resulting in the demolition
Buildings and infrastructure associated with former Staveley Chemical Works	Site of former Staveley Chemical Works, Staveley	Staveley IMD

- 2.3.133 The compound would be used to manage the construction of Works Road underbridge, which would take nine months to complete.
- 2.3.134 The compound would be used to manage the construction of the Staveley IMD earthworks, which would take two years to complete.
- 2.3.135 The compound would be used to manage the construction of Barrow Hill retaining wall, which would take three months to complete.
- 2.3.136 The compound would be used to manage the construction of the following infrastructure associated with Staveley IMD:
- Staveley IMD offices, training and welfare facilities, which would take one year and six months to complete;
 - Staveley IMD workshops and stores, which would take one year and nine months to complete;
 - Staveley IMD maintenance sheds, which would take one year and six months to complete; and
 - Staveley IMD car parking, which would take nine months to complete.
- 2.3.137 The IMD site is located on a former chemical works site, and therefore, would likely require some ground remediation for contaminated soil or the construction of an over capping layer.
- 2.3.138 The works would commence with the major permanent earthworks to bring the site to formation level together with new below ground services, Staveley IMD No. 1 and No. 2 retaining walls and Barrow Hill retaining wall. This would release the piling, foundations and ground slabs for all depot buildings together with the external concrete aprons and slabs.
- 2.3.139 The depot buildings are expected to comprise of simple steel portal frame with a composite panel envelope, all of which would be installed utilising mobile or crawler cranes for relatively short duration works (hence no tower crane). Once the buildings are weather tight, the internal mechanical, electrical and plant (MEP) and building/office fit out would proceed. The ongoing external works would be the construction of the depot access roads followed by all hard and soft landscaping. This would be followed by railway system fit out of the depot.
- 2.3.140 The compound would manage a 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 A619 Lowgates Road.
- 2.3.141 There would be three temporary material stockpile areas associated with this compound.

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

- permanent diversion of Staveley Footpaths 11, 14 and 38, 350m north of their existing alignments for 500m, crossing the route of the Proposed Scheme along Hall Lane and under Staveley IMD South chord viaduct; and
- Staveley Footpaths 11, 14 and 38, temporary diversions of 200m, north of the permanent diversion, for a duration of one year.

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

Works Road rail systems satellite compound

2.3.144 This compound would be used to manage rail systems installation works in the Staveley to Aston area, as illustrated in Figure 7 (see Volume 2: Map CT-05-631, C5 to A3).

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

2.3.146 Key railway systems works to be managed from this compound would include installation of crossovers, which would take six months to complete.

2.3.147 This compound is located outside of the current study area and therefore any impact associated with this compound will be reported in the formal ES.

Ulley embankment satellite compound

2.3.148 This satellite compound (see Map CT-05-462) would be located within the Ulley to Bramley area (LA12). It is described in Volume 2: Community area LA12, Ulley to Bramley. The compound would be used to manage the construction of the 235m section of Ulley embankment within the LA11 area.

Motorway crossing works

2.3.149 The M1 motorway North viaduct crossing west of Oxcroft would be constructed using standard construction techniques. To maintain safe operation of the motorway it would be necessary to undertake the works under traffic management. The construction of the motorway crossings in this area would be coordinated to reduce the overall duration of disruption to the motorway. The traffic management would operate for a period of one year and three months over this length of the M1, and would be likely to include temporary speed restrictions for safety, temporary use of the hard shoulder, and reduced lane widths. Night-time closures are also likely to be required to enable installation of the deck over the carriageways and modifications to motorway signage.

Staveley Railhead

2.3.150 This compound would be located within the northern part of the proposed Staveley IMD site (see Volume 2: Map CT-05-631, D4 to CT-05-632, D5) and would be used to manage the movement of imported track ballast and railway installation materials, by rail, throughout the eastern leg of the Proposed Scheme. It would provide rail systems

support to rail installation works and satellite construction compounds throughout the Proposed Scheme.

- 2.3.151 The compound would be capable of receiving and dispatching trains to/from the existing railway network. Rail deliveries into the railhead would be undertaken during day and night-time hours and at weekends, though unloading would be undertaken during standard working hours, insofar as reasonably practicable.
- 2.3.152 Key railway installation works managed directly from this construction compound would include:
- importation of track and track ballast material;
 - railway installation including track laying, overhead line equipment, communications equipment and traction power supply installation; and
 - commissioning of the Staveley IMD as the permanent facility for maintenance works for the Proposed Scheme.

Construction waste and material resources

- 2.3.153 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.
- 2.3.154 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.
- 2.3.155 Local excess or shortfall of excavated material within the Staveley to Aston 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

- 2.3.156 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

- 2.3.157 A construction programme illustrating indicative periods for each of the core construction activities described above is provided in Figure 9. Construction durations referred to in the following sections of this report are based on this indicative programme.

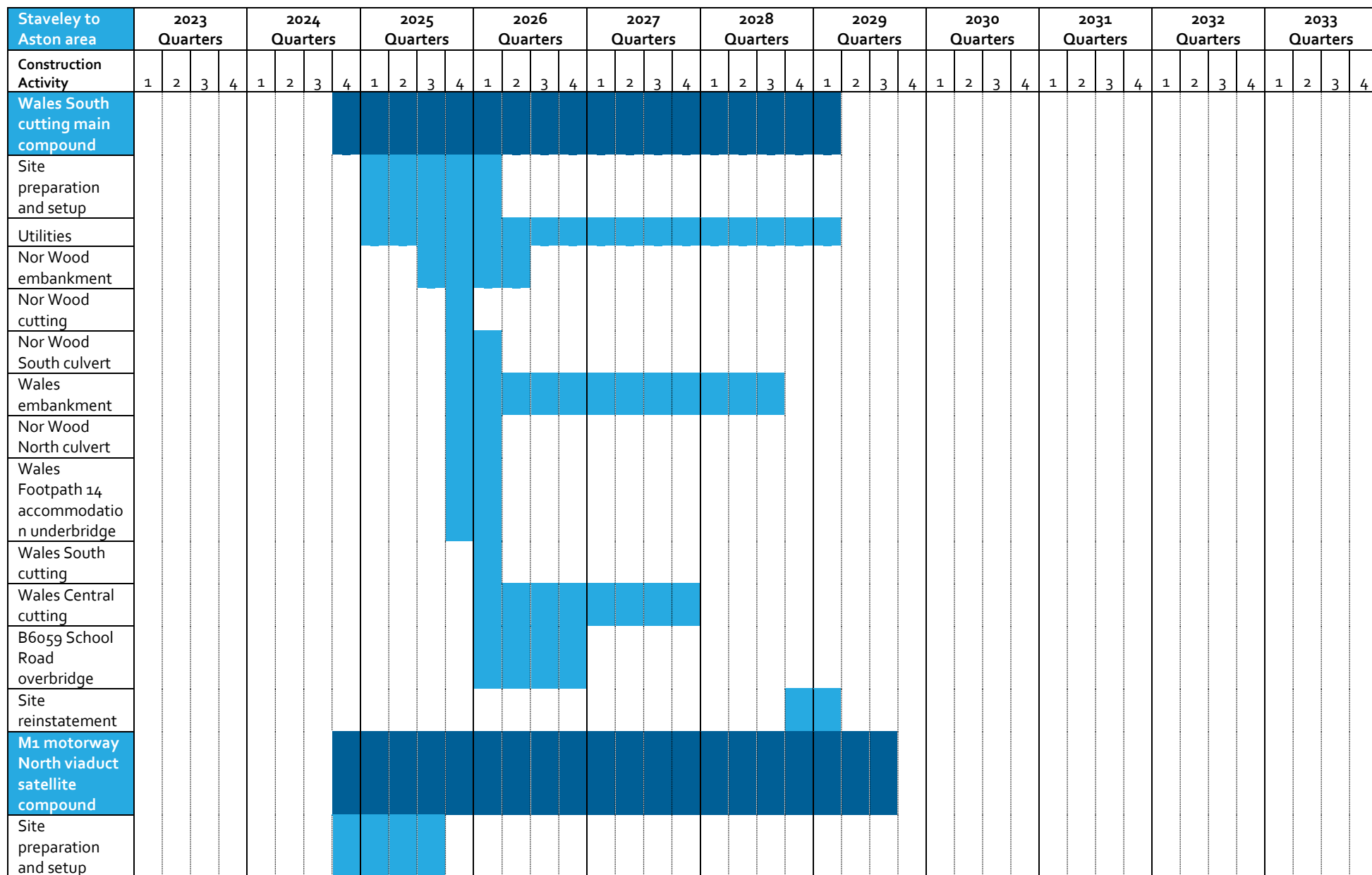
Monitoring during construction

- 2.3.158 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.

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

Figure 9: Indicative construction programme between 2023 and 2033



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2.4 Operation of the Proposed Scheme

Introduction

- 2.4.1 This section describes the operational characteristics of the Proposed Scheme in the Staveley to Aston 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 Staveley to Aston area. Services are expected to operate between 05:00 and midnight from Monday to Saturday and 08:00 and midnight on Sunday.
- 2.4.3 In this area, trains would run at speeds of up to 225mph (360kph). The trains would be either single 200m trains or two 200m trains coupled together, depending on demand and time of day.

Maintenance

- 2.4.4 Volume 1, Section 4 describes the maintenance regime for the Proposed Scheme.
- 2.4.5 Asset performance and condition monitoring would be undertaken using asset condition monitoring and unattended measurement systems fitted to the HS2 passenger rolling stock. Intrusive inspections would be carried out during the maintenance period. The maintenance approach would be a combination of risk based, preventative and reactive maintenance.
- 2.4.6 Provision for railway maintenance vehicles along the eastern leg of the route of the Proposed Scheme would be made at the Staveley IMD depot.

Staveley IMD

- 2.4.7 The facility at Staveley would be the primary location supporting the delivery of infrastructure maintenance and renewal along the eastern leg of Phase 2b, with the facilities at Ashby-de-la-Zouch and Leeds East providing local support at each end of the Phase 2b route.
- 2.4.8 The Staveley IMD would operate 24 hours a day, seven days a week once the Proposed Scheme is operational. The planning, management and preparation for maintenance activities would usually be carried out at the Staveley IMD itself during the daytime. Trackside assets would be maintained during the maintenance periods when passenger services are not operating (midnight to 04:59 Monday to Saturday and midnight to 07:59 on Sundays). For normal maintenance operations, maintenance vehicles would be loaded during the day. Once the passenger service draws to a close, maintenance vehicles would leave the IMD and travel to the area where maintenance would be required. These maintenance vehicles would then return to the Staveley IMD prior to passenger service resuming on the HS2 main line. Volume 1, Section 4 provides further information about the maintenance activities carried out at or from the Staveley IMD.

- 2.4.9 Up to 100 staff would work at the Staveley IMD in three, eight hour shifts during each 24 hour period. The maximum number of staff on site would likely be during the night shift at the start and end of the maintenance periods when 30 to 50 people could be at the Staveley IMD at any time, although peaks of activity and shift handovers could increase these numbers temporarily. Staff access to the site would be from Hall Lane.
- 2.4.10 Supplies would be delivered to the Staveley IMD via road and rail. The majority of heavy materials would arrive by rail, with access via Hall Lane only used for light equipment and spare parts, or if rail transport is not appropriate. HGV access to the Staveley IMD would be from Hall Lane.
- 2.4.11 Lighting would be required for all external working areas of the Staveley IMD, including general circulation areas and walkways, with enhanced lighting to loading areas. The height of lighting installations would be kept as low as practicable to facilitate maintenance and to reduce light pollution. Automatic lighting control systems, complete with photocells and time clocks, would likely be used to operate all external lighting. The external lighting at the Staveley IMD would satisfy the environmental guidance for a 'dark sky' lighting installation. The luminaires and their support systems would also be installed to reduce the visual impact of the lighting installation. LED or low energy lamps would be used for lighting in the external areas to reduce energy consumption.

Operational waste and material resources

- 2.4.12 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.
- 2.4.13 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

- 2.4.14 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.
- 2.4.15 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

- 2.5.1 The strategic, route-wide and route corridor alternatives to the Proposed Scheme and local alternatives considered prior to July 2017 are presented in Volume 1, Introduction and methodology and in Supporting document: Alternatives report. The local alternatives considered for the Proposed Scheme within the Staveley to Aston area since the route announcement in July 2017 are described in this section.

- 2.5.2 In this area, the route of the Proposed Scheme would be carried on viaducts, embankments and in cuttings.
- 2.5.3 As part of the design development process since July 2017, consideration has been given to the impact of the Proposed Scheme on local residents of the Staveley to Aston area, and environmental receptors including: Crabtree Wood Site of Special Scientific Interest (SSSI); Norbriggs Flash Local Nature Reserve; Romeley Wood Ancient Woodland; Pools Brook Country Park; Rother Valley Country Park Local Wildlife Site; Standing Cross Scheduled Monument in Barlborough; Grade I listed Church of All Hallows in Harthill; Grade II listed building at Nickerwood Farmhouse, and the Grade I listed Barlborough Hall.
- 2.5.4 Further consideration will be given to the construction and engineering options in this area, design and construction methods, and alternative engineering options. Further studies are ongoing and will be reported in the formal ES.

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 2a 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 13.

Table 13: Mechanisms and timeline of stakeholder engagement since route announcement

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

Draft EIA SMR consultation

- 3.2.2 The draft EIA SMR was formally consulted on between July and September 2017 and was issued to statutory bodies, non-government organisations and local authorities. It was also available on the Government's website, allowing comment by local interest groups and the public. One hundred and seven responses to the draft EIA 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 equality impact assessment (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 Staveley to Aston 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 Staveley to Aston area since the initial preferred route announcement in November 2016, and which are informing the Proposed Scheme, are:
- temporary and permanent land requirements during construction and operation, including at Cherry Tree Road, Wales;
 - refining the location of balancing ponds and environmental mitigation to reduce the loss of agricultural land;
 - reducing the impact of embankments and viaducts on surface water, minimise flooding and drainage issues at Staveley (including those related to Seymour Link Road) and reducing contaminated land issues at Staveley;
 - provision of access to severed agricultural land, including access under viaducts and the provision of farm access tracks;
 - retention or realignment of PRow in Derbyshire and Rotherham including cycleways and bridleways;

- temporary or permanent changes to road access (including at the B6059 School Road, Wales and the closure and realignment of the B6067 Worksop Road, Aston);
- issues around traffic at junction 30 of the M1 (Barlborough) and at junction 31 of the M1 (Aston) during construction;
- impacts on access to local community educational /care /sporting /leisure/ cultural facilities;
- impacts to local businesses;
- the potential visual impacts on locations including at Staveley, Wales, Wales Bar, Nor Wood, Woodall Pond, Aston Conservation Area and the parkland associated with Aston Hall;
- the potential impacts on ecology assets including at Nor Wood and Locks Local Wildlife Site (LWS), Foers Wood LWS, Nicker Wood, the Rotherham Rivers Corridor (River Rother) and Poolsbrook Country Park²⁴;
- the potential noise impacts that would occur at locations including at Aston, Staveley and Wales;
- the potential severance of communities that would occur during construction and operation including at Wales, Wales Bar and Aston Common;
- the potential impact on community and heritage assets, including at the Parklands Equestrian Centre (Aston), Aston Hall Cricket Club, Grade II listed All Saints Church, Penny Hill Wind Farm²⁵ (and associated community fund), Barrow Hill Conservation Area and Staveley Town Centre Conservation Area;
- consideration of planning policy allocations, consented schemes and development aspirations including for the Staveley Works area, Markham Vale North, Gulliver's Valley and Mastin Moor; and
- potential impacts on the Chesterfield Canal restoration.

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 Staveley to Aston 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. Engagement on the Proposed Scheme has been undertaken with local residents, MPs, elected Members, Derby and Derbyshire Local Access Forum, Rotherham Local Access Forum, Aston cum Aughton and Swallownest HS2 Action Group, Killamarsh and Renishaw HS2

²⁴ Poolsbrook Country Park is located in LA10 but is located in proximity to LA11 and therefore is of relevance to stakeholders in the LA11 area

²⁵ Penny Hill Wind Farm is located within LA12 but is located in proximity to LA11 and therefore is of relevance to stakeholders in the LA11 area

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

Working Draft Environmental Statement Volume 2: LA11

Action Group, Swallownest Scout Group, Barrow Hill Roundhouse, and Banks Group (regarding Penny Hill Wind Farm, Ulley).

- 3.4.2 The purpose of this engagement has been to give affected communities the opportunity to raise issues in relation to the Proposed Scheme. Community stakeholders have been provided with information on the development of the Proposed Scheme, as a basis from which to identify potential impacts and opportunities for mitigation within the local area, reflecting local conditions and issues.
- 3.4.3 Engagement has been, and will continue to be, undertaken with schools and educational establishments, in particular, with those within proximity to the Proposed Scheme and those with specialist interests or catering to the needs of vulnerable people within the community. This has informed the assessment of community and health in the working draft ES, whilst also informing the separate EQIA being undertaken in parallel to the EIA.
- 3.4.4 As part of the consultation process for this working draft ES, public events are being held in communities across the route of the Proposed Scheme. Communities have been notified of these events through a range of publicity, in the community area and also through the www.gov.uk/hs2 website. Documents have been made available online and in community libraries. Members of local communities and other interested parties have been invited to engage on issues pertinent to the working draft ES and the development of the Proposed Scheme design.
- 3.4.5 Table 14 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 14: Engagement to date with community stakeholders

Stakeholder	Area of focus
Sir Kevin Barron MP for Rother Valley	Three constituency surgeries hosted by Sir Kevin Barron MP for Rother Valley (for Aston, Bramley and Wales) to provide constituents with information on the Proposed Scheme, provide support and attempt to resolve their issues (including those related to the blight notice procedure, rural support zone procedure and the use of agents). Provided a briefing to Sir Kevin Barron MP for Rother Valley on the updated design at Aston, Wales, Bramley and Thurcroft which included discussions around construction, road realignments, construction compounds and an alternative route.
Lee Rowley MP for North East Derbyshire	Meetings with Lee Rowley MP (for North East Derbyshire) to discuss a broad range of matters, including issues related to optimising the benefits of the Proposed Scheme for the constituency, and identifying and mitigating potential impacts on local residents and constituents.
Sarah Champion MP for Rotherham	Provision of a project update including parkway and connectivity options.
Bolsover elected members	Briefings held to present the Proposed Scheme and hybrid Bill process to elected members. Discussion around public information events, engagement with directly affected parties and businesses and the updated design. This included access routes, road realignments and the approach to construction.
Chesterfield elected members	Briefing to elected members to discuss the project timescales, public information events, consultation and design changes. This included a discussion around construction compounds, balancing ponds, PRoW and road realignments.
Representatives of the Aston cum Aughton and Swallownest HS2 Action Group	Engagement to provide representatives of the group with an update on next steps and on the hybrid Bill process.

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

Working Draft Environmental Statement Volume 2: LA11

Stakeholder	Area of focus
Killamarsh and Renishaw HS2 Action Group	Engagement to discuss the status of the project and the property schemes available.
Derby and Derbyshire Local Access Forum (LAF)	Engagement to establish relationships with the LAF and discuss any impacts on outdoor recreation, PRoW, and access to the countryside.
Rotherham Local Access Forum (LAF)	Engagement to discuss the EIA process (and the information required to inform it), HS2 policies and standards in terms of access and mitigation, and PRoW. The meeting was also an opportunity for the LAF to share their concerns and raise queries. This engagement was facilitated through Rotherham Metropolitan Borough Council.
Barrow Hill Roundhouse, Staveley	Engagement to provide an update on HS2 within the area and to look at the existing sidings in proximity to the Barrow Hill Roundhouse.
Swallownest Scout Group	Engagement to introduce the Proposed Scheme and associated education and employment opportunities.
Penny Hill Wind Farm (Banks Group)	Engagement to discuss impacts on the Penny Hill Wind Farm and options for mitigation.

Local authorities and parish councils

- 3.4.1 Direct engagement has been undertaken with county, borough, district and parish councils within the Staveley to Aston area. The purpose of this engagement is to collate local baseline information and knowledge to inform the design and assessment, identify and understand local issues and concerns, provide access to wider stakeholders and communities and provide a mechanism for ongoing dialogue and discussion on the assessment and design development.
- 3.4.2 Engagement has focused on the technical areas which inform the assessment including, landscape and visual, sound, noise and vibration and traffic and transport, amongst others topics.
- 3.4.3 Key issues identified during engagement with local authorities and parish councils include those summarised in Table 15.

Table 15: 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 Leaders and Chief Executives. Discussion on needs of LA, including approach to engagement with stakeholders.
	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 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

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

Working Draft Environmental Statement Volume 2: LA11

Stakeholder	Area of focus
	Strategy. Derbyshire County Council shared their aspirations for a main construction compound at Staveley and for an extra train to stop at Chesterfield.
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.
	Discussions about economic impacts of the Proposed Scheme on businesses in this area.
North East Derbyshire District Council	General introductory and project update meetings, including briefings to Council leaders and elected members. Discussion on needs of LA.
	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.
Chesterfield Borough Council	General introductory and project update meetings and discussion on needs of LA.
	Meetings with Discipline Directors and technical engagement meetings 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; sound, noise and vibration; utilities; and waste and material resources
	Meeting to seek information related to planned and committed developments.
	To discuss the Staveley IMD including the HS2 design challenges and the Council's concerns.
	HS2 Ltd is represented at the HS2 Chesterfield and Staveley Delivery Board meetings. HS2 Ltd delivered a presentation on skills and employment which covered the emerging HS2 Skills and Employment Strategy, HS2 Education programme, apprenticeship opportunities and the procurement of contracts. Attendees shared aspirations for a 'HS2 Skills Strategy' and learning facilities associated with the IMD. On a separate occasion, HS2 Ltd delivered a presentation about the engagement being undertaken with local businesses which has included discussions regarding mitigation and relocation options. HS2 Ltd also participated in a visit to the site of the proposed Staveley IMD and Chesterfield Borough Council.
Rotherham Metropolitan Borough Council	General introductory and project update meetings, including briefings to Council leaders. Discussion on the needs of the local authority, approach to engagement with stakeholders, design changes and potential parkway station.
	Meeting with technical leads to collate data and discuss key assessment topics including: air quality; ecology; flood risk; drainage and water; landscape and visual issues; traffic and transport; sound, noise and vibration; utilities; and waste and material resources.
	Meeting with the Rotherham Metropolitan Borough Council Growth Board to provide an update on the Proposed Scheme. The potential parkway station and business opportunities were also discussed.

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

Working Draft Environmental Statement Volume 2: LA11

Stakeholder	Area of focus
	Meeting to seek information related to planned and committed developments
	HS2 Ltd attended a meeting with Barnsley and Rotherham Chamber of Commerce to discuss the potential parkway station, blight and local business concerns. This engagement was facilitated through Rotherham Metropolitan Borough Council.
Chesterfield, North East Derbyshire and Bolsover Parish Councils	Parish councils that would be intersected by the Proposed Scheme were individually contacted and given the opportunity to attend a meeting with HS2 Ltd. The meetings gave councils the opportunity to share information specific to the local area and their ideas and concerns. Parish Councils in this area who agreed to attend a meeting are listed below as well as their areas of focus.
Barlborough Parish Council	Engagement to discuss a range of issues including impacts to local properties, visual, noise, traffic and access impacts, Aspirations for design changes and community facilities were discussed.
Rotherham Parish Councils	Through partnership with Rotherham Metropolitan Borough Council all relevant parish councils were invited to a multi-lateral introduction meeting about the Proposed Scheme. Parishes in this area who subsequently agreed to attend a bi-lateral meeting are listed below as well their areas of focus:
Aston cum Aughton Parish Council	Briefing on project and discussion on local congestion, impacts to the local road network including the A57 and access to M1, and access and impacts to key community facilities such as the Cricket Club, Fisheries, All Saints Church and Fire Station. Provision of information on local community facilities and their usage. Specific discussion on aspirations for the Aston area.
Todwick Parish Council	Briefing on project and discussion on route of Proposed Scheme, including why Sheffield was not included in revised route. Follow up session offered to PC on identifying locations for mitigation and where accessibility and amenities may be impacted.
Wales Parish Council	Briefing on project and discussion on local congestion, impacts to the local road network such as the B6059 and access and impacts to properties, community facilities and businesses. Provision of information on local community facilities and their usage. Specific discussion on aspirations for the Wales area.

3.4.4 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)²⁶.

Expert, technical and specialist groups

3.4.5 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;
- Biological Record Centre;
- British Geological Survey;
- Campaign to Protect Rural England;
- Canal & River Trust;

²⁶ Supporting document: Draft Code of Construction Practice

High Speed Rail (Crewe to Manchester and West Midlands to Leeds)
Working Draft Environmental Statement Volume 2: LA11

- Rotherham and Barnsley Chambers of Commerce;
- Chesterfield Canal Trust;
- Chesterfield Vision Conference;
- Clinical Commissioning Groups;
- Coal Authority;
- Country Land and Business Association;
- D2N2 Local Enterprise Partnership;
- Department for Environment, Food and Rural Affairs;
- Derbyshire Record Office;
- Destination Chesterfield;
- English Heritage;
- Environment Agency;
- Equality and Human Rights Commission;
- Fera Science Ltd;
- Forestry Commission;
- Health and Wellbeing Boards and directors of Public Health;
- Highways England;
- Historic England;
- Homes England;
- HS2 Chesterfield and Staveley Delivery Board (HS2 Ltd is a member of this board);
- Inland Waterways Association;
- Internal Drainage Boards;
- 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/The Wildlife Trusts (Derbyshire Wildlife Trust and Sheffield and Rotherham Wildlife Trust);
- Sheffield and Rotherham and Barnsley Chambers of Commerce;
- Sheffield City Region Local Enterprise Partnership;
- South Yorkshire Mining Advisory Service;
- The Trans Pennine Trail;
- Utility companies relevant to this area; and
- Woodland Trust.

3.4.6 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.

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

Utilities

3.4.8 Engagement is also ongoing with utility companies and statutory stakeholders such as BT Openreach, Cadent, GeneSys, National Grid Transmission (electric), Northern Powergrid, Severn Trent Water, Yorkshire Water, Virgin Media and Western Power Distribution to establish what infrastructure exists in the Staveley to Aston area and how it may need to be modified as part of the Proposed Scheme.

Directly affected individuals, major asset owners and businesses

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

3.4.10 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.

3.4.11 Information gathered from seven 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.

3.4.12 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.

- 3.4.13 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 Staveley to Aston area, information events were held at Best Western Aston Hall Hotel on 5 June 2018 and The Speedwell Room on 11 June 2018. Facilities were available at the events for affected individuals, major asset owners and businesses to have private meetings with HS2 staff.
- 3.4.14 Engagement has been undertaken with major asset owners and businesses including Chesterfield Canal Trust regarding the interface with the canal restoration, and Banks Group to discuss the interface with Penny Hill Wind Farm.
- 3.4.15 Engagement has also been undertaken with Chatsworth Estates to discuss the interface with their strategic development aspirations at Staveley and impacts on their property. In addition, engagement has been undertaken with Rhodia to discuss the interface with their property and ground conditions at Staveley.
- 3.4.16 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 Staveley to Aston 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 Guide²⁷.
- 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: LA11 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)²⁸.
- 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)²⁹ 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

²⁷ 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>

²⁸ Supporting document: HS2 Phase 2b Environmental Impact Assessment Scope and Methodology Report

²⁹ 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 Staveley to Aston 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 Staveley to Aston 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)³⁰. Superficial deposits of alluvium are associated with tributaries of the River Doe Lea, the River Rother and Pools Brook, and comprise gravel, sand, silt and clay. Within a narrow valley to the east of Nor Wood, superficial glacial head deposits overlie the bedrock. These deposits include poorly sorted gravel, sand and clay.

- 4.3.3 The bedrock geology throughout the study area is Carboniferous grey mudstone, siltstone and pale grey sandstone of the Pennine Middle Coal Measures Formation. Coal seams are common.
- 4.3.4 Intersecting the main bedrock unit are elongated deposits of a variant of the Coal Measures which is dominated by sandstone.
- 4.3.5 Across the shallow sloping higher ground to the north of Barlborough is an outcrop of the Cadeby Formation, which is dominated by dolostone, a sedimentary carbonate rock. At the interface between the dolostone and the Pennine Middle Coal Measures Formation to the west, the Cadeby Formation becomes dominated by calcareous mudstone.

Topography and drainage

- 4.3.6 Topography within the Staveley to Aston area is dominated by a series of ridges, rock outcrops and valleys. The highest altitudes in the south of the study area are found west of Barlborough and east of Killamarsh, at around 130m to 140m above Ordnance Datum (AOD). In the north of the study area, from the north of Woodall, the highest altitudes are more commonly around 110m AOD. Slopes throughout are irregular and typically moderate to shallow, up to 7 degrees, though slopes do become steeper within the narrower valleys where gradients may be between 7 and 11 degrees (precluding the land from BMV quality). The valley sides fall to between 80m to 90m AOD.
- 4.3.7 At Staveley, the route of the Proposed Scheme passes mostly through a valley at around 60m AOD; at the westernmost reaches, the land continues to be low-lying, to around 70m AOD, where the landscape has been altered by quarrying and mineral extraction.
- 4.3.8 Drainage of the land within this study area is via a number of streams and rivers which are tributaries of the River Doe Lea. West of Clowne, drainage occurs in narrow valleys that carry water south through Romeley Wood and then westward to the River Doe Lea. To the west of Staveley, the land is low-lying at around 60m AOD and drained by the River Rother and the Chesterfield Canal.
- 4.3.9 To the west and north of Barlborough the land is drained via Smithy Brook and Park Brook respectively.
- 4.3.10 Between Woodall and Nor Wood, water is held in the Woodall Pond and Killamarsh Pond, both associated with County Dyke and its tributaries, which flow in a northerly and westerly direction away from the route of the Proposed Scheme. The route of the Proposed Scheme passes across the Fiddle Neck Pond at Aston, which sits within a

³⁰ British Geological Survey (2018). Geology of Britain viewer. Available online at: <http://mapapps.bgs.ac.uk/geologyofbritain/home.html>

valley also containing the Hepworth Pond; these two ponds are associated with a tributary of Pigeon Bridge Brook. At the north of the Staveley to Aston area, shallow slopes direct water westward to Ulley Brook.

- 4.3.11 The Environment Agency's Flood Map for Planning (rivers and sea)³¹ has been used to scope the baseline risk for flooding from main rivers and ordinary watercourses. The land adjacent to Pigeon Bridge Brook at Wales Bar viaduct is within Flood Zone 3³², within which there is 1% annual probability of flooding. Further details are provided in Section 15, Water resources and flood risk.

Description and distribution of soil types

- 4.3.12 The broad characteristics of the soils likely to be present in the study area are described by the Soil Survey of England and Wales³³ and their general distribution is shown on the National Soil Map³⁴. Soils possessing similar characteristics are amalgamated into associations. There are four known soil associations in this study area which have developed from Carboniferous mudstone. The presence of three of the associations has been confirmed in parts of the study area by published survey data.
- 4.3.13 The most extensive soils in the study area are of the Bardsey association, mapped at Staveley, north-west of Shuttlewood, and from the south-west of Woodall continuing north to Wales. Profiles are characterised by stoneless clay loam or sandy clay loam topsoils overlying grey clay or silty clay subsoils, which may be of Wetness Class³⁵ (WC) III or IV.
- 4.3.14 The second most extensive soils are of the Dale association, mapped south of Barlborough and to the south and north of Wales, and comprise stoneless clay or clay loam topsoil over grey clay subsoil. Profiles of the Dale association are typically poorly drained of WC IV.
- 4.3.15 Profiles characteristic of the Bardsey and Dale associations have been identified in detailed surveys undertaken to the south of Barlborough³⁶. Profiles are mostly of WC IV. Other profiles with similar physical characteristics have been identified, though the slowly permeable layer occurred at greater depth. According with the Bardsey association, this profile variant is of WC II or III.
- 4.3.16 Soils of the Conway association are mapped to the east and west of Staveley, along Pools Brook and River Rother respectively. Conway soils develop in alluvium and comprise profiles of 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.

³¹ Environment Agency (2018). Flood Map for Planning. Available online at: <https://flood-map-for-planning.service.gov.uk/>

³² 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.

³³ 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

³⁴ Cranfield University (2001), *The National Soil Map of England and Wales 1:250,000 scale*. Cranfield University: National Soil Resources Institute

³⁵ 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

³⁶ ADAS (1992). Agricultural Land Classification and Soil Physical Characteristics; Land at Hoodcroft, Derbyshire. Job no: 33/91

- 4.3.17 A small area of soils of the Rivington 1 association is mapped at Aston. Profiles typically comprise sandy loam or sandy silt loam topsoils over sandstone or extremely stony sandy loam subsoil. Profiles are well drained, of WC I, and may be slightly droughty for common agricultural crops. Soils characteristic of this association have also been identified in the detailed surveys undertaken south of Barlborough.
- 4.3.18 From the southern boundary of the study area and extending north to the south-east of Killamarsh, is an elongated strip of soil classified as disturbed. The soil profile characteristics in these areas are likely to be very variable and this area is likely to have been restored to low quality agricultural land.

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 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 droughtiness³⁷ limitations of the land.
- 4.3.22 The local agro-climatic data have been interpolated from the Meteorological Office's standard 5km grid point dataset³⁸ for four representative points within the study area. These data show climate in the area to be cool and moist. The number of field capacity days (FCDs)³⁹, when the moisture deficit⁴⁰ is zero, ranges from 142 to 175 days per annum. This is generally higher than average for lowland England (150 days). Where the FCD regime is fewer than 150 days, as at Aston, the climate is more favourable. Moisture deficits, which give an indication of the liability of soils to droughtiness in summer, are moderate.
- 4.3.23 Site factors include gradient and microrelief⁴¹ which are likely to limit agricultural land quality to Subgrade 3b or potentially Grade 4 in places, particularly within the narrow valleys west of Clowne. Flood risk is also likely to affect agricultural land quality within the River Rother valley at Staveley, and to the north-west of Wales, limiting land quality to Subgrade 3b. Further details are provided in Section 15, Water resources and flood risk.

³⁷ 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

³⁸ Meteorological Office (1989), *Gridpoint Meteorological data for Agricultural Land Classification of England and Wales and other Climatological Investigations*

³⁹ 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.

⁴⁰ 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

⁴¹ 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

- 4.3.24 The main physical limitations which result from interactions between soil, climate and site are soil wetness, soil droughtiness and a potential localised susceptibility to erosion in the sandy Rivington 1 soils. For soil wetness, each soil can be allocated a Wetness Class based on soil structure, evidence of waterlogging and the number of FCDs. The topsoil texture then determines its ALC grade. Soil droughtiness is determined by the moisture retention of different soil textures and thicknesses of each soil horizon, soil structures, stone content and moisture deficits.
- 4.3.25 The most extensive soil types, 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 IV with clay loam or clay topsoil are similarly limited to Subgrade 3b, and those of WC V are limited to ALC Grade 4. The publicly available ALC survey records for land to the south of Barlborough confirm that poorly permeable fine loamy and clayey Bardsey and Dale profiles of WC IV are limited by wetness to Subgrade 3b. Waterlogged soils more characteristic of the Dale association are assessed as Grade 4. The survey records also show Bardsey association profiles in which the slowly permeable layer occurs at greater depth are assessed as WC II or III. With sandy clay loam or silty clay loam topsoils, the profiles are limited by wetness and workability to Grade 2 or Subgrade 3a. Poorly drained alluvial soils developed in valley bottoms are subject to multiple limitations, including wetness, workability, groundwater and flood risk. These soils are likely to be of Subgrade 3b or Grade 4.
- 4.3.26 Well drained, fine- or coarse-loamy soils of the Rivington 1 association are most likely to be affected by soil droughtiness, the severity of which will be determined by factors such as specific stone content and depth to the bedrock. As crop moisture deficits are moderate to moderately small, droughtiness limitations are likely to be slight, limiting soils to Grade 2 or Subgrade 3a.
- 4.3.27 Published survey data for land to the south of Barlborough confirms profiles of sandy loam, sandy silt loam and sandy clay loam, occasionally becoming sandier with depth. Stone content also increases with depth, and sandstone was occasionally encountered within 30cm of the soil surface. These soils are limited slightly by droughtiness to Grade 2.
- 4.3.28 As set out in the SMR, the sensitivity of BMV land in the study area is determined relative to the abundance of such land in the area, set as a 4km corridor centred on the route of the Proposed Scheme and with reference to Department for the Environment, Food and Rural Affairs (Defra) predictive mapping⁴², which shows that there is a moderate likelihood of encountering BMV agricultural land in the locality, which makes such land a resource of medium sensitivity in this study area.
- 4.3.29 The preceding assessment of agricultural land quality attributed to the soil associations is based on publicly and commercially available data and will be

⁴² Defra (2005), *Likelihood of Best and Most Versatile Agricultural Land*

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 England⁴³ and the Government's White Paper, *The Natural Choice: securing the value of nature*⁴⁴, and include:

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

4.3.31 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 Section 11, Landscape and visual.

4.3.32 The floodplains of the River Doe Lea, River Rother, Chesterfield Canal, Smithy Brook, Pools Brook and several ponds occupy land where water has to flow or be stored in times of flood, as set out in Section 15, Water resources and flood risk. The soils and floodplains in this study area function as water stores for flood attenuation, as well as providing ecological habitat.

Land use

Land use description

4.3.33 Agricultural land in the study area is almost exclusively in arable cultivation, in medium to large regularly-shaped fields. There are small pockets of pasture normally associated with beef cattle and equestrian holdings. These can be found west of Barlborough, at Barlborough Hall, around Woodall, west of Wales, and around Aston.

4.3.34 Woodland is found throughout the Staveley to Aston area. In the south of the study area, these include Romeley Wood, Robinson's Lumb, Ingdale Wood and High Wood the latter of which is managed as part of a commercial game bird shoot. Barlborough Park has a number of notable woodlands associated with the remains of the park and gardens. Slightly further north is Nor Wood, a large area of Ancient Woodland Inventory Site and local wildlife site north-east of Killamarsh, various scattered

⁴³ Defra (2009), *Soil Strategy for England*

⁴⁴ HM Government (2011), *The Natural Choice: securing the value of nature*

woodlands associated with Rother Valley Country Park, and woodland planted as part of the restoration of the opencast coal site north of Waleswood Road. There is less woodland in the north of the study area, with the largest woods at Nicker Wood, Aston Park and Spring Wood. Except for High Wood, 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 16.

Number, type and size of holdings

- 4.3.38 Table 16 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 16 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.

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

Working Draft Environmental Statement Volume 2: LA11

Table 16: Summary of characteristics of holdings

Holding name	Holding type	Holding size (ha)	Diversification	Agri-environment scheme	Sensitivity to change
Land east of Woodthorpe Road*	Rough grassland	4	Not known	None	Low
Woodthorpe Hall Farm	Arable	658	None	ELS	Medium
Land south of Worksop Road*	Arable	19	Not known	None	Medium
Windmill House Farm	Arable, pigs, beef cattle, sheep	783	Haulage company, agricultural machinery dealer, waste management, animal feed company, engineering (steel), property	None	Medium
Land at Hawthorns Farm*	Rough grassland	2	Not known	None	Low
Westfield Farm*	Beef cattle and sheep	17	Not known	None	Medium
Springbank Nursery	Horticulture (ornamental - retail)	4	Car boot sale	None	High
Land at Throstle Farm*	Grassland	3	Not known	None	Low
Land farmed by L G K Farms*	Arable	23	Not known	None	Medium
Arrow Farm*	Arable, potatoes	183	Farm shop	None	Medium
Woodlands Farm*	Rough grassland	4	Not known	None	Low
Parkhall Farm	Arable, beef cattle and sheep	393	Shoot, fishing ponds, let dwellings	None	Medium
Carr Farm	Arable and beef cattle	344	None	HLS and CSS	Medium
Poplar Farm	Arable and equestrian (commercial)	66	Haylage and straw business, telephone mast	None	Medium
Park Farm*	Arable	91	Not known	None	Medium
Land west of Woodall*	Grassland	3	Not known	None	Low
Land north of Nor Wood*	Arable and grassland	33	Not known	None	Medium
Land at Spring Field Farm*	Arable	2	Not known	None	Medium

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

Working Draft Environmental Statement Volume 2: LA11

Holding name	Holding type	Holding size (ha)	Diversification	Agri-environment scheme	Sensitivity to change
Wales Grange Farm*	Arable	18	Not known	None	Medium
Land west of Mansfield Road*	Equestrian (non-commercial)	7	Not known	None	Low
Land east of Wales Bar*	Arable	20	Not known	None	Medium
Low Laithes Farm	Arable	515	Bird seed wholesale enterprise, contract farming	None	Medium
Land at Nickerwood Farm*	Equestrian (non-commercial)	11	Not known	None	Low
Parklands Equestrian Centre*	Equestrian (commercial)	18	Equestrian shop	None	Medium
Land north of Worksop Road*	Equestrian (non-commercial)	2	Not known	None	Low
Land north of Aston*	Equestrian (non-commercial), grassland	8	Not known	None	Low
Grange Farm*	Arable	13	Not known	None	Medium
Land at Spring Wood*	Arable	30	Not known	None	Medium

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

4.4 Effects arising during construction

Avoidance and mitigation measures

- 4.4.1 In addition to design features that would be included in the Proposed Scheme to mitigate the impacts on farm holdings, there is a need to avoid or reduce environmental impacts to soils during construction. Soil resources from the areas required temporarily and permanently for the Proposed Scheme would be stripped and stored. This would enable agricultural land that is required temporarily for construction to be returned to agricultural use. It would also enable soils to be returned to other uses, such as to support landscape planting and biodiversity, and to a suitable condition whereby they would be able to fulfil the identified function.
- 4.4.2 Compliance with the Code of Construction Practice (CoCP)⁴⁵ 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:

⁴⁵ Supporting document: Draft Code of Construction Practice

- 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 which will avoid or mitigate adverse impacts on agriculture, forestry or soils:

- Wales Footpath 14 accommodation underbridge to mitigate severance of agricultural land at land north of Nor Wood (see Volume 2: Map CT-06-640);
- Todwick Footpath 1 accommodation overbridge to mitigate severance of Low Laithes Farm (see Volume 2: Map CT-06-641); and
- Aston Footpath 16 accommodation overbridge to mitigate severance of agricultural land at Spring Wood and Spenswood Farm (see Volume 2: Map CT-06-643).

- 4.4.4 The effect of severance of agricultural land at Woodthorpe Hall Farm is also reduced by the ability of agricultural machinery to pass under the M1 motorway North viaduct.
- 4.4.5 As the design develops it will be necessary to continue to assess the requirement for access to severed parcels of agricultural land.
- 4.4.6 Upon completion of construction, it is currently anticipated that soils replaced for agricultural, forestry or landscape uses would be monitored to identify any unsatisfactory growing conditions during the five-year aftercare period.
- 4.4.7 Where agricultural uses are to be resumed on land disturbed during the construction of the Proposed Scheme, the design objective is to avoid any reduction in long term capability, which would downgrade the quality of the disturbed land, through the adoption of good practice techniques in handling, storing and reinstating soils on that land. 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

- 4.4.8 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 design of 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.
- 4.4.9 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

- 4.4.10 Interpretation of publicly available data shows that the Proposed Scheme is likely to require approximately 350ha of agricultural land within the Staveley to Aston area during the construction phase, of which approximately 15ha (4%) are likely to be

classified as BMV land (Grades 2 and 3a). This is a low magnitude of impact on BMV land.

- 4.4.11 As BMV land in this local area is a receptor of medium sensitivity, it is currently anticipated that the likely effect of the Proposed Scheme on BMV land during the construction phase would be minor adverse, which would not be significant.
- 4.4.12 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

- 4.4.13 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.
- 4.4.14 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 Soils⁴⁶. These principles would be followed throughout the construction period.
- 4.4.15 Alluvial, clayey and seasonally waterlogged soils (of 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.
- 4.4.16 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

- 4.4.17 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.
- 4.4.18 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

⁴⁶ Defra (2009), *Construction Code of Practice for the Sustainable Use of Soils on Construction Sites*

High Speed Rail (Crewe to Manchester and West Midlands to Leeds)
Working Draft Environmental Statement Volume 2: LA11

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.

4.4.19 The potential temporary effects from the construction of the Proposed Scheme on individual agricultural and related interests are summarised in Table 17 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.

4.4.20 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 17: Summary of temporary effects on holdings from construction

Holding name/ Sensitivity to change	Land potentially required	Potential severance impact	Potential scale of effect
Land east of Woodthorpe Road Low sensitivity	High	Negligible	Moderate adverse
Woodthorpe Hall Farm Medium sensitivity	Medium	High	Major/moderate adverse
Land south of Worksop Road Medium sensitivity	High	High	Major/moderate adverse
Windmill House Farm Medium sensitivity	Negligible	Negligible	Negligible
Land at Hawthorns Farm Low sensitivity	High	Negligible	Moderate adverse
Westfield Farm Medium sensitivity	High	Negligible	Major/moderate adverse
Springbank Nursery High sensitivity	High	Negligible	Major adverse
Land at Throstle Farm Low sensitivity	High	Negligible	Moderate adverse
Land farmed by L G K Farms Medium sensitivity	High	Negligible	Major/moderate adverse

High Speed Rail (Crewe to Manchester and West Midlands to Leeds)
Working Draft Environmental Statement Volume 2: LA11

Holding name/ Sensitivity to change	Land potentially required	Potential severance impact	Potential scale of effect
Arrow Farm Medium sensitivity	Negligible	Negligible	Negligible
Woodlands Farm Low sensitivity	High	Negligible	Moderate adverse
Parkhall Farm Medium sensitivity	Medium	Medium	Moderate adverse
Carr Farm Medium sensitivity	Low	Negligible	Minor adverse
Poplar Farm Medium sensitivity	High	Negligible	Major/moderate adverse
Park Farm Medium sensitivity	Low	Negligible	Minor adverse
Land west of Woodall Low sensitivity	High	Negligible	Moderate adverse
Land north of Nor Wood Medium sensitivity	High	Negligible	Major/moderate adverse
Land at Spring Field Farm Medium sensitivity	High	Negligible	Major/moderate adverse
Wales Grange Farm Medium sensitivity	High	Negligible	Major/moderate adverse
Land west of Mansfield Road Low sensitivity	High	Negligible	Moderate adverse
Land east of Wales Bar Medium sensitivity	High	Negligible	Major/moderate adverse
Low Laithes Farm Medium sensitivity	Negligible	High	Major/moderate adverse
Land at Nickerwood Farm Low sensitivity	High	Negligible	Moderate adverse
Parklands Equestrian Centre Medium sensitivity	High	Negligible	Major/moderate adverse
Land north of Worksop Road Low sensitivity	High	High	Moderate adverse
Land north of Aston	Negligible	Negligible	Negligible

High Speed Rail (Crewe to Manchester and West Midlands to Leeds)
Working Draft Environmental Statement Volume 2: LA11

Holding name/ Sensitivity to change	Land potentially required	Potential severance impact	Potential scale of effect
Low sensitivity			
Grange Farm	Negligible	Negligible	Negligible
Medium sensitivity			
Land at Spring Wood	High	High	Major/moderate adverse
Medium sensitivity			

- 4.4.21 Overall, the construction of the Proposed Scheme could potentially affect 28 holdings in the Staveley to Aston area temporarily. On the basis of information currently available, 22 would experience moderate, major/moderate or major adverse temporary effects from construction, which would be significant for each holding.
- 4.4.22 The only holding currently anticipated to experience a major adverse temporary effect would be Springbank Nursery, a high sensitivity horticultural enterprise. This is due to the proportion of the holding required during construction.
- 4.4.23 Twelve holdings are anticipated to experience major/moderate adverse temporary effects. The majority of these are arable operations with a high proportion of the holding required for construction. Other holdings with major/moderate adverse temporary effects, including Woodthorpe Hall Farm, Land south of Worksop Road, Low Laithes Farm and Land at Spring Wood would experience high severance impacts.
- 4.4.24 Nine holdings are anticipated to incur moderate adverse temporary effects, mostly due to a large proportion of land required from small holdings.
- 4.4.25 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

- 4.4.26 Interpretation of publicly available data shows that the Proposed Scheme is likely to require approximately 250ha of agricultural land permanently within the Staveley to Aston area, of which approximately 11ha (4%) are likely to be classified as BMV land (Grades 2 and 3a). This is a low magnitude of impact on BMV land.
- 4.4.27 As BMV land in this local area is a receptor of medium sensitivity, it is currently anticipated that the likely effect of the Proposed Scheme on BMV land following construction would be minor adverse, which is not significant.

Impacts on forestry land

- 4.4.28 It is currently anticipated that parts of Robinson's Lumb, High Wood, Nor Wood and Nicker Wood would be required as a result of the Proposed Scheme. High Wood, the only known commercially managed woodland, is part of a game bird shoot at Parkhall Farm. The impact on this resource is primarily relating to a reduced number of drives.

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

Working Draft Environmental Statement Volume 2: LA11

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

- 4.4.29 The potential permanent effects from the construction of the Proposed Scheme on individual agricultural and related interests are summarised in Table 18 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.
- 4.4.30 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 18: 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 east of Woodthorpe Road Low sensitivity	High	Negligible	Negligible	Moderate adverse
Woodthorpe Hall Farm Medium sensitivity	Low	High	Negligible	Major/moderate adverse
Land south of Worksop Road Medium sensitivity	High	High	Negligible	Major/moderate adverse
Windmill House Farm Medium sensitivity	Negligible	Negligible	Negligible	Negligible
Land at Hawthorns Farm Low sensitivity	High	Negligible	Negligible	Moderate adverse
Westfield Farm Medium sensitivity	High	Negligible	Negligible	Major/moderate adverse
Springbank Nursery High sensitivity	High	Negligible	High	Major adverse
Land at Throstle Farm Low sensitivity	High	Negligible	Negligible	Moderate adverse
Land Farmed by L G K Farms Medium sensitivity	High	Negligible	Negligible	Major/moderate adverse
Arrow Farm	Negligible	Negligible	Negligible	Negligible

High Speed Rail (Crewe to Manchester and West Midlands to Leeds)
Working Draft Environmental Statement Volume 2: LA11

Holding name/ Sensitivity to change	Land potentially required	Potential severance impact	Potential impact on farm infrastructure	Potential scale of effect
Medium sensitivity				
Woodlands Farm	High	Negligible	Negligible	Moderate adverse
Low sensitivity				
Parkhall Farm	Medium	Medium	Negligible	Moderate adverse
Medium sensitivity				
Carr Farm	Negligible	Negligible	Negligible	Negligible
Medium sensitivity				
Poplar Farm	Medium	Negligible	Negligible	Moderate adverse
Medium sensitivity				
Park Farm	Low	Negligible	Negligible	Minor adverse
Medium sensitivity				
Land west of Woodall	High	Negligible	Negligible	Moderate adverse
Low sensitivity				
Land north of Nor Wood	High	Negligible	Negligible	Major/moderate adverse
Medium sensitivity				
Land at Spring Field Farm	Negligible	Negligible	Negligible	Negligible
Medium sensitivity				
Wales Grange Farm	Medium	Negligible	Negligible	Moderate adverse
Medium sensitivity				
Land west of Mansfield Road	Negligible	Negligible	Negligible	Negligible
Low sensitivity				
Land east of Wales Bar	High	Negligible	Negligible	Major/moderate adverse
Medium sensitivity				
Low Laithes Farm	Negligible	High	Negligible	Major/moderate adverse
Medium sensitivity				
Land at Nickerwood Farm	High	Negligible	High	Moderate adverse
Low sensitivity				
Parklands Equestrian Centre	High	Negligible	High	Major/moderate adverse
Medium sensitivity				

High Speed Rail (Crewe to Manchester and West Midlands to Leeds)
Working Draft Environmental Statement Volume 2: LA11

Holding name/ Sensitivity to change	Land potentially required	Potential severance impact	Potential impact on farm infrastructure	Potential scale of effect
Land north of Worksop Road Low sensitivity	High	High	Negligible	Moderate adverse
Land north of Aston Low sensitivity	Negligible	Negligible	Negligible	Negligible
Grange Farm Medium sensitivity	Negligible	Negligible	Negligible	Negligible
Land at Spring Wood Medium sensitivity	High	High	Negligible	Major/moderate adverse

- 4.4.31 Overall, the construction of the Proposed Scheme could potentially affect 26 holdings in the Staveley to Aston area permanently. On the basis of information currently available, 20 could experience moderate, major/moderate or major adverse permanent effects from construction, which would be significant for each holding. Two holdings at land at Spring Field Farm and Grange Farm would not experience any permanent effects.
- 4.4.32 It is anticipated that the high sensitivity receptor at Springbank Nursery would continue to experience a major adverse effect due to the proportion of land required and the demolition of the residential property, buildings and infrastructure at the site.
- 4.4.33 Nine holdings are anticipated to experience major/moderate adverse permanent effects. One of these, Parklands Equestrian Centre, is a large commercial equestrian enterprise and is unlikely to continue operating due to the demolition of most of the buildings and the high proportion of the holding required. The high severance impacts at Woodthorpe Hall Farm, land south of Worksop Road, Low Laithes Farm and land at Spring Wood would remain, with the remaining holdings being medium sensitivity arable holdings with a high proportion of the holding required permanently.
- 4.4.34 Ten holdings are anticipated to experience moderate adverse effects from construction, which would be due to medium land required impacts on medium sensitivity holdings, or a high proportion of land required from low sensitivity holdings. The low sensitivity holding at Land at Nickerwood Farm would also experience a high impact due to the demolition of the residential property and buildings.
- 4.4.35 Although financial compensation will be available under existing statutory arrangements, there can be no certainty that this would be used to reduce the above adverse effects by the purchase of replacement land or the construction of replacement buildings. Therefore, the above assessment should be seen as the worst case, which could be reduced if the owner and/or occupier is able, and chooses, to use compensation payments to replace assets.

Other mitigation measures

- 4.4.36 Soils and their associated seed banks from the ancient woodlands would be stored separately and utilised in species translocation.
- 4.4.37 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.
- 4.4.38 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

- 4.4.39 Although the extent of land required permanently by ALC grade is not yet known in the Staveley to Aston area, current indications based on publicly available information are that the effect on BMV agricultural land during construction would be minor adverse both temporarily and permanently during construction, which would not be significant. The amount of land required by ALC grade will be assessed and reported in the formal ES.
- 4.4.40 Twenty-two of the 28 farm holdings identified are anticipated to experience moderate, major/moderate or major adverse temporary effects during construction; with 20 anticipated to experience moderate, major/moderate or major adverse permanent effects from construction, which would be significant for each holding.
- 4.4.41 Effects on forestry land and soils to be disturbed will be reported in the formal ES.

4.5 Effects arising from operation

Avoidance and mitigation measures

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

Assessment of impacts and effects

- 4.5.2 Potential impacts arising from the operation of the Proposed Scheme would include:
- noise emanating from moving trains; and
 - the propensity of operational land to harbour noxious weeds.
- 4.5.3 No livestock farm buildings have been identified within approximately 100m of the route of the Proposed Scheme. The potential for significant effects on sensitive housed 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 Staveley to Aston 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 Staveley to Aston area. Oxides of nitrogen (NO_x) including nitrogen dioxide (NO₂), fine particulate matter⁴⁷ (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), Chesterfield Borough Council (CBC), North East Derbyshire District Council (NEDDC) and Rotherham Metropolitan Borough Council (RMBC) has commenced and is ongoing. The purpose of this engagement has been to obtain relevant baseline information, which includes monitoring data in this area.
- 5.1.3 Maps showing the location of the key environmental features (Map Series CT-10) and the key construction (Map Series CT-05) and key operational (Map Series CT-06) features of the Proposed Scheme are provided in the Volume 2: LA11 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 and the Scope and Methodology Report (SMR)⁴⁸.
- 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 occur⁴⁹:
- from construction;
 - from changes in the nature of traffic during construction and operation; for example, increases in traffic flows during construction or where road closures or restrictions cause diversions and heavier traffic on adjacent roads;
 - where road alignments have changed; or
 - from the operation of combustion plant at buildings.
- 5.2.3 The assessment of construction traffic will be reported in the formal ES. The assessment will incorporate HS2 Ltd's policies on vehicle emissions. These include the use of Euro VI heavy goods vehicles (HGVs), Euro 4 petrol and Euro 6 diesel cars and light goods vehicles (LGVs) during construction of the Proposed Scheme.

⁴⁷ 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.

⁴⁸ Supporting document: HS2 Phase 2b Environmental Impact Assessment Scope and Methodology Report

⁴⁹ The assessment of construction dust emissions has been undertaken where sensitive receptors are located up to a distance of 350m from dust generating activities. The assessment of traffic emissions will be undertaken where sensitive receptors are located up to a distance of 200m from roads screened in for further assessment.

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

5.3 Environmental baseline

Existing baseline

Background air quality

- 5.3.1 The main sources of air pollution in the Staveley to Aston area are emissions from road vehicles and agricultural activities. Major roads include the M1, the A6192 Fan Road, the A619 Chesterfield Road, the A616 Oxcroft Way, the A6135 Sheffield Road, the A618 Mansfield Road, the A57 Worksop Road, the B6419 Bolsover Road, the B6067 Worksop Road and the B6463 Todwick Road.
- 5.3.2 There are no industrial installations (regulated by the Environment Agency) with permits for emissions to air within the Staveley to Aston area. 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)⁵⁰ for the baseline year of 2017, for the Proposed Scheme. These 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 Staveley to Aston area.

Local monitoring data

- 5.3.4 There is currently one local authority continuous monitoring site located within the Staveley to Aston area. This site is located within Wales, on the B6059 School Road. Measured concentrations in 2016 exceeded both the short and long term NO₂ air quality standards⁵¹.
- 5.3.5 There are currently 11 local authority diffusion tube sites located within the Staveley to Aston area for monitoring long-term NO₂ concentrations. Measured concentrations in 2016 were within the air quality standard with the exception of one site, located at Wales primary school.

Air quality management areas

- 5.3.6 There are three Air Quality Management Areas (AQMAs) within the Staveley to Aston area, namely Barlborough AQMA No. 1, Barlborough AQMA No.2 and Rotherham

⁵⁰ Department for Environment, Food and Rural Affairs (Defra) Defra Background Pollutant Concentration Maps; <https://uk-air.defra.gov.uk/data/laqm-background-maps?year=2015>

⁵¹ At the time of assessment, measurements for 2016 were the latest published annual monitoring baseline data

AQMA 1 Part 3. All three are designated for exceedances of the annual mean NO₂ standard.

- 5.3.7 The Barlborough AQMA No. 1 covers a single property adjacent to the A619 Chesterfield Road/the A616 Oxcroft Way roundabout and was declared in August 2005. The Barlborough AQMA No. 2 encompasses five residential dwellings on Orchard Close, Barlborough bordering the M1 and was declared in October 2007. The Rotherham AQMA 1 Part 3 covers an area of Wales, Rotherham encompassing a small number of properties on either side of the M1/the B6059 School Road bridge. This AQMA was declared in July 2003, and the designation was later amended in December 2016 to include the 1-hour mean NO₂ standard.

Receptors

- 5.3.8 Several locations in the area have been identified as sensitive receptors, which are considered to be susceptible to changes in air quality due to their proximity to dust generating activities or traffic routes during construction or operation of the Proposed Scheme.
- 5.3.9 Most of the receptors which may be affected by the Proposed Scheme are residential, located within areas including Barrow Hill, Staveley, Mastin Moor, Woodthorpe, Barlborough, Woodall, Wales and Aston. Other receptors include schools, medical centres, community centres and care homes.
- 5.3.10 There are no statutory designated ecological sites within the Staveley to Aston area. Other non-statutory sensitive ecological sites identified close to the Proposed Scheme include five ancient woodland inventory site (AWIS) and 15 local wildlife sites (LWS).
- 5.3.11 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)⁵². 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;

⁵² Supporting document: Draft Code of Construction Practice

- 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.

- 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 risk from demolition of existing buildings, earthworks, construction of new structures and trackout⁵³ have been assessed for their effect on dust soiling, human health⁵⁴ and ecological sites. There are residential and ecological receptors located within the Staveley to Aston area.
- 5.4.6 It has been identified that the risk of dust effects would range from low to high within this area for all dust generating activities, depending on the location of sensitive receptors and the magnitude of the activities. There would also be a low to medium risk of human health effects from all dust generating activities. There would be a 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.

⁵³ 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

⁵⁴ Human health effects relate mainly to short-term exposure to particles of size between 2.5µm to 10µm, measured as PM₁₀

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 A6192 Fan Road, the A619 Chesterfield Road, the A616 Oxcroft Way, the A6135 Sheffield Road, the A618 Mansfield Road, the A57 Worksop Road, the B6419 Bolsover Road, the B6067 Worksop Road, the B6463 Todwick Road, Ireland Close, Hall Lane, Westfield Lane, Sheffield Road/West End/High Street/Church Street, and Common Road would likely provide the primary access for construction vehicles in this area. An increase in traffic flows as a result of construction traffic, temporary closures or diversions is anticipated on these roads. A detailed assessment of air quality impacts from traffic emissions in the area will be undertaken and reported in the formal ES.
- 5.4.10 Direct and indirect effects from changes in air quality, such as those arising from increased levels of construction traffic, will be considered for all sensitive receptors within 200m of construction routes. These will include human receptors and those ecological habitats considered to be sensitive to changes in air quality. These effects will be reported in the formal ES.

Permanent effects

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

Other mitigation measures

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

Summary of likely residual significant effects

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

5.5 Effects arising from operation

Avoidance and mitigation measures

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

Assessment of impacts and effects

- 5.5.2 Impacts from the operation of the Proposed Scheme would arise from changes in the volume, composition and/or speed of road traffic, changes in road alignments and emissions from the operation of combustion plant in buildings.
- 5.5.3 There would be no direct atmospheric emissions from the operation of trains that would cause an impact on air quality, and therefore no assessment is required. Indirect

emissions from sources such as rail and brake wear have been assumed to be negligible.

Rail emissions at Staveley IMD and Staveley spur

- 5.5.4 The impact from diesel trains associated with Staveley IMD and Staveley spur is anticipated to be negligible. Therefore, no significant effects would be anticipated from the operation of diesel trains at this location.

Combustion plant emissions at Staveley IMD and Staveley spur

- 5.5.5 Emissions from any stationary sources, such as combustion plant, will be included in the air quality assessment. Concentrations of NO₂ will be predicted at sensitive receptors and any effects will be reported in the formal ES.

Operational traffic effects

- 5.5.6 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

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

Summary of likely residual significant effects

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

Monitoring

- 5.5.9 Volume 1, Section 9 sets out the general approach to environmental monitoring during operation of the Proposed Scheme.
- 5.5.10 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 Staveley to Aston area.
- 6.1.2 The assessment draws on information gathered from engagement with the users and operators of community facilities including Chesterfield Borough Council (CBC), North East Derbyshire District Council (NEDDC), Derbyshire County Council, Bolsover District Council (BDC), Aston cum Aughton Parish Council, Wales Parish Council and Barlborough Parish Council. The purpose of this engagement has been to understand how the facilities are used and to obtain relevant baseline information to inform the design development and assessment of the Proposed Scheme. Engagement will continue with these and other stakeholders to inform the formal ES.
- 6.1.3 Maps showing the location of the key environmental features (Map Series CT-10) and the key construction (Map Series CT-05) and key operational (Map Series CT-06) features of the Proposed Scheme can be found in the Volume 2: LA11 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)⁵⁵.
- 6.2.2 The assessment of in-combination effects will draw upon the findings of other technical disciplines (e.g. air quality, sound, noise and vibration, landscape and visual and traffic and transport). Likely significant in-combination effects on community facilities and resources will be reported in the formal ES.
- 6.2.3 Effects relating to the severance of public rights of way (PRoW) (public footpaths and bridleways) and highway and pedestrian diversions, are assessed under the Traffic and transport topic. However, where PRoW and other routes are a 'promoted' destination in their own right as a recreation resource, they will be considered within the community assessment. Where impacts on open space and PRoW are considered, these have been informed by open space and PRoW condition surveys, where it has been possible to undertake such surveys.
- 6.2.4 Where reasonably practicable, public footpaths and routes would be reinstated or convenient alternatives provided. HS2 Ltd will seek to provide a temporary or permanent alternative route in advance of a closure of a road or PRoW. No significant effects on these routes are likely once the mitigation measures have been implemented. Alternative temporary routes have not been defined in all cases due to the relatively early stage of design of the Proposed Scheme. Where this is the case they will be reported in the formal ES.

⁵⁵ 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.

6.3 Environmental baseline

- 6.3.1 The route of the Proposed Scheme through the Staveley to Aston area would be approximately 13.1km in length, with an additional 8.5km long Staveley spur to the Staveley Infrastructure Maintenance Depot (IMD). The Proposed Scheme in this area would be within the CBC, BDC, NEDDC and Rotherham Metropolitan Borough Council (RMBC) areas. It would extend from Staveley, passing close to the settlements of Barlborough, Woodall, Killamarsh, Wales and Aston.
- 6.3.2 The area is predominantly rural in nature with a mix of settlements that vary in size. The main concentrations of community facilities are located in the town of Staveley and the villages of Barlborough, the village of Wales and the village of Aston, which are within the study area. Barrow Hill, Lowgates, Woodthorpe, Netherthorpe, Poolsbrook, Woodall, High Moor and Wales Bar are villages and hamlets located within the study area. The villages of Mastin Moor and Norwood are located partially within the study area, albeit further away from the HS2 main line. 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 individual dwellings and small clusters of dwellings within rural areas.
- 6.3.3 There are two promoted PRow in the study area: the Trans Pennine Trail (Staveley Bridleway 47) and the Cuckoo Way (Staveley Footpath 1). The Trans Pennine Trail is a

long distance path running from coast to coast across Northern England. The Cuckoo Way is a 74km route that follows the Chesterfield Canal.

Staveley and surrounds

- 6.3.4 The town of Staveley is located approximately 3km north-east of Chesterfield, bordered by the Rother River to the north-west and Poolsbrook Country Park to the south-east. The town comprises approximately 6,600 residential properties. Some residential properties would be on the Staveley spur. Within the study area the community facilities include: police station; fire station; library; the Salvation Army Community Centre; and religious facilities and places of worship, including Staveley Methodist Church and St. John the Baptist Church. Francis House is a care facility located in the town.
- 6.3.5 Netherthorpe, Lowgates and Poolsbrook are adjoining settlements within the study area. Community resources in Lowgates include Cee Dees Café, Staveley Miners Social and Cricket Club and Bent Lane Bowling Green. There are also allotment gardens on Bellhouse Lane and Victoria Avenue. Community resources in Netherthorpe include Netherthorpe common land and Netherthorpe School Science College and playing fields. Community resources in Poolsbrook include Poolsbrook social welfare centre, Poolsbrook Primary School and Community Centre and St. Albans Church. The area surrounding the settlement of Poolsbrook includes Poolsbrook Country Park, which is an area of public open space that offers walks and trails.
- 6.3.6 The village of Barrow Hill is located approximately 1.5km north-west of Staveley, north of the River Rother. Barrow Hill comprises approximately 950 residential properties. The nearest residential properties would be approximately 50m north of the Staveley spur. Community facilities include Barrow Hill Methodist Church, Barrow Hill Memorial Club, Barrow Hill Community Centre, Barrow Hill Primary School, Barrow Hill Medical Centre and amenity green and common land off Hall Lane.
- 6.3.7 Woodthorpe is a village located approximately 1km east of Staveley, west of the M1. The village of Woodthorpe comprises approximately 250 properties. The nearest residential properties would be approximately 500m from Staveley spur and the HS2 main line. Woodthorpe includes community facilities such as Norbriggs Primary School, Woodthorpe Primary School, the Albert Inn and Willows Care Nursing Home.

Barlborough

- 6.3.8 Barlborough is a village located approximately 4km north-east of Staveley, east of the M1 junction 30. The village comprises approximately 1,400 residential properties. The nearest residential properties would be approximately 50m from the HS2 main line. Notable community facilities include: the Dusty Miller Inn, Barlborough Primary School, Barlborough Heritage Centre, Barlborough Methodist Church, Park Farm Equestrian Centre, Barlborough NHS Treatment Centre, Barlborough Hall, Barlborough Hall School and Barlborough Spring Fisheries.
- 6.3.9 High Wood is an area of publicly accessible woodland located approximately 800m north-west of the main settlement of Barlborough and on the HS2 main line.

Woodall, High Moor and Norwood

- 6.3.10 Woodall is a village located approximately 2km east of Killamarsh, east of the M1. The village comprises approximately 80 residential properties. The nearest residential properties would be approximately 500m from the HS2 main line. Woodall is closely linked with Harthill via Woodall Lane. Harthill is a village located approximately 1km east of Woodall outside the study area, and includes a number of local services and community facilities, such as a primary school, a care home and All Hallows Church.
- 6.3.11 High Moor is a village approximately 1km east of Killamarsh, west of the M1. The village comprises approximately 70 residential properties. The nearest residential properties would be approximately 700m from the HS2 main line. The A618 Mansfield Road links the community of High Moor to Norwood, a village located approximately 850m north of High Moor, comprising approximately 350 residential properties. Notable community facilities in High Moor include Killamarsh Ponds, Nor Wood and Norwood Cottage Lakes.

Wales and surrounds

- 6.3.12 Wales is a village located approximately 500m to the east of Rother Valley Country Park, and is bisected by the M1. Wales village and neighbouring settlement Kiveton Park both fall within the Civil Parish of Wales. Kiveton Park is located to the east of Wales village and is partially within the study area. The village of Wales comprises approximately 1,900 residential properties. Some residential properties would be on the HS2 main line. There are a number of local community resources within the study area including: Waleswood Sports Cricket Club, Wales Kiveton Methodist Church, Wales Primary School and recreation area, Wales Jubilee Sports and Social Club, Kiveton Park and Wales Village Hall, Stockwell Lane Cemetery, and St. John the Baptist Church and Cemetery.

Aston

- 6.3.13 Aston is a village located approximately 1.5km north of Rother Valley Country Park, west of the M1. The village comprises approximately 5,000 residential properties. Some residential properties would be on the HS2 main line. The village comprises a number of local services and community facilities, which include: Aston Park Fisheries, Aston Park, Engine House Plantation, Aston Hall Junior and Infant School, All Saints Church and Cemetery, Aston Hall Cricket Club, Parklands Equestrian Centre, Aston Park Fire Station, William Layne Reading Room (Aston Reading Room/library) and the Yellow Lion public house.

6.4 Effects arising during construction

Avoidance and mitigation measures

- 6.4.1 The draft Code of Construction Practice (CoCP)⁵⁶ includes a range of provisions that will help to mitigate community effects associated with construction within this area, including:
- implementation of a community engagement framework to provide

⁵⁶ Supporting document: Draft Code of Construction Practice

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 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 Part of the outdoor garden space of 18 residential properties in Staveley would be within the land required for the construction of the Staveley West cutting and the A619 Lowgates Road overbridge. Nine of these properties are located on Bellhouse Lane, one on A619 Lowgates Road, one on Fan Road, one on Wharf Lane and six on Netherthorpe. These areas of outdoor garden space would be required for approximately one year.
- 6.4.3 The construction of Staveley East embankment would temporarily require part of the garden of a residential property on Milton Place, Staveley, for a duration of approximately two years and six months.
- 6.4.4 It would also be necessary to carry out works associated with the construction of Staveley West cutting satellite compound on land that falls within the shared garden space of 21 flats on Pullman Close, for a duration of two years and nine months.
- 6.4.5 The temporary loss of these small areas of outside space in Staveley would not impact on the ability of the residents to use their dwellings and access would be maintained throughout construction. This would result in a moderate adverse effect, which would be significant.
- 6.4.6 Part of the outdoor garden space of two residential properties in Barlborough would be within the land required for the construction of Mastin Moor cutting, Mastin Moor embankment and Barlborough cutting. One of these properties is on the A619 Chesterfield Road and the other is on Westfield Lane. The duration of these works would be for approximately three years and six months. The temporary loss of these small areas of outside space would not impact on the ability of the residents to use

their properties, and access would be maintained throughout construction. This would result in a minor adverse effect, which would not be significant.

- 6.4.7 Part of a driveway on Woodhouse Lane, Barlborough, would fall within the land required for the construction of Mastin Moor cutting. The duration of these works would be approximately three years and three months. The temporary loss of this small area of outside space would not impact on the ability of the residents to use their property and access would be maintained throughout construction. This would result in a minor adverse effect, which would not be significant.
- 6.4.8 It would be necessary to carry out works associated with the construction of Wales North cutting and Wales Bar cutting on land which falls within the boundaries of 15 residential properties in the village of Wales, although none of these properties would need to be demolished. Two properties are located on School Road and 13 properties are located on Cherry Tree Road. The duration of these works would be approximately six months. The temporary loss of these areas of outside space would not impact on the ability of the residents to use their property and access would be maintained throughout construction. This would result in a moderate adverse effect, which would be significant.

Community facilities

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

Recreational facilities

- 6.4.10 The construction of Aston North embankment would temporarily require approximately 15% of the car park of the Yellow Lion public house, Aston. This community resource could remain open and continue to be used for its intended purpose. The duration of these works would be for approximately one year. This would result in a minor adverse effect, which would not be significant.

Open space and PRow

- 6.4.11 Part of the amenity green and common land off Hall Lane in Barrow Hill, is located within the land required for the construction of the Staveley IMD and realignment of Hall Lane. Approximately 25% of the amenity green and common land would be inaccessible for approximately 12 months, and footpaths through this area would be temporarily diverted. Following construction, approximately 20% of the site would be reinstated with areas of landscape mitigation planting, woodland habitat creation and wetland creation. The amenity green and common land is moderately used and valued resource in the local community. The area of open space, which is easily accessible and well signposted from Hall Lane, has no notable facilities within it. The temporary loss of approximately 25% of the amenity land and common land, would result in a moderate adverse effect, which would be significant.
- 6.4.12 Part of Poolsbrook Country Park, Staveley, would be located within the land required for the construction of Staveley East embankment. Approximately 20% of the open space would be inaccessible for approximately one year, and footpaths through this area would be temporarily diverted. Poolsbrook Country Park is well used and is a highly valued resource in the local community. Overall, the park is of very good quality

and is well maintained. It includes a large children's play area, an outdoor gym, two water wheels on entrance, lakes, litter bins, signage, seating, car parking, and it is also the former site of the Ireland Colliery. The temporary loss of approximately 20% of the open space would result in a moderate adverse effect, which would be significant.

- 6.4.13 The construction of High Wood cutting and associated landscape earthworks would temporarily require part of the publicly accessible land from High Wood. Approximately 15% would be inaccessible for a duration of approximately 12 months. Barlborough Heritage Trail runs through this area, however, overgrown vegetation currently restricts access at the entrance and there are limited facilities on site. The area is semi-regularly used by walkers and likely to be a moderately valued resource in the local community. The temporary loss of approximately 15% of the open space would result in a moderate adverse effect, which would be significant.
- 6.4.14 The construction of Nor Wood viaduct and Wales embankment would temporarily require part of the publicly accessible land from Nor Wood and Woodall Pond, which forms part of Killamarsh Ponds. Approximately 30% would be inaccessible for a duration of approximately three years and three months. The area of open space is semi – regularly used, well sign-posted and is likely to be a moderately valued resource in the local community. Cuckoo Way is a promoted PRoW that runs through the open space. The temporary loss of the open space would result in a major adverse effect, which would be significant.
- 6.4.15 The construction of Fiddle Neck viaduct would temporarily require land from Aston Park Fisheries. Approximately 5% of the site would be inaccessible for a duration of approximately two years and three months. This recreational facility could remain open and continue to be used for its intended purpose throughout this period. This would result in a minor adverse effect, which would not be significant.
- 6.4.16 The construction of the B6067 Worksop Road diversion, the Aston South embankment and Aston South embankment satellite compound would temporarily require part of Aston Park and part of an area of woodland within it, Engine House Plantation. Approximately 40% of the open space would be inaccessible for a duration of approximately three years and six months. This would result in a major adverse effect, which would be significant.

Permanent effects

Residential properties

- 6.4.17 Staveley West cutting and associated landscape earthworks would require the demolition of four residential properties on Bellhouse Lane. These residential properties would be permanently lost.
- 6.4.18 The Staveley West cutting would permanently require approximately 2% of the back/side gardens of two residential properties on Wharf Lane, Staveley. The loss of the gardens would not impact on the ability of residents to use their dwelling. This is not considered to have a significant community effect.

- 6.4.19 Mastin Moor cutting would require land within Barlborough. This would require the demolition of five residential properties on the A619 Chesterfield Road. This would result in a moderate adverse effect, which would be significant.
- 6.4.20 Barlborough cutting and associated landscape earthworks would require demolition of two residential properties on Westfield Lane and two residential properties on Sheffield Road. These residential properties would be permanently lost.
- 6.4.21 The A6135 Sheffield Road overbridge would permanently require part of the garden of one residential property located on Sheffield Road, Barlborough. The loss of this area of outside space would not impact on the ability of residents to use their dwelling. This is not considered to have a significant community effect.
- 6.4.22 A driveway to a residential property located on Woodhouse Lane, Barlborough, would be permanently required for the construction and operation of Mastin Moor cutting. Residents would still be able to access this property via a second driveway on Woodhouse Lane. The loss of this area of outside space would not impact on the ability of residents to use their dwelling. This is not considered to have a significant community effect.
- 6.4.23 Wales Central cutting and associated landscape earthworks would require demolition of three residential properties on the B6059 School Road. These residential properties would be permanently lost.
- 6.4.24 Landscape planting would require a small part of the garden space along the boundaries of two residential properties on Church Street, Wales. The loss of this area of outside space would not impact on the ability of residents to use their dwellings. This is not considered to have a significant community effect.
- 6.4.25 Nicker Wood embankment and associated landscape earthworks would require demolition of three residential properties on the A618 Mansfield Road, Aston. These residential properties would be permanently lost.
- 6.4.26 Aston North embankment and associated landscape earthworks would require demolition of two properties on the B6067 Worksop Road. These residential properties would be permanently lost.

Community facilities

- 6.4.27 Part of Stockwell Lane Cemetery, Wales, falls within land required for landscape mitigation planting associated with the construction of Wales embankment. The land required would be along the boundary of the facility, which is currently used for landscaping and is not used as part of the cemetery. The cemetery would remain open and would be able to continue to be used for its intended purposes. This would result in a minor adverse effect, which would not be significant.

Recreational facilities

- 6.4.28 The A619 Lowgates Road overbridge would require the demolition of Cee Dees Café on the A619 Lowgates Road in Staveley. There are alternative cafés and restaurants in easy travelling distance that have similar qualities and characteristics in terms of food

offered to the local community. The loss of this facility would result in a minor adverse effect, which would not be significant.

- 6.4.29 Landscape mitigation planting associated with the construction of Wales North cutting would require part of Waleswood Sports Cricket Club. The land required would be along the boundary of the facility and is currently used for landscaping. The club would remain open and the functioning of the club would not be compromised. This would result in a negligible adverse effect, which would not be significant.
- 6.4.30 Landscape mitigation planting associated with the construction of Aston South embankment and Aston cutting would require part of Aston Hall Cricket Club. The land required would be along the boundary of the facility and is currently used for landscaping. The club would remain open and the functioning of the club would not be compromised. This would result in a negligible adverse effect, which would not be significant.
- 6.4.31 Aston cutting would require the demolition of Parklands Equestrian Centre in Aston. Parklands Equestrian Centre provides riding lessons, livery and training. This facility is well used and is a highly valued resource. There are alternative equestrian centres in that have similar qualities and characteristics in terms of facilities on offer and value to the local equestrian community, the nearest of which is located approximately 3km from Parklands Equestrian Centre. This loss of this facility would result in a major adverse effect, which would be significant.

Open space and PRow

- 6.4.32 Staveley IMD and the realignment of Hall Lane would permanently require approximately 5% of the publicly accessible land from the amenity green and common land off Hall Lane, Barrow Hill. The amenity green and common land is moderately used and valued resource in the local community. The remaining area of open space would not be compromised, and the open space could continue to be used without detriment to users. This would result in a minor adverse permanent effect, which would not be significant.
- 6.4.33 Staveley East embankment would permanently require approximately 2% of the publicly accessible land from Poolsbrook Country Park. The remaining area of open space would not be compromised and the open space could continue to be used without detriment to users. Poolsbrook Country Park is well used and is a highly valued resource in the local community. This would result in a minor adverse effect, which would not be significant.
- 6.4.34 Staveley West cutting would require land from two promoted PRow: the Trans Pennine Trail and the Cuckoo Way. Staveley Footpath 1 overbridge and Staveley Bridleway 47 overbridge would provide a permanent realignment of these promoted PRow. This would result in a negligible effect, which would not be significant.
- 6.4.35 High Wood cutting and associated landscape earthworks would permanently require approximately 5% of the publicly accessible land from High Wood. The remaining area of open space would not be compromised and could continue to be used without detriment to users. The area is semi-regularly used by walkers and likely to be a

moderately valued resource in the local community. This would result in a minor adverse effect, which would not be significant.

- 6.4.36 Nor Wood viaduct and Wales embankment would permanently require approximately 5% of the publicly accessible land from Nor Wood and Woodall Pond, which forms part of Killamarsh Ponds. The remaining area of open space would not be compromised and could continue to be used without detriment to users. The area is semi-regularly used and is likely to be a moderately valued resource in the local community. This would result in a minor adverse effect, which would not be significant.
- 6.4.37 The B6067 Worksop Road diversion would permanently require approximately 10% of publicly accessible land from Aston Park. Aston Park is a moderately used and valued resource in the local community and is well maintained. The B6067 Worksop Road diversion would cut through the park and sever it into two parts. This would permanently compromise the usability of approximately 30% of Aston Park, resulting in a major adverse effect, which would be significant.

Other mitigation measures

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

Summary of likely residual significant effects

- 6.4.40 Land required for construction of the Proposed Scheme is likely to result in temporary residual significant effects on the following community resources:
- open space of 19 residential properties on Bellhouse Lane, A619 Lowgates Road, Fan Road, Wharf Lane, Netherthorpe and Milton Place, and shared space of 21 flats on Pullman Close in Staveley;
 - open space of 15 residential properties on the B6059 School Road and Cherry Tree Road in Wales;
 - amenity green and common land off Hall Lane in Barrow Hill;
 - Poolsbrook Country Park in Staveley;
 - High Wood in Barlborough;
 - Nor Wood and Woodall Pond (which forms part of Killamarsh Ponds) in Norwood; and
 - Aston Park and Engine House Plantation in Aston.
- 6.4.41 Land required for the construction of the Proposed Scheme is likely to result in permanent residual significant adverse effects:
- loss of residential properties on the A619 Chesterfield Road in Barlborough;
 - demolition of Parklands Equestrian Centre in Aston; and

- loss of publicly accessible land from Aston Park in Aston.

Cumulative effects

- 6.4.42 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.
- 6.4.43 No cumulative effects have been identified at this time. Any combined effects on a community during construction of the Proposed Scheme, which would result in cumulative community effects, will be reported in the formal ES.

6.5 Effects arising from operation

Avoidance and mitigation measures

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

Assessment of impacts and effects

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

Other mitigation measures

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

Summary of likely residual significant effects

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

Cumulative effects

- 6.5.5 Community wide effects occur where a number of individual impacts on resources come together within a location and have a wider impact on the community, such that they change the experience of a considerable proportion of people within that community.
- 6.5.6 No cumulative effects have been identified at this time. Any combined effects on a community during construction 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 the Staveley to Aston 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, Forestry Commission, Rotherham Metropolitan Borough Council (RMBC), Derbyshire County Council (DCC) 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 Borough Council (CBC), and Sheffield and Rotherham Wildlife Trust 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: LA11 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)⁵⁷.
- 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.

⁵⁷ Supporting document: HS2 Phase 2b Environmental Impact Assessment Scope and Methodology Report

- 7.3.2 Land required for the construction of and adjacent to the Proposed Scheme in this area consists mainly of agricultural land, varying sizes of woodland (e.g. standalone woodland blocks and woodland associated with the M1 corridor), residential or commercial properties, and farmsteads. The Proposed Scheme in the Staveley to Aston area would also include the Staveley spur to the Staveley Infrastructure Maintenance Depot (IMD). The Staveley spur would follow the disused mineral railway, before connecting to a large brownfield site (previously the Staveley Chemical Works site), within which the Staveley IMD would be constructed. The Staveley spur would pass through Netherthorpe and Staveley. The route of the Proposed Scheme would cross the River Doe Lea, River Rother, Hawke Brook, Pools Brook, Pigeon Bridge Brook and a number of unnamed tributaries and drains. The M1 corridor lies to the east and runs parallel to the route of the Proposed Scheme.
- 7.3.3 Statutory and non-statutory designated sites are shown on Map Series CT-10, Volume 2: LA11 Map Book.

Designated sites

- 7.3.4 This section describes the ecological baseline relevant to the assessment, including designated sites, habitats and species.
- 7.3.5 There are no statutory sites of international importance that are relevant to the assessment in the Staveley to Aston area.
- 7.3.6 There is one nationally important site of special scientific interest (SSSI) that is relevant to the assessment in the Staveley to Aston area. Crabtree Wood SSSI covers an area of 3.5ha, and is designated for its botanical interest associated with base rich water flushes and diverse underlying soils and geology. It is located north-east of Barlborough and 1.3km east of the land required for the Proposed Scheme. The land required for the Proposed Scheme is within the Impact Risk Zone relevant to railway infrastructure for this site⁵⁸.
- 7.3.7 There are three local nature reserves (LNR) of potential relevance to the assessment in the Staveley to Aston area, each of which is of county/metropolitan value:
- Norbriggs Flash LNR, covering an area of 38.2ha, is designated for a mosaic of species rich grassland, open water (a subsidence flash), reed beds and marginal aquatic vegetation, and old meanders of the River Doe Lea. The site is important for wintering wading birds and wildfowl. The LNR is within an existing corridor of local wildlife sites (LWS) that link the River Doe Lea to the River Rother and other wetland sites along Pools Brook. The LNR is 130m north-east of the land required for the Proposed Scheme, north of Lowgates;
 - Bluebank Pools LNR, covering an area of 8.4ha, is part of Chesterfield Canal and is designated for grassland, woodland and river oxbows. Kingfisher, water vole, and grass snake have been recorded in the LNR. The LNR is 1.3km south-west of the land required for the Proposed Scheme, south of New Whittington;

⁵⁸ 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

and

- Brearley Wetland LNR, covering an area of 9.9ha, is designated for the rare invertebrates recorded; the site also provides habitat for migrating birds. Other habitats include wet grassland, hedgerows and scrub. The LNR is 1.7km south-west of the land required for the Proposed Scheme, south of New Whittington.

7.3.8

There are 22 LWSs of potential relevance to the assessment in the Staveley to Aston 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, publically available sources of information have been used. Details of site interest features and reasons for designation will be updated in the formal ES. The LWS are:

- Chesterfield Canal LWS, covering an area of 1.6ha, is designated for its water vole population. The LWS is adjacent to the land required the Proposed Scheme for the purpose of habitat creation, south of the former Staveley Chemical Works site;
- Doe Lea Flash LWS, covering an area of 7.9ha, is designated for its lowland swamp communities, broadleaved wet woodland, and standing open water. The whole of the LWS is within the land required for the Proposed Scheme adjacent to the disused mineral railway;
- Poolsbrook Flash LWS, covering an area of 0.2ha, is designated for its lowland swamp. The whole of the LWS is within the land required for the Proposed Scheme adjacent to the disused mineral railway;
- Netherthorpe Flash LWS, covering an area of 4.7ha, is designated for its lowland swamp. The LWS is 350m east of the land required for the Proposed Scheme, east of Lowgates;
- Pinnock North Flash LWS, covering an area of 17.6ha, is designated for its lowland swamp, it is associated with Norbriggs Flash LNR. The LWS is 396m north-east of the land required for the Proposed Scheme, north of Lowgates;
- Romeley Wood LWS, covering an area of 9.3ha, is designated for ancient semi-natural woodland, characterised by a mix of pedunculate oak, ash, rowan, alder, and sycamore and a field layer including bluebell, dog's mercury, ramsons, and wood anemone. The LWS is 9m south-east of the land required for the Proposed Scheme for the purpose of habitat creation, south of Barlborough;
- Robinson's Lumb LWS, covering an area of 2.4ha, is designated for an area of woodland (including ancient semi-natural oak woodland) with a stream running through the centre. The canopy is composed of pedunculate oak, sycamore, ash and the field layer includes bluebell, yellow archangel, red campion, and ramsons. The LWS is partially within the land required for the Proposed Scheme, south-west of Barlborough;

- Westfield Railway LWS, covering an area of 5.5ha, is designated for the presence of unimproved calcareous grassland. The LWS is partially within the land required for the Proposed Scheme, south-west of Barlborough;
- Beighton Fields Plantation, Alder Carr and Meadow LWS, covering an area of 0.9ha, is designated primarily for the presence of an area of unimproved neutral grassland. The site supports different habitats with a transition from wet woodland to wet meadow. The LWS is partially within the land required for the Proposed Scheme, south-east of Renishaw;
- Sheffield Road Field LWS, covering an area of 2.4ha, is designated for the presence of areas of semi-improved neutral grassland, characterised by sweet vernal grass, meadow fox-tail and oxeye daisy, pignut, and selfheal. However, there are also areas of species poor grassland. The LWS is adjacent to the land required for the Proposed Scheme, west of Barlborough;
- Thompson's Holt Pond LWS, covering an area of 0.6ha, is designated for two ponds and broad-leaved woodland, which may be ancient in origin. One of the ponds dates from before the year 1900 and both ponds support a variety of marginal emergent species and aquatic plants. The LWS is adjacent to the land required for the Proposed Scheme for the purpose of habitat creation, north of Barlborough;
- High Wood and Thompson's Holt LWS, covering an area of 11.6ha, is designated for its ancient semi-natural oak woodland. The field layer includes bluebell and yellow archangel. The LWS is partially within the land required for the Proposed Scheme, east of Spinkhill;
- Quarrydam Fields Complex LWS, covering an area of 5.9ha, is designated for three fields of semi-improved neutral grassland on the sides of a river valley. One of the fields is quite wet and there are also small areas of broad-leaved wet woodland. The LWS is adjacent to the land required for the Proposed Scheme for the purpose of habitat creation, east of Spinkhill;
- Quarrydam Pond LWS, covering an area of 0.4ha, is designated for a pond surrounded by swamp and wet woodland. The LWS lies 154m south-west of the land required for the Proposed Scheme, east of Spinkhill;
- Hawke Wood Pond LWS, covering an area of 0.2ha, is designated for assemblages of reptiles and amphibians, including great crested newts. The LWS lies 135m south-east of the land required for the Proposed Scheme, west of Harthill;
- Killamarsh Pond LWS, covering an area of 1.5ha, is designated for standing open water and is associated with Nor Wood and Locks LWS. The LWS is 94m north-west of the land required for the Proposed Scheme, east of Killamarsh;
- Nor Wood and Locks LWS, covering an area of 57.2ha, is designated for an area of woodland (including ancient semi-natural oak woodland). The LWS supports the nationally scarce large-leaved lime, true fox sedge, and water

vole is present within the LWS⁵⁹. The LWS is partially within the land required for the Proposed Scheme, east of Killamarsh;

- Rother Valley Country Park LWS covering an area of 153.3ha. The LWS is 147m south-west of the land required for the Proposed Scheme, north of Killamarsh;
- Nickerwood and Ponds LWS covering an area of 11.5ha. It is designated for woodland (including ancient semi-natural woodland), a series of fishing lakes, and acid grassland. The LWS supports the nationally scarce large-leaved lime and true fox sedge, and potentially supports water vole⁶⁰. The LWS is partially within the land required for the Proposed Scheme, east of Aston;
- Todwick Common LWS covering an area of 182.7ha. The LWS is 37m east of the land required for the Proposed Scheme, north of Wales and to the east of the M1 corridor;
- Foers Wood LWS covering an area of 12.4ha. It is a privately owned woodland with a stream and ponds; bat roosts have been recorded on the LWS. The LWS is 19m south-west of the land required for the Proposed Scheme for the purpose of habitat creation, north of Aston; and
- Brampton Common LWS covers an area of 144ha. It is a large area of arable and pastoral fields. The LWS is 143m north-east of the land required for the Proposed Scheme, south of Ulley Beaches and to the east of the M1 corridor.

7.3.9 There are five Ancient Woodland Inventory Sites (AWIS) of potential relevance to the assessment in the Staveley to Aston area, each of which, due to the habitats and species present are considered to be of up to county/metropolitan value. They are also designated as LWS, as described above. They are:

- Romeley Wood AWIS, covering an area of 9.5ha and is located 9m east of the land required for the Proposed Scheme for the purpose of habitat creation;
- Robinson's Lumb AWIS, covering an area of 1.7ha, is located adjacent to the land required for the Proposed Scheme;
- High Wood AWIS, which covers an area of 10ha, is located partially within the land required for the Proposed Scheme;
- Nor Wood AWIS, which covers an area of 32.3ha, is located partially within the land required for the Proposed Scheme; and
- Nicker Wood AWIS, which covers an area of 2.6ha, is located partially within the land required for the Proposed Scheme.

⁵⁹ Sheffield and Rotherham Wildlife Trust, (2017), *Route Refinement Consultation Document*. Available online at: <https://www.wildsheffield.com/campaign/hs2/>

⁶⁰ Sheffield and Rotherham Wildlife Trust, (2017), *Route Refinement Consultation Document*. Available online at: <https://www.wildsheffield.com/campaign/hs2/>

- 7.3.10 A review is being undertaken to identify any additional woodlands that are not currently listed on the Ancient Woodland Inventory 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 50 discrete lowland deciduous woodlands outside designated sites (likely to qualify as habitats of principal importance⁶¹ and either a Derbyshire or Rotherham local Biodiversity Action Plan (BAP)^{62,63} habitat) within the land required for the Proposed Scheme. These woodland areas are near:

- the disused mineral railway;
- the former Staveley Chemical Works site;
- the M1 corridor;
- land south of the A619 Worksop Road, east of Mastin Moor;
- land east of Quarrydam Wood, west of Barlborough;
- land south of Low Plantation, east of Killamarsh;
- Low Plantation, east of Killamarsh; and
- land north of Wales, south of the Sheffield to Worksop Railway.

- 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.

- 7.3.14 There is one unnamed traditional orchard, north of the B6067 Worksop Road, Aston, which covers an area of 0.2ha and which is within the land required for the Proposed Scheme. It may qualify as a habitat of principal importance and as a Rotherham local BAP habitat. Therefore, in the absence of a field survey, it is considered to be of up to district/borough value.

Grassland

- 7.3.15 Grasslands outside of designated sites occur within the land required for the Proposed Scheme. This includes floodplain grazing marsh south of the former Staveley Chemical Works, which covers an area of 8.3ha. These grasslands may qualify as a habitat of principal importance and Derbyshire or Rotherham local BAP habitat. On a precautionary basis, pending the findings of field surveys (which may identify these as

⁶¹ Natural Environment and Rural Communities Act 2006 (Chapter 16, Part 3, Section 41). London, Her Majesty's Stationary Office.

⁶² Lowland Derbyshire Biodiversity Partnership, (2011), *Lowland Derbyshire Biodiversity Action Plan 2011-2020*. Available online: <https://www.derbyshire.gov.uk/site-elements/documents/pdf/environment/conservation/ecology/lowland-derbyshire-biodiversity-action-plan/lowland-derbyshire-biodiversity-action-plan-lbap-2011-2020.pdf>

⁶³ Rotherham's Biodiversity Forum, (2012), *Rotherham Biodiversity Action Plan Woodland Habitat Action Plan*. Available online at: http://www.rotherham.gov.uk/localplanexamination/download/downloads/id/30/ebo6h_ecology_-_rotherham_woodland_habitat_plan_2012.pdf

unimproved grasslands) these grasslands are considered to be of up to district/borough value.

Hedgerows

- 7.3.16 Many of the hedgerows within the land required for the Proposed Scheme are likely to qualify as a habitat of principal importance and as a local BAP habitat. Some may also meet the wildlife and landscape criteria to be 'important' hedgerows as defined in the Hedgerows Regulations 1997⁶⁴. In addition, these hedgerows could also provide commuting corridors for wildlife, as well as 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

- 7.3.17 The River Doe Lea, River Rother, Hawke Brook, Pools Brook, a tributary of the County Dike, Pigeon Bridge Brook, tributary of Ulley Brook, and several smaller unnamed tributaries of the above lie within land required for the Proposed Scheme. The River Doe Lea and River Rother 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, River Rother, Pools Brook, a tributary of the County Dike, Pigeon Bridge Brook, and a tributary of Ulley Brook are considered to be of up to county/metropolitan value. The smaller watercourses and unnamed tributaries are considered to be of up to district/borough value.

Water bodies

- 7.3.18 There are 26 ponds that would be within, or partly within, the land required for the Proposed Scheme. 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

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

Open mosaic habitats on previously developed land

- 7.3.20 There is an area classified⁶⁵ as open mosaic habitat on previously developed land, which is outside of designated sites and is within the land required for the Proposed Scheme. This includes an area that covers 57ha on the former Staveley Chemical Works site, which may qualify as a habitat of principal importance and Derbyshire local BAP habitat. It is a brownfield site and comprises bare ground, scrub, trees and

⁶⁴ The Hedgerow Regulations, (1997), *Statutory Instrument 1997 No. 1160*. Her Majesty's Stationary Office

⁶⁵ Natural England (2017) *Open Mosaic Habitat (Draft)*. Available on at: <https://data.gov.uk/dataset/8509c11a-de20-42e8-9ce4-b47e0ba47481/open-mosaic-habitat-draft>

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

Working Draft Environmental Statement Volume 2: LA11

grassland. On a precautionary basis, pending the findings of field surveys, it is considered to be of up to county/metropolitan value.

Protected and notable species

- 7.3.21 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 provide in Table 19.

Table 19: Species potentially relevant to the assessment within the Staveley to Aston area

Resource/feature	Value	Rationale
Bats	Up to regional	Chesterfield Canal Trust⁶⁶ references a bat roost in a partially blocked up canal tunnel in the north of Nor Wood and Locks LWS, within the land required for the Proposed Scheme. The tunnel has potential to provide for a variety of roost types such, as maternity and hibernation, and has potential to support common and rarer species. There is suitable habitat for roosting and foraging bats within the land required for the Proposed Scheme. 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. Derbyshire Mammal Group reports bat records near the Proposed Scheme: Brandt's bat, brown long-eared bat, Daubenton's bat, common pipistrelle, Leisler's bat, Natterer's bat, noctule, and soprano pipistrelle.
Otter	Up to county/metropolitan	During HS2 surveys in 2018 there was an incidental sighting of an otter on the River Rother 1km west of former Staveley Chemical Works site. There are also records of otter on the River Rother adjacent to the former Staveley Chemical Works site⁶⁷ within 100m of the land required for the Proposed Scheme. Habitat potentially suitable for otter is present along the restored sections of the Chesterfield Canal, Pools Brook, and River Doe Lea and are either adjacent to or within the land required for the Proposed Scheme. There is habitat suitable for otter at Nor Wood and Locks LWS and Nickerwood and Ponds LWS.
Water vole	Up to county/metropolitan	Bluebank Pools LNR is 1.3km south-west of the land required for the Proposed Scheme, there are anecdotal records of water vole presence in this LNR (Derbyshire County Council⁶⁸). The LNR is connected via the Chesterfield Canal and the River Rother to habitats along the route of the Proposed Scheme at the Staveley IMD. Chesterfield Canal LWS adjacent to the former Staveley Chemical Works site, and within 100m of the land required for the Proposed Scheme, is also cited to support water vole populations. Anecdotal records for water vole also exist at Poolsbrook Country Park (Chesterfield Borough Council⁶⁹), which is partially within land required for the Proposed Scheme, including Pools Brook. There are anecdotal records of water vole at Nor Wood and Locks LWS and Nicker Wood and Ponds LWS (Sheffield and Rotherham Wildlife Trust⁷⁰).

⁶⁶ Chesterfield Canal Trust, *Options for Replacing the Norwood Tunnel*, Paragraph 14.6.6; <http://www.chesterfield-canal-trust.org.uk/restoration/future-plans/options-for-replavcing-the-norwood-tunnel/>

⁶⁷ Derbyshire Environmental Record Centre

⁶⁸ Derbyshire County Council, *Bluebank Pools Local Nature Reserve (LNR)*, <https://www.derbyshire.gov.uk/leisure/countryside/countryside-sites/waterways-wetlands/bluebank-pools-local-nature-reserve-lnr.aspx>

⁶⁹ Chesterfield Borough Council, *Poolsbrook Country Park*, <https://www.chesterfield.gov.uk/explore-chesterfield/parks-and-green-spaces/parks/a-z-of-parks/poolsbrook-country-park.aspx>

⁷⁰ Sheffield and Rotherham Wildlife Trust, (2017), *Route Refinement Consultation Document*. Available online at: <https://www.wildsheffield.com/campaign/hs2/>

High Speed Rail (Crewe to Manchester and West Midlands to Leeds)
Working Draft Environmental Statement Volume 2: LA11

Resource/feature	Value	Rationale
		Suitable habitat for water vole is potentially present along Pools Brook and River Doe Lea, Hawke Brook, and several other watercourses.
Great crested newt	County/metropolitan	There are great crested newt records within 100m of land required for the Proposed Scheme; north of the disused mineral railway and east of Doe Lea Flash LWS⁷¹. There is also a great crested newt European Protected Species licence for a field south of High Wood, west of the M1 corridor and adjacent to the land required for the Proposed Scheme. There are ponds and suitable terrestrial habitat for great crested newt in High Wood. One pond at Nickerwood Farm, north of Wales Bar and south of Aston, had a positive field survey result for great crested newt in 2017. The pond is within the land required for the Proposed Scheme.
Birds	County/metropolitan	Two barn owl roosts were recorded during a field survey east of Killamarsh. One within Nor Wood and Locks LWS, which is partially within the land required for the Proposed Scheme, and one south of the LWS. A barn owl was also recorded during a field survey north of Aston. This area comprises agricultural land with large arable fields, hedgerows, and patches of woodland, which offer potential foraging and roosting opportunities for barn owl. The farmland and woodland is suitable for breeding and wintering birds. Species associated with these habitats include lapwing, barn owl, skylark, tree sparrow, yellow wagtail, linnet, and yellowhammer, which breed in low numbers in farmland habitats.
White-clawed crayfish	Up to county/metropolitan	Suitable habitats for white-clawed crayfish are likely to be present in watercourses within the land required for the Proposed Scheme. Potential suitable habitats are present around the Rother and Doe Lea Valley areas, which are associated with the disused mineral railway (including Pools Brook), although there are no desk study records in the vicinity of the Staveley to Aston area.
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 along the disused mineral railway and within the former Staveley Chemical Works site. Other suitable habitat present within the land required for the Proposed Scheme includes the AWIS, poor-semi improved grassland, and where undisturbed grassland is present within the M1 corridor.
Fish	Up to district/borough	There are records of fish in the Don and Rother catchments including brook lamprey, Atlantic salmon, bullhead, European eel and brown/sea trout (data from Environment Agency National Fish Populations Database (NFPD) ⁷²). Suitable habitat for protected and notable fish species is likely to be present in watercourses within the land required for the Proposed Scheme.
Reptiles	Up to district/borough	A juvenile grass snake was recorded during reptile surveys and an adult grass snake was recorded as an incidental sighting on the southern boundary of Nor Wood and Locks LWS, within land required for the Proposed Scheme. There is a range of suitable habitats associated with the LWS that provide foraging, refuge and hibernation habitat comprising of wetland habitats, woodland, and grassland edges.

⁷¹ Derbyshire Environmental Record Centre

⁷² 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>

Resource/feature	Value	Rationale
		There are records of grass snake on the former Staveley Chemical Works and adjacent to the disused mineral railway⁷³, within or adjacent to the land required for the Proposed Scheme. There are suitable habitats for common species of reptiles within the land required for the Proposed Scheme, notably on the former Staveley Chemical Works site, the disused mineral railway, Robinson's Lumb LWS, High Wood, Thompsons Holt LWS, and Nickerwood and Ponds LWS.

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: LA11 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 M1 motorway North viaduct, Wales Bar viaduct, Nor Wood viaduct and Fiddle Neck viaduct would reduce the loss of woodland habitat and maintain the existing ecological connectivity to adjacent habitats under the route of the Proposed Scheme. The inclusion of Nor Wood viaduct and Fiddle Neck viaduct would also reduce habitat loss and fragmentation in Nor Wood and Locks LWS and Nicker Wood and Ponds LWS, respectively, and allow free passage for wildlife beneath these structures;
- construction of the Staveley IMD South chord viaduct over the River Rother would avoid direct effects to the watercourse and allow free passage for wildlife beneath it, including along the river and its banks;
- new woodland planting would contribute towards replacing the losses of woodland (e.g. woodland along the disused mineral railway as part of the proposed Staveley spur and woodland adjacent to the M1 corridor), and towards enhancing connectivity between remaining woodlands;
- provision of new ecological ponds (ponds lost would be replaced on a minimum 1:1 basis);
- provision of some new species-rich hedgerows, using appropriate native species, to help maintain connectivity of the ecological network in the surrounding areas, including along the margins of the route of the Proposed Scheme; and
- provision of new grassland habitats, including some species rich grasslands.

⁷³ Derbyshire Environmental Record Centre reptiles records

- 7.4.2 The assessment assumes implementation of the measures set out within the draft Code of Construction Practice (CoCP)⁷⁴, which includes translocation of protected species where appropriate.
- 7.4.3 Section 9 of the draft CoCP requires contractors to implement a range of measures to protect ecological receptors including the following:
- manage impacts from construction, including the timing of works, on designated sites, protected and notable species and other features of ecological importance such as ancient woodlands and watercourses;
 - reduce habitat loss by keeping the working area to the reasonable minimum;
 - reinstatement of areas of temporary habitat loss;
 - restoration and replacement planting;
 - implement management measures for potential ecological impacts to control dust, water quality and flow, noise and vibration, and lighting;
 - provision of a watching brief, where relevant;
 - relocation or translocation of species, soil and/or plant material, as appropriate;
 - consultation with Natural England, the Environment Agency, local wildlife trusts and relevant planning authorities prior to and during construction; and
 - compliance with all wildlife licensing requirements, including those for protected and invasive species and designated sites.

Assessment of impacts and effects

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

Designated sites

- Crabtree Wood SSSI is 1.3km east of the land required for the Proposed Scheme and would be separated from the Proposed Scheme by the M1 corridor. Given the distance from the land required for the Proposed Scheme, there would be no significant hydrological or other effects on the designated features (base-rich flush habitats) in Crabtree Wood SSSI.
- Construction of Staveley East embankment, the realignment of the River Doe Lea, and the construction of a new balancing pond would result in the permanent loss of the whole of Doe Lea Flash LWS (7.9ha), which is designated for its lowland swamp. Habitat loss would result in a permanent adverse effect on site integrity that would be significant at

⁷⁴ Supporting document: Draft Code of Construction Practice

county/metropolitan level.

- Construction of Staveley East embankment and the realignment of River Doe Lea would result in the permanent loss of the whole of Poolsbrook Flash LWS (0.2ha), which is designated for its lowland swamp. Habitat loss would result in a permanent adverse effect on site integrity that would be significant at county/metropolitan level.
- Construction of Mastin Moor embankment and Robinson's Lumb culvert would result in the permanent loss of 0.4ha (18.7%) of Robinson's Lumb LWS, which is designated for its semi-natural oak woodland. Loss of non-ancient woodland habitat within this site would result in a permanent adverse effect on site integrity that would be significant at county/metropolitan level.
- Construction of Mastin Moor embankment and Robinson's Lumb culvert would result in indirect construction impacts on adjacent ancient woodland within Robinson's Lumb AWIS and species using it. It is anticipated that adoption of measures in the draft CoCP would reduce this effect to a level that is not significant. However, on a precautionary basis, in the absence of more detailed information, this would result in a temporary adverse effect that is significant at the district/borough level.
- Construction of Mastin Moor embankment and Robinson's Lumb culvert would result in the permanent loss of 0.4ha (7.1%) of Westfield Railway LWS, which is designated for its unimproved calcareous grassland. Habitat loss would result in a permanent adverse effect on site integrity that would be significant at county/metropolitan level.
- Construction of the site access route/haul route off Barbers Row road south-east of Renishaw would result in the permanent loss of 0.6ha (20.3%) of Beighton Fields Plantation, Alder Carr and Meadow LWS, which is designated primarily for its unimproved neutral grassland. Habitat loss would result in a permanent adverse effect on site integrity that would be significant at county/metropolitan level.
- Construction of High Wood embankment would result in the permanent loss of 1ha of High Wood and Thompson's Holt LWS (8.5%), which is designated for its ancient semi-natural oak woodland and ancient woodland in High Wood AWIS (10%). Habitat loss would result in a permanent adverse effect on site integrity that would be significant at county/metropolitan level.
- Construction of Nor Wood embankment, Nor Wood cutting, Wales embankment and Nor Wood viaduct would result in the permanent loss of 18ha of Nor Wood and Locks LWS (31.5%) which supports ancient semi-natural woodland, watercourses and water bodies, and a loss of 4.1ha of ancient woodland in Nor Wood AWIS (12.7%). Habitat loss would result in a permanent adverse effect on site integrity that would be significant at county/metropolitan level.

- Construction of Fiddle Neck viaduct would result in the permanent loss of 0.7ha of Nicker Wood and Ponds LWS (6.5%) which supports ancient semi-natural woodland, acid grassland and fishing lakes and a loss of 0.4ha of ancient woodland in Nicker Wood AWIS (15.4%). Habitat loss would result in a permanent adverse effect on site integrity that would be significant at up to county/metropolitan level.

Habitats

Woodland

- 7.4.5 The Proposed Scheme would result in the loss of 30.3ha of lowland mixed deciduous woodland outside designated sites. Woodland losses would mainly be associated with construction of the Staveley spur (along the disused mineral railway), Staveley IMD, M1 motorway North viaduct, Mastin Moor cutting, Barlborough cutting and embankment, Woodall embankment, Wales Central cutting, and Wales Bar viaduct. Incorporated woodland creation is not expected to reduce the loss to a level that is not significant given the potential for the ongoing review to identify additional ancient woodlands. The permanent loss of these woodlands would therefore result in an effect that would be significant at up to county/metropolitan level.

Grassland

- 7.4.6 The Proposed Scheme would result in the loss of grassland outside designated sites, including 5.7ha of floodplain grazing marsh at Staveley due to the construction of the Staveley IMD. In the absence of further survey information, it has been assumed that none of the grassland lost would be unimproved and hence the loss would be significant at up to district/borough level.

Hedgerows

- 7.4.7 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 offset 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

- 7.4.8 The route of the Proposed Scheme would cross the River Doe Lea via the River Doe Lea underbridge. The realignment of the River Doe Lea would result in a temporary adverse effect that would be significant at up to county/metropolitan level. Indirect effects to parts of the river either side of the works would not be significant as they would be controlled through the implementation of measures set out in the draft CoCP.
- 7.4.9 The Proposed Scheme will result in the diversion of a tributary of the County Dike east of the embankment between Woodall Bottoms drop inlet culvert and Nor Wood viaduct; this diverts a 940m length of the existing channel. The diversion extends as

far as Woodall Pond where the channel would connect back into the pond. The diversion of the County Dike would result in a temporary adverse effect that would be significant at up to county/metropolitan level. Indirect effects to parts of the County Dike either side of the works would not be significant as they would be controlled through the implementation of measures set out in the draft CoCP.

- 7.4.10 The route of the Proposed Scheme would cross Hawke Brook on the M1 motorway North viaduct, the River Rother on the Staveley IMD South chord viaduct, Pigeon Bridge Brook on the Wales Bar viaduct and a tributary of Pigeon Bridge Brook on the Fiddle Neck 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 set out in the draft CoCP. However, the Proposed Scheme would result in the permanent loss of sections of other smaller watercourses and severance of smaller unnamed watercourses where these would be culverted (13). This habitat loss and fragmentation would result in a permanent adverse effect that would be significant at up to district/borough level.
- 7.4.11 The construction of the Pools Brook drop inlet culvert would result in the permanent loss of a section of, and create severance of, Pools Brook, which would result in a permanent effect that would be significant at up to district/borough level.

Water bodies

- 7.4.12 Twenty-six 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 at up to county/metropolitan level, if it is confirmed through field surveys that they support great crested newts or other priority species.

Ancient and veteran trees

- 7.4.13 It is assumed that veteran trees recorded within the land required for the Proposed Scheme in the Staveley to Aston 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 the county/metropolitan level in each case.

Open mosaic habitats on previously developed land

- 7.4.14 Outside of the designated sites, the Proposed Scheme would result in the loss of 57ha of open mosaic habitats on previously developed land from the Staveley IMD. In the absence of further survey information, it has been assumed that the loss would be significant at up to county/metropolitan level.

Species

Bats

- 7.4.15 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 this would be controlled through measures set out 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 regional level.

Otter

- 7.4.16 Otter has been recorded (a single incidental sighting) on the River Rother 1km west of the former Staveley Chemical Works (the site for the proposed Staveley IMD). There are also records of otter on the River Rother adjacent to the Former Staveley Chemical Works site, within 100m of the land required for the Proposed Scheme. The proposed River Rother viaduct and viaducts over water bodies and smaller watercourses in Nor Wood and Locks LWS and Nicker Wood and Ponds LWS would avoid loss of habitat along the River Rother and LWSs, Indirect effects from construction could result in disturbance to this species, if present, during the construction period, and preventing them from moving along the corridor. However, it is anticipated that these indirect effects would be controlled through measures set out in the draft CoCP.
- 7.4.17 Habitat loss would affect the River Doe Lea and several smaller watercourses crossed by the Proposed Scheme. 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 these species that would be significant up to county/metropolitan level.

Water vole

- 7.4.18 Water vole has been recorded along the Chesterfield Canal LWS adjacent to the former Staveley Chemical Works site, within 100m of the land required for the Proposed Scheme. There are also anecdotal records for water vole along the disused mineral railway (associated with the River Rother and River Doe Lea (Staveley spur area)), and at Nor Wood and Locks LWS and Nickerwood and Ponds LWS. The River Rother viaduct and viaducts over water bodies and smaller watercourses in Nor Wood and Locks LWS and Nickerwood and Ponds LWS would avoid loss of habitat along the River Rother and LWSs, respectively. Indirect effects from construction activities could result in disturbance to this species, if present, during the construction period, and preventing them from moving along the corridor. However, it is anticipated that these indirect effects would be controlled through implementation of measures set out in the draft CoCP.
- 7.4.19 Habitat loss would affect the River Doe Lea and several smaller watercourses crossed by the Proposed Scheme. On a precautionary basis, in the absence of further survey information, impacts to water voles would result in an adverse effect on the conservation status of these species that would be significant up to county/metropolitan level.

Great crested newt

- 7.4.20 On a precautionary basis, it has been assumed that all 26 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

- 7.4.21 Land required for the Proposed Scheme, would result in the loss of nesting and foraging habitat for a range of breeding and wintering birds, predominantly farmland and woodland species. These are likely to include barn owl, a Schedule 1 species which has been recorded through field surveys within Nor Wood and Locks LWS, south of the LWS and north of Aston, adjacent to, or 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 county/metropolitan level.

White-clawed crayfish

- 7.4.22 The proposed viaducts over the River Rother and water bodies and smaller watercourses in the Nor Wood and Locks LWS and Nicker Wood and Ponds LWS would avoid loss of potential suitable white-clawed crayfish habitat. Indirect effects from construction activities on white-clawed crayfish, if present, would be controlled through measures in the draft CoCP. White-clawed crayfish in the River Doe Lea (which would be realigned on one section associated with the Staveley spur) and in smaller watercourses could still be affected. 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 county/metropolitan level.

Aquatic invertebrates

- 7.4.23 The land required for the Proposed Scheme would result in the loss of habitat suitable for aquatic invertebrates (including Section 41 species). 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 district/borough level.

Terrestrial invertebrates

- 7.4.24 The Proposed Scheme would result in the loss of habitat suitable for terrestrial invertebrates (including Section 41 species). 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 district/borough level.

Fish

- 7.4.25 There are desk study records of fish in the Don and Rother catchments including brook lamprey, Atlantic salmon, bullhead (all species listed on Annex II of the EC

Habitats Directive), European eel and sea trout. Although the route of the Proposed Scheme would pass over these watercourses on viaducts, indirect impacts to the fish populations would be controlled through measures set out in the draft CoCP. However, fish populations in the River Doe Lea (which would be realigned on one section associated with the Staveley spur) and in smaller watercourses would still be affected and may require assessment under the Water Framework Directive (WFD)⁷⁵. 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 district/borough level.

Reptiles

- 7.4.26 There is suitable habitat for common species of reptiles within the land required for the Proposed Scheme, and grass snake has been recorded in Nor Wood and Locks LWS. 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 district/borough level.
- 7.4.27 Effects on other habitats and species that would be significant at the local/parish level during construction will be reported in the formal ES.
- 7.4.28 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

- 7.4.29 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:
- compensatory measures in response to the permanent loss of parts of three woodland sites that are classified as ancient semi-natural woodland: High Wood AWIS; Nor Wood AWIS; and Nicker 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 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

⁷⁵ European Commission, *The EU Water Framework Directive – integrated river basin management for Europe*, ec.europa.eu/environment/water/water-framework/index_en.html

lost, and/or enhancement of remaining woodlands including the below measures;

- options to create new species rich grasslands and options to create new and enhanced areas of floodplain grazing marsh south of the proposed Staveley IMD site. This would include wetland planting;
- options to create new areas of open mosaic habitats to replace the loss of open mosaic habitats on previously developed land surrounding the proposed Staveley IMD site;
- provision of additional hedgerows which would replace the losses and maintain the connectivity of the hedgerow network;
- options to enhance and restore watercourses such as the River Rother and Chesterfield Canal south of the proposed Staveley IMD site, and the River Doe Lea and tributary of the County Dike. This would include wetland planting and habitat creation;
- options to create ecological ponds on a one to one basis and include associated wetland and grassland planting;
- considering the need for inclusion of structures to reduce severance effects on bats;
- provision of additional measures to facilitate connectivity where significant foraging or commuting routes of fauna species would be affected;
- use of temporary fencing or retention of existing habitat links to reduce the risk of disturbance to otters during construction; design of watercourse culverts and underpasses to allow the free passage of wildlife;
- provision of alternative roosting habitat for bats; 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

7.4.30 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 20.

Table 20: Residual significant effects on ecological resources/features during construction

Resource/feature	Residual effect	Level at which the effect would be significant
Doe Lea Flash LWS	Loss of 7.9ha lowland swamp habitat leading to total loss of the site.	Up to county/metropolitan

High Speed Rail (Crewe to Manchester and West Midlands to Leeds)
Working Draft Environmental Statement Volume 2: LA11

Resource/feature	Residual effect	Level at which the effect would be significant
Poolsbrook Flash LWS	Loss of 0.2ha lowland swamp habitat leading to total loss of the site.	Up to county/metropolitan
Robinson's Lumb LWS	Loss of 0.4ha (18.7%) woodland habitat.	Up to county/metropolitan
Robinson's Lumb AWIS	Indirect temporary effects on ancient woodland during construction.	Up to district/borough
Westfield Railway LWS	Loss of 0.4ha (7.1%) unimproved neutral grassland habitat.	Up to county/metropolitan
Beighton Fields Plantation, Alder Carr and Meadow LWS	Loss of 0.6ha (20.3%) unimproved neutral grassland habitat.	Up to county/metropolitan
High Wood and Thompson's Holt LWS and High Wood AWIS	Irreplaceable loss of 1ha of ancient woodland (8.5% of the LWS).	Up to county/metropolitan
Nor Wood and Locks LWS and Nor Wood AWIS	Loss of 18ha (31.5%) woodland habitat including 4.1 ha of irreplaceable ancient woodland.	Up to county/metropolitan
Nicker Wood and Ponds LWS and Nicker Wood AWIS	Loss of 0.7ha (6.5%) woodland habitat including 0.4 ha of irreplaceable ancient woodland.	Up to county/metropolitan
Woodland	Loss of 30.3ha of woodland habitat. A review is being undertaken to identify any additional woodlands that are not currently listed on the Ancient Woodland Inventory but that may nevertheless be ancient. These will be identified and assessed in the formal ES.	Up to county/metropolitan
Grassland	Loss of 5.7ha of grassland habitat	Up to district/borough
Hedgerows	Permanent loss of hedgerows.	Up to district/borough
Watercourses	Loss of sections of small watercourse and severance of smaller unnamed watercourses. Realignment of the River Doe Lea.	Up to district/borough
Water bodies	Loss of 26 ponds.	Up to county/metropolitan
Ancient and veteran trees	Permanent loss of individual trees.	Up to county/metropolitan
Open mosaic habitat on previously developed land	Loss of 57ha open mosaic habitat on previously developed land habitat.	Up to county/metropolitan
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	Up to county/metropolitan

High Speed Rail (Crewe to Manchester and West Midlands to Leeds)
Working Draft Environmental Statement Volume 2: LA11

Resource/feature	Residual effect	Level at which the effect would be significant
	watercourses and water bodies crossed by the route of the Proposed Scheme.	
Water vole	Habitat loss and construction effects would affect several smaller watercourses and water bodies crossed by the route of the Proposed Scheme.	Up to county/metropolitan
Great crested newts	Loss of 26 ponds and surrounding terrestrial habitat which may support great crested newts.	Up to county/metropolitan
Birds	Loss of nesting and foraging habitat.	Up to county/metropolitan
White-clawed crayfish	Habitat loss and construction effects would affect several smaller watercourses and water bodies crossed by the route of the Proposed Scheme.	Up to county/metropolitan
Aquatic invertebrates	Habitat loss and construction effects would affect several smaller watercourses and water bodies crossed by the route of the Proposed Scheme.	Up to district/borough
Terrestrial invertebrates	Habitat loss.	Up to district/borough
Fish	Habitat loss and construction effects would affect several smaller watercourses and water bodies crossed by the route of the Proposed Scheme.	Up to district/borough
Reptiles	Potential permanent adverse effect on populations due to loss of refuge and foraging habitat, and fragmentation.	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, potentially near Nor Wood and Locks LWS and in the Aston area, where a barn owl has been recorded and where there is suitable grassland foraging habitat. The grassland vegetation that would grow along the embankments of the Proposed Scheme may encourage barn owls to forage close to trains, with the risk that they may be killed. Mortality, even if infrequent, could affect the conservation status of this Schedule 1 species and the ongoing reduction in numbers would result in a permanent adverse effect that would also be significant at up to county/metropolitan level. 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 plan⁷⁶ 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 21.

Table 21: 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 Staveley to Aston area.

⁷⁶ Currently in development for Phase 1 of HS2

8 Health

8.1 Introduction

- 8.1.1 This section identifies the communities within the Staveley to Aston area that would be subject to impacts associated with the Proposed Scheme and describes the changes that are considered to be potentially important for the health and wellbeing of people within these communities, where these effects are considered to be consequential.
- 8.1.2 Engagement with key public health bodies is underway, including 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 Staveley to Aston area that may not be identified solely through a review of publicly available data. Engagement with key public health organisations 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 Staveley to Aston 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: LA11 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)⁷⁷.
- 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.
- 8.2.4 The health determinants of relevance within the Staveley to Aston area are:
- for impacts during construction (temporary and permanent):

⁷⁷ Supporting document: HS2 Phase 2b Environmental Impact Assessment Scope and Methodology Report

- neighbourhood quality
 - access to services, health and social care;
 - access to green space, 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 Staveley to Aston area

- 8.3.1 The Staveley to Aston area is characterised by towns, villages and individual properties set within a rural area. As reported in Section 14, Traffic and transport, there are a number of public rights of way (PRoW) within the vicinity of the route 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.

Staveley, Barrow Hill, Woodthorpe and surrounds

- 8.3.3 Staveley is a town, which is bordered by the Rother River to the north-west and Poolsbrook Country Park to the south-east. Staveley comprises approximately 6,600 residential properties, where the nearest would be on the route of the Proposed Scheme (Staveley spur section). Community facilities within Staveley include churches, a care home and a secondary school. Victoria Park and Staveley Cricket Club provide recreational opportunities for the general public.
- 8.3.4 Barrow Hill is a village to the north of the River Rother, comprising approximately 950 residential properties. The nearest residential properties would be located approximately 50m north of the route of the Proposed Scheme. Community facilities within Barrow Hill include a medical centre, a primary school, a community centre and churches. In addition, amenity green and common land off Hall Lane provide recreational opportunities for the general public.
- 8.3.5 Woodthorpe is a village comprising approximately 250 residential properties. The nearest residential properties would be located approximately 500m from the route of the Proposed Scheme. Community facilities include primary schools and a nursing home.

Netherthorpe, Lowgates and Poolsbrook

- 8.3.6 Netherthorpe, Lowgates and Poolsbrook are adjoining settlements. Community facilities include allotments, a church, a primary school, a secondary school Staveley Miners Social and Cricket Club, Bent Lane Bowling Green and Poolsbrook social welfare centre. In addition, Poolsbrook Country Park provides recreational opportunities for the general public.

Barlborough and surrounds

- 8.3.7 Barlborough is a village where the majority of properties are located to the east of the route of the Proposed Scheme. Between Barlborough and the route of the Proposed Scheme is the M1. The village comprises approximately 1,400 residential properties, the nearest of which would be approximately 50m west of the route; these properties are located closer to the route than the properties to the east.
- 8.3.8 Community facilities within Barlborough include children's nurseries, primary schools, churches, a healthcare facility and a village hall. Within Barlborough and on the outskirts of the village, Park Farm Equestrian Centre, Barlborough Spring Fisheries, High Wood and Barlborough Hall all provide recreational opportunities for the general public.

Woodall, Harthill, Killamarsh, High Moor, Norwood and surrounds

- 8.3.9 Woodall is a village to the east of the route of the Proposed Scheme, which comprises approximately 80 residential properties. The nearest residential properties would be approximately 500m from the route. Between Woodall and the route is the M1. Woodall is closely linked to Harthill and is connected by Woodall Lane. While Woodall is predominantly residential, community facilities within Harthill include a primary school, a care home and a church.
- 8.3.10 To the west of the route of the Proposed Scheme are the villages of Killamarsh, High Moor and Norwood, which are connected to Woodall and Harthill by Killamarsh Lane. High Moor is the closest village to the route. High Moor comprises approximately 70 residential properties, where the nearest residential properties would be 700m from the route.
- 8.3.11 Within these settlements, Killamarsh Ponds, Norwood Cottage Lakes and Nor Wood all provide recreational opportunities for the general public. Additional recreation opportunities are provided by Rother Valley Golf Centre and Rother Valley Country Park, which lie to the north of Killamarsh.

Wales and surrounds

- 8.3.12 Wales is a village which is bisected by the M1 and route of the Proposed Scheme. The village is comprised of approximately 1,900 residential properties, the majority of which are located to the east of the route. Some residential properties would be on the route of the Proposed Scheme. Community facilities include churches, a nursery, primary schools, a secondary school, a village hall, and a sports and social club. In addition, Waleswood Sports Cricket Club and Waleswood Plantation provide recreational opportunities for the general public.

Aston and surrounds

- 8.3.13 Aston is a village comprised of approximately 5,000 residential properties. Some residential properties would be on the route of the Proposed Scheme. Community facilities within Aston include a primary school, a public house, a library and a church. In addition, Aston Park Fisheries, Aston Park, Aston Hall Cricket Club and Parklands Equestrian Centre all provide recreational opportunities for the general public.

Demographic and health profile of the Staveley to Aston area

- 8.3.14 The local communities in the Staveley to Aston area have a relatively low population density, commensurate with the rural nature of the area.
- 8.3.15 Data provided by the Office for National Statistics⁷⁸ for the local authority areas of Bolsover District Council (BDC), Chesterfield Borough Council (CBC) and Rotherham Metropolitan Borough Council (RMBC), shows that this population has a broadly similar health status compared with the national (England) averages.

⁷⁸ 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.

- 8.3.16 The population has similar levels of deprivation to the national average, with regard to the combined indices of multiple deprivation⁷⁹, and the health domain (a sub-set of the indices of multiple deprivation).
- 8.3.17 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 Staveley to Aston 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.

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. Insofar as reasonably practicable, mitigation measures have been incorporated into the design of the Proposed Scheme with the aim of avoiding or reducing adverse health effects. Examples of the mitigation measures incorporated into the design of the Proposed Scheme include the following:
- reducing the loss of property and community assets, insofar as reasonably practicable;
 - reducing visual intrusion and noise, insofar as reasonably practicable;
 - incorporating landscape design and screening into the design; and
 - permanent realignment and diversion of a number of PRoW and roads to maintain access (see Section 14, Traffic and transport for further detail).
- 8.4.2 In addition, the locations of construction compounds and site haul routes have been selected to reduce exposure to construction impacts as insofar as reasonably practicable.
- 8.4.3 HS2 Ltd would require its contractors to comply with the environmental management regime for the Proposed Scheme, which would include the measures set out in the draft Code of Construction Practice (CoCP)⁸⁰, 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 insofar 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

⁷⁹ 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>

⁸⁰ Supporting document: Draft Code of Construction Practice

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

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

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

Assessment of impacts and effects

Neighbourhood quality

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

8.4.8 The construction of the Proposed Scheme 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 Staveley to Aston 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 permanent⁸¹ 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 Staveley to Aston 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.

⁸¹ 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.

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 feelings of isolation and enabling participation in society, as well as accessing basic needs such as food shopping.
- 8.4.19 The Staveley to Aston area is predominantly rural in character. Typically, there is a reliance on a limited range of shops and services in nearby settlements within the area. To access alternative services and facilities 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 at a number of locations in the Staveley to Aston area, where publicly accessible open space is either temporarily or permanently lost, community facilities are permanently lost, or where the usability of land is compromised. This includes the following:
- approximately 25% of publicly accessible amenity green and common land off Hall Lane in Barrow Hill would be inaccessible for approximately one year during construction of Staveley Infrastructure Maintenance Depot and realignment of Hall Lane;
 - approximately 20% of open space within Poolsbrook Country Park would be inaccessible for approximately one year during the construction of Staveley East embankment;
 - demolition and permanent loss of the Parklands Equestrian Centre which

provides riding lessons, livery and training in Aston, due to the presence of the Aston cutting;

- approximately 15% of publicly accessible land within High Wood would be inaccessible for a duration of approximately one year during the construction of High Wood cutting and associated landscape earthworks;
- approximately 30% of publicly accessible open space within Nor Wood and Woodall Pond, which forms part of Killamarsh Ponds would be inaccessible for approximately two years and three months during the construction of Nor Wood viaduct and Nor Wood embankment; and
- approximately 40% of Aston Park and part of an area of woodland within it would be inaccessible for approximately three years and six months due to the construction of the B6067 Worksop Road diversion, the Aston South embankment and Aston South embankment satellite compound. In addition, the B6067 Worksop Road diversion would permanently require approximately 10% of publicly accessible land from Aston Park, which would permanently compromise the usability of approximately 30% of Aston Park.

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 Staveley to Aston 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. In the case of recreational users, it is considered that alternative routes would be available. For those using these routes for active travel to work or to access shops and services, there is the possibility that people would choose instead to travel by car, temporarily reducing levels of physical activity and associated health and wellbeing benefits.

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 trust⁸².”

- 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 small, 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 Staveley, Barrow Hill, Barlborough, Killamarsh, Wales and Aston. The duration of the works at each site ranges from approximately one year to four years and nine 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 ES will include an assessment of impacts resulting from the loss of residential properties. The loss of five properties is identified as the threshold for a significant Community effect. In some cases, the Community assessment may identify significant impacts below this threshold, for example where the demolitions make up a significant proportion of a very small community.
- 8.4.31 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

⁸² Office for National Statistics- Measuring Social Capital:
http://webarchive.nationalarchives.gov.uk/20160107115718/http://www.ons.gov.uk/ons/dcp171766_371693.pdf

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 Staveley to Aston area, there is a potential for such impacts to occur, where it is currently anticipated that 21 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 Staveley to Aston 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 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 Staveley to Aston area. Consideration is given to the extent and value (significance) 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, South Yorkshire Archaeology Service, Chesterfield Borough Council (CBC) and Derbyshire County Council (DCC), and at a strategic level with North East Derbyshire District Council (NEDDC), Bolsover District Council (BDC) and Rotherham Metropolitan Borough Council (RMBC). 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: LA11 Map Book. Only designated heritage assets within the Staveley to Aston area are shown on maps CT-10-106b to CT-10-111a. 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. 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)⁸³, including the method for determining the value of a heritage asset and magnitude of impact (tables 19 and 20 in the SMR, respectively).

⁸³ Supporting document: HS2 Phase 2b Environmental Impact Assessment Scope and Methodology Report

- 9.2.2 The assessment focuses on the extent to which the Proposed Scheme would affect designated and non-designated heritage assets. Impacts on assets as a result of the Proposed Scheme would occur largely through the physical removal and alteration of heritage assets and changes to their setting.
- 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 significance 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 been undertaken on that basis. However, in relation to the following assets although the asset is partially or wholly within the land required for the Proposed Scheme and may be affected, any effect is unlikely to be significant:
- Aston Conservation Area;
 - Barrow Hill Conservation Area;
 - Barlborough Hall Park (NHLE 1001365), a Grade II registered park and garden;
 - The Chesterfield Canal (MDR 6152 and MSY 5481) at Staveley and Nor Wood, comprising canal remains, locks, bridges, feeder reservoirs and Norwood Tunnel;
 - Barlborough medieval deer park (MDR 14233);
 - the line of the Chesterfield to Worksop turnpike road (now the A619 Chesterfield Road) (MDR 11650);
 - Hollingwood Tunnel (MDR 22789);

- Staveley Iron Works (site of) (MDR 6140);
- Staveley Park (MDR 13632);
- earthworks, including possible fishponds at Staveley (MDR 13686) and Priory Farm, Barlborough (MDR 6159);
- railways and former railways, including the dismantled Great Central Railway Derbyshire Mainline and its branch lines (MDR 11055), the disused Clowne branch of the Midland Railway (MDR 10205) and the former Lancashire, Derbyshire & East Coast Railway, Beighton branch line (MDR a10133) and Langwith to Beighton branch;
- former railway stations: Barrow Hill Station (MDR 11072) and Staveley Central Station (MDR 12153); and
- the sites of former collieries, including Hartington Colliery (MDR 11078), New Hollingwood Colliery, of which Hartington House may be a remnant, and Cottam Colliery No 1 and No 2, Barlborough (MDR 14870).

9.2.9 With respect to overhead line diversions/realignments in particular, it is likely that the majority of the heritage assets can in fact be retained, as the land is only required to allow for raising or lowering of pylons and/or re-stringing of cables, or to provide an access route to the works

9.2.10 Common features of the historic landscape such as marl pits, field boundaries and former areas of ridge and furrow are not individually considered but have been included in the baseline, as part of the historic landscape character and will be considered as part of the overall assessment of impacts on historic landscape reported in the formal ES.

9.2.11 In undertaking the assessment, the following limitations were identified and assumptions made:

- field surveys are ongoing, and are subject to land access and site conditions. The result of field surveys will be 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 and South Yorkshire HER;

- conservation area appraisals;
- historic maps and aerial photography; and
- Derbyshire Records Office.

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:

- Nickerwood Farmhouse (NHLE 1314670), a Grade II listed building of moderate value;
- Farmbuilding approximately 40m to the north-east of Nickerwood Farmhouse (NHLE 1192972), a Grade II listed building of moderate value;
- two conservation areas of moderate value: Aston Conservation Area and Barrow Hill Conservation Area; and
- Barlborough Hall Park (NHLE 1001365), a Grade II registered park and garden of moderate 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:

- a scheduled monument of high value: Standing Cross (in Barlborough; NHLE 1011756);
- three Grade I listed buildings of high value: Barlborough Hall (NHLE 1108972), Church of All Hallows (in Harthill, NHLE 1132709) and Church of All Saints (in Aston, NHLE 1151917);
- 12 Grade II* listed buildings of high value: Church of St John the Baptist (in Staveley, NHLE 1334670), The Hagge (in Staveley, NHLE 1205056), Beightonfields Priory (in Barlborough, NHLE 1052227), Church of St James (in Barlborough, NHLE 1335412); Village Cross⁸⁴ (in Barlborough, NHLE 1039862), Barlborough Old Hall (NHLE 1335416), Gazebo at Barlborough Hall (NHLE 1367143), Park Hall (in Barlborough, NHLE 1372089), 4 Walseker Lane, Woodall (NHLE 1132671), Church of St Giles (in Killamarsh, NHLE 1057656), Church of St John the Baptist (in Wales, NHLE 1286360) and Aughton Court (in Aston, NHLE 1314660);
- 111 Grade II listed buildings of moderate value: five of these are located in Staveley Conservation Area, 18 in Barlborough Conservation Area, seven in Harthill Conservation Area, five in Wales Conservation Area and 11 in Aston Conservation Area. The majority of the buildings outside of these villages are

⁸⁴ This asset is the same as the Standing Cross in Barlborough (NHLE 1011756)

farmhouses and associated farm buildings. A small number of listed structures are associated with industrial activity and the infrastructure that supported it;

- five conservation areas of moderate value: Staveley Conservation Area, Barlborough Conservation Area, Eckington and Renishaw Conservation Area, Harthill Conservation Area, and Wales Conservation Area; and
- a Grade II* registered park and garden of high value: Renishaw Hall Park (NHLE 1000683).

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:

- The Chesterfield Canal (MDR 6152 and MSY 5481) at Staveley and Nor Wood, comprising canal remains, locks, bridges, feeder reservoirs and Norwood Tunnel;
- Barlborough medieval deer park (MDR 14233);
- Longford medieval deer park (MDR 14234); and
- Aston Park, a designed landscape lying to the south and east of Aughton Court.

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

- the line of the Chesterfield to Worksop turnpike road (now the A619 Chesterfield Road) (MDR 11650);
- Hollingwood Tunnel (MDR 22789);
- Staveley Iron Works (site of) (MDR 6140);
- Staveley Park (MDR 13632);
- earthworks, including possible fishponds at Staveley (MDR 13686) and Priors Farm, Barlborough (MDR 6159);
- railways and former railways, including the dismantled Great Central Railway Derbyshire Mainline and its branch lines (MDR 11055), the disused Clowne branch of the Midland Railway (MDR 10205) and the former Lancashire, Derbyshire & East Coast Railway, Beighton branch line (MDR a10133) and Langwith to Beighton branch;
- former railway stations: Barrow Hill Station (MDR 11072) and Staveley Central Station (MDR 12153); and
- the sites of former collieries, including Hartington Colliery (MDR 11078), New Hollingwood Colliery, of which Hartington House may be a remnant, Woodhouse Lane Colliery (MDR 14874) and Cottam Colliery No 1 and No 2, Barlborough (MDR 14870).

- 9.3.7 Non-designated heritage assets located partially or wholly within 500m of the land required, temporarily or permanently, for the construction and operation of the Proposed Scheme include 62 assets of low value, predominantly of post-medieval date, including houses, industrial sites and earthworks.

Historic environment overview

- 9.3.8 The bedrock geology of the Staveley to Aston area is formed for the most part of Pennine Middle Coal Measures although limestone of the Cadeby Formation is present in the vicinity of Barlborough. The coal seams have been subject to extensive open cast, shallow and deep mining into recent times. Localised mining of ironstone and clay has also taken place within the Coal Measures Group. Alluvial deposits variably comprising silty clay, silt, sand, peat and gravel are found associated with the River Doe Lea, the River Rother and Pools Brook near Staveley, as well as their tributaries.
- 9.3.9 Despite evidence for Lower and Middle Palaeolithic activity in Yorkshire and the East Midlands generally not surviving well because of the scouring effects of the Devensian glaciation, some Middle and Early Upper Palaeolithic artefacts, representing the activity of “a few highly mobile groups” have been found at Creswell Crags, which lies approximately 6km east of the land required for the Proposed Scheme⁸⁵.
- 9.3.10 In Derbyshire, archaeological fieldwork has established the presence of Mesolithic sites in all geological regions⁸⁶, including areas with coal measures similar to those in the Staveley to Aston area. Notable concentrations of Mesolithic flintwork, indicating the probable location of temporary camps used by mobile groups of hunter gatherers, have been recovered from sites overlooking the River Rother and its tributaries at Chesterfield, Unstone and Aston cum Aughton⁸⁷.
- 9.3.11 Evidence for Neolithic activity from the study area is limited, but there have been discoveries of flint scatters in the vicinity of Clowne, Barlborough and Harthill⁸⁸ indicating the possible presence of settlements or farming activity. Additionally, burials from a chambered cairn⁸⁹ at Whitwell have been dated by radiocarbon analysis to the early Neolithic period⁹⁰.
- 9.3.12 The early to middle Bronze Age saw the consolidation of agricultural practices, the gradual adoption of metal in place of stone, and the appearance of round barrows⁹¹ and ring ditches⁹². Metal finds from the study area are very rare, being limited to spearheads found at Barlborough and Elmtun and a palstave axe⁹³ at Thurcroft colliery (but almost certainly imported with material from elsewhere). Some of the

⁸⁵ McNabb, J, ‘The Palaeolithic’ in Cooper, N J (ed), 2006, *The Archaeology of the East Midlands: An Archaeological Resource Assessment and Research Agenda*, Leicester Archaeology Monograph No. 13, 30, 36

⁸⁶ *ibid*, 63

⁸⁷ Radley, J and Mellars, B, 1963, ‘Hail Mary Hill, a mesolithic site in the Rother Valley’, *Hunterian Archaeological Society Transactions* vol 8, 307-11

⁸⁸ The apparent concentration east of the M1 is quite probably a result of collection bias.

⁸⁹ A chambered cairn is a burial monument consisting of a sizeable chamber around and over which a cairn of stones was constructed

⁹⁰ Dates ranged from 4630 to 3720 cal. BC (calibrated dates BC). Schuting (2000) cited in Clay, P, ‘The Neolithic and Early to Middle Bronze Age’, in Cooper, N J. *op cit*, 75

⁹¹ A round barrow is a mound of earth constructed over one or more burials

⁹² A ring ditch is a trench of circular or penannular (incomplete circle) plan. When excavated, ring ditches are usually found to be the ploughed-out remains of a round barrow where the barrow mound has completely disappeared, leaving only the infilled former quarry ditch

⁹³ A palstave is a type of early [bronze axe](#), although precise definitions differ, an axe is generally deemed to be a palstave if it is hafted by means of a forked wooden handle kept in place with high, cast flanges and stop bar

worked flints commonly encountered in the Staveley to Aston area may also be Bronze Age in date.

- 9.3.13 Although round barrows are the most common form of Early Bronze Age monument, with 187 known in the Derbyshire uplands alone, no monuments of this period are known in the Staveley to Aston area. The Late Bronze Age and Iron Age are characterised by the appearance of farmsteads and defended sites, and a decline in the prominence of burial monuments. However, the only defensive site in proximity to the Staveley to Aston area is the scheduled promontory fort at Markland Grips (NHLE 1011428), which lies just over 4km east of the land required for the Proposed Scheme. Similarly, artefacts and settlement sites of this period are rare, and largely unknown within the areas underlain by coal measures⁹⁴.
- 9.3.14 Evidence from the Roman period is “both extensive and abundant” in the East Midlands⁹⁵. Two Roman roads run through the area. A portion of the road running northwards from a fort at Chesterfield has been located at The Hagge, Staveley⁹⁶, and a second road may have run southward from Kiveton Park through Harthill and Clowne⁹⁷. It is thought likely that there was a fort on this road at Damsbrook, south of Clowne. Finds of Roman coins, pottery and other objects are widespread throughout the Staveley to Aston area, and include a possible coin hoard at Whitwell. Settlement sites have been identified at Barlborough⁹⁸, Camp Hill⁹⁹ and Whalley¹⁰⁰, and pottery finds from the promontory fort at Markland Grips suggest that the site was re-occupied in the 2nd or 3rd centuries¹⁰¹.
- 9.3.15 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 unknown”¹⁰². The 9th to 11th century period was one of great change which saw the division of land into shires. An insight into the resultant settlement patterns, landholdings and economy of the area is provided by the late 11th century Domesday Book entries for Elmton, Clowne, Barlborough, Staveley and Killamarsh¹⁰³ in Derbyshire, and Harthill, Todwick, Kiveton, Wales, Aughton Hall and Aston in Yorkshire¹⁰⁴. It is evident that much of the medieval and later settlement pattern visible in the Staveley to Aston area had been established by the mid-11th century.
- 9.3.16 Medieval fabric survives in the churches of St John the Baptist in Staveley (NHLE 1334670), St John the Baptist in Clowne (NHLE 1040039), St James in Barlborough (NHLE 1335412), St Giles in Killamarsh (NHLE 1057656), St John the

⁹⁴ For example, Willis, S, ‘The Later Bronze Age and Iron Age’ in Cooper, N J, *op cit*, 94

⁹⁵ Taylor, J, in Cooper, N J, *op cit*, 137

⁹⁶ Hart, C, 1981, *The North Derbyshire Archaeological Survey to AD 1500*, 92-94

⁹⁷ Derbyshire HER reference MDR6185

⁹⁸ Hart, C, *op cit*, 95-6

⁹⁹ *ibid*, 143

¹⁰⁰ Radley, J, 1967, ‘Excavations at a rock shelter at Whaley’, *Derbyshire Archaeological Journal* vol 87, 14-15

¹⁰¹ Lane, H C, 1969, ‘Markland Grips Iron Age Promontory Fort: an interim report’, *Derbyshire Archaeological Journal* vol 89, 65

¹⁰² Vince, A, ‘The Anglo-Saxon Period (c.400-850)’ in Cooper, N J, *op cit* 161

¹⁰³ Morgan, P (ed), 1978, *Domesday Book, volume 27, Derbyshire*. Phillimore (Chichester)

¹⁰⁴ Faull, M L and Stinson, M, 1986, *Domesday Book, volume 30, Yorkshire*, Phillimore (Chichester)

Baptist in Wales (NHLE 1286360) and All Saints in Aston (NHLE 1151917). Crosses of medieval date survive at Staveley (NHLE 1088355) and Barlborough (NHLE 1011756).

- 9.3.17 A characteristic feature of the medieval period was the creation of deer parks on aristocratic estates in imitation, on a smaller scale, of royal hunting forests (the nearest of which were The Peak and Sherwood Forests). There is reliable evidence for deer parks at Staveley, Elmtun, Whitwell, Barlborough and Longford (Barlborough)¹⁰⁵. Less reliable evidence exists for a park at Romeley¹⁰⁶. Beightonfields Priory (NHLE 1052227) may have been the site of a medieval hospital, although the buildings on the site today are principally of 17th century or later date¹⁰⁷.
- 9.3.18 Barlborough Hall (NHLE 1108972) is an example of a Tudor 'prospect house'¹⁰⁸ built in 1583-4 for Francis Rodes, a prominent lawyer whose patron was the Earl of Shrewsbury¹⁰⁹. The hall has a 16th century garden pavilion and parkland developed from the medieval deer park noted above. Staveley Hall (NHLE 134671), The Hagge (NHLE 1205056) and Park Hall (NHLE 1372089) are slightly later, being constructed in the first half of the 17th century. Aughton Court (originally known as Aston Hall, NHLE 1314660) is the work of John Carr of York and dates to c.1772.
- 9.3.19 There is evidence that ironworking was taking place at Staveley from as early as the 17th century¹¹⁰. By the 19th century the Staveley area was very largely an industrial district, with extensive collieries. The Staveley Chemical Works was established east of the original iron works in the 20th century. The need to attract a workforce to the Staveley Iron Works led Richard Barrow, its director, to build a model village at Barrow Hill¹¹¹. The development of the area was facilitated by improved transport infrastructure. The first turnpike road in Derbyshire was authorised in 1724, and many of the major routes were turnpikes by the 1750s and 1760s¹¹². The Chesterfield to Worksop turnpike via Staveley and Barlborough was authorised in 1739. The Chesterfield Canal opened in 1777.
- 9.3.20 Railways followed in the 19th century, with the first line in the area being the North Midland Railway¹¹³. In the 1860s its railway works moved to Barrow Hill and in 1869 the roundhouse (now listed and preserved, NHLE 1140134) was constructed. The Great Central Railway's Derbyshire Main Line and Chesterfield Loop opened in 1891/2 with stations at Staveley Works, Staveley Town and Killamarsh. Subsequently, a number of branch lines to nearby collieries were opened. Finally, in 1897 the

¹⁰⁵ Wiltshire, M & Woore, S, 2009, *Medieval Parks of Derbyshire*, Landmark (Ashbourne), 28-29, 74-75, 168-169 and 184-185

¹⁰⁶ *ibid*, 213

¹⁰⁷ Hart, C, *op cit*, index

¹⁰⁸ A 'prospect house' was one designed to have panoramic views from the house, often from the roof as at Barlborough, over the parkland and wider estate. The underlying purpose was to demonstrate the wealth, taste and status of the owner.

¹⁰⁹ Robert Smythson who designed the Earl's house at Worksop may also have designed Barlborough (see listing description for NHLE 1001365 and 1108972). Smythson was also heavily involved in the design of Hardwick Hall for Bess of Hardwick, the Earl's second wife.

¹¹⁰ Chesterfield Borough Council, 2010, *Staveley Conservation Area Appraisal*, 10

¹¹¹ See Chesterfield Borough Council, 2008, Barrow Hill Conservation Area, 7-8. Raymond Unwin, one of the early supporters of the Garden City Movement had been an apprentice engineer at the Staveley Iron & Coal Company and as a partner in the architectural firm of Parker & Unwin had designed the Church of St Andrew (built 1893-5), see Pevsner, N, 1978, *The Buildings of England: Derbyshire*, Yale University Press, New Haven and London, 84

¹¹² Hey, D, 2008, *Derbyshire: a history*, Carnegie (Lancaster)

¹¹³ The North Midland Railway merged with two other companies to form the Midland Railway in 1844

Lancashire, Derbyshire and East Coast Railway was opened, with stations at Spinkhill and Clowne.

9.4 Effects arising during construction

Avoidance and mitigation measures

- 9.4.1 The design of the Proposed Scheme has sought to avoid impacts on heritage assets within the area insofar as reasonably practicable.
- 9.4.2 Section 8 of the draft Code of Construction Practice (CoCP)¹¹⁴ sets out the measures that will be adopted, insofar as reasonably practicable, to control effects on heritage assets. These include:
- the incorporation of retaining walls in the design of the Staveley IMD to avoid direct physical impacts on the heritage asset at Cavendish Place (NHLE 1387210);
 - 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 Cavendish Place (NHLE 1387210) is a Grade II listed building of moderate value located, at its nearest point, 15m from the land required for the Proposed Scheme. It comprises a mid-19th century terrace of houses with attached outbuildings constructed for G H Barrow of Staveley Iron Works as the works managers' houses. It derives its significance from its architectural interest and its evidential value as an example of integrated industrial planning. The setting of Cavendish Place includes its

¹¹⁴ Supporting document: Draft Code of Construction Practice

residual relationship with the now largely demolished Staveley Works, and its reciprocal views to Barrow's home at Ringwood House (NHLE 1088354). This setting would be affected by construction activity associated with Staveley Infrastructure Maintenance Depot (IMD) which would interrupt the reciprocal views to Ringwood House and bring noise and visual intrusion into the immediate vicinity of the building. The construction would constitute a medium magnitude of impact and a moderate adverse effect.

Permanent effects

- 9.4.6 Permanent significant effects can occur either as a result of physical impacts on heritage assets within the land required for the Proposed Scheme, or through changes to the setting of heritage assets through the presence of the Proposed Scheme.
- 9.4.7 The following significant effects are currently expected to occur as a result of permanent physical impacts on heritage assets within the land required for the construction and operation of the Proposed Scheme.
- 9.4.8 Nickerwood Farmhouse (NHLE 1314670), a Grade II listed building of moderate value, is possibly of 16th century date, later encased and added to in the 18th century. The farmhouse would be demolished in order to construct Nicker Wood embankment. This would constitute a high magnitude of impact and a major adverse effect.
- 9.4.9 The Farmbuilding approximately 40m to north-east of Nickerwood Farmhouse (NHLE 1192972) is a Grade II listed building of moderate value. The building is a 'combination farmbuilding' of probable early 19th century date. The building would be demolished in order to construct Nicker Wood embankment. This would constitute a high magnitude of impact and a major adverse effect.
- 9.4.10 Longford medieval deer park (MDR 14234), one of two medieval deer parks at Barlborough, is a non-designated asset of moderate value. The park, established in 1330, was named after Nicholas Longford and included the site of the family seat now occupied by Park Hall. Although disrupted in parts by modern industry, the park boundary can still be traced. Mitigation planting and material placement in the north-east corner of the park will remove any associated buried remains such as the park pale¹¹⁵ and will alter the existing features in the area which aid identification of the former boundary for a distance of approximately 1400m. This would constitute a medium magnitude of impact and a moderate adverse effect.
- 9.4.11 The site of Woodhouse Lane Colliery (MDR 14874), a heritage asset of 19th century date of which no remains survive above ground, is a non-designated asset of low value. Construction of the Staveley East cutting will entirely remove any below-ground remains which may survive. This will constitute a high magnitude of impact and a moderate adverse effect.
- 9.4.12 Aston Park, a designed landscape associated with Aughton Court, was constructed to a design by Lancelot 'Capability' Brown concurrently with the rebuilding of Aughton Court by John Carr of York. The park is a non-designated asset of moderate value. The

¹¹⁵ A wooden stake fence defining the extent of a deer park. Often associated with earthworks

construction of Aston South embankment, the diversion of Worksop Road and associated landscape mitigation planting will result in a tree lined road running diagonally through the centre of the parkland, severing the eastern and western parts of the park, and a substantial earthwork in the north-east corner of the park. This will alter the remaining 'Brownian' character of the landscape to a noticeable degree. This would constitute a medium magnitude of impact and a moderate adverse effect.

9.4.13 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:

9.4.14 Aughton Court (also known as Aston Hall) in Aston (NHLE 1314660), a Grade II* listed building of high value, is a country house built in c.1772 by John Carr of York. Its setting includes parkland to the east and south which was laid out to a design by Lancelot 'Capability' Brown¹¹⁶ (see entry above for Aston Park). A ha-ha ensured uninterrupted views to the south-east from the garden front of the house towards Nicker Wood where a water feature had been created from earlier fishponds¹¹⁷. The parkland setting contributes to the significance of the house by allowing an understanding to be gained of the relationship of the house to its wider estate, and the degree to which the design of the house and its setting conformed to contemporary 18th century taste. Diversion of the B6067 Worksop Road will result in it passing through the parkland from a point approximately 350m south-east of the house before passing east of the house at a distance of approximately 100m severing the house from the eastern portion of the park. This would adversely affect views between the asset and its landscape setting, constituting a medium magnitude of impact and a major adverse effect.

Other mitigation measures

9.4.15 No additional construction phase mitigation measures beyond those included within the Proposed Scheme design have been identified at this stage, however potential opportunities for further mitigation measures will continue to be considered through detailed design. These may include the identification of:

- suitable locations for advance planting, to reduce impacts on the setting of heritage assets;
- locations where the physical impacts on below ground heritage assets can be reduced through the design of earthworks.

Summary of likely residual significant effects

9.4.16 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.

9.4.17 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

¹¹⁶ <http://www.parksandgardens.org/places-and-people/site/7540/summary>

¹¹⁷ Lynch, K. Capability Brown in Yorkshire in Eyres, P. (ed) (2016) Yorkshire Capabilities: The Yorkshire landscapes of Capability Brown. New Arcadian Journal n.75/76 pp.55-57

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 measures have been incorporated into the design of the Proposed Scheme, which would reduce the impacts and effects on heritage assets as shown on the CT-o6 Map Series within the Volume 2: LA11 Map Book:

- noise mitigation measures have been included within the Proposed Scheme to reduce potential impacts on identified assets;
- landscape planting would increasingly reduce impacts on the setting of the designated assets within the study area as it matures; and
- the incorporation of retaining walls in the design of the Staveley IMD to avoid direct physical impacts on the heritage asset at Cavendish Place (NHLE 1387210).

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 Aughton Court 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.

Other mitigation measures

9.5.7 The Proposed Scheme includes a number of design measures to address potential impacts and significant effects. At this time, no additional operational mitigation measures beyond those included within the Proposed Scheme design have been

identified. Potential opportunities for further mitigation have not been identified, but will be considered as part of the detailed design process.

Summary of likely residual significant effects

- 9.5.8 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 construction.

Monitoring

- 9.5.9 Volume 1, Section 9 sets out the general approach to environmental monitoring during operation of the Proposed Scheme.
- 9.5.10 No area-specific heritage monitoring requirements during operation of the Proposed Scheme have been identified at this stage.

10 Land quality

10.1 Introduction

- 10.1.1 This section of the report presents the baseline conditions that exist along the Proposed Scheme in the Staveley to Aston area in relation to land quality, and reports the likely impacts and significant effects identified to date resulting from construction and operation of the Proposed Scheme. Consideration is given to land that potentially contains contamination and land that has special geological significance, either from a scientific, historical, mineral exploitation or mineral resources point of view including geological sites of special scientific interest (SSSI) and local geological sites (LGS), and areas of designated mineral resources. Consideration is also given to petroleum (including gas) prospects and licensing.
- 10.1.2 Engagement has been undertaken with the British Geological Survey (BGS), The Coal Authority, Derbyshire County Council (DCC), Rotherham Metropolitan Borough Council (RMBC), Chesterfield Borough Council (CBC), the Environment Agency, Fera Science Limited (FSL)¹¹⁸, 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: LA11 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)¹¹⁹.
- 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.
- 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

¹¹⁸ Formerly known as the Food and Environment Research Agency

¹¹⁹ Supporting document: HS2 Phase 2b Environmental Impact Assessment Scope and Methodology Report

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 resources¹²⁰ identified on published minerals 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 Minerals Plan).
- 10.2.8 The geo-conservation assessment is based upon publicly available local geological trust records.

10.3 Environmental baseline

Existing baseline

- 10.3.1 Baseline data have been collected from a range of sources including Ordnance Survey mapping, the BGS, Coal Authority, RMBC, CBC, DCC, Public Health England, the Environment Agency, Natural England, FSL and APHA records, as well as web sources such as publically available local geological trusts.

Geology

- 10.3.2 This section describes the underlying ground conditions within the Staveley to Aston area. Recent changes in lithostratigraphic classifications by the BGS have been incorporated where appropriate.
- 10.3.3 Table 22 provides a summary of the geology (made ground, superficial and bedrock units) underlying the Proposed Scheme in the study area.

¹²⁰ Defined in the SMR as 'mineral body including aggregates, salt, coal and other hydrocarbons, Petroleum Extraction Development Licences (PEDLs), Shale Prospective Areas (SPAs)'

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

Working Draft Environmental Statement Volume 2: LA11

Table 22: Summary of the geology underlying the land quality study area

Geology	Distribution	Formation description	Aquifer classification
Made ground			
Made ground	Numerous deposits between Staveley and Ulley Beeches	Artificial ground comprising variable deposits of reworked natural and man-made materials.	N/A
Superficial			
Alluvium	Deposits in the Staveley area and to the south of Netherthorpe	Clays, silts, sands and gravels	Secondary A
Head	Deposits around the Staveley area and between Woodall and Wales	Clays, silts, sands and gravels	Secondary (undifferentiated)
Bedrock			
Cadeby Formation (Zechstein Group)	150m to the east of the M1 at Barlborough	Oolitic ¹²¹ compact and granular well bedded dolomitic limestone Mudstone interbeds present at the base of the unit. Reef- limestone present at the top of the unit	Principal
Basal Permian Sands (Rotliegendes Group)	Approximately 100m to the east of the M1 near Barlborough	Yellow to brown evenly graded fine to medium false-bedded loosely cemented sand and sandstone	Principal
Pennine Middle Coal Measures – Mudstone, siltstone and sandstone	The majority of the study area	Interbedded mudstone/siltstone/sandstone with coal seams	Secondary A
Pennine Middle Coal Measures Oaks Rock – Sandstone	Intermittently crosses the M1 between Barlborough and Wales	Light brown fine grained sandstone, which has been split into two components separated by thin dirt partings and locally by a mudstone bed up to 3m thick	Secondary A
Pennine Middle Coal Measures – Mexborough Rock - sandstone	Located to the west of the M1 Junction 31 between Aston Park, Netherthorpe and Ulley Beeches Smaller outcrop east of the M1 near to Vessey Close Farm	Grey and green medium to coarse sandstone, with local micaceous beds, purple shale bands and iron staining on discontinuity surfaces	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 study area, for example

¹²¹ Ooidal limestone-A limestone that is formed of abundant ooids (sometimes called oolites), small spheres of calcium carbonate that look like fish eggs. This is sometimes called 'oolitic limestone'. <https://www.bgs.ac.uk/discoveringGeology/glossary.html>

where ponds, sand or marl pits have been backfilled. There is evidence of historical and authorised landfilling within the study area, which may comprise more significant deposits of made ground.

- 10.3.5 Geological mapping of the area shows large areas of made ground or ground subject to shallow mine workings.
- 10.3.6 Various locations of made ground are present along the Proposed Scheme between Staveley and Wales Bar. Made ground is generically described as variable composition, man-made deposits, located in areas where the ground has been cut away and then had artificial ground deposited.
- 10.3.7 Elongated zones of ground subject to shallow mine workings (<30m depth) are located along the Proposed Scheme between Staveley and Ulley Beeches.
- 10.3.8 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 Staveley to Aston area. In all cases, records do not provide an exact location for the burial or pyre sites. However, the APHA FMD County Status maps¹²² show that the study area falls within the FMD free counties category. 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.

Superficial geology

- 10.3.9 Alluvial deposits variably comprising silty clay, silt, sand and gravel occur along the courses of streams and rivers. Alluvium is present in the study area associated with the River Doe Lea, the River Rother and Pools Brook near Staveley, as well as their tributaries, and the Pigeon Bridge Brook and Hepworth Pond to the south of Netherthorpe.
- 10.3.10 Head deposits, which typically comprise clay, sand, silt and gravel, are present between Woodall and Wales and around Poolsbrook, Woodthorpe, and Barrow Hill in the Staveley area.

Bedrock geology

- 10.3.11 The bedrock geology in this area comprises the Cadeby Formation (Zechstein Group), the Basal Permian Sand (Rotliegendes Group) and the Pennine Coal Measures Group – Middle Coal Measures.
- 10.3.12 The Cadeby Formation (Zechstein Group) is located 150m to the east of the route of the Proposed Scheme near Barlborough. The Cadeby Formation is described as grey compact oolitic and granular, dolomitic limestone, with interbeds of mudstone, dolomitic siltstone and sandstone. The dolomite and dolomitic limestone have been mined in the area around Barlborough.

¹²² APHA Foot and Mouth County Series Maps. <https://data.gov.uk/dataset/1c7ae62d-3268-467d-a2df-e8c5a6d93ab3/foot-and-mouth-disease-2001-county-status-map-29-10-2001>

- 10.3.13 The Basal Permian Sand is located 100m to the east of the route of the Proposed Scheme at Barlborough, and has typically been described as yellow to brown evenly graded false-bedded loosely cemented sand, comprised entirely of quartz grains.
- 10.3.14 The Pennine Middle Coal Measures Formation underlies the majority of the Proposed Scheme in this study area, and comprises cyclical¹²³ layers of interbedded mudstone, siltstone and sandstone with coal seams. The Pennine Middle Coal Measures Formation is characterised by well-developed cyclothems¹²⁴, good quality economically important coal seams and thick sandstone beds. Coal was extracted from open cast sites and underground workings of varying depths.
- 10.3.15 Many of the coal seams in the study area outcrop at the surface and have been worked economically in the past. Key seams include:
- Top Hard;
 - Deep soft;
 - Backshale;
 - Furnance;
 - Sough;
 - High Hazel;
 - Fox Earth;
 - Clowne; and
 - Swinton Pottery.
- 10.3.16 Brick clay, ironstone and shale from the Coal Measures mudstones, Fireclay Coal Measures and Secondary Open-cast Coal resources have historically been mined across much of the study area, excluding the area north-west of Harthill and area south-west of Wales Bar.
- 10.3.17 Records from the Coal Authority show that the route of the Proposed Scheme would pass through areas of recorded historical underground coal mining activities throughout the entire Staveley to Aston area. In addition, abandoned underground roadways and mineral workings and pit heads, associated with coal mining, are also recorded. There are over 400 known mine entries within the Staveley to Aston area. There are eleven recorded mine entries located within the land required for construction of the Proposed Scheme and a further 381 recorded within the wider study area. Available details for the current status of the mine entries are limited. Some of the mine entries have been backfilled, and it is not known if all backfilled entries were regulated and completed to any required standard, as such the material within some of the mine entries may comprise unknown waste materials. Coal Authority records show some have been infilled to an unspecified standard.

¹²³ Repetitive patterns of different rock layers, caused by repeated changes in the depositional environment

¹²⁴ Coarsening-upward sequences of mudstone, siltstone and sandstone, often topped with seatearths and coal seams

- 10.3.18 Records indicate that underground mining of the Deep Hard Coal and Flockton (Sitwell) Coal has been undertaken near Staveley. The depths of workings are anticipated to be greater than 100mbgl.
- 10.3.19 There are a number of named sandstone strata within the Pennine Middle Coal Measures Formation, notably (from south to north) the Oaks Rock and Mexborough Rock. There are also numerous unnamed sandstone strata outcropping within the study area. Many of these sandstone strata have been historically worked for building stone and grinding stones.
- 10.3.20 The Pennine Middle Coal Measures Formation, has been heavily folded and faulted. Fault lines intersect the route of the Proposed Scheme to the north of Barlborough and to the north and south of Netherthorpe.

Radon

- 10.3.21 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 Dataset¹²⁵
- 10.3.22 The Proposed Scheme lies within the following radon affected areas:
- to the north-west of junction 30 of the M1 near Barlborough it is stated that between 5% and 10% of homes are estimated to have radon at or above the action level of 200 becquerels per cubic metre of air (Bq/m³) for residential properties;
 - immediately north of Woodthorpe Hall Farm and to the north-west of Barlborough to Highwood it is stated that between 3% and 5% of homes are estimated to have radon at or above the action level; and
 - between Staveley and junction 30 of the M1 it is stated that between 1% and 3% of homes are estimated to have radon at or above the action level.
- 10.3.23 The radon potential relates to the percentage of homes estimated to have radon levels at or above the action level of 200 becquerels per cubic metre of air (Bq/m³) for residential properties. For the remainder of the Staveley to Aston area, less than 1% of homes are estimated to be at or above the radon action level.
- 10.3.24 The formal ES will include an assessment of areas where there are 5% of homes estimated to have radon levels at or above 200Bq/m³.

Groundwater

- 10.3.25 Three categories of aquifer have been identified within the study area, as defined by the Environment Agency:
- the Cadeby Formation and the Basal Permian Sand are designated as Principal aquifers;

¹²⁵ 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). Indicative Atlas of Radon in England and Wales. Public Health England. ISBN: 978-0-85951-608-2. 29 pp) available at www.ukradon.org/information/ukmaps

- the Pennine Coal Measures Group, comprising the Middle Coal Measures, is designated as a Secondary A aquifer. The Alluvial deposits are also classified as a Secondary A aquifer; and
- the head deposits are designated as a Secondary (undifferentiated) aquifer.

- 10.3.26 The Environment Agency reports that there are two groundwater abstraction licences within the 1km study area. One is located approximately 600m to the east of the Proposed Scheme, to the north of Harthill. This abstraction is used for general agriculture spray irrigation. A second abstraction licence is located 830m west of the Proposed Scheme at Norwood Industrial Estate and is used for industrial process water.
- 10.3.27 There are no groundwater source protection zones (SPZ)¹²⁶ identified within the study area.
- 10.3.28 Details of the 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 SPZ₁ and a default 250m radius SPZ₂. There is no default SPZ₃ for total catchment with respect to this type of abstraction.
- 10.3.29 There are no private groundwater abstractions that require a permit registered within the study area.
- 10.3.30 There are no Drinking Water Safeguarding Zones in the Staveley to Aston area.
- 10.3.31 Further information on the groundwater in the study area is provided in Section 15, Water resources and flood risk.

Surface water

- 10.3.32 The Proposed Scheme would intersect the following watercourses. The Water Framework Directive (WFD) designation of each watercourse is shown in brackets. The River Rother (Main River) and the River Doe Lea (Main River) are within the study area. The River Rother would be crossed by the route of the Proposed Scheme near Staveley and the River Doe Lea would be crossed by the route of the Proposed Scheme south of Netherthorpe. The Chesterfield Canal (Canal) is located to the south of the River Rother at Staveley and connects to Staveley Town Basin located approximately 100m to the south of the route of the Proposed Scheme, near Hall Lane Junction. A disused section of the Chesterfield Canal is present at Nor Wood. The route of the Proposed Scheme crosses the canal as it passes through the disused Norwood Tunnel which was closed in 1907 after a collapse as a result of subsidence from mining.
- 10.3.33 Killamarsh Pond (Ordinary Watercourse) and Woodall Pond (Ordinary Watercourse) are located at Nor Wood and feed a number of unnamed tributaries. Pigeon Bridge Brook and Todwick Beck are located in the area between Wales and Aston. There are

¹²⁶ 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

a number of ponds close to this section of the Proposed Scheme including Fiddle Neck Pond and Hepworth Pond.

- 10.3.34 There are also a number of unnamed streams, tributaries, drains, ponds and culverts located within the area of the Proposed Scheme.
- 10.3.35 There are no Drinking Water Protected Areas (DrWPAA) or Surface Water Safeguarding Zones (SgZs)¹²⁷ in the Staveley to Aston area.
- 10.3.36 Surface water bodies in the Staveley to Aston area are described in more detail in Section 15, Water resources and flood risk.
- 10.3.37 There are no licensed surface water abstractions within the study area.
- 10.3.38 No licensed private water supplies from surface water sources have been identified within the study area. As there is no obligation to register private water supplies, unregistered private surface water supplies may be present.

Current and historical land use

- 10.3.39 Current potentially contaminative land uses within the study area include one authorised landfill site, two cemeteries, one sewage works, an oil depot, garage workshops, motorway service stations, a petrol filling station, and several agricultural farm sites.
- 10.3.40 Historical land uses identified within the study area with the potential to have caused contamination include six landfill sites, former coal mining areas, open cast and shallow underground workings, pit heads and spoil heaps, former chemical works, gas and coke works, associated dismantled mineral railway rail yards, engine sheds, a chemical pharmaceutical works, a gas manufacturing and distribution site, former petrol filling stations and other fuel storage tanks, tanneries, smithies, sewage works, scrap yards, depots, garage workshops and industrial sites. The key historical potentially contaminative sites are: Staveley Works, former licenced and unlicensed mining and the probable shallow mine workings.
- 10.3.41 The Staveley area has a history of licensed and unlicensed mining, and industry at the Seymour, Speedwell/Ireland and New Hollingwood/Hartington collieries. In addition to underground mining, open cast/surface mining was carried out at Hall Lane and Summit Sidings.
- 10.3.42 The proposed Staveley Infrastructure Maintenance Depot (IMD) area has been the site of heavy industry for over a hundred years and is referred to as the Staveley Works site. The site included the Devonshire Iron and Chemical works, the Staveley Iron and Pipe works, Summit Sidings, a pharmaceutical factory and landfilling. All works at the site ceased operation in 2007 and the buildings have been demolished to ground level. Foundations and underlying structures and services remain in place. The site has been levelled and remediation has taken place in isolated areas of the site. A small Short-

¹²⁷ Surfacewater SgZs are defined around potable water abstractions where pollution prevention measures are needed to prevent continued deterioration in water quality. A SgZ is identified to meet the requirements of Article 7 of the Water Framework Directive. The measures that need to be implemented in Safeguard Zones can be found in the safeguard zone action plans that can be found in the River Basin Management Plans or from the EA's Area Groundwater & Contaminated Land team.

High Speed Rail (Crewe to Manchester and West Midlands to Leeds)
Working Draft Environmental Statement Volume 2: LA11

term Operative Reserves (STOR) plant has recently been constructed at the Staveley Works site, providing electricity for power surge demands.

- 10.3.43 Further details of these current and historical contaminative land uses within the study area are shown in Table 23, Table 24 and Table 25.

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

Name and Area Reference	Location	Description
Staveley Landfill Site, Hall Lane, Staveley, Derbyshire, S43 3TP LA11-2	The landfill is located approximately 510m south-west of Hartington Industrial Estate.	The Environment Agency records that the authorised landfill is operated by Derbyshire Waste Limited. Staveley Landfill is classed as an A4 landfill that accepts household, commercial and industrial waste.
Hall Lane Tip LA11-12	The landfill is located approximately 160m west of Hartington Industrial Estate.	The Environment Agency records that the historical landfill last received waste in 1966.
Chesterfield Road Landfill LA 11-89	This landfill is located immediately south of Hawthorns Farm.	The Environment Agency records the historical landfill was licensed to have accepted inert, industrial, commercial, household and liquid/sludge waste between December 1983 and December 1990.
Railway Cutting LA 11-138	The landfill is located 290m east of Springfield Farm.	The Environment Agency records the historical landfill was licensed to have accepted inert and industrial waste between December 1969 and December 1976.
Rother Valley Country Park LA11-147	The landfill is located at Mansfield Road, Wales Bar approximately 200m north of Norwood.	The Environment Agency records the historical landfill was licensed to have accepted inert and commercial waste between December 1984 and December 1990.

Table 24: Current and historical mining, mineral sites and colliery spoil sites located in the study area

Name and Area Reference	Location	Description
Spun Pipe Plant and Spun Pipe Plant Phase II Open Cast LA11-1	Located south of Staveley Works, at the River Rother and the Chesterfield Canal	Surface mined coal, Pennine Middle Coal Measures Formation.
Seymour Colliery and, Speedwell Colliery LA11-59	Staveley	Unlicensed coal and ironstone mining, from deep underground mining and open cast. Known coal seams which were worked include the Top Hard, Deep Soft and Backshale seam. Two mine shafts are recorded within this site. Records indicate these were both capped in 1972, open beneath.
New Hollingwood/Hartington Colliery LA 11-19	Hartington Industrial Estate, north of mineral railway and Hall Lane Junction, east of Staveley	Includes two recorded mineshafts that were capped in 1967 and 1991
Ireland Colliery Tips 40 and 41 Open Cast LA11-49, LA 11-53, LA 11- 57	Between Poolsbrook and Netherthorpe	Colliery spoil arisings (mudstone and siltstone). The High Hazels Coal seam was worked adjacent to the route between 1994 and 1998 to a depth of 26m AOD.

High Speed Rail (Crewe to Manchester and West Midlands to Leeds)
Working Draft Environmental Statement Volume 2: LA11

Name and Area Reference	Location	Description
Ireland Colliery pit head LA 11-47; LA 11-42; LA 11-40	Between Poolsbrook and Netherthorpe	The High Hazels Coal seam was worked at depth adjacent to the route in 1997 and 1998. Includes two recorded mineshafts; one of which has been recorded as capped in 1989.
Hall Lane Waste Site Open Cast LA11-2	North of the former Staveley Works immediately to the west of Hall Lane	The Top Hard Coal seam was worked between 1991 and 1993; the Dunsil Coal was recovered adjacent to the proposed alignment prior to 2002.
Hall Lane Open Cast LA11-2	North of Staveley Works immediately west of Hall Lane	The Top Hard Coal was worked adjacent to the route from 1987 to 1989. Historic shallow coal workings were encountered.
Hall Lane Coal Occs –open cast LA11-18	North-east of Staveley Works, along the A6192	Open cast common clay and shale, Pennine Middle Coal Measures Formation. Partially occupied by the Staveley Town canal basin and the A6192.
Summit Sidings Open Cast LA11-2	Located within the former Staveley Works	Backfilled open cast materials. The Dunsil and Top Hard coals were worked between 1993 and 1994.
Oxcroft Colliery LA11-81	East of the M1 and Seymour Link Road	Labelled as Oxcroft Colliery on 1973 mapping
North Romeley Open Cast Woodhouse Lane Colliery LA11-85	Extends beneath the M1 at Romeley Wood to the A619 south of Woodhouse Lane Farm	No information recorded, expected to comprise open cast interburden/overburden. Backfilling was completed in 1946.
Lumb Open Cast/Woodhouse Lane Colliery LA11-85	West of the M1, near Woodhouse Lane Farm	No information recorded, expected to comprise open cast interburden/overburden. The route intercepts workings of the Furnace coal in cutting. The Furnace Coal was worked in 1949 and 1950.
Mastin Moor LA11-66, LA11-68	East of Mastin Moor, north (LA11-68) and south (LA11-66) of Worksop Road	Open cast sandstone. Pennine Middle Coal Measures Formation. Ceased. Old quarry labelled on 1938 mapping.
California Open Cast/Westfield Colliery LA11-197	Immediately southwest of the M1 Junction 30 near Westfield Farm	No information recorded, expected to comprise open cast interburden/overburden. The Sough and Furnace seams were worked in 1949. Old working voids were encountered in the Furnace seam. A mine entry is recorded within this site.
Hazel Colliery LA11-105	Immediately north-west of junction 30 of the M1	Labelled as Hazel Lane Sidings and Hazel Colliery and Brick Works on 1921 mapping. Two mine entries are recorded within this site. One is recorded as grouted to a depth of 103m and capped. Unlicensed open cast sandstone and unlicensed underground coal mining.
Cottam Colliery LA11-72 and LA11-109	750m south-west of junction 30 of the M1 West (LA11-72) and LA11-109 is located 300m north-west of junction 30 of the M1, north of A6135 Sheffield Road	Underground deep coal mining. Pennine Coal Measures Group. Some of site may have been part of Ward Hazel to the north or Hazel Colliery to the south. Two mine entries are recorded within LA11-72 site. There is one mine shaft recorded in LA11-109.

High Speed Rail (Crewe to Manchester and West Midlands to Leeds)
Working Draft Environmental Statement Volume 2: LA11

Name and Area Reference	Location	Description
Newman Spinney Open Cast LA11-120	Located between Comberwood Farm and west of the M1, to the south of Woodall Common	The Furnace, Sough, Fox Earth, Clowne and Swinton Pottery seams were worked, with coaling completed in 1966. Old working voids were identified in all except the Swinton Pottery seams. Underground workings in the Furnace, Sough, Fox Earth and Clowne seams are noted. May have been part of Norwood Colliery or Highmoor Colliery. Highmoor is labelled to the north on 1893 mapping.
Ward Hazel Open Cast LA11-120	Located between Quarrydam Wood and west of the M1, North west of Barlborough	No information recorded, expected to comprise open cast interburden/overburden of sandstone and shale. The Sough and Furnace seams were worked in 1952 and 1953. Old working voids were identified in both seams.
Norwood Colliery LA11-123	North of High Wood and Quarrydam Wood and east of Parkhall	Labelled as Norwood Colliery open cast on historical mapping. No further information.
Hawke Wood Open Cast/Parkhall Colliery LA11-124, LA11-124, LA11-126	Located between High Wood and west of the M1, to the west of Barlborough Hall School	Underground deep coal mining and open cast. Two worked areas for the Furnace and Sough coals at the Hawke Wood open cast mine. Backfilling was completed in 1945.
Highmoor Colliery Site (Park Brook Reclamation) LA11-127	Located between Comberwood Farm and Woodall Common, south of Hutt Lane	Underground deep coal mining. The Clowne seam and Two foot seam was mined. A mine entry is recorded within this site.
Unknown title, open cast LA11-128	Area of Doncarr field and Stone Hill, including area of existing Woodall Services	No Coal Authority information recorded. The location has been identified from historical mapping, and was a possible unlicensed shallow coal open cast mine.
Pithouse West Open Cast/West Kiverton LA11-1140, LA11-141	West of the A618 and south of the A57 at Wales Common	Labelled as open cast workings on 1873 mapping. May be part of Brookhouse Colliery, to the north or West Kiverton Quarry to the east (labelled on 1902 mapping). Also, underground deep coal mining.
Unknown title, unlicensed open cast LA11-151	Area beneath footprint of the M1, west of Wales, north of School Road.	No Coal Authority information recorded. The location has been identified from historical mapping, and was a possible unlicensed shallow coal open cast mine.
Unknown title unlicensed open cast LA11-154	North of Wales, between the M1 to the west and Manor Road properties to the east	No Coal Authority information recorded. The location has been identified from historical mapping, and was a possible unlicensed shallow coal open cast mine.
Waleswood Colliery and spoil heap LA11-159	Located approximately 150m to the west of the M1 at Wales Bar	Colliery discard, including coal and brick and burnt shale. A mine entry is recorded within this site.
Probable shallow mine workings (study area wide)	Largely located between Staveley and Barlborough; limited probable shallow workings at Woodall, Wales and the area around junction 31 of the M1.	Shallow coal mining is defined by the Coal Authority as underground coal workings whose depth is 30m or less from the surface. The Coal Authority describe probable workings as the likely extent of shallow underground coal workings for which no recorded plans exist.

High Speed Rail (Crewe to Manchester and West Midlands to Leeds)
Working Draft Environmental Statement Volume 2: LA11

Name and Area Reference	Location	Description
Historical mine entries	Various locations throughout the study area	Historical mine entries comprising both shafts and adits. The mine entries were identified from historical Ordnance Survey maps and information obtained from the Coal Authority.
Iron ore - bedded	All of the section up to Nor Wood, east of Norwood, and areas around Wales Bar	Highly likely that localised small-scale underground mining may have occurred in this area.
Sand mining	North of Barlborough	Area where small scale sand mining may have occurred, but deemed to be unlikely.

Table 25: Current and historical industrial/commercial sites located within the study area

Name and Area Reference	Location	Description
Staveley Coal and Iron company; Staveley Iron and Chemical company; Devonshire Iron and Chemical Works Pharmaceutical manufacture LA11-1	Staveley	Former coal mining and chemical production from coal products. During World War 1 (WW1) coal-tar chemical, sulphuric acid and nitric acids, Trinitrotoluene (TNT) and gun cotton were produced. Sodium chlorate and caustic soda were also produced at the site. Production at the site occurred between 1862- 2012. Former pharmaceutical works, no longer present. The site has been levelled and hotspot remediation has taken place in localised areas of the site. There are three mine shafts recorded in this site.
Hartington Industrial Estate LA 11-19 and Flogas Britain Ltd LA11-20	200m east of Hall Lane Tip	Former colliery site. Industrial estate includes a gas manufacturing and distribution Control of Major Accident Hazards (COMAH) site (LA11-20).
Former gas manufacturing and distribution centre LA11-22	20m east of Bell House Lane	Former gas manufacturing and distribution site, now occupied in part by residential properties and allotment gardens. Several pipelines are shown on the latest OS mapping. A mine entry is also recorded within this site.
Ireland Industrial Estate LA 11-40 and LA11-42	Adelphi way, Staveley, Chesterfield	Industrial estate comprising a mixture of business units which include engineering workshops, insulations and plastic mouldings, fencing and printers. A mine entry is also recorded within this site.
Speedwell Industrial Estate 11-39 and 11-30	Far Road, Staveley, Chesterfield	Industrial estate comprising a mixture of business units which include engineering workshops metal fabricators, equipment/service providers, food services, automotive sales
Woodall services LA11-129, LA11-131	Woodall, north of junction 30 of the M1	Motorway service station, fuel storage and refuelling; Partially located above a coal mining area.
BP Fuelling station LA11-150	Junction of A618 Rotherham Road and Cherry Tree Road, Wood Hill, West of the M1 at Wales	Fuel storage and refuelling station

10.3.44 Contaminants commonly associated with sites in Table 23, Table 24 and Table 25 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.

- 10.3.45 Contaminants associated with sites in Table 24 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.
- 10.3.46 Contaminants commonly associated with industrial sites in Table 25 could include metals, semi-metals, asbestos, organic and inorganic compounds.

Other regulatory data

- 10.3.47 The regulatory data reviewed included pollution incidents (major, significant and minor categories), radioactive and hazardous substances consents and environmental permits (previously landfill, integrated pollution control and integrated pollution prevention and control licences).
- 10.3.48 There is one Control of Major Accident Hazards (COMAH) site within the area of the Proposed Scheme. This is a fuel storage/distribution company, located at Hartington Industrial Estate north of Staveley.
- 10.3.49 There was one minor pollution incident to land reported over a 17-year period between 2001 and 2017. The Environment Agency records show one Enforcement Notice for large quantities of mercury released into the River Rother at Staveley, no further details are provided.
- 10.3.50 The Environment Agency reports that there no consented discharges to groundwater within the study area. Further details on the groundwater in the Staveley to Aston area can be found in Section 15, Water resources and flood risk.
- 10.3.51 There are 27 discharge consents to surface water within the study area, six of which are within the land required for the construction of the Proposed Scheme.
- 10.3.52 Nineteen surface water discharge permits have been identified within the study area, five of which permits relate to trade discharge. The remaining 14 permits are for sewage discharge to surface waters.
- 10.3.53 There are no nationally significant ecological designations as defined in the land quality section of the SMR¹²⁸ 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 sandstone, clay, ironstone, limestone and coal, which can be protected via local or county level minerals 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).

¹²⁸ Sensitive ecological receptors are defined as national designations such as SSSIs

Minerals plans

- 10.3.55 The route of the Proposed Scheme in the Staveley to Aston area crosses the counties of Derbyshire and South Yorkshire. DCC is responsible for the overall mineral and waste local plans for the Derbyshire County. A new Minerals Local Plan (MLP) for Derbyshire is currently under consultation¹²⁹. The new MLP will guide mineral-related development in Derbyshire until 2030 by setting out where it is expected quarrying and mining will take place and outlining principles to inform planning application decisions during this period.
- 10.3.56 RMBC is responsible for the overall mineral and waste local plans for the borough. The Proposed Scheme north of Woodall Common falls under RMBC jurisdiction. Doncaster Council and RMBC have developed a joint approach to minerals planning for their combined authority areas, and the most recent Local Aggregates Assessment was published in 2015¹³⁰. This document identifies the Proposed Scheme as an infrastructure project that may contribute to local demand for minerals, noting that construction is unlikely to start until towards the end of the 2016-2030 plan period.
- 10.3.57 The location of specific mineral and mining resources within the study are described below.

Clay, limestone and sandstone

- 10.3.58 Dolomite and dolomitic limestone are present in the area around Barlborough. The limestone is safeguarded under MS8 Industrial Limestone Provision. The limestone resource is of significant local and national importance because Derbyshire is one of the few areas of the country which supplies limestone of industrial and aggregate quality to meet national requirements.

Coal mining

- 10.3.59 Available records from the Coal Authority show that the route of the Proposed Scheme would pass through areas of recorded historical coal mining activities. 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 area are listed in Paragraph 10.3.15.

Open cast and shallow coal mining

- 10.3.60 Shallow coal mining is defined by the Coal Authority as underground coal workings whose depth is 30m or less from the surface. The southern part of the Staveley to Aston area (south of Barlborough) is underlain by an area identified by the Coal Authority as having probable shallow coal working. There are further probable shallow workings located at Woodall, Wales and junction 31 of the M1.
- 10.3.61 Available records from the Coal Authority show that the route of the Proposed Scheme would intercept three Future Open Cast licensed areas for coal mining within

¹²⁹ Derbyshire County Council, Minerals Local Plan <https://www.derbyshire.gov.uk/environment/planning/planning-policy/minerals-waste-development-framework/minerals-plan/minerals-local-plan.aspx>

¹³⁰ Doncaster and Rotherham Local Aggregate Assessment 2016

the study area. The areas are: Wellsthorpe, Hoodcroft, Pinnock and are located between Netherthorpe and Barlborough.

Deep coal mining

- 10.3.62 Geological mapping from the BGS shows that coal seams are present at depth beneath the entire study area and have the potential to be exploited in the future, for both coal and coal bed methane. The MLP identifies the coal reserves as areas of hydrocarbon resources.

Petroleum Exploration Development Licences/Hydrocarbons

- 10.3.63 There are two PEDLs within the Staveley to Aston area. Licence number PEDL300 covers land located in the southern part of the study area between Staveley to Woodall Services. Licence number PEDL304 covers land in the northern part of the study area between Woodall services to Ulley¹³¹.
- 10.3.64 The entire study area is located within a shale prospective area, known as the Bowland Prospective Area¹³². As such, it is considered that the study area is within an area where hydrocarbon resources including coal bed methane could be identified and extracted in the future.

Geo-conservation resources

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

Receptors

- 10.3.66 The sensitive receptors that have been identified within the study area are summarised in Table 26. A definition of receptor sensitivity is given in the SMR.

Table 26: Summary of sensitive receptors

Issue	Receptor type	Receptor description	Receptor sensitivity
Land contamination	People	Residents of existing properties, nurseries, schools, study centres, play areas, parks and public open space.	High
		Employees and visitors at commercial areas, retail parks and areas, hotels	Moderate
		Industrial	Low
	Groundwater	The Cadeby Formation and the Basal Permian Sand principal aquifers	High
		The Alluvial deposits and the Pennine Coal Measures Group Secondary A aquifers and	Moderate
		Head deposits Secondary (undifferentiated) aquifer	Low

¹³¹ Oil & Gas Authority, Onshore Oil and Gas Activity. Available online at: <https://decc-edu.maps.arcgis.com/apps/webappviewer/index.html?id=29c31fa4b00248418e545d222e57ddaa>

¹³² Oil & Gas Authority, Onshore Oil and Gas Activity. Available online at: <https://decc-edu.maps.arcgis.com/apps/webappviewer/index.html?id=29c31fa4b00248418e545d222e57ddaa>

High Speed Rail (Crewe to Manchester and West Midlands to Leeds)
Working Draft Environmental Statement Volume 2: LA11

Issue	Receptor type	Receptor description	Receptor sensitivity
	Surface waters	River Rother (WFD: Moderate)	Moderate
		River Doe Lea (WFD: Moderate)	
		Pigeon Bridge Brook (WFD: Moderate)	Low
		Unnamed tributaries of County Dike, Smithy Brook, Hawke Brook, (WFD: Moderate); Ulley Brook (WFD: Good)	
		The Chesterfield Canal and Staveley Town Basin (WFD: Moderate)	
	Built environment	Underground structures and buried services	Low
	Natural environment	Norbriggs Flash local nature reserve (LNR)	Moderate
Impacts on mining/mineral and petroleum (gas) sites (severance and sterilisation)	Mining/mineral sites	PEDL 300 and 304; Bowland Shale Prospective area	Moderate
		Mineral safeguarding for surface coal (future licensed open cast areas (Wellsthorpe, Hoodcroft and Pinnock))	
		Other mineral resources (non-coal mining) Ironstone, limestone, clay, sandstone	

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)¹³³. 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, 16);
 - the management of human exposure for both construction workers and people living and working nearby (Sections 6, 7, 11, 13 and 14);
 - methods for the storage and handling of excavated materials (both contaminated and uncontaminated) (Sections 6, 7, 11 and 15);
 - management of any unexpected contamination found during construction

¹³³ Supporting document: Draft Code of Construction Practice

(Sections 11 and 15);

- a post-remediation permit to work system (Section 11);
- storage requirements for hazardous substances such as oil (Sections 5, 11 and 16);
- traffic management to ensure that there is a network of designated haul routes to reduce compaction/degradation of soils (Sections 5, 6 and 14);
- methods to monitor and manage flood risk and other extreme weather events which may affect land quality during construction (Sections 5 and 16); and
- methods to manage discovery of unknown animal burial pits (Section 6).

10.4.3 The draft CoCP would require that prior to and during construction, a programme of further detailed investigations, which may include both desk based and site based work, takes place in order to confirm the full extent of areas of contamination. It also 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 CLR11¹³⁴ and British Standards BS10175¹³⁵ and BS8576¹³⁶.

10.4.4 Where significant contamination is encountered, a remedial options appraisal would be undertaken to define the most appropriate remediation techniques. Where appropriate, this appraisal would be undertaken based on multi-criteria attribute analysis that considers environmental, resource, social and economic factors in line with the framework set out by the Sustainable Remediation Forum UK¹³⁷. The preferred option would then be developed into a remediation strategy.

10.4.5 Contaminated soils excavated within the site, where practicable, would be treated to remove or render contamination inactive and reused within the Proposed Scheme where needed and suitable for use. Treatment techniques are likely to include stabilisation, soil washing and bio-remediation. Contaminated soil removed off-site would be taken to a soil treatment facility, another construction site (for treatment and reuse) or to an appropriately permitted landfill.

Assessment of impacts and effects

10.4.6 Construction of the Proposed Scheme in this area would require earthworks, utility diversions, deep foundations, grouting, ground stabilisation and other activities, including the construction of the various viaducts and road infrastructure works. These aspects of the Proposed Scheme, along with other construction features, are shown on the Map Series CT-05 in the Volume 2: LA11 Map Book.

¹³⁴ Environment Agency, (2004), *CLR11 Model Procedures for the Management of Land Contamination*

¹³⁵ British Standard, (2011), *BS10175+A1:2017 Investigation of Potentially Contaminated Sites*

¹³⁶ British Standard, (2013) *BS8576 Guidance on investigations for ground gas – Permanent gases and Volatile Organic Compounds (VOCs)*

¹³⁷ 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, mining and commercial 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 27. 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 27: Summary of baseline CSM for sites which may pose a contaminative risk for the Proposed Scheme

Area reference ¹³⁸	Area name	Human health risk	Groundwater risk	Surface water risk	Ecosystem risk	Buildings risk
On site ¹³⁹						
LA11-5 and LA11-6, LA 11-161	Existing railway	Very Low	Moderate/Low	Moderate/Low	Not present	Very Low to Low

¹³⁸ Each potentially contaminated site is allocated a unique reference number

¹³⁹ 'On site' is within the area of land required for construction of the Proposed Scheme

High Speed Rail (Crewe to Manchester and West Midlands to Leeds)
Working Draft Environmental Statement Volume 2: LA11

Area reference ¹³⁸	Area name	Human health risk	Groundwater risk	Surface water risk	Ecosystem risk	Buildings risk
LA11-6	Farms	Very Low to Moderate/Low	Moderate/Low	Moderate/Low	Not present	Very Low to Moderate/Low
LA11-2 (and LA11-7, LA11-8), LA11-12, LA11-89, LA11-138	Landfills	Very Low to Moderate	Moderate	Moderate	Not present	Moderate/Low
LA11-18, LA11-19, LA11-41, LA11-43, LA11-51, LA11-53, LA11-57, LA11-58, LA11-59, LA11-71, LA11-72, LA11-81, LA11-85, LA11-87, LA11-96, LA11-97, LA11-109, LA11-114, LA11-120, LA11-140, LA11-141, LA11-149, LA11-151, LA11-159, LA11-70, LA11-75, LA11-106	Coal mining, pit heads and spoil mounds (and recorded mine entries)	Moderate	Moderate	Moderate	Not present	Moderate
LA11-105 (and LA11-111), LA11-166, LA11-76, LA11-80, LA11-90, LA11-101, LA11-9, LA11-13, LA11-23, LA11-24, LA11-46, LA11-54	Rail goods yards and engine sheds, disused railways	Low to Moderate/Low	Moderate/Low	Moderate	Not present	Moderate/Low to Low
Study area	Probable shallow mine workings	Very Low to Moderate	Moderate	Moderate	Not present	Moderate/Low to Moderate
LA11-133	Sewage works - Killamarsh Lane	Very Low/Low	Moderate/Low	Moderate/Low	Not present	Low to Moderate/Low
LA11-1	Staveley works	Very Low to High	Moderate	Moderate	Not present	Moderate to High
Off site ¹⁴⁰						
LA11-17, LA11-73, LA11-144	Cemeteries	Low	Moderate/Low	Low	Not present	Very Low to Moderate/Low
LA11-3	Existing railway	Very Low	Moderate/Low	Moderate/Low	Not present	Very Low to Low

¹⁴⁰ 'Off site' is beyond the land required for construction of the Proposed Scheme but within 250m of it

High Speed Rail (Crewe to Manchester and West Midlands to Leeds)
Working Draft Environmental Statement Volume 2: LA11

Area reference ¹³⁸	Area name	Human health risk	Groundwater risk	Surface water risk	Ecosystem risk	Buildings risk
LA11-32, LA11-94, LA11-104, LA11-146, LA11-74, LA11-77, LA11-83, LA11-110	Farms	Very Low to Moderate/Low	Moderate/Low	Moderate/low	Not present	Very Low to Moderate/Low
LA11-25, LA11-169	Fire stations	Very Low	Moderate	Moderate	Not present	Very Low to Low
LA11-20, LA11-122, LA11-158	Fuel storage	Low to Moderate/Low	Moderate/Low	Moderate/low	Not present	Low to Moderate
LA11-28	Garage workshops	Very Low to Moderate/Low	Moderate/Low	Very low	Not present	Low to Moderate/Low
LA11-37, LA11-109	Former Gas and coke works	Moderate/Low	Moderate/Low	Low	Moderate/Low	Low
LA11-30, LA11-39, LA11-40, LA11-42, LA11-152	Industrial estates	Very Low to Moderate/Low	Low	Low	Not present	Moderate/Low to Moderate
LA11-21, LA11-78	Rail goods yards and engine sheds, disused railway	Low to Moderate/Low	Moderate/Low	Moderate	Not present	Moderate/Low to Moderate
LA11-tbc	Landfill (Rother Valley Country Park)	Very Low to Moderate/Low	Moderate	Moderate/Low	Not present	Moderate/Low to Moderate
LA11-129, LA11-131, LA11-150	Petrol filling	Low to Moderate/Low	Moderate	Low	Not present	Very Low to Moderate/Low
Study area	Probable shallow mine workings	Very Low to Moderate/Low	Moderate	Moderate	Moderate/Low	Moderate/Low
LA11-4, LA11-35, LA11-36, LA11-45, LA11-47, LA11-48, LA11-49, LA11-50, LA11-63, LA11-64, LA11-68, LA11-84, LA11-92, LA11-93, LA11-95, LA11-102, LA11-103, LA11-112, LA11-117, LA11-119, LA11-123, LA11-126, LA11-127, LA11-128, LA11-130, LA11-135, LA11-143, LA11-154,	Coal mining pit heads and spoil	Low to Moderate	Moderate	Moderate	Not present	Moderate

High Speed Rail (Crewe to Manchester and West Midlands to Leeds)
Working Draft Environmental Statement Volume 2: LA11

Area reference ¹³⁸	Area name	Human health risk	Groundwater risk	Surface water risk	Ecosystem risk	Buildings risk
LA11-157, LA11-160, LA11-163						
LA11-47, LA11-tbc, LA11-165	Sewage works	Very Low to Low	Moderate/Low	Moderate/Low	Not present	Low to Moderate/Low

Temporary effects

- 10.4.11 In order to identify potential temporary effects, the baseline and construction CSM have been compared to determine the change in level of risk at receptors during the construction stage, and thus to define the level of effect at the construction stage.
- 10.4.12 Where there is no change between the main baseline risk and the main construction risk, the temporary effect significance is deemed to be negligible even if the risk is deemed to be high. For example, this would be the case where the construction of the Proposed Scheme does not alter the risks from an existing potentially contaminated site that is outside the area required for construction.
- 10.4.13 A worsening risk at construction stage compared to baseline would result in a negative effect, and conversely, an improvement would result in a positive effect. The assessment assumes that contamination would be controlled through the general measures in the draft CoCP.
- 10.4.14 For mining sites, a potential for significant adverse effects has been identified associated with the uncertainty around mine gas and mine water in historical workings. For the working draft ES, the CoCP does not address this in detail, but is being further developed in consultation with authoritative consultees to develop mechanisms for mitigating any significant adverse effects.
- 10.4.15 All of the sites set out in Table 27 have been assessed for the change in impact associated with the construction stage of the work. Table 28 presents the summary of the resulting construction effects that have been found to be significant. All other sites referenced in Table 27 were found to have non-significant effects.
- 10.4.16 The assessment has considered the engineering design together with the specific nature of the potential current and historical contamination sources and receptors identified. The following key issues have been identified which the draft CoCP would address:
- Staveley Works: Earthworks necessary for construction of the IMD could have the potential to impact on the local water quality in the area including the River Rother and Chesterfield Canal and the underlying Secondary A aquifer of the Pennine Middle Coal Measures. In addition, excavated material arising from the site may require treatment prior to re-use; and
 - where old shallow mine workings are to be grouted during construction, consideration would be given to the potential adverse effect on nearby receptors. Grouting of worked seams has the potential to remove or interrupt

High Speed Rail (Crewe to Manchester and West Midlands to Leeds)
Working Draft Environmental Statement Volume 2: LA11

mine gas or mine water flow pathways, causing it to build up or escape from new pathways.

Table 28: Summary of construction CSM effects

Name and area ref ¹⁴¹	Receptor	Main baseline risk	Main construction risk	Temporary effect
Coal mining, pit heads and spoil mounds (and recorded mine entries) on site LA11-18, LA11-19, LA11-41, LA11-43, LA11-51, LA11-53, LA11-57, LA11-58, LA11-59, LA11-71, LA11-72, LA11-81, LA11-85, LA11-87, LA11-96, LA11-97, LA11-109, LA11-114, LA11-120, LA11-140, LA11-141, LA11-149, LA11-151, LA11-159 LA11-70, LA11-75, LA11-106	Human health (Exposure of off-site human receptors by direct contact, ingestion and inhalation of vapours from contaminated waters)	Low	Moderate	Moderate adverse
	Controlled waters- Surface water - Discharge of contaminants to surface water by lateral migration through groundwater and direct runoff from site	Moderate	Very high	Moderate adverse
	Building receptors- Exposure of property to explosive gases	Moderate	Very high	Moderate adverse
Probable shallow mine workings – on site	Human health (Exposure of off-site human receptors by direct contact, ingestion and inhalation of vapours from contaminated soils)	Very low	Moderate/low	Moderate adverse
	Human Health (Exposure of off-site human receptors by direct contact, ingestion and inhalation of vapours from contaminated waters)	Very low	Moderate	Moderate adverse
	Controlled waters- Discharge of contaminants to surface water by lateral migration through groundwater and direct runoff from site	Moderate	Very high	Moderate adverse
	Building receptors- Exposure of property to explosive gases	Moderate	Very high	Moderate adverse
	Building receptors- Direct contact of property with contaminated soils and waters	Moderate/low	High	Moderate adverse

10.4.17 In the event that unexpected contamination is encountered during the construction of the route of the Proposed Scheme in this area, this would be remediated as described in the draft CoCP resulting in an overall beneficial effect.

¹⁴¹ Each potentially contaminated site is allocated a unique reference number

- 10.4.18 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.
- 10.4.19 For mining sites, a potential for significant adverse effects has been identified associated with the uncertainty around mine gas and mine water in historical workings. For the working draft ES, the CoCP does not address this in detail, but is being further developed in consultation with authoritative consultees to develop mechanisms for mitigating any significant adverse effects

Permanent effects

- 10.4.20 In order to identify potential permanent effects, a screening assessment has been undertaken comparing the baseline and post-construction CSM to assess the permanent (post-construction) effects.
- 10.4.21 The magnitude of the permanent effects and their significance have been determined by assessing the change in risk between the main baseline risk and the main post-construction risk. Therefore, where there is no change between the main baseline risk and the main post-construction risk, the permanent effect significance is deemed to be 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.
- 10.4.22 In relation to the potential significant effects associated with mining sites at construction stage, there will be a greater level of knowledge and understanding of the mine workings ground model and the best means to mitigate the potential effects on a permanent basis.
- 10.4.23 All of the sites set out in Table 27 have been assessed for the change in impact associated with the permanent post-construction stage. Table 29 presents the summary of the resulting post-construction effects that have been found to be significant. All other sites referenced in Table 27 were found to have non-significant effects.

Table 29: Summary of permanent (post-construction) effects

Name and area ref	Receptor	Main baseline risk range	Main post-construction risk range	Post-construction effect
Staveley	Human health (direct contact, ingestion, inhalation of vapours from contaminated soils, waters and inhalation of ground gases on site)	High	Very Low	Major beneficial (significant)

- 10.4.24 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

- 10.4.25 Construction of the Proposed Scheme has the potential to affect existing mineral resources and proposed areas of mineral exploitation. This could occur by sterilisation of the resource through direct excavation during construction of the Proposed Scheme or through temporary and/or permanent severance or isolation that may occur during the construction phase of the Proposed Scheme, possibly continuing through to its operation.
- 10.4.26 The route of the Proposed Scheme would cross two PEDL areas for potential shale areas, three future open cast coal mining areas and limestone, sandstone and clay extraction areas.

Temporary effects

Sand, gravel and clay deposits

- 10.4.27 The effect of construction of the Proposed Scheme on the sand, gravel and clay areas would be negligible.

Clay, limestone and sandstone

- 10.4.28 The Cadeby limestone deposits occur within the study area at Barlborough. Limestone is quarried for Industrial limestone further east of the study area at Whitwell. The limestone is safeguarded under MS8 Industrial Limestone Provision. The effect of construction of the Proposed Scheme on the limestone areas would be negligible. Temporary adverse effects may occur where a temporary haulage route is proposed within the Mineral Safeguarding Area (MSA). There will be a temporary sterilisation of the resource during construction works, but this is not considered to represent a significant effect and the resource will not be lost permanently.

Coal mining -Open cast and shallow mining

- 10.4.29 The effect of construction of the Proposed Scheme on the future open cast coal mines areas would be minor adverse. Temporary adverse effects may occur where construction compounds are proposed within these licensed areas. In such cases, there will be a temporary sterilisation of the resource during construction works, but this is not considered to represent a significant effect and the resource will not be lost permanently.

Coal mining -Deep coal mining

- 10.4.30 There will be no permanent effects on the deep coal reserves. The coal resource is potentially present deep underground and would remain accessible across the study area.

Petroleum Exploration Development Licences/Hydrocarbons

- 10.4.31 The route of the Proposed Scheme will cross an area covered by two PEDLs of the Bowland Shale Prospective area, both licenced by the Oil and Gas Authority (OGA). The effect of construction of the Proposed Scheme on the identified PEDLs would be negligible. The PEDLs identify the hydrocarbon 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 shale gas resource is potentially present deep underground and would remain accessible across the licenced area.

Permanent effects

Sand, gravel and clay deposits

- 10.4.32 The effect of the Proposed Scheme on the sand, gravel and clay areas would be negligible.

Clay, limestone and sandstone

- 10.4.33 There will be no permanent effects on the limestone MSA.

Coal mining -Open cast and shallow mining

- 10.4.34 The effects of the Proposed Scheme on the Future licensed open cast coal mine areas will be permanent where overlain by the footprint of the permanent works, with a strip of mineral becoming sterilised. Appropriate mitigation measures would be discussed in advance of the works with the Mineral Planning Authority, the Coal Authority, DCC, RMBC and the mineral owner.

Coal mining -Deep coal mining

- 10.4.35 There will be no permanent effect of the Proposed Scheme on the deep coal reserves.

Petroleum Exploration Development Licences

- 10.4.36 The effects of the Proposed Scheme on the identified PEDLs would be negligible.
- 10.4.37 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 hydrocarbons 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.

Limestone

- 10.4.38 There would be no permanent effects on the limestone MSA.
- 10.4.39 Table 30 reports the assessment of permanent effects from construction on the mining and mineral resources identified.

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

Working Draft Environmental Statement Volume 2: LA11

Table 30: Summary of effects for mining and mineral resources

Site name	Status	Description	Sensitivity/ value	Magnitude of impact	Effect and significance (Y/N)
PEDLs 300 and 304; Bowland Shale Prospective area	PEDL	Potential future shale gas reserves	Medium	Negligible	Negligible (N)
Mineral safeguarding for surface coal (future licensed open cast areas- Wellsthorpe, Hoodcroft and Pinnock)	MSA	Licensed future open cast sites	Medium	Minor	Negligible (N)
Mineral safeguarded area for Industrial limestone	MSA	Safeguarded under policy MS8	Medium	Minor	Negligible (N)

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

Geo-conservation sites

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

Other mitigation measures

- 10.4.42 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.
- 10.4.43 Mitigation of the effects on mineral resources within the future open cast areas 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 RMBC 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

- 10.4.44 Significant residual effects are anticipated associated with construction of the Proposed Scheme. Major beneficial effects to human health receptors are anticipated at the Staveley IMD site.

10.5 Effects arising from operation

- 10.5.1 Users of the Proposed Scheme (i.e. rail passengers) are at all routine times within a controlled environment (i.e. within trains), and have therefore been scoped out of the assessment.

Avoidance and mitigation measures

- 10.5.2 Maintenance and operation of the Proposed Scheme would be in accordance with environmental legislation and good practice. Spillage and pollution response procedures similar to those to be outlined in the draft CoCP would be established for all high risk activities and employees would be trained in responding to such incidents.

Assessment of impacts and effects

- 10.5.3 The Proposed Scheme within this area would include two auto-transformer stations: Barlborough auto-transformer station located at High Wood embankment and Aston auto-transformer station at Nicker Wood embankment. Auto-transformer 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 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.

Monitoring

- 10.5.7 Volume 1, Section 9 sets out the general approach to environmental monitoring during operation of the Proposed Scheme. Requirements for monitoring would be determined as part of the investigation, treatment and validation of contamination on a site-specific basis as part of the detailed design process. Monitoring requirements may include water quality, air quality and/or (landfill bulk and trace gases), depending on the site being considered.

11 Landscape and visual

11.1 Introduction

- 11.1.1 This section of the report presents the assessment of the likely significant landscape and visual effects identified to date within the Staveley to Aston 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 Chesterfield Borough Council (CBC), Bolsover District Council (BDC), Rotherham Metropolitan Borough Council (RMBC), North East Derbyshire District Council (NEDDC), Derbyshire County Council (DCC), 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: LA11 Map Book shows the locations of key environmental features (Map Series CT-10) and the key construction (Map Series CT-05) and operational (Map Series CT-06) features of the Proposed Scheme. It also shows the locations of landscape and visual impact mitigation measures (Map Series CT-06) and viewpoints that would potentially be significantly affected at the construction (Map Series LV-03) and operation (Map Series LV-04) phases.
- 11.1.5 A separate, but related, assessment of effects on the setting of heritage assets is reported in Section 9, Historic environment.

11.2 Scope, assumptions and limitations

- 11.2.1 The scope, key assumptions and limitations for the landscape and visual assessment are set out in full in Volume 1 (Section 8) and the Scope and Methodology Report (SMR)¹⁴².
- 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 accessible land in this area; therefore, for the working draft ES assumptions have 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.

¹⁴² Supporting document: HS2 Phase 2b Environmental Impact Assessment Scope and Methodology Report

- 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 2.5km have been considered at settlements across the study area.
- 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 at peak activity. The assessment of operational visual effects covers the situation in winter and summer of year 1 and summer of year 15. The assessment of landscape effects is undertaken for the construction phase and for the operational phase at both year 1 and year 15. The landscape assessment does not consider seasonal variations e.g. winter/summer, since these do not affect character. Likely significant landscape and visual effects for year 30 will be reported in the formal ES.
- 11.2.7 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 the east of Staveley in the south to Aston in the north and, for the Staveley spur, from east of Staveley in the east, to Barrow Hill in the west. The landform slopes up towards an elevated plateau to the east with the low-lying

Rother Valley to the west. The underlying geology, Pennine Lower and Middle Coal Measures to the west alongside an area of upland limestone to the east, is expressed at ground level as an obvious change in elevation: a north-south topographic feature which is reinforced by the broad River Rother valley. Running across this broad south to north valley is a secondary pattern of smaller tributary valleys, which results in a broadly undulating landscape and a repeating rhythm of wide valleys and rolling ridges.

- 11.3.2 The study area is a mixture of towns, villages, scattered dwellings, industry and agriculture (predominantly arable but with some pasture, particularly in river valleys). Fields are generally large to medium in scale with some small remnants of the historic field pattern, marked by denser hedges with hedgerow trees. Beyond the hedgerow network, irregular woodland belts often line the many transport routes and watercourses, or surround active or restored industrial sites. Examples of this include former colliery sites within one of several country parks (e.g. Pools Brook Country Park and Rother Valley Country Park) and planting adjacent to the M1 corridor. Remnant semi-natural woodland is rare and of particular importance in this area. This includes several areas of ancient woodland and the plantations and spinneys at Barlborough Hall.
- 11.3.3 The underlying deposits of coal and iron, along with availability of water power, have had a strong influence on how the landscape has developed. There is now a strong industrial/post-industrial influence across much of the landscape. However, several properties and remnant historic parks (including Aston and the large estate at Barlborough) pre-date this and provide notable contrast and points of interest. The settlement pattern includes expanding former mining villages, such as Aston, Killamarsh and Wales, which in the north of the area are influenced by the urban expansion of Sheffield. Towns in the south-west of the area, such as Staveley, are influenced by the urban expansion of Chesterfield. Larger towns have also developed on the west to east transport axis of the A6135 Sheffield Road, including Renishaw, Barlborough and Clowne. There is also a dispersed pattern of smaller historic villages with a strong local vernacular of limestone and sandstone buildings.
- 11.3.4 Transport routes including railways, the motorway and numerous busy A roads have a major influence and contribute to the urbanisation of the area.
- 11.3.5 There is a network of public footpaths that cross the area, including the Trans Pennine Trail and the Cuckoo Way (long distance footpaths) and a number of public rights of way (PRoW) which cross over or under the M1 corridor. Rivers and canals provide a valued recreational resource of green corridors with tranquil settings for both people and wildlife, including the route of the partially restored Chesterfield Canal. Owing to industrial decline further opportunities have opened up to create new landscapes, which can provide a strong sense of place for local populations. Landscape restoration is evident in a number of woodlands and country parks such as Rother Valley Country Park.
- 11.3.6 The project LCAs have been identified 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 project

LCAs will be refined upon completion of the historic landscape characterisation exercise and these final project LCAs will be included in the formal ES. Use has been made of published landscape character assessments and a wide range of supporting GIS data, aerial photography and Ordnance Survey mapping, plus desk study and fieldwork. Published landscape character assessments reviewed include the relevant National Landscape Character Areas¹⁴³. The Landscape Character of Derbyshire¹⁴⁴ and Rotherham Landscape Character Assessment¹⁴⁵.

- 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 study area for Staveley to Aston has been subdivided into 18 LCAs. These LCAs are draft and subject to review in consultation with local planning authorities. Full descriptions of these will be provided in Volume 5 of the formal ES.
- 11.3.9 Eight of the 18 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. Ulley Tributary Valley LCA would be significantly affected by the Proposed Scheme and is included in Volume 2: Community area report LA12 Ulley to Bramley as it is located for the most part in the Ulley to Bramley area.
- 11.3.10 A summary of the remaining nine LCAs that would be significantly affected within the Staveley to Aston area is provided in Table 31.

¹⁴³ 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>

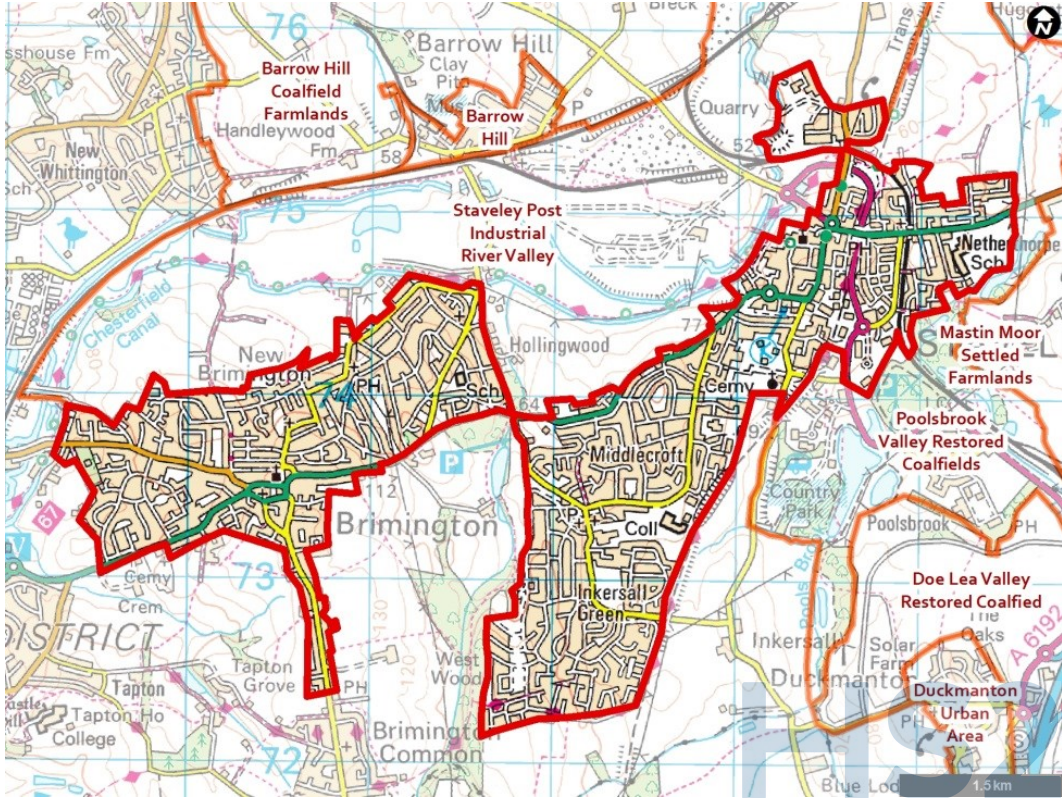
¹⁴⁴ Derbyshire County Council (2014). *The Landscape Character of Derbyshire (4th Ed.)*. Available online at: <http://www.derbyshire.gov.uk/environment/conservation/landscapecharacter/>

¹⁴⁵ Rotherham Metropolitan Borough Council (2010). *Rotherham Landscape Character Assessment*. Available online at: http://www.rotherham.gov.uk/downloads/file/1054/landscape_character_assessment_2010

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

Working Draft Environmental Statement Volume 2: LA11

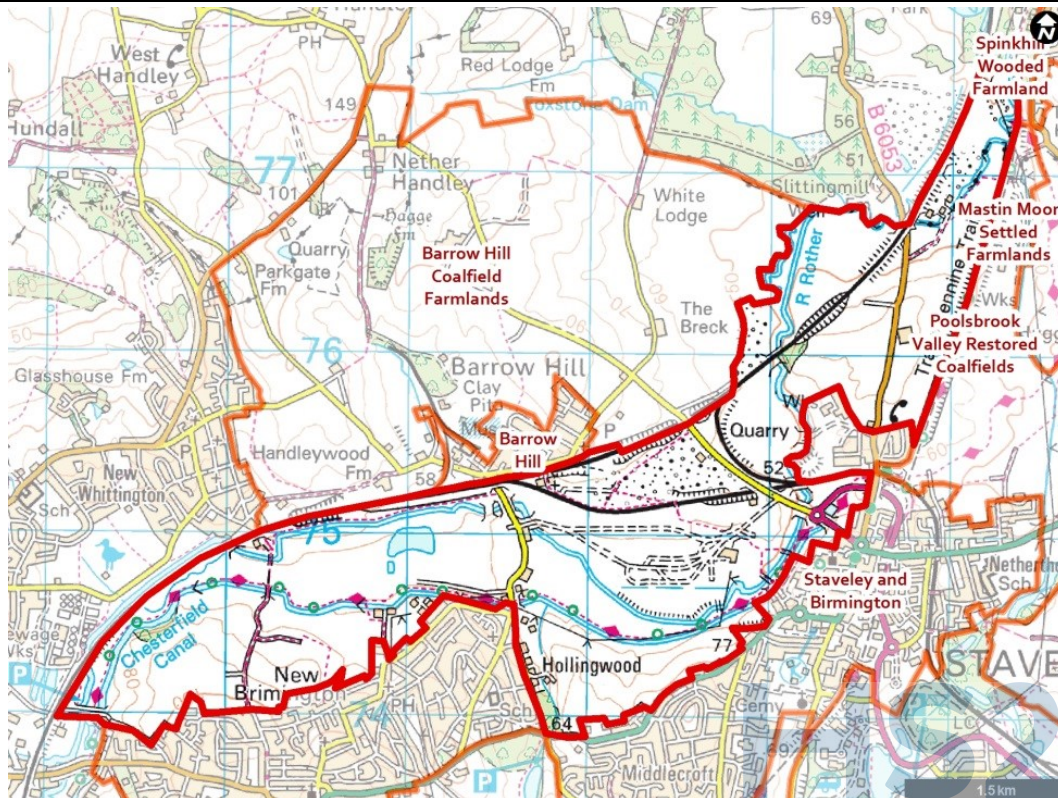
Table 31: Summary of significantly affected LCAs

Staveley and Brimington	
	
Historic built development within Staveley.	Well-treed area of modern built development in Staveley.
	
The Staveley and Brimington LCA is defined by the boundary of the two settlements and situated on valley slopes between the River Rother, to the west, and the River Doe Lea, to the east. The settlements have grown to the point where there is little distinction between them and adjacent settlements to the northeast of Chesterfield. Staveley includes an intact historic core, designated as conservation area, centred on the High Street and Church Street and containing a concentration of listed buildings overlaid on a medieval street pattern. Local sandstone and locally available red brick are predominant building materials and the Church of St John the Baptist is a focal point in the area and a landmark in views from outside the area. Away from the conservation area, character is influenced by extensive areas of modern housing, open spaces, large industrial estates in the east, post-industrial landscapes centred on the Staveley Iron Works to the north and major transport corridors. The Trans Pennine Trail also passes through the town. The A619 Worksop Road is a busy transport corridor and the movement and volume of traffic this brings influences the character of the area. Based on the mix of historic core with transportation and modern development described above, the overall value of this LCA is medium.	

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

Working Draft Environmental Statement Volume 2: LA11

Staveley Post Industrial River Valley



General overview of former industrial sites in Rother Valley.

Boundary treatment and self-generating woodland.



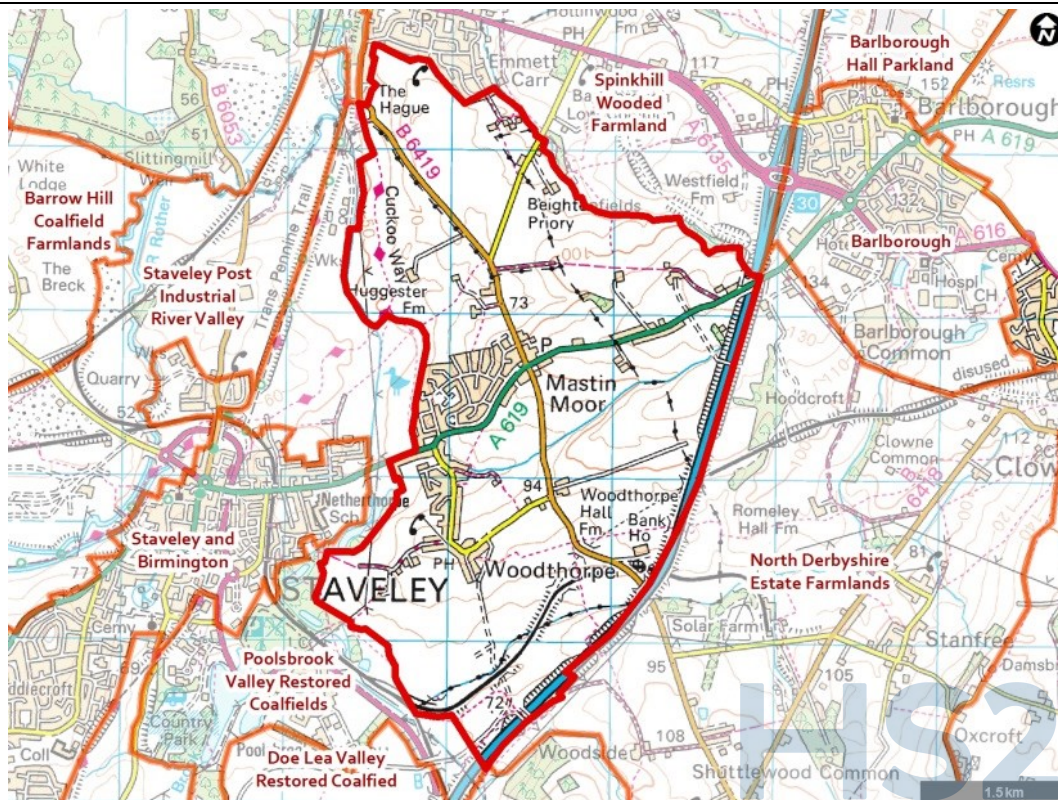
The Staveley Post Industrial Valley LCA is a broad valley containing the River Rother and the partially restored Chesterfield Canal to the north of Staveley. Underlying geology consists of Pennine Lower and Middle Coal Measures overlain with alluvium deposits along the flat valley floor. Slopes of the broad valley rise gently towards the edge of Staveley and Brimington to the south and the colliery village of Barrow Hill to the north. Remnants of the former industrial sites are common but there is also a fragmented pattern of irregular arable fields on the valley sides. Scrub and regenerating woodland are colonising the landscape, and mature woodland exists adjacent to watercourses. Local PRoW, the Trans Pennine Trail and the Cuckoo Way provide recreational links to Chesterfield Canal, Pools Brook Country Park and Rother Valley Country Park. Cross valley views can be gained from the higher slopes on the edge of Staveley towards the church spire at Barrow Hill which forms a local landmark. Areas affected by historic mining and industry have, in places, been neglected but this has allowed naturally regenerating woodland to establish, giving a green and softer appearance than might be anticipated of a landscape part-shaped by dereliction. The landscape holds associations and memories that bring pride and value for local people and there is a degree of peace and tranquillity. However, in places, the seclusion can also give a sense of uneasiness and concern about safety and potential to encounter anti-social behaviour.

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

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

Working Draft Environmental Statement Volume 2: LA11

Mastin Moor Settled Farmlands



Undulating farmland with linear woodland beyond.



Arable field with industrial sheds at Markham Vale.



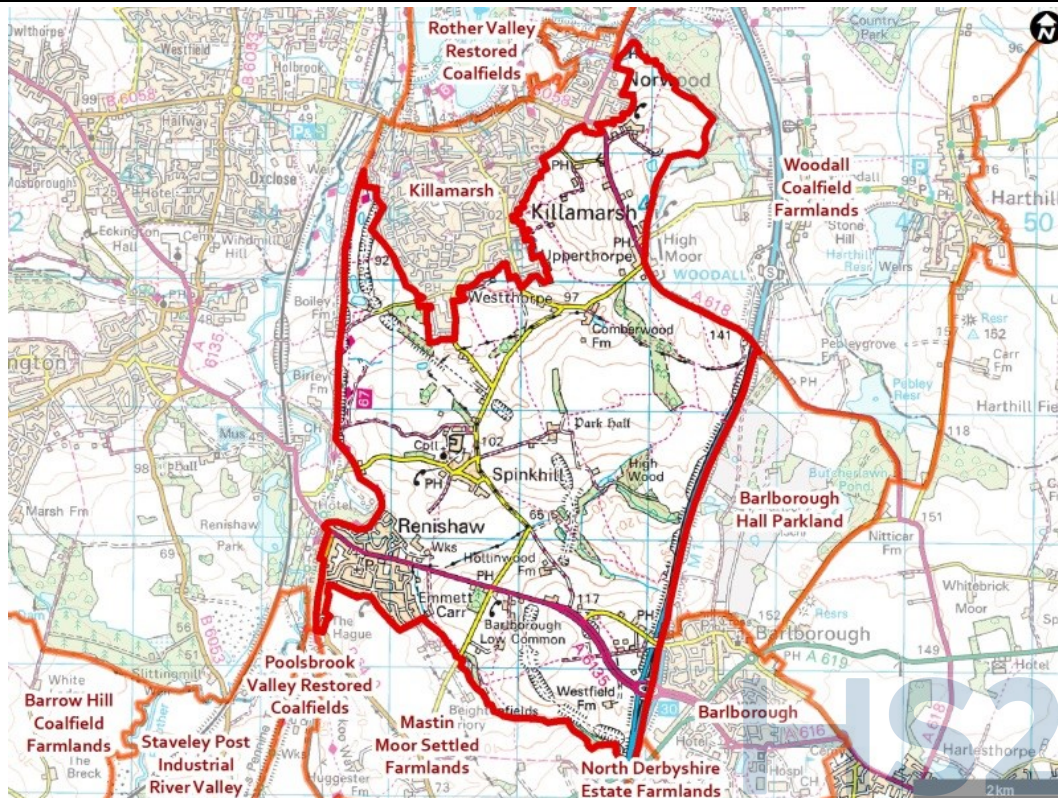
The Mastin Moor Settled Farmlands LCA is between Staveley to the west and the M1 corridor to the east. The broad undulating landform, underlain by Pennine Middle Coal Measures, rises steadily from the Doe Lea Valley in the west toward limestone plateau to the east. Arable farmland is dominant but there are small pastoral fields adjacent to farmsteads; however, the wider field pattern tends to be medium to large in scale and defined by thorn hedges with few hedgerow trees. Quality of hedgerows varies and there is little woodland cover, except for narrow linear woodlands along watercourses and the route of the disused mineral railway to the south (now the Clowne Branch Line Greenway). Character is influenced by movement and noise of the busy A619 Worksop Road and, although often hidden by landform, the M1 corridor. There is also a prevalence of modern settlement at Mastin Moor and large sheds at Markham Vale. The small linear village of Woodthorpe includes historic buildings and a listed church; it has notable mature trees and, despite proximity to modern development and infrastructure, has a sense of seclusion. Lanes through the area tend to be narrow, winding and sunken with irregular width verges. Higher ground tends to be more rural in character and offers open, long distance views across the landscape and west towards the River Rother.

Based on the contrasting development, character and perceptual qualities described above the overall value of this LCA is medium-low.

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

Working Draft Environmental Statement Volume 2: LA11

Spinkhill Wooded Farmlands



Open, arable fields with wooded pasture beyond.

Open, arable fields with wooded pasture beyond.



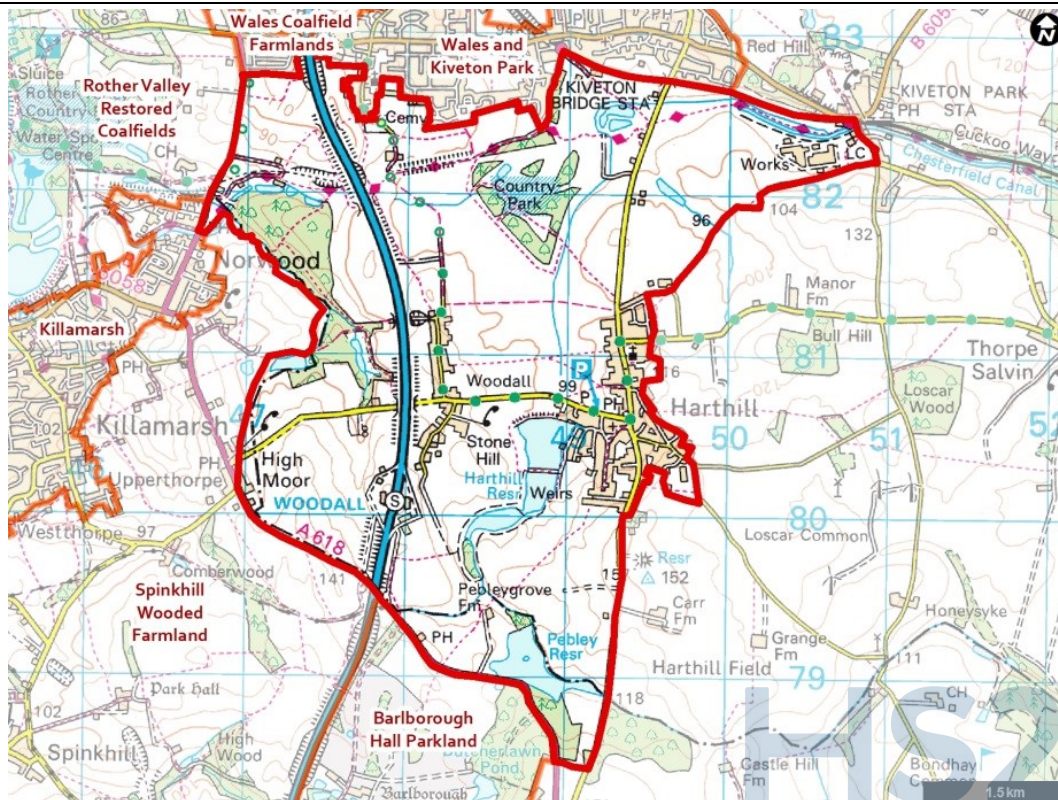
The Spinkhill Wooded Farmlands LCA lies west of the M1 corridor and Barlborough Hall Parkland, between Killamarsh to the north and Renishaw to the south. The elevated, undulating landform is underlain by Pennine Middle Coal Measures and is incised by small stream valleys, typically running east to west. Farming is generally arable and with medium to large fields but small pastoral fields, ancient enclosures and remnant medieval strip fields can be found on the fringes of Killamarsh. The area is relatively wooded with areas dense riparian willow; scattered hedgerow trees (e.g. oak and ash); species-rich hedgerows; and former field boundary trees. Settlement consists of isolated farmsteads and the small nucleated village of Spinkhill, where the domed copper roof at Mount St. Mary's RC College forms a prominent local landmark. This contrasts with the busy M1 corridor and fragmented areas around it. The area is also crossed by a network of public footpaths and is overlooked from elevated ground to the east where there are also long distance views west to the Peak District which include wind turbines and communication masts.

Based on the above associations and perceptual qualities, and considering the relatively small area affected by the M1 corridor, the overall value of this of this LCA is medium-high.

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

Working Draft Environmental Statement Volume 2: LA11

Woodall Coalfield Farmlands



Rolling arable farmland with boundary hedgerow and trees.

Recreational access along a wooded watercourse.



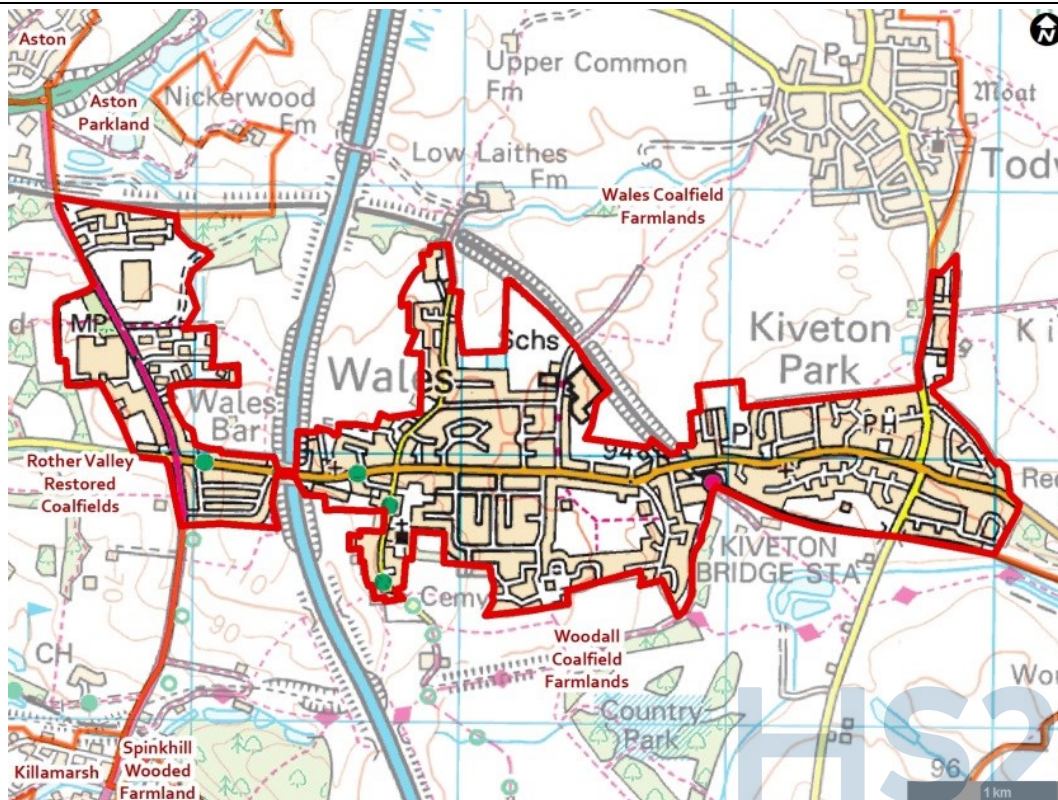
The Woodall Coalfield Farmlands LCA is located to the south of Wales and Kiveton Park. The landform is broadly rolling with wide valleys underlain by Pennine Middle Coal Measures. Farmland is the main land use and land cover and typically consists of an irregular pattern of predominantly large scale arable fields with some smaller pasture fields closer to settlement edges. Woodland is concentrated around the large reservoirs at Harthill and Pebley; the large ancient woodland at Nor Wood; and restored community woodland at Kiveton. The settlement pattern consists of scattered farmsteads and the linear village of Woodall linked by rural hedged lanes (including Killamarsh Lane). Parts of this landscape are very rural and have a sense of remoteness or seclusion but adjacent settlements on higher ground are visually prominent and, along with the movement and noise of the M1 corridor, somewhat detract from this. The local association with coal mining is still evident through reclaimed lakes and restored woodland at Kiveton Pit and the disused mineral railway and partially restored Chesterfield Canal, which crosses the area from east to west. There are wide views from higher ground along the settlement edges west towards the Pennines.

Based on the land uses, associations and recreational opportunities the overall value of this LCA is medium-high.

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

Working Draft Environmental Statement Volume 2: LA11

Wales and Kiveton Park



East along the B6059 (School Road).

West along the B6059 (School Road).



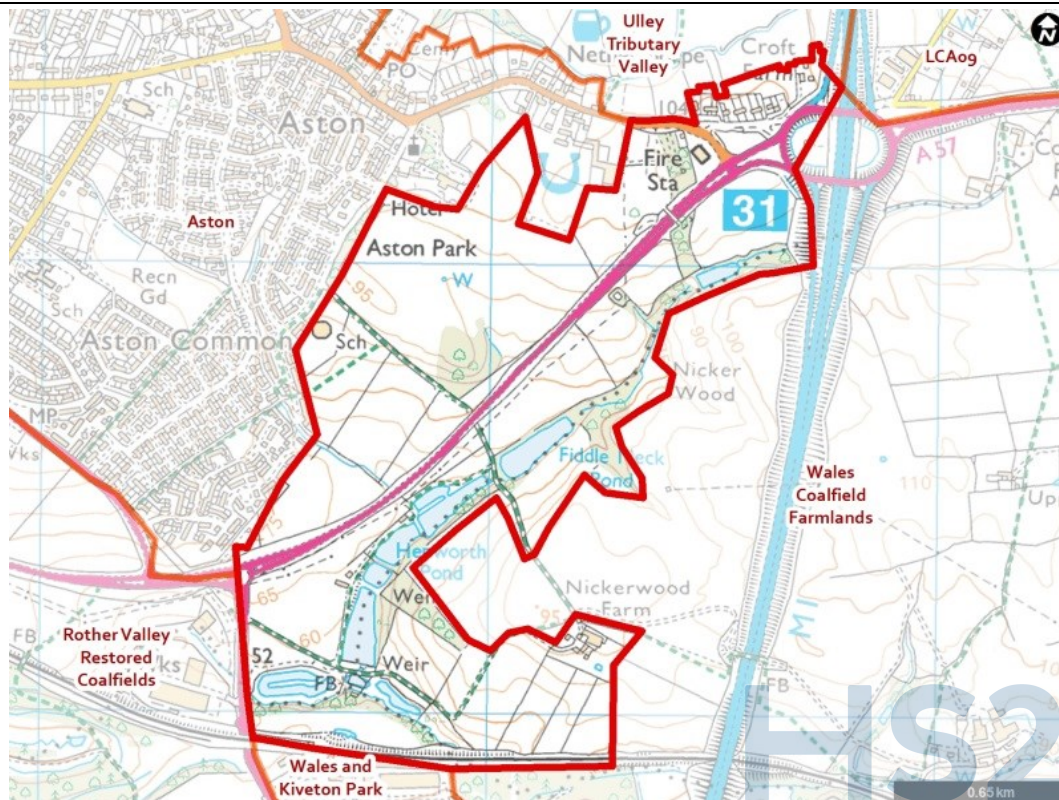
The Wales and Kiveton Park LCA is focused around the hilltop settlements of Wales, Wales Bar and Kiveton Park. All three settlements are connected by the B6059 School Road but Wales and Wales Bar are separated by the busy M1 corridor, connected via a wide road bridge and urban road with grass verges. Trees and hedges reduce the perception of the M1 corridor which is in cut under the bridge but character is affected by traffic noise. The historic core of Wales, running north-south along Church Street and Manor Road, is in contrast to the busy main road and areas of post-war, semi-detached single or two storey housing found elsewhere. North of the settlement is Wales Common, a large industrial area which is visually prominent in the surrounding landscape. The village cricket pitch to the north and PRoW between the settlement and the M1 corridor provide a local recreational resource.

Based on the development pattern and perceptual qualities described above the overall value of this LCA is medium-low.

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

Working Draft Environmental Statement Volume 2: LA11

Aston Parkland



Mature broadleaf woodland.



Aston Hall Hotel from within the parkland.



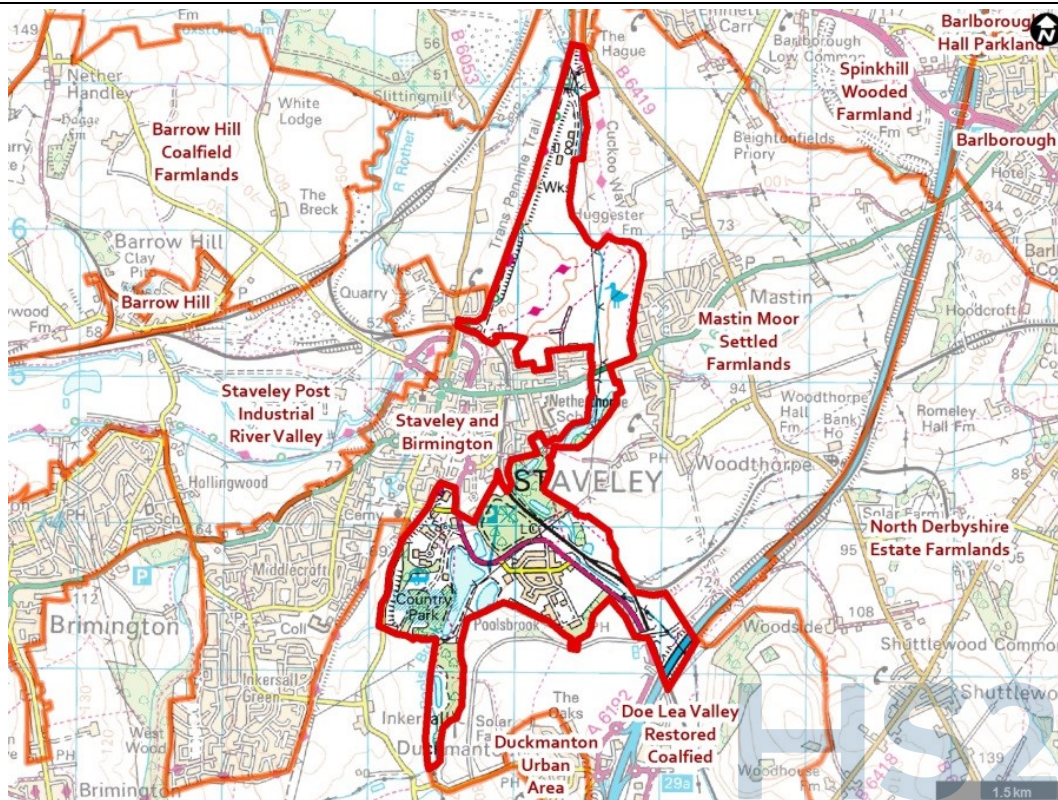
The Aston Parkland LCA sits between the settlement edge of Aston and the M1 corridor. Landform is gently rolling, underlain by Pennine Middle Coal Measures, and falls gently toward a series of fishing ponds alongside a stream which runs north-east to south-west. Farmland includes large, irregular fields and numerous small pastoral fields within a network of local pathways. Aston Hall features a Capability Brown designed parkland which strongly influences the setting of the historic edge of the settlement. This parkland is integral to the town's recreational space and includes a cricket club and equestrian centre. Woodland cover includes copses of mature trees within parkland; semi-natural riparian woodland (including ancient woodland at Nicker Wood); hedgerow trees along field boundaries and dense woodland along the A57 Aston Way. Views across the area are relatively open, except within the lower wooded valley. There is a listed church within Aston conservation area which forms a prominent local landmark. The rural character is influenced by major transport routes, including: the rail line to the south; the M1 corridor including junction 31 to the east; and the A57 Aston Way which bisects the LCA. While these routes introduce some movement (and noise) into the rural, parkland landscape, a sense of seclusion and tranquillity generally remains here.

Based on the recreational opportunity, landform, landcover and perceptual qualities described above the overall value of this LCA is medium-high.

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

Working Draft Environmental Statement Volume 2: LA11

Poolsbrook Valley Restored Coalfields



Open water body within Pools Brook Country Park.



Industrial heritage feature near Pools Brook.



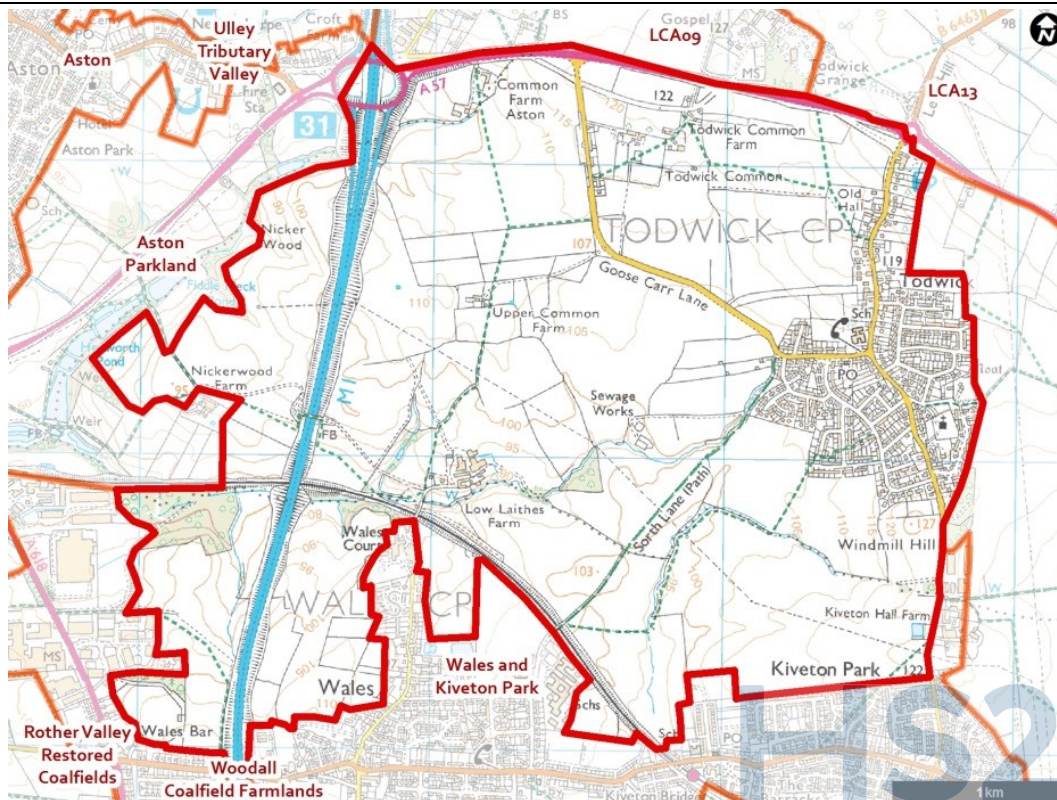
The Poolsbrook Valley Restored Coalfields LCA is largely defined by a river valley, containing the meandering River Doe Lea between Staveley to the west and Mastin Moor to the east. Underlying geology consists of Pennine Middle Coal Measures and there are restored mining sites at Pools Brook Country Park. The landscape is well wooded with blocks of immature woodland on the valley slopes and on restored mineral sites. However, to the north there are areas of arable farmland bounded by hedgerows and so the landscape is more open. Open water at Pools Brook Country Park and Norbriggs Flash Nature Reserve are fringed by wetland and grassland habitats, woodland and scrub. Areas of development often sit within woodland, e.g. an industrial estate extending south of Staveley, the caravan park at Pools Brook Country Park and residential estates at Poolsbrook. The landscape displays a disrupted character due to the ongoing presence of open cast mining and landfill, industrial units (particular the large sheds at Markham Vale) and railways and pylon lines which cross the landscape. Views are generally contained by woodland and landform but raised ground at Pools Brook Country Park allows panoramic views north and east.

Despite cultural association and recreational opportunity, based on the disrupted nature of this landscape and ongoing industrial influences described above the overall value of this LCA is medium-low.

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

Working Draft Environmental Statement Volume 2: LA11

Wales Coalfield Farmlands



Gently rolling farmland.



Recreational route bounded by hedgerow.



The Wales Coalfield Farmlands LCA is largely enclosed by settlement (including Todwick to the east and Kiveton Park, Wales and Wales Bar to the south) with the M1 corridor in the west and the A57 Aston Way to the north. The landform is gently rolling with small stream undulations underlain by Pennine Middle Coal Measures. Land cover is characterised by an irregular pattern of predominantly large scale arable fields with some smaller pasture fields closer to settlements. Woodland cover is limited to small pockets associated with watercourses and hedgerow trees along field boundaries. Settlement is limited to scattered farms although the LCA is influenced by the surrounding settlements on higher ground, which are visually prominent. The landscape is fragmented by major transport corridors (including the M1 corridor, A57 Aston Way and junction 31, as well as the existing railway) and electrical transmission infrastructure that runs along the south of the area. There are wide and long distance views from higher ground along the settlement edges to the west towards the Pennine Hills.

Based on the contrasting landcover, scenic quality and perceptual qualities described above the overall value of this LCA is medium.

Visual baseline

- 11.3.12 A summary description of the distribution and types of receptors most likely to be affected is provided below. The viewpoints are numbered to identify their locations and are shown on the viewpoint location maps (see Volume 2: LA11 Map Book, Map Series LV-03). 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: Recreational¹⁴⁶, 4: Transport, 5: Hotels/healthcare/education and 6: Employment.
- 11.3.13 Views within the Staveley to Aston area can generally be gained from public highways, PRow, settlements, residential properties and employment areas.
- 11.3.14 Elevated, longer distance views can be gained from the rising ground to the east of the study area, which includes the ridge-top settlements of Barlborough and Wales. Both of these settlements have outward looking views in various directions from their edges. Clowne, Harthill and Todwick are also located on rising ground to the east and from here the terrain offers outward looking views focused west from the settlement edges. Outward views can also be gained from settlement edges to the west of the study area, including Mastin Moor, Killamarsh and Aston. These settlements are located on ridges of higher ground to the east of the River Rother. There are views south towards Staveley from Mastin Moor. To the east of the study area and where settlements, such as Renishaw, are located in the River Rother valley and linking tributary valleys, rising landform to the east tends to foreshorten views in this direction.
- 11.3.15 In Staveley, Wales Bar and Aston, views out from the settlement edges are apparent. Staveley and the village of Barrow Hill also overlook the former iron works, being located on higher ground to the south and north of this feature which sits in the River Rother valley.
- 11.3.16 Views from PRow can be gained across the study area. From south to north this includes views from the footpath network around Staveley (Footpaths 28, 29, 37, 66, 49 and 11), Barlborough (Footpath 36, 6, 28 and 25), Killamarsh (Footpath 47), Harthill (Footpaths 16A, 18 and 17), Wales (Footpaths 15, 14, 13 and 12), Todwick (Footpath 1 and 15) and Aston (Footpaths 13, 20 and 16). Localised hedgerows, vegetation and woodland plays a varying role in screening views from parts of the footpath network. However, where open views are available footpaths on the higher valley sides tend to offer elevated longer distance views over the surrounding countryside.
- 11.3.17 Views for motorists and road users travelling on the road network, including the M1 corridor, which runs from south to north through the centre of the area, are often restricted by roadside vegetation/built form and local variations in landform. Mature vegetation along the M1 corridor typically screens close range views. However, where the M1 corridor runs on more open sections of embankment, views of the surrounding area can be gained. In terms of the wider road network views can be gained from

¹⁴⁶ Reference to specific civil parish numbers for footpaths is provided where available otherwise the adjacent road name is used as a reference to the footpath

certain sections of road including the A6192 Ireland Close, the A619 Worksop Road, the A6135 Sheffield Road, the A618 Mansfield Road and the A57 Aston Way.

- 11.3.18 The most notable areas of employment tend to be focused around the larger settlements including Staveley, Barlborough, Killamarsh, Wales and Aston. Staveley, Barlborough and Wales also have large industrial areas, on the edge of these settlements. Local built form, both in the form of neighbouring residences and employment areas, tends to foreshorten views from within the interior of these settlements.

11.4 Temporary effects arising during construction

- 11.4.1 As is commonplace with major infrastructure works, the scale of the construction activities means that works would be visible from many locations and would have the potential to give rise to significant temporary effects that cannot practicably be mitigated. Such effects are temporary and would vary over the construction period depending on the intensity and scale of the works at the time. The assessment of landscape and visual effects has been based on the activities occurring during the peak construction phase, which is defined as the period during which the main construction works would take place, including the presence of compounds, main earthworks and structure works.
- 11.4.2 The effects associated with the peak construction stage in this area are generally considered to be medium-term, based on the indicative construction programme in Section 2.3. It is currently anticipated that the peak civil engineering stage in this area would be undertaken between the start of 2024 and the end of 2028. Effects during other stages of works are likely to be less intensive due to less construction equipment being required at the time and a reduced intensity of construction activity.
- 11.4.3 Section 2.2 sets out the key permanent features of the Proposed Scheme and Section 2.3 describes the construction compounds and associated temporary works that have been considered in this assessment.

Avoidance and mitigation measures

- 11.4.4 Measures that have been incorporated into Sections 12 and 14 of the draft Code of Construction Practice (CoCP)¹⁴⁷ to avoid or reduce landscape and visual effects, where reasonably practicable, during construction include the following:
- avoidance of unnecessary tree and vegetation removal, and protection of existing trees in accordance with BS 5837: Trees in relation to design, demolition and construction¹⁴⁸;
 - 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

¹⁴⁷ Supporting document: Draft Code of Construction Practice

¹⁴⁸ BS 5837:2012 Trees in relation to design, demolition and construction – Recommendations, 2012, British Standard

- 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.

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 formation of embankments; excavation of cuttings; erection of viaducts; temporary structures, haul routes and construction compounds (along with associated activity); construction activity associated with the removal of existing landscape elements such as woodland, trees and hedgerows; formation of balancing ponds and the culverting, closure and diversion of existing water bodies and watercourses; and the closure and diversion of existing public highways and PRoW. Other key changes include the construction works associated with the overbridges and underbridges; the presence of transfer nodes and the demolition of buildings and structures.

11.4.7 These features and activities will occur at several locations along the route and there will be a concentration at the site of the Staveley Infrastructure Maintenance Depot (IMD).

Landscape assessment

11.4.8 Based on the current design it is anticipated that the LCAs set out in Table 32 would be significantly affected during construction of the Proposed Scheme.

Table 32: Summary description and assessment of effects on LCAs

Staveley and Brimington LCA	Medium susceptibility and sensitivity
Susceptibility to change: The mix of distinctive historic core alongside modern development results in medium susceptibility to change arising from the Proposed Scheme. The LCA would be directly affected by construction works associated with Staveley spur and Staveley IMD. Staveley spur would pass through the LCA and Staveley IMD would be constructed adjacent to it (this would result in indirect effects on the LCA and require access through it). Other elements which would be constructed in the LCA include modifications to existing earthworks along the disused mineral railway and new B6053 Eckington Road and A619 Lowgates Road overbridges. An HS2 pumping station would also be located here. Temporary features which would be located in this LCA include the Staveley West cutting and A619 Lowgates Road overbridge satellite compounds; and temporary material stockpiles. There would be works associated with PRoW closures, diversions and overbridges. Demolition of four residential properties on Bellhouse Lane and several outbuildings nearby would also be required. These works would result in increased noise, activity levels and volume of traffic in the predominantly residential character area. Removal of mature vegetation, variations in landform and relatively limited demolition works would also result in some change. However, all of these works would result in increased presence of equipment and movement of construction vehicles, increasing movement (and noise) into this urban environment, with effects focused to the north-east of the town. There would therefore be an overall medium magnitude of change and a moderate adverse effect.	Level of effect: Moderate adverse (significant)

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

Working Draft Environmental Statement Volume 2: LA11

Staveley Post Industrial River Valley LCA	Medium susceptibility and medium-low sensitivity
Susceptibility to change: Although post-industrial, this landscape has developed a distinct character with medium susceptibility to change arising from the Proposed Scheme. The LCA would be directly affected by construction works associated with Staveley IMD. Elements which would be constructed in the LCA include Staveley IMD; the Staveley IMD South chord viaduct; retaining walls and earthworks to the IMD perimeter; Works Road underbridge and Hall Lane modifications. Temporary features which would be located in this LCA include Staveley railhead; Works Road RSADS compound; Staveley IMD South chord viaduct satellite compound and Staveley IMD satellite compound; Staveley IMD transfer node and three material stockpiles. There would be works associated with PRoW closures and diversions. These works would result in the removal of large areas of pioneer and semi-mature tree cover, opening up views to construction activity, equipment and the formation of structures, piers and spans. Recreational opportunity would be restricted and existing tranquillity would be removed. There would therefore be an overall high magnitude of change and a moderate adverse effect.	Level of effect: Moderate adverse (significant)
Mastin Moor Settled Farmlands LCA	Medium-low susceptibility and sensitivity
Susceptibility to change: Although agricultural, this landscape is influenced by urban fringe, industry and transport corridors and has medium-low susceptibility to change arising from the Proposed Scheme. The LCA would be directly affected by construction works associated with Staveley spur and the main route. Elements which would be constructed in the LCA include Staveley East embankment, Staveley East cutting, Woodthorpe embankment and Mastin Moor cutting; retaining walls; M1 motorway North viaduct; B6419 Bolsover Road underbridge, Woodthorpe underbridge and Chesterfield Road overbridge; B6419 Bolsover Road realignment and M1 Woodthorpe northbound carriageway realignment. Some of these would result in minor amendment to existing features and landform but the activities required to construct them would alter the perceptual qualities of the landscape. Temporary features which would be located in this LCA include the Staveley East embankment satellite compound, M1 motorway North viaduct satellite compound and Mastin Moor cutting satellite compound; Mastin Moor cutting transfer node and several temporary material stockpiles. These areas would be noticeable in the landscape, increasing the degree of noise and movement already evident. There would be works associated with PRoW closures, diversions and overbridges, thereby limiting recreational access. Demolition of five residential properties, a horticultural nursery building and outbuilding would be undertaken on the A619 Worksop Road, altering an already fragmented landscape in the vicinity of the M1 corridor. There would therefore be an overall medium magnitude of change and a moderate adverse effect.	Level of effect: Moderate adverse (significant)
Spinkhill Wooded Farmlands LCA	Medium susceptibility and medium-high sensitivity
Susceptibility to change: The rural character, despite proximity to urban fringe and transport corridors, results in medium susceptibility to change arising from the Proposed Scheme. The LCA would be directly affected by construction works. Elements which would be constructed in the LCA include Mastin Moor embankment, Barlborough cutting, Woodall Common cutting; retaining walls; A6135 Sheffield Road overbridge and Sheffield Road overbridge; and Westfield Lane diversion and Sheffield Road realignment. The removal of existing features and construction activity required would be evident in the landscape. Temporary features which would be located in this LCA include the Barlborough cutting satellite compound and Woodall Common cutting satellite compound; and two temporary material stockpiles where increased movement and noise would be apparent. There would be works associated with PRoW closures, diversions and underbridges which would limit existing recreational access. Demolition of three residential properties, a haulage depot, a horticultural nursery, overbridge and telecommunication	Level of effect: Moderate adverse (significant)

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

Working Draft Environmental Statement Volume 2: LA11

masts would be undertaken, altering an already disrupted area around the M1 corridor. Proximity of the works to the busy M1 corridor would limit the overall magnitude of change. There would therefore be an overall medium magnitude of change and a moderate adverse effect.	
Woodall Coalfield Farmlands LCA	Medium susceptibility and sensitivity
Susceptibility to change: The tranquil and rural character here, despite the presence of the M1 corridor, results in medium susceptibility to change arising from the Proposed Scheme. The LCA would be directly affected by construction works. Elements which would be constructed in the LCA include Woodall Common cutting, Woodall embankment, Nor Wood embankment, Nor Wood cutting, Wales embankment, Wales South cutting and Wales Central cutting; Nor Wood viaduct; and A618 Rotherham Road overbridge and Killammarsh Lane Underbridge. The presence of equipment, movement of construction vehicles and the erection of viaduct piers and spans would result in noticeable change to this rural landscape. Temporary features which would be located in this LCA include the Wales South cutting main compound; Nor Wood viaduct satellite compound; and two temporary material stockpiles. These would be noticeable areas of increased activity levels. There would also be works associated with PRoW closures, diversions and underbridges which would limit recreational access to the landscape. These works would result in removal of deciduous woodland including ancient woodland at Nor Wood, woodland between Woodall Pond and Woodall Bottoms and some woodland along the M1 corridor. Hedgerows and farmland would also be removed. However, it is recognised that the tranquillity of this landscape is already locally disrupted by the M1 corridor. There would therefore be an overall high magnitude of change and a major adverse effect.	Level of effect: Major adverse (significant)
Wales and Kiveton Park LCA	Medium-high susceptibility and medium sensitivity
Susceptibility to change: Existing severance resulting from the M1 corridor results in medium-high susceptibility to change arising from the Proposed Scheme. The LCA would be directly affected by construction works. Elements which would be constructed in the LCA include Wales Central cutting and the B6059 School Road overbridge. There would also be indirect effects resulting from construction works in adjacent LCA, including Wales South cutting, Wales North cutting and Wales Bar South embankment. Temporary features which would be located in adjacent LCA and which would result in indirect effects include the Wales South cutting main compound; the Wales Bar South embankment satellite compound; and a temporary material stockpile. There would be works associated with PRoW closures and diversions. The works would result in demolition activity associated with the removal of three residential properties and overbridges in the vicinity of Wales Central cutting and Wales embankment and the loss of woodland screening along the M1 corridor. Indirect changes to the landform and land cover, including materials stockpiles to the north and construction site compounds to the south would also affect the rural setting the surrounding countryside provides. The presence of equipment and movement of construction vehicles (particularly along School Road which is already a busy road running through the town), would introduce substantial change in this largely suburban landscape. There would therefore be an overall high magnitude of change and a major adverse effect.	Level of effect: Major adverse (significant)
Aston Parkland LCA	Medium-high susceptibility and medium-high sensitivity
Susceptibility to change: Scenic quality and recreational use result in medium-high susceptibility to change arising from the Proposed Scheme. The LCA would be directly affected by construction works. Elements which would be constructed in the LCA include the Nicker Wood embankment, Aston South embankment and Aston cutting; the Fiddle Neck viaduct and part of the Wales Bar viaduct; the A57 Aston Way realignment and Worksop Road diversion.	Level of effect: Major adverse (significant)

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

Working Draft Environmental Statement Volume 2: LA11

This construction activity would affect tranquillity in Aston Park and would change the historic context and mature landscape around Aston Hall. The erection of viaduct piers and spans would also result in noticeable change to this landscape. Temporary features which would be located in this LCA include the Nicker Wood embankment satellite compound and Aston South embankment satellite compound; Aston South embankment transfer nodes; and a temporary material stockpile. Recreational use of this LCA would be limited throughout this LCA due to works. There would therefore be an overall high magnitude of change and a major adverse effect.	
Poolsbrook Valley Restored Coalfields LCA	Medium-low susceptibility and sensitivity
Susceptibility to change: Recreational areas are contained by mature woodland and the Proposed Scheme would directly affect unrestored post-industrial areas. There is therefore medium-low susceptibility to change arising from the Proposed Scheme. The LCA would be directly affected by construction works associated with Staveley spur. Elements which would be constructed in the LCA include the Staveley East embankment and the River Doe Lea underbridge which would result in changes to the land cover through the clearance of woodland and some areas of hedgerows. There would be works associated with a PRoW closure, diversion and overbridge, limiting recreational access here. Changes to the valley landform would also occur as a result of the Staveley East cutting (although these would be limited in the context of the existing but disused mineral railway). The presence of equipment and movement of construction vehicles, including vehicles on the haul route to the north of the Proposed Scheme, would introduce noticeable change. There would therefore be an overall medium magnitude of change and a moderate adverse effect.	Level of effect: Moderate adverse (significant)
Wales Coalfield Farmlands	Medium susceptibility and sensitivity
Susceptibility to change: The tranquil and rural character here, despite the presence of the M1 corridor, results in medium susceptibility to change arising from the Proposed Scheme. The LCA would be directly affected by construction works. Elements which would be constructed in the LCA include the Wales North cutting, Wales Bar South embankment, Wales Bar cutting and Wales Bar North embankment; and Wales Bar viaduct. There would also be indirect effects resulting from construction of the Fiddleneck viaduct. The presence of equipment, movement of construction vehicles and the erection of viaduct piers and spans would result in noticeable change to this rural landscape. Temporary features which would be located in this LCA, and where increased levels of activity and vehicle movements would be noticeable, include the Wales Bar South embankment satellite compound and part of the Nicker Wood embankment satellite compound; and three temporary material stockpiles. There would be works associated with PRoW closures, diversions, realignment and overbridges and these would limit recreational access to the landscape. These changes would be localised within the context of the LCA, focused along the western fringes and to the west of the M1 corridor. There would therefore be an overall medium magnitude of change and a moderate adverse effect.	Level of effect: Moderate adverse (significant)

Visual assessment

Introduction

- 11.4.9 The following section describes the likely significant effects on visual receptors during construction. The construction assessment has been undertaken for the winter period, in line with best practice guidance, to ensure a robust assessment. However, in some cases, visibility of construction activities may be reduced during summer when vegetation, if present in a view, would be in leaf.

High Speed Rail (Crewe to Manchester and West Midlands to Leeds)
Working Draft Environmental Statement Volume 2: LA11

- 11.4.10 Where a viewpoint represents multiple types of receptor, the assessment is based on the most sensitive receptors. Effects on other receptor types with lower sensitivity would be lower than those reported.
- 11.4.11 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.
- 11.4.12 Table 33 describes the construction phase potentially significant effects based on the current design of the Proposed Scheme. Viewpoint locations are shown in Map Series LV-03 in the Volume 2: LA11 Map Book.

Table 33: Construction phase potentially significant visual effects

Views east from PRow (Aston Footpath 21 and 20) to north of Aston (VPs 403-03-001 and 403-03-002)	Medium-high Sensitivity Receptors
Users of recreational footpaths would experience substantial changes to near distance open and expansive rural views from elevated locations on the PRow network north of Aston. Clearance works would include the removal of woodland and demolition of the equestrian centre on Worksoy Road. This would alter the relatively settled composition of the view. Construction works associated with the Hardwick cutting and Aston North embankment, temporary material stockpile east of the Hardwick cutting and construction of the railway would detract from rural characteristics of the view. Mitigation planting would not contribute to any screening or visual integration at this stage. There would therefore be an overall high magnitude of change and major adverse effect.	Level of effect: Major adverse (significant)
Views east for residents and pedestrians on Worksoy Road (VP 402-02-007)	High to medium Sensitivity Receptors
Residents and transport receptors would experience substantial changes to near distance views looking east along Worksoy Road from the junction with Melton Court. The Proposed Scheme would cross the B6067 Worksoy Road in the Aston Cutting, severing the existing road, which would be diverted to the south, and foreshortening views. Two residential properties on Worksoy Road and buildings off the B6067 Worksoy Road (equestrian centre) would be demolished and would alter the settled nature of views in this area. Clearance of existing mature roadside trees, works associated with severance of the existing road and construction of the Proposed Scheme would be clearly visible. Mitigation planting would not contribute to any screening or visual integration at this stage. There would therefore be an overall high magnitude of change and a major adverse effect.	Level of effect: Major adverse (significant)
Views west and south-west for residents on eastern edge of Aston and recreational users of Aston Park and footpaths to the south-east (Aston Footpath 26 and Todwick Footpath 15) (VP 402-03-005 and 402-03-003)	High to medium-high Sensitivity Receptors
Recreational users of Aston Park and residents on the settlement edge would experience views of construction activities associated with the Fiddle Neck viaduct and formation of earthworks to either side of this. Site clearance works, including demolition of Nickerwood Farmhouse and associated buildings, would be visible. This activity would be noticeable and the removal of features would alter the composition of views. Close distance views of the formation of the Nicker Wood embankment would be obtainable from Todwick Footpath 15. Prior to formation of the embankment, there is also potential for views of a haul route, the Nicker Wood embankment satellite compound and material stockpile east of the proposed route. Construction activities on top of the embankment are likely to be visible for the duration of works.	Level of effect: Moderate adverse (significant)

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

Working Draft Environmental Statement Volume 2: LA11

This would all increase movement in views and would alter the existing focal points which characterise existing views. Mitigation planting would not provide any screening or visual integration at this stage. There would therefore be an overall high magnitude of change and a moderate adverse effect.	
Views east for PRoW (Wales Footpath 12) users on eastern edge of Wales Bar (VP 401-03-010)	Medium-high Sensitivity Receptors
Users of the footpath network east of the industrial estate (Wales Footpath 12) would experience prominent changes in view as a result of construction activities. Footpath users would experience foreground views of a haul route, and associated vehicle movements. There would be close distance views of the Wales Bar South embankment, the Wales Bar South embankment satellite compound (to the north) and material stockpiles (to the south). Visual focus, composition of views and the level activity visible would change as a result. Prior to formation of the Wales Bar South embankment, there is potential for views of a haul route and material stockpile to the east. These would gradually be replaced by construction activities associated with the embankment and railway. Mitigation planting would not provide any screening or visual integration at this stage. There would therefore be an overall high magnitude of change and a major adverse effect.	Level of effect: Major adverse (significant)
Views east and west for residents and PRoW users on eastern edge of Wales Bar (Wales Footpath 13) and western edge of Wales (Wales Footpaths 14 and 15) and pedestrians and recreational users of School Road (VP 401-03-006, 401-02-005 and 401-04-012)	High to medium Sensitivity Receptors
Residents and footpath users (Wales Footpath 13) on the edge of Wales Bar (VP 401-03-006), residents and footpath users (Wales Footpaths 14 and 15) on the edge of Wales (401-02-005) and residents and road users on School Road (401-04-012) would experience close distance, elevated views to construction activities at Wales South cutting, Wales Central cutting and Wales North cutting. There would also be views to the Wales South cutting main compound and an adjacent haul route. Increased activity levels and new focal points would alter the view. Demolition works would include three residential properties on School Road and clearance works would include removal of mature woodland alongside the M1 corridor which currently helps to screen the road and traffic from these receptors. Mitigation planting would not provide any screening or visual integration at this stage. There would therefore be an overall high magnitude of change and a major adverse effect.	Level of effect: Major adverse (significant)
Views east and west for users of the Cuckoo Way (VP 401-03-004 and 401-03-002)	Medium-high Sensitivity Receptors
Users of the Cuckoo Way would experience activities that are continuously highly visible across the majority of the view. Formation of the Wales embankment would be a substantial alteration, crossing much of the available view. From the west (VP 401-03-004), a haul route, formation of the Wales South cutting and the Wales South cutting main compound would be visible and there would be views of clearance works at Nor Wood. From the east (VP 401-03-002), a temporary material stockpile would be immediately adjacent. Following formation of Wales embankment, construction activities would be seen on the skyline. Mitigation planting would not contribute to any screening or visual integration at this stage. There would therefore be an overall high magnitude of change and a major adverse effect.	Level of effect: Major adverse (significant)

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

Working Draft Environmental Statement Volume 2: LA11

Views west for residents on edge of Woodall and users of PRoW (Harthill Footpath 20) extending north from Woodall over Baugy Hill (VP 400-03-003)	High to Medium-high sensitivity receptors
Residents and users of recreational footpaths to the north of Woodall would experience substantial changes in middle distance and elevated views, looking west over the M1 corridor, as a result of construction activities. Construction of the Nor Wood viaduct and formation of the Woodall and Nor Wood embankments would be noticeable across much of the available view. The emerging structure and increased activity levels would alter the focus and composition of views. West of the Proposed Scheme, the Nor Wood viaduct satellite compound may be visible (although this would be gradually as construction progresses). East of the Proposed Scheme, a nearby temporary material stockpile would be visible. This increased activity would be noticeable in the view. Following formation of earthworks and structures, construction activities would be visible against the backdrop of distant views to the Pennines. Mitigation planting would not contribute to any screening or visual integration at this stage. There would therefore be an overall medium magnitude of change and a moderate adverse effect.	Level of effect: Moderate adverse (significant)
Views east from for PRoW (Barlborough Footpath 5) to east of Spinkhill and views west from PRoW (Barlborough Footpath 20) at Barlborough Hall (VP 399-03-003 and 399-03-002)	Medium-high Sensitivity Receptors
Users of recreational footpaths would experience noticeable change from elevated short to middle distance views as a result of construction activities. Construction activities would be visible, running broadly parallel to the M1 corridor, across undulating farmland between these two viewpoints. Formation of the High Wood embankment would be apparent alongside three temporary material stockpiles, crossing a wide extent of the available view. From the east (VP 399-03-002), there is also potential for views of formation of the Woodall Common cutting. Once earthworks were complete, construction activities associated with the railway would be visible. From footpaths around Barlborough Hall, activities and features would also be seen on the opposite side of the M1 corridor, although roadside vegetation would filter views. Mitigation planting would offer little screening or visual integration at this stage. There would therefore be an overall high magnitude of change and a major adverse effect.	Level of effect: Major adverse (significant)
Views west for PRoW (Clowne Footpath 23) west of Romely Farm (VP 397-03-005)	Medium-high Sensitivity Receptors
Users of recreational footpaths would experience substantial changes to short distance views as a result of construction activities. Activities visible would include construction of the M1 motorway North viaduct, nearby and crossing the majority of the view to the west. This would be seen partly against the skyline and partly against the distant Pennines, altering the composition and length of view available. Construction of the railway would also be apparent and result in increased levels of activity being visible. Adjacent to the PRoW, the M1 motorway North viaduct satellite compound and a temporary material stockpile would be prominent in the foreground. Beyond the M1 motorway North viaduct, it is likely that the Staveley East embankment satellite construction compound, Mastin Moor cutting transfer node and further temporary material stockpiles, along with construction of the Staveley spur, would be visible (although partly screened by the viaduct as construction progresses). Mitigation planting would offer no screening or visual integration of the structure. There would therefore be an overall high magnitude of change and a major adverse effect.	Level of effect: Major adverse (significant)

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

Working Draft Environmental Statement Volume 2: LA11

Views south-east for residents at Woodthorpe Hall Farm and Norbridggs Cottages (B6419 Bolsover Road) and users of PRoW (Staveley Footpath 27) and residents on south-eastern edge of Woodthorpe village (VP 397-04-006 and 397-03-003)	High to medium-high Sensitivity Receptors
Residents and users of recreational footpaths would experience substantial changes in short to middle distance elevated views as a result of construction activities. Construction, tree clearance and formation of the Staveley East embankment would be seen along the disused mineral railway, alongside works associated with the B6419 Bolsover Road realignment and B6419 Bolsover Road underbridge. This would alter the composition of relatively settled views. The Staveley East embankment satellite compound, Mastin Moor cutting transfer node and several material stockpiles would be visible in nearby fields and activities here would be apparent. Construction of the M1 motorway North viaduct would be apparent in longer distance views and seen largely against the horizon, altering the composition and interpretation of the landscape. The M1 motorway North viaduct satellite compound and temporary material stockpiles would be located adjacent but, as construction progresses, these would be screened. Mitigation planting would not contribute to any visual integration or screening at this stage. There would therefore be an overall high magnitude of change and a major adverse effect.	Level of effect: Major adverse (significant)
Views north and north-west for residential and recreational receptors on the north-western edge of Staveley (Hall Lane) and recreational users of Chesterfield Canal and Canal Basin including the Cuckoo Way (VP 450-04-007 and 450-03-008). Views south and south-east from the Trans Pennine Trail and Hall Lane (VP 450-03-010 and 450-03-011)	High to Medium-high Sensitivity Receptors
Residents and users of recreational footpaths to the north-west of Staveley, including from around the Canal Basin, would experience substantial changes in short distance views as a result of construction activities. Clearance of post-industrial features and vegetation would be seen and followed by construction of Staveley IMD, Staveley West embankment, retaining walls and Staveley IMD South chord viaduct. The Staveley IMD satellite compound, Staveley IMD South chord viaduct satellite compound, Staveley IMD transfer node and temporary material stockpiles would also be visible. The relatively calm and settled views available now would be altered by this. Construction of the railway would be seen although largely back dropped by the rising landform behind. Close distance views of the construction of the Staveley spur and B6053 Eckington Road overbridge would also be apparent, particularly from the Trans Pennine Trail. Mitigation planting would not contribute to any visual integration or screening at this stage. There would therefore be an overall high magnitude of change and a major adverse effect.	Level of effect: Major adverse (significant)
Views south for residents on southern edge of Barrow Hill and recreational users of PRoW (Staveley Footpaths 38 and 14) within the former Hall Lane landfill site (VP 451-03-006 and 450-03-009)	High to medium-high Sensitivity Receptors
Residential receptors and users of recreational footpaths would experience a substantial alteration to existing, slightly elevated and open views across the Staveley Former Works, as a result of construction activities. Clearance of post-industrial features and regenerating vegetation would be extensive. This would be followed by construction of Staveley IMD, earthworks and retaining walls to Staveley IMD perimeter. Staveley IMD satellite compound and temporary material stockpiles would also be visible. Mitigation planting would not provide any visual integration or screening at this stage. There would therefore be an overall high magnitude of change and a major adverse effect.	Level of effect: Major adverse (significant)

High Speed Rail (Crewe to Manchester and West Midlands to Leeds)
Working Draft Environmental Statement Volume 2: LA11

Views north for residents on north-western edge of Staveley and Brimington (VPs 450-04-004 and 451-02-003)	High Sensitivity Receptors
Residential receptors and road users would experience a noticeable alteration to existing, elevated and open views across the Rother valley (and Staveley Former Works) as a result of construction activities. Clearance of post-industrial features and regenerating vegetation would be extensive in views from the north-western edge of Staveley (VP 450-04-004). This would be followed by construction of the Staveley IMD with earthworks and retaining walls to the Staveley IMD perimeter. The Staveley IMD satellite compound and temporary material stockpiles would also be visible. Similar, albeit slightly more framed views would also be available from Brimington (VP 451-02-003), looking north-east along Private Drive. Mitigation planting would not provide any visual integration or screen at this stage. There would therefore be an overall medium magnitude of change and a moderate adverse effect.	Level of effect: Moderate adverse (significant)

Other mitigation measures

- 11.4.13 To further reduce the significant effects described above, consideration will be given during the detailed design stage to where planting can be established early in the construction programme, including early planting in ecological mitigation sites, which would have the additional benefit of providing some visual screening. However, not all landscape and visual effects can be mitigated due to the visibility of construction activity and the sensitivity of surrounding receptors. No other mitigation measures are considered practicable during construction.

Summary of likely residual significant effects

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

11.5 Permanent effects arising from operation

- 11.5.1 The permanent features of the Proposed Scheme that have been taken into account in determining the effects arising during operation on landscape and visual receptors are presented in Section 2.2 of this report.

Avoidance and mitigation measures

- 11.5.2 The operational assessment of impacts and effects is based on year 1 (2033) and year 15 (2048) of the Proposed Scheme, with Year 30 (2063) to be reported in the formal ES. A process of iterative design and assessment has been employed, and is ongoing, to avoid or reduce adverse effects during the operation of the Proposed Scheme. Measures that would be integrated into the design of the Proposed Scheme include:

- design of earthworks to tie the engineering earthworks for embankments (such as Wales Bar South embankment and Nor Wood embankment) and cuttings into the wider landscape context and to mitigate views of structures and overhead line equipment from sensitive receptors, where reasonably practicable. Earthworks design also takes account of the relationship to surrounding land uses and management, such as agriculture;
- landscape mitigation planting, woodland habitat creation in areas of loss, using the same species composition and planting types (and appropriate planting density). Such mitigation would compensate for the partial loss of woodland, and provide habitat connectivity, enhance landscape/green infrastructure connectivity, as well connectivity of historic landscape features, where reasonably practicable, and to soften embankments and viaduct abutments;
- hedgerow habitat creation and translocation/restoration in areas of loss to restore connectivity and landscape pattern, where reasonably practicable, and using an appropriate palette of hedgerow types and species to tie the Proposed Scheme mitigation into the wider landscape character; compensation for loss of field ponds with new wetlands, ecological ponds and biodiversity wetland features and wetland enhancement;
- provision of new areas of informal semi natural greenspace at the intersection of the Proposed Scheme with the M1 corridor and A57 Aston Way 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;
- diversion/realignment of PRow to maintain a high level of interconnectivity, and a good recreational network, and to provide interesting and diverse footpath routes; and
- a proposed public realm area would run along the Chesterfield Canal at Staveley near the confluence of the Chesterfield Canal with the Trans Pennine Way and the Cuckoo Way. This seeks to mitigate the landscape and visual impact of the Staveley IMD and Staveley spur on residential receptors in Staveley and users of the PRow through providing new areas of public realm along the Chesterfield Canal. These include stepped terraced seating and

planting to the east, facing the Chesterfield Canal, as well as providing a flexible public square around Staveley Canal Basin, which could support local activities and events.

Assessment of impacts and effects

- 11.5.3 The likely effects on landscape and visual receptors during operation of the Proposed Scheme relate to the presence of new structures and elements in the landscape including viaducts, underbridges, overbridges and the presence of large scale earthworks. Other aspects include the presence of overhead line equipment and the movement of trains.

Landscape assessment

- 11.5.4 Based on the current design, it is currently anticipated that the LCAs described in Table 34 would be significantly affected during operation of the Proposed Scheme.

Table 34: Operational phase significant landscape effects

Staveley Post Industrial River Valley LCA	Medium susceptibility and sensitivity
Susceptibility to change: the post-industrial character, valley terrain, associations of pride, pioneering vegetation and recreational interest provided through the PRoW result in a medium susceptibility to change. Year 1: The Proposed Scheme would run in an east-west alignment through the centre of this LCA, and include an area of development in the former Staveley Chemical Works (associated with the proposed Staveley IMD). The Staveley IMD would introduce large scale maintenance sheds, infrastructure, train movement (and noise) in a semi-rural/post-industrial valley landscape. To the east of the Staveley IMD the scale of the Staveley IMD South chord viaduct and its elevated location over Hall Lane would introduce further prominent infrastructure, in proximity to the partially restored Chesterfield Canal and basin. New planting would offer little mitigation in Year 1. This would permanently alter the developing perception of a landscape which, although neglected in parts, is being regenerated by pioneer woodland and has recreational value. There would therefore be an overall high magnitude of change and a moderate adverse effect.	Level of effect: Moderate adverse (significant)
Year 15: By year 15, established mitigation planting would help to integrate some structures into the landscape and reinstate the river corridor/canal vegetation with the potential to enhance the species mix and formalise recreational access. There would therefore be an overall medium magnitude of change and moderate adverse effect.	Level of effect: Moderate adverse (significant)
Woodall Settled Coalfields LCA	Medium susceptibility and sensitivity
Susceptibility to change: the rolling landform, rural but highly settled character and overlooked nature (with surrounding settlements on higher ground being visually prominent) result in a medium susceptibility to change. Year 1: The Proposed Scheme would result in direct effects and would run south–north through this LCA, enclosing a large area of land between the Proposed Scheme and the M1 corridor, to the east. This would also result in changes to rolling landform due to a series of embankments and cuttings. Most notably, Nor Wood embankment, which would cross an infilled section of the Chesterfield Canal, would exert a strong influence over the rural landscape character due to its position on the valley side to the east of Nor Wood and proximity to the ancient woodland. The Nor Wood viaduct would introduce further large scale engineered features into the landscape and influence the character of the valley landscape which contains Woodall Pond and associated watercourse.	Level of effect: Moderate adverse (significant)

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

Working Draft Environmental Statement Volume 2: LA11

There would therefore be a high magnitude of change and a moderate adverse effect.	
Year 15: Mitigation planting would assist with some integration and screening of structures into the landscape by the summer of year 15. However, changes associated with severance of the landscape, changes to the landform and introduction of large scale engineered features would remain unchanged. There would therefore be an overall medium magnitude of change and moderate adverse effect.	Level of effect: Moderate adverse (significant)
Wales and Kiveton LCA	Medium-high susceptibility and medium sensitivity
Susceptibility to change: The densely settled and built up nature suburban nature and role the surrounding countryside and recreational areas play in providing a setting result in a medium-high susceptibility to change. Year 1: The Proposed Scheme would run through this LCA in the Wales Central cutting. This would result in direct effects associated with increased sense of separation between the settlements of Wales Bar and Wales on the other side of the M1 corridor. There would be loss of residential properties and mature vegetation to the west of the M1 corridor, increasing the influence of traffic on the landscape. Indirect landscape effects would also be experienced on the rural setting of Wales Bar Cricket Club due to the proximity of the Proposed Scheme which would run through Wales North cutting and on Wales Bar South embankment to the north of the settlement. There would therefore be an overall high magnitude of change and a major adverse effect.	Level of effect: Major adverse (significant)
Year 15: Mitigation planting would assist with some integration of structures into the landscape by the summer of year 15 and help to screen views of the M1 corridor further north and south of the settlement. However, changes associated with severance and effects on the rural setting of the settlement would remain significant. There would therefore be an overall medium magnitude of change and a moderate adverse effect.	Level of effect: Moderate adverse (significant)
Aston Parkland LCA	Medium-high susceptibility sensitivity
Susceptibility to change: the rolling terrain, mature vegetation pattern, parkland character and role this landscape plays in providing a setting to adjacent settlements result in a medium-high susceptibility to change. Year 1: The Proposed Scheme would run along the eastern fringes of the LCA to the south of Nickerwood Farm and through the eastern side of Aston park. Earthworks would alter the landform (particularly the Nicker Wood embankment). The scale and elevation of Fiddle Neck viaduct would exert a strong influence on the character of the enclosed valley. There would be loss of deciduous riparian woodland, potentially including a small area of ancient woodland at Nicker Wood. The Proposed Scheme would pass through the settlement of Aston (resulting in demolition of properties and permanent diversion of Worksop Road), would alter the character of the designed parkland landscape at Aston and the setting of Aston Hall and the conservation area. Direct changes would largely be focused to the eastern half of the LCA. Further direct changes resulting from the proposed Worksop Road diversion and widespread indirect effects would also alter the rural character and parkland qualities of the wider LCA to the west. There would therefore be an overall high magnitude of change and a major adverse effect.	Level of effect: Major adverse (significant)
Year 15: Mitigation planting would assist with some integration of structures into the landscape by the summer of year 15 and provide some screening, particularly for the link road across Aston Park. However, changes associated with the severance of the landscape, changes to the landform and introduction of large scale engineered features would remain significant.	Level of effect: Major adverse (significant)

High Speed Rail (Crewe to Manchester and West Midlands to Leeds)
Working Draft Environmental Statement Volume 2: LA11

There would therefore be an overall high magnitude of change and a major adverse effect.	
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Visual assessment

Introduction

- 11.5.5 The following section describes the likely significant effects on visual receptors during operation year 1 and year 15. Effects at operation year 30 will be reported in the formal ES. The assessment has been undertaken for the winter period, in line with best practice guidance, to ensure a robust assessment. However, in some cases, visibility of the operational Proposed Scheme may be reduced during summer when vegetation, if present in a view, would be in leaf.
- 11.5.6 Where a viewpoint represents multiple types of receptor, the assessment is based on the most sensitive receptors. Effects on other receptor types with a lower sensitivity would be lower than those reported.
- 11.5.7 Table 35 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: LA11 Map Book.

Table 35: Operation phase significant visual effects

Views east from PRoW (Aston Footpath 21 and 20) to north of Aston (Medium-high sensitivity receptors) (VPs 403-03-001 and 403-03-002)	
Year 1 – winter and summer: Users of recreational footpaths would experience substantial changes to near distance open and expansive rural views from elevated high points on the PRoW network to the north of Aston. Engineered earthworks (particularly the Hardwick cutting) would be out of keeping with the natural landform and this would be visible. Overhead line equipment and the movement of trains would also detract from the rural characteristics of the view. The mitigation planting would not contribute to any screening or visual integration at this stage. There would therefore be an overall high magnitude of change and a major adverse effect.	Level of effect: Major adverse (significant)
Year 15 – summer: Due to the maturing mitigation vegetation which would be present in views, landform and overhead line equipment would partly be screened. Overall effects would therefore reduce to non-significant by year 15.	Level of effect: Non-significant
Views east for residents and pedestrians on Worksop Road (High to medium sensitivity receptors) (VP 402-02-007)	
Year 1 – winter and summer: Residents and transport receptors would experience substantial changes to near distance views looking east along B6067 Worksop Road from the junction with Melton Court. The Proposed Scheme crosses B6067 Worksop Road in the Aston cutting, severing the road with the Worksop Road diversion to the south and out of view. The Proposed Scheme would truncate the view and result in the loss of some mature roadside trees and introduce close distance views of train movements in framed views looking east. The mitigation planting would not contribute to any screening or visual integration at this stage. There would therefore be an overall high magnitude of change and a major adverse effect.	Level of effect: Major adverse (significant)
Year 15 – summer:	Level of effect:

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

Working Draft Environmental Statement Volume 2: LA11

Due to the proximity and framed nature of the view mitigation planting would offer little screening benefit by the summer of year 15. There would therefore be an overall high magnitude of change and a major adverse effect.	Major adverse (significant)
Views west and south-west for residents on eastern edge of Aston and recreational users of Aston Park and footpaths to the south-east (Aston Footpath 26 and Todwick Footpath 15) (High to medium-high sensitivity receptors) (VPs 402-03-005 and 402-03-003)	
Year 1 – winter and summer: Recreational users of Aston Park and residents on the edge of Aston would experience views of Fiddle Neck viaduct and earthworks to either side of this (Nicker Wood embankment and Aston South embankment). Changes to local landform, land cover and vegetation pattern (along with the loss of existing features) would alter the composition of the view. Prominent features would also create new focal points. The Worksop Road diversion through Aston Park and realignment of the A57 Aston Way would also be apparent from certain locations within the park. Close distance views of Nicker Wood embankment would be obtainable from Todwick Footpath 15, as walkers head south-east out of Aston Park. Mitigation planting would not provide any screening or visual integration at this stage. There would therefore be an overall high magnitude of change and a major adverse effect.	Level of effect: Major adverse (significant)
Year 15 – summer: By summer year 15, established mitigation planting would assist with some integration of structures into the landscape and provide some screening, particularly for the link road across Aston Park. However, the Proposed Scheme would remain very apparent within closer distance views from the PRoW network to the east of Aston and from the settlement itself, where the route crosses the B6067 Worksop Road. As such, the magnitude of change and level of effect are unchanged.	Level of effect: Major adverse (significant)
Views east for PRoW (Wales Footpath 12) users on eastern edge of Wales Bar (Medium-high sensitivity receptors) (VP 401-03-010)	
Year 1 – winter and summer: Footpath users (Wales Footpath 12) on the network to the east of the industrial estate would experience close distance, slightly elevated views east towards Wales Bar South embankment. In these views the Proposed Scheme would obscure views of the M1 corridor and associated roadside vegetation, seen passing through open undulating farmland, and result in linear transport infrastructure being visible, unscreened, closer to the viewer than is currently the case. Mitigation planting would not provide any screening or visual integration at this stage. There would therefore be a medium magnitude of change and a moderate adverse effect.	Level of effect: Moderate adverse (significant)
Year 15 – summer: Due to the maturing mitigation vegetation which would be present in the view, effects would reduce to non-significant by year 15.	Level of effect: Non-significant
Views east and west for residents and PRoW users on eastern edge of Wales Bar (Wales Footpath 13) and western edge of Wales (Wales Footpaths 14 and 15) and pedestrians and recreational users of School Road (high to medium sensitivity receptors) (VPs 401-03-006, 401-02-005 and 401-04-012)	
Year 1 – winter and summer: Residents and footpath users (Wales Footpath 13) on the eastern edge of Wales Bar (VP 401-03-006) would experience close distance, slightly elevated views toward Wales South cutting. Residents and footpath users (Wales Footpaths 14 and 15) would experience middle distance elevated views looking west, over the M1 corridor, to the Proposed Scheme (VP 401-02-005). In these views, the Proposed Scheme would result in loss of mature woodland and planting alongside the M1 corridor, which currently helps to screen the road and traffic. Wales South cutting, Wales Central cutting and Wales embankment would also introduce new topographic features along with train movement and overhead line equipment. Residents and road users on	Level of effect: Major adverse (significant)

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

Working Draft Environmental Statement Volume 2: LA11

School Road (VP 401-04-012) would experience close distance, framed and elevated views, along with associated woodland removal along the M1 corridor, of the Wales Central cutting. In addition, there would be longer range views extending along the Proposed Scheme. Mitigation planting would not provide any screening or visual integration at this stage. There would therefore be a high magnitude of change and a major adverse effect.	
Year 15 – summer: By summer of year 15, established mitigation planting (which extends along both side of the Proposed Scheme to Nor Wood to the south) would assist with some integration of earthworks into the landscape and provide some screening. This would help reduce the magnitude of change to medium and result in moderate adverse effects.	Level of effect: Moderate adverse (significant)
Views east and west for PRoW users on the Cuckoo Way (Medium-high sensitivity receptors) (VPs 401-03-004 and 401-03-002)	
Year 1 – winter and summer: Users of recreational footpaths would experience substantial changes to near distance views as a result of the Proposed Scheme from the Cuckoo Way. The Wales embankment would form a substantial alteration in the view, crossing much of the view, and creating visual segregation of the path. The loss of woodland at Nor Wood, as footpath users approach the Proposed Scheme from the west, would also be apparent. Overhead line equipment and movement of trains would also be seen on the skyline. Mitigation planting would not contribute to any screening or visual integration at this stage. There would therefore be an overall high magnitude of change and a major adverse effect.	Level of effect: Major adverse (significant)
Year 15 – summer: Views of Wales embankment, overhead line equipment and the movement of trains would be partially filtered by mitigation planting which would offer some integration of the structure. New woodland planting along the Cuckoo Way would also help to partially filter views. However, due to the proximity mitigation planting would offer little screening benefit by the summer of year 15. As such, the magnitude of change and level of effect are unchanged.	Level of effect: Major adverse (significant)
Views west for residents on edge of Woodall and users of PRoW (Harthill Footpath 20) extending north from Woodall over Baugy Hill (High to Medium-high sensitivity receptors) (VP 400-03-003)	
Year 1 – winter and summer: Residents and users of recreational footpaths to the north of Woodall would experience substantial changes in medium distance and elevated views, over the M1 corridor, toward the Proposed Scheme. The Nor Wood viaduct, and associated earthworks (Nor Wood embankment and Woodall embankment), would introduce a noticeable engineered feature and a new focal point in the view. Associated woodland loss and changes to landform would change the view to the west and obscure the remaining parts of Nor Wood. Overhead line equipment and movement of trains would also be apparent, seen against the distant Pennines. Mitigation planting would not contribute to any screening or visual integration at this stage. There would therefore be an overall medium magnitude of change and a moderate adverse effect.	Level of effect: Moderate adverse (significant)
Year 15 – summer: Views of the embankments either side of Nor Wood viaduct, overhead line equipment and the movement of trains would be partially screened and filtered by mitigation planting by the summer of year 15. However, the Nor Wood viaduct would remain a noticeable alteration to the view and the magnitude of change and the level of effect would be unchanged.	Level of effect: Moderate adverse (significant)

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

Working Draft Environmental Statement Volume 2: LA11

Views east from for PRoW (Barlborough Footpath 5) to east of Spinkhill and views west from PRoW (Barlborough Footpath 20) at Barlborough Hall (Medium-high sensitivity receptors) (VPs 399-03-003 and 399-03-002)

Year 1 – winter and summer:

Users of recreational footpaths would experience noticeable change from elevated short to medium distance views as a result of the Proposed Scheme. The Proposed Scheme would cross undulating farmland between these two viewpoints, running broadly parallel to the M1 corridor. High Wood embankment and Woodall Common cutting would be apparent, along with overhead line equipment and movement of trains, and would change the topography as seen from this location. From footpaths around Barlborough Hall the Proposed Scheme would be seen on the opposite side of the M1 corridor with roadside planting helping to partially filter views.

Mitigation planting would offer little screening or visual integration at this stage.

There would therefore be an overall medium magnitude of change and a moderate adverse effect.

Level of effect:

Moderate adverse (significant)

Year 15 – summer:

Due to the maturing mitigation vegetation which would be present in views, effects would reduce to non-significant by year 15.

Level of effect:

Non-significant

Views west for PRoW (Clowne Footpath 23) west of Romely Farm (Medium-high sensitivity receptors) (VP 397-03-005)

Year 1 – winter and summer:

Users of recreational footpaths would experience substantial changes to short distance views as a result of the Proposed Scheme. The key change to the view would be the introduction of the visually prominent M1 motorway North viaduct crossing the majority of the view west. This feature would be seen partially on the skyline and partially back dropped by distant views of the Pennines to the west and would clearly alter the composition of the view. Overhead line equipment and the movement of trains would also be apparent. Mitigation planting would offer no screening or visual integration of the structure.

There would therefore be an overall high magnitude of change and a major adverse effect.

Level of effect:

Major adverse (significant)

Year 15 – summer:

Although mitigation planting would offer some visual integration of the visible sections of embankment either side of the M1 motorway North viaduct, the viaduct itself would remain a visually prominent component of the view. The magnitude of change and level of effect would be unchanged.

Level of effect:

Major adverse (significant)

Views south-east for residents at Woodthorpe Hall Farm and Norbridggs Cottages (B6419 Bolsover Road) and users of PRoW (Staveley Footpath 27) and residents on south-eastern edge of Woodthorpe village (High to medium-high sensitivity receptors) (VPs 397-04-006 and 397-03-003)

Year 1 – winter and summer:

Residents and users of recreational footpaths would experience substantial changes in short to middle distance elevated views as a result of the Proposed Scheme. The Staveley spur would cross through open farmland along the disused mineral railway, which crosses under the B6419 Bolsover Road in the foreground of the view. Staveley East embankment and tree loss along the disused mineral railway, along with the B6419 Bolsover Road realignment and underbridge would be apparent in the foreground. Slightly longer distance views of the M1 motorway North viaduct to the south-east would also be apparent, seen largely back dropped by the distant horizon. Mitigation planting would not contribute to any visual integration or screening at this stage.

Level of effect:

Major adverse (significant)

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

Working Draft Environmental Statement Volume 2: LA11

There would therefore be an overall high magnitude of change and a major adverse effect.	
Year 15 – summer: Mitigation planting, including reinstatement of woodland along the existing landform of the disused mineral railway, would help to screen and visually integrate the Proposed Scheme. However, foreground changes associated with the B6419 Bolsover Road realignment and underbridge, the movement of trains and longer distance views of M1 motorway North viaduct would still be apparent. As such, the magnitude of change would reduce to medium, resulting in a moderate adverse effect.	Level of effect: Moderate adverse (significant)
Views north and north-west for residential and recreational receptors on the north-western edge of Staveley (Hall Lane) and recreational users of Chesterfield Canal and Canal Basin including the Cuckoo Way (High to Medium-high sensitivity receptors) (VPs 450-04-007 and 450-03-008) Views south and south-east from the Trans Pennine Trail and Hall Lane (High to Medium-high sensitivity receptors) (VP 450-03-010 and 450-03-011)	
Year 1 – winter and summer: Residents and users of recreational footpaths to the north-west of Staveley (VP 450-03-08), including from around the Canal Basin, would experience noticeable changes in short distance views as a result of the Proposed Scheme. Key changes would be associated with the Staveley IMD South chord viaduct, which would be apparent in open views. Overhead line equipment and the movement of trains would be apparent. Views of the Staveley IMD South chord viaduct would also be obtainable from Hall Lane (VP450-04-007). Close distance views of the Staveley Spur and B6053 Eckington Road overbridge would be apparent, particularly from the Trans Pennine Trail (VP 450-03-011). Mitigation planting would not contribute to any visual integration or screening at this stage. There would therefore be an overall high magnitude of change and a major adverse effect.	Level of effect: Major adverse (significant)
Year 15 – summer: By the summer of year 15, mitigation planting including riparian woodland planting along route of Chesterfield Canal and around Staveley Canal Basin and hedge and field tree planting south of Staveley IMD would provide some screening, helping to reduce the magnitude of change to medium and level of effect to moderate.	Level of effect: Moderate adverse (significant)
Views south for residents on southern edge of Barrow Hill and recreational users of PRow (Staveley Footpaths 38 and 14) within the former Hall Lane landfill site (High to medium-high sensitivity receptors) (VPs 451-03-006 and 450-03-009)	
Year 1 – winter and summer: Residential receptors and users of recreational footpaths would experience a substantial alteration to existing, slightly elevated and open views across the Staveley Former Works, as a result of the Proposed Scheme. Staveley IMD would substantially alter the post-industrial wooded landscape of the Staveley Former Works and replace it with rail track, sidings, train movements, lighting and new built features. Mitigation planting would not provide any visual integration or screen at this stage. There would therefore be an overall high magnitude of change and a major adverse effect.	Level of effect: Major adverse (significant)
Year 15 – summer: By the summer of year 15, mitigation planting would help to partially filter views; however, the elevated or close distance nature of the views and large scale change are such that the magnitude of change and level of effect would be unchanged.	Level of effect: Major adverse (significant)

Views north for residents on north-western edge of Staveley and Brimington (High sensitivity receptors) (VPs 450-04-004 and 451-02-003)

Year 1 – winter and summer: Residential receptors would experience a noticeable alteration to existing, elevated and open views across the Rother valley (and Staveley Former Works) as a result of the Proposed Scheme (VP 450-04-004). Staveley IMD would substantially alter the post-industrial wooded landscape of the Staveley Former Works and replace it with rail track, sidings, train movements, lighting and new built features. Similar, albeit slightly more framed views would also be available from Brimington (VP 451-02-003), looking northeast along Private Drive. Mitigation planting would not provide any visual integration or screen at this stage. There would therefore be an overall medium magnitude of change and a moderate adverse effect.	Level of effect: Moderate adverse (significant)
Year 15 – summer: Due to the maturing mitigation vegetation which would be present in views, effects would reduce to non-significant by year 15.	Level of effect: Non-significant

Other mitigation measures

- 11.5.8 The permanent effects of the Proposed Scheme on landscape and visual receptors have been reduced through integration of the measures described in this section. Effects in Year 1 may also be further reduced through establishing planting early or in advance of the main construction programme. Other features such as additional earthworks, planting or public realm greenspace would be considered as part of the ongoing development of contextual design. These measures would potentially provide additional screening and/or greater integration of the Proposed Scheme into the landscape.

Summary of likely residual significant effects

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

Monitoring

- 11.5.10 Volume 1, Section 9 sets out the general approach to environmental monitoring during operation of the Proposed Scheme.
- 11.5.11 There are no area-specific requirements for monitoring landscape and visual mitigation during the operation of the Proposed Scheme in the Staveley to Aston 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 Staveley to Aston area. The assessment considers existing businesses, community organisations, local employment and local economies, including planned growth and development.
- 12.1.2 Engagement with Rotherham Metropolitan Borough Council (RMBC), Bolsover District Council (BDC) and Chesterfield Borough Council (CBC) 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: LA11 Map Book.

12.2 Scope, assumptions and limitations

- 12.2.1 The scope, assumptions and limitations for the socio-economics assessment are set out in Volume 1 (Section 8) and the Scope and Methodology Report (SMR)¹⁴⁹.
- 12.2.2 The assessment of in-combination effects will draw upon the findings of other technical disciplines (e.g. air quality, sound, noise and vibration, landscape and visual and traffic and transport). Likely significant in-combination effects on socio-economic receptors and resources will be reported in the formal ES. 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 Staveley to Aston area. It lies within the administrative areas of RMBC, BDC and CBC. In addition, the area includes small parts of two further administrative areas - Sheffield District Council and North East Derbyshire District Council (NEDDC) where the effects are considered marginal in relation to the local economies concerned and are therefore not reported in this

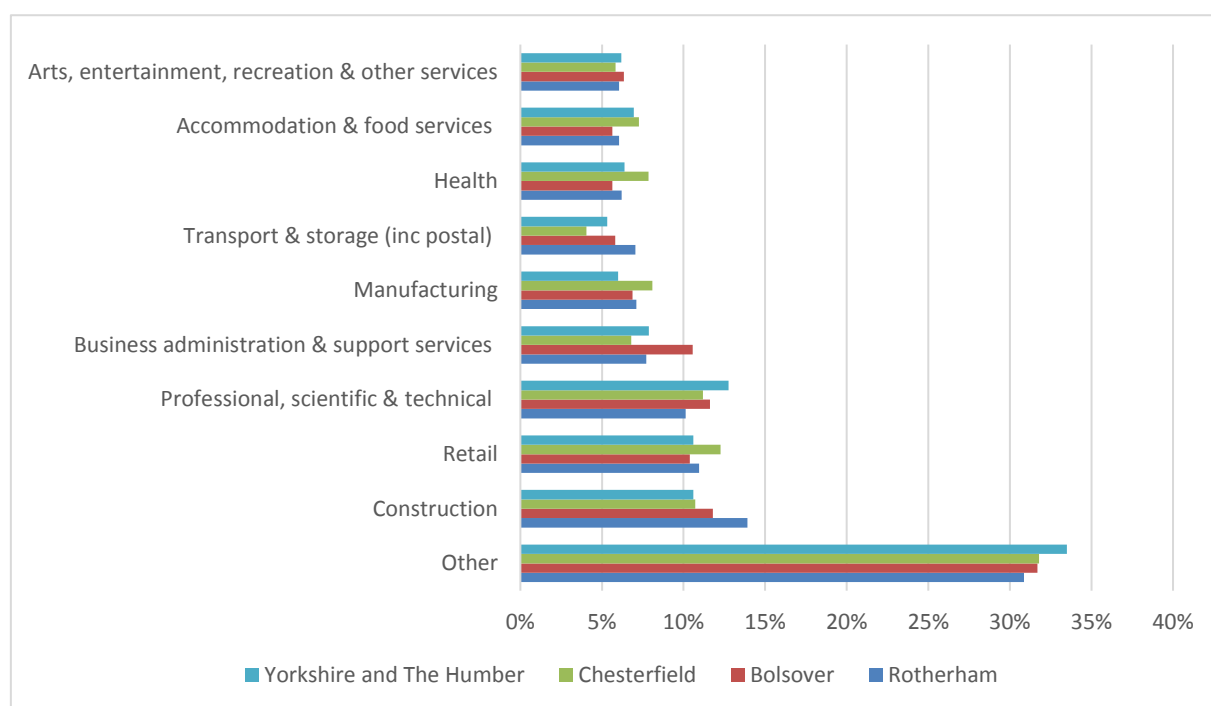
¹⁴⁹ Supporting document: HS2 Phase 2b Environmental Impact Assessment Scope and Methodology Report

baseline analysis. It also falls wholly within the Sheffield City Region Local Enterprise Partnership (LEP) area¹⁵⁰ and Yorkshire and the Humber region.

Business and labour market

- 12.3.2 Within the Staveley to Aston area there is a wide spread of business types reflecting a diverse range of commercial activities. Within the RMBC area, the local authority that covers the largest geographic extent of the area, construction accounts for the largest proportion of businesses (14%) alongside the retail (11%) and professional, scientific and technical (10%) sectors. In the adjacent BDC area, construction accounts for the largest proportion of businesses (12%) alongside the professional, scientific and technical (12%) and business administration and support services (11%) sectors. In the CBC area, retail accounts for the largest proportion of businesses (12%) with the professional, scientific and technical (11%) and construction (11%) sectors also accounting for relatively large proportions. This is shown below in Figure 10. For comparison, within the Yorkshire and the Humber region¹⁵¹, the professional, scientific and technical sector accounts for the largest number of businesses (13%) with construction (11%) and also retail (11%) accounting for relatively large numbers of businesses.

Figure 10: Business sector composition in the RMBC, BDC and CBC areas and the Yorkshire and the Humber region ¹⁵²



- 12.3.3 In 2016¹⁵³, approximately 107,000 people worked in the RMBC area, 33,000 people worked in the BDC area and 51,000 in the CBC. According to the Office for National

¹⁵⁰ Sheffield City Region, (2014), *Strategic Economic Plan*. Available online at:

<https://sheffieldcityregion.org.uk/wp-content/uploads/2018/01/Strategic-Economic-Plan-2015-2025.pdf>

¹⁵¹ Office for National Statistics (ONS), *UK Business count – Local Units 2017*. Available online at: <https://www.nomisweb.co.uk>

¹⁵² 'Other' includes: Arts, entertainment, recreation and other services; Wholesale; Information and communication; Motor trades; Education; Public administration and defence; Property; Financial and insurance; Agriculture, forestry and fishing; and Mining, quarrying and utilities

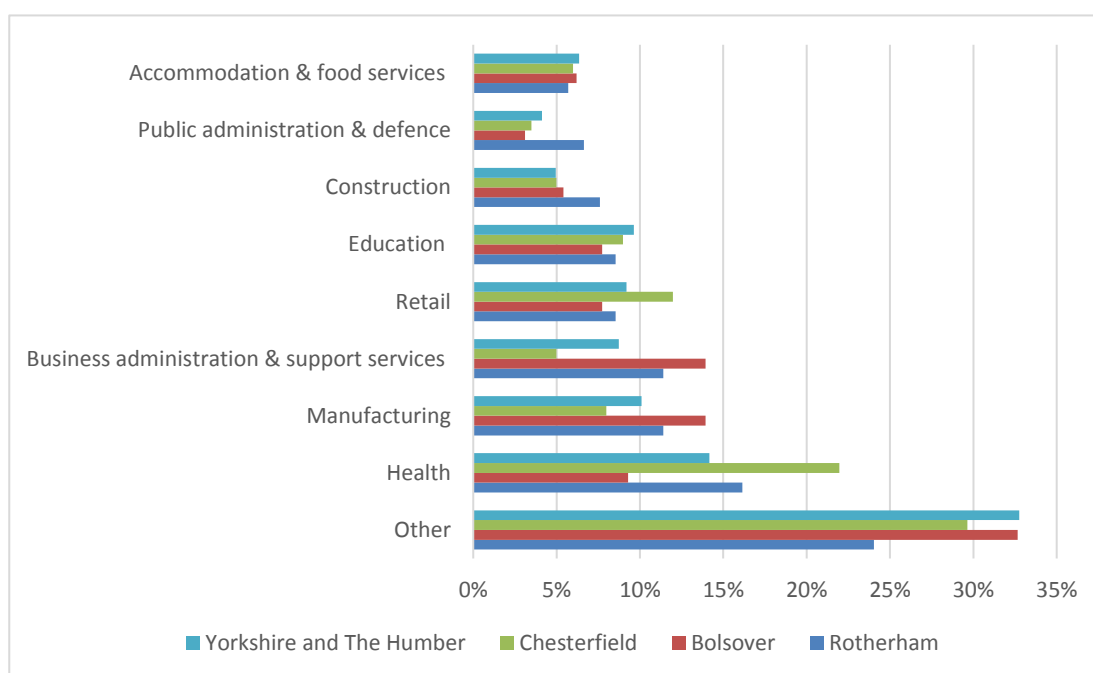
¹⁵³ Office for National Statistics; 2015; Business Register and Employment Survey; <http://www.nomisweb.co.uk> - This number includes both residents and non-residents who work within the local authority boundaries.

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

Working Draft Environmental Statement Volume 2: LA11

Statistics Business Register and Employment Survey 2016, the top five sectors in terms of share of employment in the RMBC area were: health (16%); manufacturing (11%); business administration and support services (11%); retail (9%) and education (9%). In the BDC area, the top five sectors were: manufacturing (14%); business administration and support services (14%); transport and storage (including postal) (9%); health (9%); and retail (8%). In the CBC area, the top five sectors were: health (22%); retail (12%); education (9%); manufacturing (8%); and wholesale (6%). These compare with the top five sectors for the Yorkshire and the Humber region, which were: health (14%); manufacturing (10%); education (10%); retail (9%); and business administration and support services (9%). This is shown in Figure 11¹⁵⁴.

Figure 11: Employment by industrial sector in the RMBC, BDC and CBC areas and the Yorkshire and the Humber region¹⁵⁵



12.3.4 According to the Annual Population Survey (2016)¹⁵⁶, the employment rate¹⁵⁷ within the RMBC area was 67% (105,500 people); within the BDC area the rate was 75% (36,600 people) and within the CBC area the rate was 73% (46,900). These rates compare with recorded rates for the Yorkshire and the Humber region (72%) and for England (74%). In 2016, the unemployment rate¹⁵⁸ in the RMBC area was 8%; the rate

¹⁵⁴ 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 who work within the local authority boundaries

¹⁵⁵ 'Other' includes: Transport and storage (including postal); Arts, entertainment, recreation and other services; Wholesale; Professional, scientific and technical; Motor trades; Information and communication; Mining, quarrying and utilities; Financial and insurance; Property; and Agriculture, forestry and fishing

¹⁵⁶ Office for National Statistics (ONS), (2016), *Annual Population Survey*. Available online at: <http://www.nomisweb.co.uk>

¹⁵⁷ The proportion of working age (16-64 year olds) residents that is in employment

¹⁵⁸ 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.

in the BDC area was 4%; while the rate in the CBC area was 5%. These rates compare with the Yorkshire and the Humber region (5%) and with England (5%).

- 12.3.5 According to the Annual Population Survey (2016)¹⁵⁹, 25% of RMBC residents aged 16-64 were qualified to National Vocational Qualification Level 4 (NVQ4) and above, compared to 31% in the Yorkshire and the Humber region and 38% in England, while 12% of residents had no qualifications, which is higher than Yorkshire and the Humber (10%) and England (8%). In the BDC area, 22% of residents aged 16-64 were qualified to NVQ4 and above, with 8% of its residents having no qualifications. In the CBC area, 31% of residents aged 16-64 were qualified to NVQ4 and above, with 6% of its residents having no qualifications.

Property

- 12.3.6 A review of employment land in 2015 identified a supply of 260ha of available employment land in the RMBC area¹⁶⁰, which is considered sufficient to meet the anticipated need of 235ha. In addition, a supply for 68ha of employment land has been identified in the BDC¹⁶¹ area compared to an employment land target of 80 to 100ha to meet local needs, and 92ha in the CBC area, considered sufficient to meet the expected need of 45ha¹⁶².
- 12.3.7 The average vacancy rate for industrial and warehousing property in the RMBC area has been assessed as 14% based on marketed space against known stock; in the BDC area it has been assessed as 4% and the CBC area had a vacancy rate of 23%.

12.4 Effects arising during construction

Avoidance and mitigation measures

- 12.4.1 The draft Code of Construction Practice (CoCP)¹⁶³ 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);

¹⁵⁹ Office for National Statistics (ONS), (2016), *Annual Population Survey*. Available online at: <http://www.nomisweb.co.uk>

¹⁶⁰ Sheffield City Council and Rotherham Metropolitan Borough Council, (2015), *Sheffield and Rotherham Joint Employment Land Review Final Report*. Available online at: https://www.google.co.uk/url?sa=t&rct=j&q=&esrc=s&source=web&cd=3&ved=0ahUKewi3od3Zhv7XAhXiAsAKHvTJAQIQFggyMAI&url=http%3A%2F%2Fwww.rotherham.gov.uk%2Fdownload%2Fdownloads%2Fid%2F2705%2Fsheffield_and_rotherham_employment_land_review_2015.pdf&usq=AOvVaw1K3kev-ghyJC1xtMF-Wdj

¹⁶¹ 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

¹⁶² Chesterfield District Council, (2008), *East Midlands Northern Sub Region Employment Land Review*. Available online at: <https://www.chesterfield.gov.uk/media/367764/east-midlands-northern-sub-region-employment-land-review-2008.pdf>

¹⁶³ Supporting document: Draft Code of Construction Practice

- site specific traffic management measures including requirements relating to the movement of traffic from business and commercial operators of road vehicles, including goods vehicles (Section 14);
- 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, 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 Staveley to Aston 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 as a result of the Proposed Scheme at Staveley to Aston. Isolation effects will be reported in the formal ES.

Construction employment

12.4.5 Wales South cutting main compound and Staveley railhead would be used to manage civil engineering works and rail systems works respectively and provide support to 14 satellite compounds in the Staveley to Aston area. These sites would result in the creation of up to 4,420 person years of construction employment opportunities¹⁶⁴, broadly equivalent to 450 full-time jobs¹⁶⁵, which, depending on skill levels required

¹⁶⁴ 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

¹⁶⁵ Based on the convention that 10 employment years is equivalent to one full time equivalent job

and the skills of local people, are potentially accessible to local residents and to others living further afield. The impact of the direct construction employment creation has been considered as part of the route-wide assessment (see Volume 3: Route-wide effects).

- 12.4.6 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 Fourteen business accommodation units or sites in the Staveley to Aston area will experience direct impacts as a result of the Proposed Scheme. These 14 units or business sites, together, form eight defined resources including:
- Worksoy/M1 (two units engaged in the provision of animal services and business services);
 - Highfields (one unit engaged in retail horticultural nursery);
 - Sheffield Road/M1 (three units engaged in hairdressing and beauty treatments, retail sale of food and a public house/bar);
 - Depot/M1 (one unit engaged in the provision of depot services);
 - Westfield/M1 (one unit engaged in plant propagation);
 - Aston/M1 (four units engaged in retail sale of sporting equipment, other sports activities, sale of new cars and a fire station);
 - Lowgates (one unit engaged in retail sale of food and café services); and
 - Aston pond (one unit engaged in the provision of outdoor sports, retail sale of fishery equipment and a café).
- 12.4.10 It is currently expected that no businesses in the area would experience significant permanent direct effects as a result of land required by the Proposed Scheme. Across all of the employment sectors reviewed in the area, it is currently expected that an

estimated 80 jobs¹⁶⁶ would either be displaced, or possibly lost within the Staveley to Aston area. There is a reasonable probability that businesses would be able to relocate to places that would still be accessible to local residents within the travel to work areas, due to the general availability of vacant premises. However, there may be cases where alternative locations are problematic and the businesses may be unable to relocate on a like-for-like basis within the area. The impact on the local economy from the relocation or loss of jobs is considered to be relatively modest in the context of the total number of people employed in the Staveley to Aston area (approximately 191,000 jobs).

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

Other mitigation measures

- 12.4.12 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.
- 12.4.13 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

- 12.4.14 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.

¹⁶⁶ 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.

In-combination effects

- 12.5.3 In-combination effects will be assessed and reported in the formal ES.

Operational employment

- 12.5.4 The Proposed Scheme will create direct operational employment opportunities at locations along the route including stations, train crew facilities and infrastructure/maintenance depots. The Staveley Infrastructure Maintenance Depot (IMD) will be located within the area with initial estimates suggesting a gross direct employment of approximately 200 jobs.
- 12.5.5 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.
- 12.5.6 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

- 12.5.7 No mitigation measures during operation of the Proposed Scheme are proposed in relation to business resources.

Summary of likely residual significant effects

- 12.5.8 Any likely residual significant socio-economic effects will be reported in the formal ES.

Monitoring

- 12.5.9 Volume 1, Section 9 sets out the general approach to environmental monitoring during operation of the Proposed Scheme.
- 12.5.10 There are no area-specific requirements for monitoring socio-economic effects during the operation of the Proposed Scheme in the Staveley to Aston 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 Staveley to Aston 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 areas¹⁶⁷; and
 - 'non-residential receptors'¹⁶⁸ such as:
 - community facilities including schools, hospitals, places of worship and 'quiet areas'¹⁶⁹; 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 policy¹⁷⁰, planning policy, planning practice guidance on noise (PPGN)¹⁷¹ and EIA Regulations as described in the Scope and Methodology Report¹⁷² (SMR).
- 13.1.3 Engagement has been undertaken with Rotherham Metropolitan Borough Council (RMBC), Derbyshire County Council (DCC), Bolsover District Council (BDC), North East Derbyshire District Council (NEDDC) and Chesterfield Borough Council (CBC) 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 Staveley to Aston 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

¹⁶⁷ '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.

¹⁶⁸ 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

¹⁶⁹ '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.

¹⁷⁰ Noise Policy Statement for England, (2015) Department for Environment, Food & Rural Affairs (Defra)

¹⁷¹ Department for Communities and Local Government (DCLG) (2014), Planning Practice Guidance – Noise. Available online at:

<https://www.gov.uk/guidance/noise--2>

¹⁷² Supporting document: HS2 Phase 2b Environmental Impact Assessment Scope and Methodology Report

be found in the Volume 2: LA11 Map Book. Map Series SV-01 also presents key 'non-residential receptors'. These receptors will be reviewed and developed further to incorporate, where appropriate, consultation feedback and ongoing stakeholder engagement.

- 13.1.5 The assessment of noise and vibration likely significant effects on agricultural, heritage and ecological receptors and the assessment of tranquillity is ongoing and will be reported in the formal ES.

13.2 Scope, assumptions and limitations

- 13.2.1 The approach to assessing sound, noise and vibration and identifying envisaged mitigation is outlined in Volume 1 (Section 8 and Section 9) and the SMR.
- 13.2.2 In this assessment 'sound' is used to describe the acoustic conditions that people experience as a part of their everyday lives. Noise is taken as unwanted sound and hence adverse effects are noise effects and mitigation is, for example, by noise barriers.
- 13.2.3 Effects can either be temporary from construction or permanent from the operation of the Proposed Scheme. These effects may be direct, resulting from the construction or operation of the Proposed Scheme, and/or indirect, resulting from changes in traffic patterns on existing roads or railways that result from the construction or operation of the Proposed Scheme.
- 13.2.4 The effects of construction noise and vibration are assessed qualitatively, based on construction compound locations, construction routes, initial construction estimates and professional judgement. No quantitative assessment has been undertaken for the construction of the Proposed Scheme at this stage. The quantitative assessment will be reported in the formal ES.
- 13.2.5 The effects on operational noise and vibration are assessed quantitatively, based on forecast noise emission from the Proposed Scheme, combined with outline baseline information and professional judgement. As baseline information is limited at this stage, the quantitative assessment, including a full baseline, will be reported in the formal ES.

13.3 Environmental baseline

- 13.3.1 The SMR describes the three rounds of baseline data collection covering existing sources, modelling and by targeted monitoring. Baseline sound levels will be published in the formal ES.
- 13.3.2 The area is characterised by a mix of towns, villages, hamlets and isolated residential properties in a predominantly 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 that contribute to the sound environment of the Staveley to Aston area: the M1, which runs broadly parallel to the Proposed Scheme for much of this area; the A619 Chesterfield Road, which connects Clowne and

Barlborough with the M1 at junction 30; the A6135 Sheffield Road, which connects Renishaw with the M1 at junction 30; the A619 Lowgates Road, which connects Whitwell with Staveley and passes through Barlborough; the A618 Rotherham Road, which connects Aston, Killamarsh, and Clowne; and the A57 Aston Way/Worksop Road, which connects Aston and Anston with the M1 junction 31.

- 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 Agglomerations¹⁷³, Roads¹⁷⁴ or Railways¹⁷⁵. HS2 Ltd will engage with the Competent Authorities responsible for the relevant Important Areas. Map Series SV-01 (Volume 2: LA11 Map Book) shows any noise Important Areas in the Staveley to Aston 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)¹⁷⁶. 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-time periods. 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 CoCP¹⁷⁷ (Section 13), which are:

¹⁷³ Noise Action Plan: Agglomerations (large urban areas) (2014) Department for Environment, Food & Rural Affairs

¹⁷⁴ Noise Action Plan: Roads (including major roads) (2014) Department for Environment, Food & Rural Affairs

¹⁷⁵ Noise Action Plan: Railways (including major railways) (2014) Department for Environment, Food & Rural Affairs

¹⁷⁶ Supporting document: Draft Code of Construction Practice

¹⁷⁷ Additional Documents: HS2 Phase 2b: Crewe to Manchester and West Midlands to Leeds Environmental Impact Assessment, Draft Code of Construction Practice

- Best practicable means (BPM) as defined by the Control of Pollution Act 1974 (CoPA) and Environmental Protection Act 1990 (EPA), which will be applied during construction activities to minimise noise (including vibration) at neighbouring residential properties and other sensitive receptors¹⁷⁸.
- 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 an 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.

¹⁷⁸ Including local businesses and quiet areas designated by the local authority

Assessment of impacts and effects

- 13.4.6 Potential construction airborne noise significant effects could at the communities, or those part of the communities, that are nearest to the Proposed Scheme in the following locations, as a result of the construction works illustrated on Map Series CT-05 (Volume 2: LA11 Map Book):
- Barrow Hill, arising from construction activities such as cutting formation, underbridge construction, retaining wall and landscape bund construction;
 - Staveley, arising from construction activities such as demolition, use of transfer node, cutting formation, embankment formation, overbridge construction, road realignment, balancing pond construction, landscape bund construction, and construction of the Staveley IMD;
 - Netherthorpe, arising from construction activities such as demolition, cutting formation, embankment formation, overbridge construction, balancing pond construction and landscape bund construction;
 - Woodthorpe, arising from construction activities such as embankment formation and landscape bund construction;
 - Mastin Moor, arising from construction activities such as demolition, retaining wall, road realignment, cutting formation and landscape bund construction;
 - Barlborough, arising from construction activities such as demolition, cutting formation, embankment formation, road realignment and landscape bund construction;
 - Woodall, arising from construction activities such as embankment formation and landscape bund construction;
 - Wales, arising from construction activities such as demolition, cutting formation, retaining wall, overbridge construction and landscape bund construction; and
 - Aston, arising from construction activities such as demolition, use of transfer nodes, cutting formation, embankment formation, underbridge construction, road realignment, balancing pond construction and landscape bund construction.
- 13.4.7 Map Series SV01 (Volume 2: LA11 Map Book) shows key non-residential properties that have been identified within the study area as defined in the SMR. Of these, the following are likely to experience significant effects (to be confirmed in the formal ES):
- Barrow Hill Primary School;
 - St. Andrew's Church in Barrow Hill;
 - Aston Hall Hotel;
 - Barrow Hill Methodist Church;
 - Barlborough Hall School; and
 - All Saints Church Aston.

- 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 B6053 Eckington Road between the A619 Lowgates and Hall Lane;
 - Hall Lane and Ireland Close, between the B6053 Eckington Road and A6192 Fan Road in Staveley;
 - Seymour Link Road and Woodthorpe Road, between Woodthorpe and B6419 Bolsover Road;
 - the B6419 Bolsover Road, Renishaw Road and Barbers Row, between the A619 Worksop Road junction with the B6419 Renishaw Road and Priory Farm;
 - Sheffield Road, West End, High Street, Ruthyn Avenue and Ward Lane, between the A6135 Sheffield Road and Proposed Scheme on Sheffield Road;
 - Woodall Road between the junction with the A618 Mansfield Road and Killamarsh Lane;
 - National Cycle Route 6, Hard Lane and the B6059 School Road, between Nor Wood viaduct and the A618 Mansfield Road; and
 - the B6463 Todwick Road and Common Road between the A57 Worksop Road and Long Road.
- 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 reported in the formal ES and will 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 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.

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 2.1 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 Staveley to Aston 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 HS2 main line with an operating speed of 205mph (330kph) for 90% of services and 225mph (360kph) for 10% of services. Services would be expected to operate between 05:00 and midnight from Monday to Saturday and 08:00 and midnight on Sunday. 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 The Staveley IMD would be operational 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 insofar 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 will be provided in the formal ES. This will include reduction of aerodynamic noise from the pantograph that otherwise would occur above 186mph (300kph) 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 225mph (360kph) compared to the current minimum European standards¹⁷⁹.
- 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 would be acoustically absorbent on the railway side and would be located 5m from the outer rail. The envisaged noise barrier locations based upon the currently available information are shown on Map Series SV-01 (Volume 2: LA11 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 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 discretionary criteria, to provide the same mitigation as defined in 'the NI Regulations' at residential buildings where¹⁸⁰ 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 Europe¹⁸¹ or the maximum noise level criteria¹⁸² 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. The Staveley IMD would be designed and operated to control noise and vibration and hence avoid significant effects.

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.

¹⁷⁹ Technical Specification for Interoperability (TSI) Noise – EU Commission Regulation No 1304/2014

¹⁸⁰ Following Government's National Planning Practice Guidance <https://www.gov.uk/government/collections/planning-practice-guidance>

¹⁸¹ World Health Organization (2010), *Night time Noise Guidelines for Europe*

¹⁸² Dependent on the number of train passes

Assessment of impacts and effects

- 13.5.15 Map Series SV-01 (Volume 2: LA11 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. Noise and vibration from the depots and associated access lines has not been assessed at this stage but will be fully assessed in the formal ES. 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 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 Section 2.2, Volume 1 (Section 9), and presented in Map Series SV-01 (Volume 2: LA11 Map Book) and Map Series CT-06 (Volume 2: LA11 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:

- Western side of Barlborough: occupants of residential properties on Sheffield Road, located closest to the Proposed Scheme, identified by LA11-Co1 on Map SV-01-381; and
- Aston: occupants of residential properties on the B6067 Worksop Road, located closest to the Proposed Scheme, identified by LA11-Co2 on Map SV-01-384.

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:

- Bank House Farm in the vicinity of the B6419 Bolsover Road (identified on Map SV-01-380b);
- Barlborough in the vicinity of the A619 Chesterfield Road (identified on Map SV-01-381);
- Barlborough in the vicinity of Westfield Lane (identified on Map SV-01-381);
- Barlborough in the vicinity of the A6135 Sheffield Road (identified on Map SV-01-381);
- Wales in the vicinity of Cherry Tree Road and B6059 School Road (identified on Map SV-01-384);
- Lawton Lodge on Cricket Field Lane (identified on Map SV-01-384); and
- Aston in the vicinity of the B6067 Worksop Road (identified on Map SV-01-384).

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

13.5.25 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 Staveley to Aston area.
- 14.1.2 Engagement with Highways England, Derbyshire County Council (DCC), Rotherham Metropolitan Borough Council (RMBC) 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: LA11 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)¹⁸³.
- 14.2.2 The study area for traffic and transport includes: Staveley; Barlborough; High Moor; Killamarsh; Wales; and Aston.
- 14.2.3 The study area for traffic and transport also includes all roads potentially affected by the Proposed Scheme including: the M1 which is the only strategic route in the Staveley to Aston area. It also includes the following local roads: the A57/Worksop Road; the A616; the A618 Rotherham Road/Mansfield Road; the A619 Lowgates/Worksop Road/Chesterfield Road; the A6135 Sheffield Road; the A6192 Fan Road; the B6052 Springwell Hill; the B6053 Eckington Road; the B6059 School Road/Wales Road/Station Road; the B6067 Worksop Road; the B6419 Bolsover Road; the B6419 Renishaw Road; the B6463 Todwick Road; Woodthorpe Road; Seymour Link Road; Wharf Lane; Ireland Close; Barbers Row; Bellhouse Lane; Hall Lane; Works Road; Whittington Road; Parkgate Lane; Staveley Lane; Westfield Lane; Sheffield Road/West End/High Street/Church Street; Ruthyn Avenue; Ward Lane; Woodall Road/Killamarsh Lane; Walseker Lane; Coalpit Lane; Hard Lane; Waleswood Road; and Common 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.

¹⁸³ Supporting document: HS2 Phase 2b Environmental Impact Assessment Scope and Methodology Report

- 14.2.5 No quantitative assessment has been undertaken at this stage. A quantitative assessment will be presented in the formal ES.

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, RMBC 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 RMBC. Assessment of these data indicates that the peak hours in the area are 07:30-08:30 and 16:30-17:30. However, there are only small differences (3% to 5%) 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 August and September 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 that passes through the area. The strategic road network around the interchanges at the M1 junctions 30 and 31 are 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 A57/Worksop Road; the A616; the A618 Rotherham Road/Mansfield Road; the A619 Lowgates/Worksop Road/Chesterfield Road; the A6135 Sheffield Road; the A6192 Fan Road; the B6052 Springwell Hill; the B6053 Eckington Road; the B6059 School Road/Wales Road/Station Road; the B6067 Worksop Road; the B6419 Bolsover Road; the B6419 Renishaw Road; the B6463 Todwick Road; Barbers Row; Bellhouse Lane; Church Street; Coalpit Lane; Common Road; Hall Lane; Hard Lane; High Street; Ireland Close; Ruthyn Avenue; Seymour Link Road; Sheffield Road; Staveley Lane; Waleswood Road; Walseker Lane; Ward Lane; West End; Westfield Lane; Wharf Lane; Whittington Road; Woodall Road/Killamarsh Lane; Woodthorpe Road; and Works Road. The A6192 Fan Road between Staveley and the M1 junction 29a (located in the Tibshelf to Shuttlewood area experiences congestion and delays at peak times, but

the local road network in this area generally operates well, although some localised delays can be experienced, particularly at peak times.

- 14.3.6 Relevant accident data for the road network subject to assessment have been obtained from the Department for Transport¹⁸⁴. 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 Staveley to Aston area: at the M1 junction 31 (29 accidents, including three with serious casualties).
- 14.3.8 The route of the Proposed Scheme would cross 13 roads with footways within the Staveley to Aston area. These are: the A618 Rotherham Road; the A619 Lowgates; the A6192 Fan Road; the B6053 Eckington Road; the B6059 School Road; the B6067 Worksop Road; Seymour Link Road; Wharf Lane; Bellhouse Lane; Works Road; Sheffield Road; Walseker Lane; and Waleswood Road. In addition, the A618 Mansfield Road, the A57, the B6419 Bolsover Road, Hall Lane, Westfield Lane and Killamarsh Lane have no footways but were observed to be used by pedestrians.

Parking and loading

- 14.3.9 There is on-street parking on various roads, particularly on residential streets in the Staveley area, which could be affected by the Proposed Scheme. There are also off street parking and loading areas around Woodthorpe that could be affected.

Public transport network

- 14.3.10 Seventeen bus routes operate on ten roads that are crossed by the route of the Proposed Scheme in the Staveley to Aston 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 A619 Chesterfield Road: Bus service 77 (Chesterfield - Staveley - Clowne - Worksop);
 - the A619 Worksop Road: 70 (Chesterfield - Mastin Moor - Eckington - Killamarsh/Norwood), 71, 72 (Chesterfield - Mastin Moor - Killamarsh - Sheffield), 77 (Chesterfield - Staveley - Clowne - Worksop), 81 (Bolsover - Staveley - Markham Vale);
 - the A6192 Fan Road: 81 (Bolsover - Staveley - Markham Vale), 90 (Ripley - Leabrooks - Kirkby);
 - the A618 Mansfield Road: 26, 26A (Crystal Peaks - Killamarsh - Kiveton Park);
 - the B6419 Bolsover Road: 81 (Bolsover - Staveley - Markham Vale);
 - the B6059 School Road: 26, 26A (Crystal Peaks - Killamarsh - Kiveton Park);

¹⁸⁴ Department for Transport; Crashmap.co.uk; www.crashmap.co.uk. CrashMap provides accident data for the UK.

- the B6067 Worksop Road: X54 (Sheffield - Aston - Harthill), X55 (Sheffield - Aston - Dinnington via Anston);
- Works Road: 90 (Ripley - Leabrooks - Kirkby);
- Sheffield Road: 73, 74 (Clowne - Renishaw - Eckington/Killamarsh - Crystal Peaks), 53, 53A (Sheffield - Eckington - Clowne - Bolsover - Mansfield); and
- Woodall Road/Killamarsh Lane: 26, 26A (Crystal Peaks - Killamarsh - Kiveton Park).

- 14.3.11 National and local rail services are accessible via Chesterfield Station and local rail services are accessible via Kiveton Park Station. Chesterfield Station provides access to national services to London, Sheffield, Birmingham, Newcastle, Plymouth, Edinburgh/Glasgow, Nottingham and Liverpool. Kiveton Park Station provide access to local services to Sheffield and Lincoln.

Non-motorised users

- 14.3.12 There are pedestrian footways adjacent to many of the roads in the built up areas of Staveley, Mastin Moor, Barlborough, Harthill, Killamarsh, Kiveton Park, Wales and Aston. 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 35 PRow within the Staveley to Aston 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 inform the assessment showed that there were fewer than 10 people recorded on 18 of the PRow. The routes with the greatest usage during the survey day were: Staveley Footpath 1 (Trans Pennine Trail and Cuckoo Way) used by 97 pedestrians and 114 cyclists; Staveley Bridleway 48 (Trans Pennine Trail) used by 84 pedestrians and 83 cyclists; Staveley Bridleway 47 (Trans Pennine Trail) used by 67 pedestrians and 104 cyclists; Staveley Footpath 50 (Trans Pennine Trail) used by 85 pedestrians and 222 cyclists; the A619 Lowgates used by 478 pedestrians and 48 cyclists; Staveley Footpath 66 used by 283 pedestrians and 16 cyclists; A6192 Fan Road used by 144 pedestrians and eight cyclists; Killamarsh Lane used by 1 pedestrian and 166 cyclists; and the B6059 School Road used by 91 pedestrians and 12 cyclists.
- 14.3.14 Some of these PRow form part of four local walking routes: the Fox and Magpie Heritage Trail; the Millennium Walk Heritage Trail; the Miners Way Trail; and the Chaffinch Trail. The Clowne Branch Greenway is also crossed. The Trans Pennine Trail and Cuckoo Way also provide access to a wider network of long distance footpaths.
- 14.3.15 In the Staveley area, National Route 67 (part of the National Cycle Network), the Trans Pennine Trail central route between Chesterfield and Leeds, crosses the Proposed Scheme. In the Wales/Killamarsh area, National Route 6 crosses the route of the Proposed Scheme as it runs along the B6059 School Road. National Routes 6 and 67 are connected via routes through the Rother Valley Country Park, which is located to the west of the route of the Proposed Scheme.

Waterways and canals

- 14.3.16 There is one navigable waterway in the Staveley to Aston area. The Chesterfield Canal is located on the north-west side of Staveley, with another open section east and west of the route of the Proposed Scheme at Nor Wood. Remaining sections of the canal route are being restored, such as at Staveley.

Air transport

- 14.3.17 There is no relevant air transport in the Staveley to Aston area. Consequently, this topic is not considered further in this assessment.

14.4 Effects arising during construction

Avoidance and mitigation measures

- 14.4.1 The following measures are currently proposed to avoid or reduce effects on transport users:

- new highways (roads and PRoW) would be constructed and operational prior to the permanent closure of any existing highways, insofar as reasonably practicable;
- the majority of roads crossing the route of the Proposed Scheme would be maintained or locally diverted during construction to limit the need for diversion of traffic onto alternative routes;
- traffic management measures would be implemented to limit any disruption;
- road closures would be restricted to overnight and weekends, insofar as reasonably practicable;
- temporary alternative routes for PRoW would be provided during construction, insofar as reasonably practicable, where either the existing or final proposed route is not available;
- where reasonably practicable, site haul routes would be created adjacent to the route of the Proposed Scheme to transport construction materials and equipment to reduce heavy goods vehicle (HGV) movements on public roads with access taken via the main road network;
- HGV would be routed, insofar as reasonably practicable, along the strategic and/or primary road network;
- the use of the local road network would, insofar as reasonably practicable, be limited to use for site set-up, access for surveys and on-going servicing (including refuse collection and general deliveries to compounds) during construction;
- the reuse of excavated material along the route of the Proposed Scheme, insofar as reasonably practicable;

- highway measures including junction improvements, passing places and carriageway widening would be provided, as required, to manage the safe passing of construction vehicles on construction HGV routes;
- on-site welfare facilities would be provided which would reduce daily travel by site workers; and
- the proposed railhead at the site of the Staveley Infrastructure Maintenance Depot (IMD) would reduce the volume of construction traffic on the road network.

- 14.4.2 Section 14 of the draft Code of Construction Practice (CoCP)¹⁸⁵ includes measures that aim to reduce the adverse impacts and effects on local communities and maintain public access. This includes the impacts of deliveries of construction materials and equipment.
- 14.4.3 The measures in the draft CoCP include controls on vehicle types, hours of site operation and routes for HGVs to reduce the impact of road-based construction traffic. In order to achieve this, general and site specific traffic management measures would be implemented during the construction of the Proposed Scheme on or adjacent to public roads and PRow affected by the Proposed Scheme.
- 14.4.4 The draft CoCP includes the requirement to develop local traffic management plans in consultation with the highway and traffic authorities and the emergency services. These would consider the local traffic management strategy including consideration of sensitive receptors, such that adverse impacts would be reduced insofar as reasonably practicable and any effect on safety and accidents would not be significant.
- 14.4.5 Specific measures would include core site operating hours of 08:00-18:00 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 plans¹⁸⁶ to be produced that would include a range of potential measures to mitigate the impacts of traffic and transport movements associated with construction of the Proposed Scheme.
- 14.4.7 Where works potentially affect Network Rail assets, disruption to travelling passengers and freight movements would be reduced insofar as reasonably practicable. This includes measures such as:

¹⁸⁵ Supporting document: Draft Code of Construction Practice

¹⁸⁶ 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.

- programming the construction works to coincide with the possessions that are required and planned by Network Rail for the general maintenance of their railway;
- planning the required construction works so that they can be undertaken in short overnight stages so that passenger services are not disrupted; and
- programming longer closures at the weekend and on bank holidays to reduce insofar as reasonably practicable the number of passengers affected.

Assessment of impacts and effects

Temporary effects

14.4.8 The traffic and transport impacts during the construction period within the Staveley to Aston area are likely to include:

- construction vehicle movements to and from the various construction compounds;
- road closures and associated realignments and diversions;
- alternative routes for PRoW; and
- possessions on the conventional rail network.

14.4.9 The construction assessment has also considered any impacts in the Staveley to Aston area that arise from construction of the Proposed Scheme in the adjoining community areas.

14.4.10 Construction vehicle movements required to construct the Proposed Scheme would include the delivery of plant and materials, movement of excavated materials and site worker trips. Works would include utilities diversions, earthworks, underpass, viaduct, bridge and highway construction.

14.4.11 Construction activities would be managed from compounds. Details of the construction compounds are provided in Section 2.3. The locations of the compounds are shown in Map Series CT-05 in the Volume 2: LA11 Map Book.

Strategic and local highway network

14.4.12 The primary HGV access routes for construction vehicles would be the strategic and/or primary road network with the use of the local road network limited, where reasonably practicable. The construction routes would also provide access to compounds. Where reasonably practicable, HGVs would use the site haul routes alongside the route of the Proposed Scheme to reduce the impact on the local road network. In this area, it is expected that the main construction routes would use:

- the M1 junctions 30 and 31;
- the A57/Worksop Road between the A618 Mansfield Road and B6463 Todwick Road;
- the A616 between the A619 Chesterfield Road and M1 junction 30;

- the A618 Rotherham Road/Mansfield Road from the A57 to the south of High Moor;
- the A619 Lowgates/Worksop Road/Chesterfield Road between the B6053 Eckington Road and Church Street;
- the A6135 Sheffield Road between the M1 junction 30 and Sheffield Road;
- the A6192 Fan Road between the A619 Lowgates and Cemetery Lane;
- the B6053 Eckington Road between the A619 Lowgates and Hall Lane;
- the B6052 Springwell Hill between Parkgate Lane and Staveley Lane;
- the B6059 School Road/Wales Road/Station Road between the A618 Mansfield Road and Hard Lane;
- the B6067 Worksop Road between the A57 and Church Lane;
- the B6419 Bolsover Road between the A619 Worksop Road and the M1;
- the B6419 Renishaw Road between the A619 Worksop Road and Barbers Row;
- the B6463 Todwick Road between the A57 Worksop Road and Common Road;
- Woodthorpe Road between the B6419 Bolsover Road and Seymour Link Road;
- Seymour Link Road between Woodthorpe Road and the Proposed Scheme;
- Ireland Close;
- Barbers Row;
- Hall Lane;
- Works Road;
- Whittington Road;
- Parkgate Lane;
- Staveley Lane;
- Westfield Lane;
- Sheffield Road/West End/High Street/Church Street;
- Ruthyn Avenue between High Street and Ward Lane;
- Ward Lane;
- Woodall Road/Killamarsh Lane between the A618 Mansfield Road and the Proposed Scheme;
- Hard Lane between the B6059 Station Road and Northlands;
- Waleswood Road; and
- Common Road.

- 14.4.13 A number of these construction routes would have limited use¹⁸⁷ including: the B6419 Renishaw Road; the B6059 School Road/Wales Road/Station Road; Woodthorpe Road; Seymour Link Road; Barbers Row; Ruthyn Avenue; Ward Lane; Woodall Road/Killamarsh Lane; Hard Lane; and Waleswood Road.
- 14.4.14 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 A618 Rotherham Road between High Moor and the M1;
 - local realignment of the A619 Worksop Road between Woodhouse Lane (west) and Slayley Lane;
 - local realignment of the A619 Lowgates between the A6192 Fan Road and Ralph Road; and
 - local realignment of the A6135 Sheffield Road between Westfield Lane and M1 junction 30.
- 14.4.15 Permanent changes to highways are reported under operation.
- 14.4.16 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.
- 14.4.17 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

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

Parking and loading

- 14.4.19 It is currently expected that the Proposed Scheme could have temporary impacts on parking and loading in Staveley and Woodthorpe. This could include parking bays or other parking amenities affected or temporarily suspended due to construction works. Some roads that could be used as construction routes and have on-street parking could be affected. Any significant effects will be reported in the formal ES.

Public transport network

- 14.4.20 There are no temporary road closures or diversions required in this area that would substantially affect bus services or stops although any increase in general traffic

¹⁸⁷ Limited use refers to a low level of HGV use generally over a short length of time, for example for site set up or minor works

delays could affect bus services. Any consequent effects will be reported in the formal ES.

- 14.4.21 There are interfaces with the existing rail network in this area, in particular on the operation of the Sheffield to Worksop line and its rail freight services and the Chesterfield to Beighton line. The majority of the rail possessions would have little or no impact on the operation of rail services as they would be relatively minor localised works, such as work on and adjacent to track when not in use. In addition, many of the interventions would be combined to reduce the frequency of potential disruption. However, there would still potentially be a requirement for a number of disruptive possessions to allow for the Wales Bar viaduct construction over the Sheffield to Worksop line and the Staveley IMD connection on the Chesterfield to Beighton line. The effects of railway possessions will be assessed and reported in the formal ES.

Non-motorised users

- 14.4.22 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.
- 14.4.23 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:
- Staveley Footpath 29 (off Bolsover Road, near Woodthorpe);
 - Staveley Footpath 27 (off Bolsover Road, near Woodthorpe);
 - Staveley Footpath 14 (off Hall Lane near Barrow Hill);
 - Staveley Footpath 38 (off Cavendish Place, Barrow Hill);
 - Staveley Footpath 11 (near Cavendish Place, Barrow Hill);
 - Staveley Footpath 4 (near Works Road, Barrow Hill);
 - Staveley Bridleway 47 (off Pullman Close, Staveley);
 - Staveley Footpath 1 (Trans Pennine Trail and Cuckoo Way near the B6053 Eckington Road, Staveley);
 - Staveley Footpath 50 (Trans Pennine Trail north of Ireland Close, Staveley);
 - Barlborough Bridleway 12 (Woodhouse Lane);
 - Barlborough Footpath 6 (off Sheffield Road, Barlborough);
 - Barlborough Footpath 28 (east of Spinkhill);
 - Barlborough Footpath 25 (east of Spinkhill);
 - Killamarsh Footpath 47 (off A618 Rotherham Road near High Moor);

- Harthill Footpath 18 (north of Killamarsh Lane near Nor Wood);
- Harthill Footpath 16a (north of Killamarsh Lane near Nor Wood);
- Wales Footpath 15 (near Nor Wood, Wales);
- Wales Footpath 17 (near Nor Wood, Wales);
- Wales Footpath 14 (near Nor Wood, Wales);
- Wales Footpath 1 (near Nor Wood, Wales);
- Todwick Footpath 15 (Fiddle Neck Lane, Wales Bar); and
- Todwick Footpath 1 (near Fiddle Neck Lane, Wales Bar).

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

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

Waterways and canals

14.4.26 It is not currently expected that the construction of the Proposed Scheme would have a significant effect upon navigable waterways or canals in the Staveley to Aston area.

Permanent effects

14.4.27 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

14.4.28 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.

14.4.29 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

14.4.30 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 A57/Worksop Road; the A616; the A618 Rotherham Road/Mansfield Road; the A619 Lowgates/Worksop Road/Chesterfield Road; the A6135 Sheffield Road; the A6192 Fan Road; the B6052 Springwell Hill; the B6053 Eckington Road; the B6059 School Road/Wales Road/Station Road; the B6067 Worksop Road; the B6419 Bolsover Road; the B6419 Renishaw Road; the B6463 Todwick Road; Woodthorpe Road; Seymour Link Road; Ireland Close; Barbers Row; Hall Lane; Works Road; Whittington Road; Parkgate Lane; Staveley Lane; Westfield Lane; Sheffield Road/West End/High

Street/Church Street; Ruthyn Avenue; Ward Lane; Woodall Road/Killamarsh Lane; Hard Lane; Waleswood Road; and Common 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.

- 14.4.31 Construction of the Proposed Scheme is also likely to result in the temporary closures and diversions or realignments of the following: the A618 Rotherham Road; the A619 Worksop Road; the A619 Lowgates; and the A6135 Sheffield Road.
- 14.4.32 There is potential that construction of the Proposed Scheme could have temporary impacts on parking and loading in the Staveley and Woodthorpe areas.
- 14.4.33 Construction of the Proposed Scheme has the potential to result in delays to rail services and passengers on the Sheffield to Worksop line and Chesterfield to Bighton line as a result of rail possessions.
- 14.4.34 Construction of the Proposed Scheme would require the temporary closure or diversion/realignment of PRow including: Staveley Footpath 29; Staveley Footpath 27; Staveley Footpath 14; Staveley Footpath 38; Staveley Footpath 11; Staveley Footpath 4; Staveley Bridleway 47; Staveley Footpath 1; Staveley Footpath 50; Barlborough Bridleway 12 (Woodhouse Lane); Barlborough Footpath 6; Barlborough Footpath 28; Barlborough Footpath 25; Killamarsh Footpath 47; Harthill Footpath 18; Harthill Footpath 16a; Wales Footpath 15; Wales Footpath 17; Wales Footpath 14; Wales Footpath 1, Todwick Footpath 15 (Fiddle Neck Lane); and Todwick Footpath 1.
- 14.4.35 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.
- 14.5.2 A depot travel plan for Staveley IMD would include measures that aim to reduce the impacts and effects of traffic and transport movements.

Assessment of impacts and effects

- 14.5.3 The following section considers the impacts on traffic and transport and the likely consequential effects resulting from the operational phase of the Proposed Scheme. Operational effects arising from the Proposed Scheme in year 2033 and year 2046 will be reported in the formal ES.

Key operation transport issues

- 14.5.4 The operation of the Proposed Scheme could result in impacts within this area due to increased traffic associated with the Staveley IMD. However, the maintenance of the

Proposed Scheme would generate limited vehicular trips and the effect 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:

- the realignment of the northbound carriageway of the M1 (at Woodthorpe);
- the A57 would be realigned to accommodate the Proposed Scheme;
- the B6419 Bolsover Road would be realigned to the north of its existing alignment;
- the B6067 Worksop Road would be closed with a new road link to the west reconnecting the B6067 Worksop Road with the realigned section of the A57;
- modifications to the vertical alignment of Hall Lane;
- Sheffield Road would be realigned to the south of its existing alignment to cross the route of the Proposed Scheme. A section would be retained to maintain access to existing properties; and
- Westfield Lane would be realigned at its northern end to accommodate the Proposed Scheme and to tie into the realignment of Sheffield Road.

- 14.5.7 In addition, the following roads would be realigned to accommodate the Proposed Scheme:

- the A618 Rotherham Road via an overbridge;
- the A619 Lowgates via an overbridge;
- the A619 Chesterfield Road/Worksop Road via an overbridge;
- the A6135 Sheffield Road overbridge;
- the B6053 Eckington Road via an overbridge;
- the B6059 School Road via an overbridge;
- Works Road via an underbridge; and
- Killamarsh Lane via an underbridge.

- 14.5.8 The permanent highway changes are not expected to result in significant changes in travel distances with the exception of the B6067 Worksop Road. The effects of these changes including on non-motorised users will be reported in the formal ES.

- 14.5.9 The proposed Staveley IMD would generate additional vehicle movements due to staff, servicing and operational traffic. However, the weekday peak hour trip

generation is expected to be low, the depot is expected to operate a shift pattern, with changeover times that would not coincide with the morning and evening peak periods on the local road network. There will also only be limited operational traffic. Therefore, any traffic and transport impacts due to the depot would primarily be during off-peak periods. The maintenance of the Proposed Scheme would generate limited vehicular trips. The effects of this will be reported in the formal ES.

Accidents and safety and safety

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

Parking and loading

- 14.5.11 It is not expected that operation of the Proposed Scheme would have any impacts on parking and loading. Any significant effects will be reported in the formal ES.

Public transport network

- 14.5.12 It is expected that the Proposed Scheme would generate 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 Phase 2b services;
- significantly improved journey times between Chesterfield, the Midlands and the south of England, as detailed in Volume 1, Section 4; and
- released capacity on the existing rail network easing pressure and reducing crowding on other passenger rail services creating significant major beneficial effects to both local commuters and potentially freeing up space for freight.

- 14.5.13 The permanent realignment of roads could increase travel distances for bus passengers. However, as most of the realignments would be likely to be less than 1km in length, it is not currently expected that there would be significant effects on public transport within the Staveley to Aston area.

Non-motorised users

- 14.5.14 A number of PROW that cross the route of the Proposed Scheme would be either permanently realigned or diverted including:

- Barlborough Bridleway 12 (Woodhouse Lane) would be diverted to the west of its existing alignment onto the A619 Worksop Road/Chesterfield Road;
- Barlborough Footpath 36 (Westfield Lane) would be diverted to the west of its existing alignment, with a new connection to Sheffield Road;
- Barlborough Footpath 6 would be diverted to the south of its existing alignment onto the retained section of Sheffield Road, where access across the Proposed Scheme would be provided via the Sheffield Road realignment;
- Barlborough Footpath 28 would be realigned via a new underbridge;
- Killamarsh Footpath 47 would be diverted to the west of its existing alignment,

where it would connect with the A618 Rotherham Road to the west of the route of the Proposed Scheme;

- Barlborough Footpath 25 would be closed. Alternative routes would be along the A618 Rotherham Road and Killamarsh Footpath 47 or Barlborough Footpath 20 and Barlborough Footpath 28;
- Harthill Bridleway 16a would be diverted under a viaduct;
- Harthill Footpath 18 would be diverted under a viaduct via the route shared with Harthill Bridleway 16a;
- Wales Footpath 14 would be diverted to the south of its existing alignment where it crosses the route of the Proposed Scheme
- Wales Footpath 15 would be diverted to the north of its existing alignment via the Wales Footpath 14 accommodation underbridge;
- Wales Footpath 13 would be diverted to the north of its existing alignment via the A618 Mansfield Road and the B6059 School Road;
- Wales Footpath 12 would be diverted to the west of its existing alignment, reconnecting with the B6059 School Road to the south;
- Wales Footpath 17 would be diverted to the north of its existing alignment via the Wales Footpath 14 accommodation underbridge;
- Todwick Footpath 15 (Fiddle Neck Lane) would be diverted to the north of its existing alignment;
- Todwick Footpath 1 would be realigned to the north of its existing alignment onto an accommodation overbridge;
- Aston Footpath 13 would be realigned to the south of its existing alignment, where it would cross the route of the Proposed Scheme via an underbridge;
- Aston Footpath 20 (Piper Lane) would be diverted to the north of its existing alignment, connecting into Aston Footpath 16 which crosses the route of the Proposed Scheme via an overbridge;
- Aston Footpath 16 (Piper Lane) would be diverted to the north of its existing alignment onto an overbridge;
- Staveley Footpath 14 would be realigned to the north of its existing alignment at its western end;
- Staveley Footpath 38 would be diverted to the north of its existing alignment, connecting with the realignment/diversion of Staveley Footpath 14 and Staveley Footpath 11;
- Staveley Footpath 11 would be diverted to the north of its existing alignment with a new connection onto the realigned Hall Lane
- Staveley Footpath 1 (Trans Pennine Trail and Cuckoo Way) would be realigned

via an overbridge, where it will connect into the realigned Staveley Bridleway 48;

- Staveley Bridleway 48 (Trans Pennine Trail) would be realigned to the north of its existing alignment;
- Staveley Bridleway 47 (Trans Pennine Trail) would be realigned to the northwest of its existing alignment via an overbridge, which connects with Staveley Bridleway 48 and Staveley Footpath 71;
- Staveley Footpath 50 (Trans Pennine Trail) would be realigned;
- Staveley Footpath 66 would be realigned via an overbridge;
- Staveley Footpath 37 would be realigned via an overbridge;
- Staveley Footpath 30 would be realigned to the west of its existing alignment and over an overbridge;
- Staveley Footpath 35 would be diverted via the realigned Staveley Footpath 30;
- Bolsover Footpath 64 would be diverted to the south of its existing alignment and across the route of the Proposed Scheme via an accommodation overbridge;
- Staveley Footpath 29 would be diverted to the north of its existing alignment where it would connect to the realigned B6419 Bolsover Road; and
- Staveley Footpath 28 would be diverted to the south of its existing alignment where it would reconnect with Staveley Footpaths 27 and 29 via the realigned B6419 Bolsover Road.

- 14.5.15 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 Staveley Footpath 11, Bolsover Footpath 64 and Wales Footpath 17. The assessment of changes to PRow will be reported in the formal ES.

Waterways and canals

- 14.5.16 It is not currently expected that the operation of the Proposed Scheme would have a significant effect upon navigable waterways or canals in the Staveley to Aston area.

Other mitigation measures

- 14.5.17 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.
- 14.5.18 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

- 14.5.19 Operation of the Proposed Scheme would require the permanent diversion of: the M1; the A57; the B6067 Worksop Road; the B6419 Bolsover Road; Hall Lane; Sheffield Road; and Westfield Lane. Increases in traffic could also result in increased traffic severance for non-motorised users of the routes and changes in traffic could result in changes in accident risk.
- 14.5.20 It is expected that the Proposed Scheme would have beneficial effects for rail passengers that use Chesterfield Station including increased rail capacity, significantly improved journey times and released capacity on the existing rail network.
- 14.5.21 Operation of the Proposed Scheme would require the permanent realignment or diversion of 32 PRow including: Barlborough Bridleway 12 (Woodhouse Lane); Barlborough Footpath 36 (Westfield Lane); Barlborough Footpath 6; Barlborough Footpath 28; Killamarsh Footpath 47; Barlborough Footpath 25; Harthill Bridleway 16a; Harthill Footpath 18; Wales Footpath 14; Wales Footpath 15; Wales Footpath 13; Wales Footpath 12; Wales Footpath 17; Todwick Footpath 15 (Fiddle Neck Lane); Todwick Footpath 1; Aston Footpath 13; Aston Footpath 20 (Piper Lane); Aston Footpath 16 (Piper Lane); Staveley Footpath 14; Staveley Footpath 38; Staveley Footpath 11; Staveley Footpath 1 (Trans Pennine Trail and Cuckoo Way); Staveley Bridleway 48 (Trans Pennine Trail); Staveley Bridleway 47 (Trans Pennine Trail); Staveley Footpath 50 (Trans Pennine Trail); Staveley Footpath 66; Staveley Footpath 37; Staveley Footpath 30; Staveley Footpath 35; Bolsover Footpath 64; Staveley Footpath 29 and Staveley Footpath 28.
- 14.5.22 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

- 14.5.23 Volume 1, Section 9 sets out the general approach to environmental monitoring during operation of the Proposed Scheme.
- 14.5.24 A workforce travel plan will detail monitoring of travel associated with operation of the Staveley IMD.
- 14.5.25 There are no other area-specific monitoring requirements currently proposed for traffic and transport in the Staveley to Aston 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 Staveley to Aston 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), Chesterfield Borough Council (CBC), Bolsover District Council (BDC) and Lead Local Flood Authorities (LLFA), Derbyshire County Council (DCC) and Rotherham Metropolitan Borough Council (RMBC). Engagement has also been undertaken with Severn Trent Water Limited and Yorkshire Water Services 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: LA11 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 the route of the Proposed Scheme with the Sequential Test and Exception Test policies in the National Planning Policy Framework (NPPF)¹⁸⁸.

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 SMR¹⁸⁹.

¹⁸⁸ National Planning Policy Framework, DCLG, 2015

¹⁸⁹ Supporting document: HS2 Phase 2b Environmental Impact Assessment Scope and Methodology Report

- 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.
- 15.2.3 This assessment is based on desk study information, including information provided to date by consultees and stakeholders, as well as surveys of accessible water features.
- 15.2.4 Where surveys have not been undertaken due to land access constraints, a precautionary approach has been adopted in the assessments of receptor value and impact magnitude.
- 15.2.5 Hydraulic analysis is currently being undertaken of watercourses and key structures within flood risk areas. This includes modelling of the River Rother, River Doe Lea, Hawke Brook, Pools Brook, County Dike and Pigeon Bridge Brook.
- 15.2.6 Groundwater levels have been inferred from the available Environment Agency groundwater level monitoring boreholes, historic borehole logs and topographic data, as well as from spring and watercourse locations.
- 15.2.7 Impacts on biological receptors such as aquatic fauna and flora are assessed in Section 7, Ecology and biodiversity.
- 15.2.8 The assessments in this working draft ES are based on professional judgement using the information that is currently available. A precautionary approach has been adopted with regard to assessing the potential for adverse impacts to occur. The surveys, analysis and modelling work currently in progress, and the results of the consultation process, will be used to refine the assessments reported in the formal ES.

15.3 Environmental baseline

Existing baseline - Water resources and WFD

Surface water

- 15.3.1 All surface water bodies in the study area fall within the Don and Rother and the Idle and Thorne catchments of the Humber river basin district (RBD).
- 15.3.2 The river basin management plan¹⁹⁰ identifies the chemical¹⁹¹ and ecological¹⁹² status of surface water bodies, and the quantitative¹⁹³ and chemical¹⁹⁴ 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

¹⁹⁰ Environment Agency (2015), Water for life and livelihoods Part 1: Humber river basin district: River basin management plan

¹⁹¹ The chemical status of surface waters reflects concentrations of priority and hazardous substances present

¹⁹² 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.

¹⁹³ 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

¹⁹⁴ 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

High Speed Rail (Crewe to Manchester and West Midlands to Leeds)
Working Draft Environmental Statement Volume 2: LA11

good status where this has not already been achieved. The Proposed Scheme should also avoid adverse impacts on protected or priority species and habitats.

- 15.3.4 Specialist field surveys are being undertaken, where access is available. Receptor values will be adjusted to reflect the outputs from these surveys, in close consultation with the Environment Agency. In the absence of field surveys, surface water bodies, other than minor ponds and ditches, have been identified within this assessment as being of either high or very high value on a precautionary basis.
- 15.3.5 Summary information relating to the surface water bodies potentially affected by the Proposed Scheme within this study area is provided in Table 36. The receptor value attributed to each individual water body is based on the methodologies set out in the SMR.

Table 36: Surface water body receptors

Water body name and location ¹⁹⁵	Designation	Q95 value (m ³ /s) ¹⁹⁶	Receptor value	Parent WFD water body name and identification number ¹⁹⁷	Current WFD Status/Objective ¹⁹⁸
Hawke Brook WR-01-362- B6	Ordinary watercourse	0.01	Low	Hawke Brook from source to Doe Lea GB104027057320	Moderate/Good by 2027
Tributary of the Hawke Brook 1 WR-01-362- B7	Ordinary watercourse	<0.002	Low	Hawke Brook from source to Doe Lea GB104027057320	Moderate/Good by 2027
Tributary of the Hawke Brook 2 WR-01-362- B7	Ordinary watercourse	<0.002	Low	Hawke Brook from source to Doe Lea GB104027057320	Moderate/Good by 2027
Tributary of the Hawke Brook 4 WR-01-362- B7	Ordinary watercourse	0.005	Low	Hawke Brook from source to Doe Lea GB104027057320	Moderate/Good by 2027
Tributary of the Doe Lea 21 WR-01-362- C7	Ordinary watercourse	<0.002	Low	Doe Lea from Hawke Brooke to River Rother GB104027057301	Moderate/Good by 2027
Tributary of Smithy Brook 1 WR-01-362- D7	Ordinary watercourse	<0.002	Low	Rother, Doe Lea to Don GB104027057772	Moderate/Good by 2027
Tributary of Smithy Brook 2 WR-01-362-E7	Ordinary watercourse	<0.002	Low	Rother, Doe Lea to Don GB104027057772	Moderate/Good by 2027

¹⁹⁵ The feature locations are indicated by the grid coordinates on the relevant Volume 2: LA11 Map Book figure (in this case WR-01)

¹⁹⁶ This is the flow within the watercourse that is exceeded for 95% of the time

¹⁹⁷ The Environment Agency has attributed each surface water and groundwater body a unique water body identification (ID) number

¹⁹⁸ Status and objectives are based on those set out in the 2015 River basin management plan

High Speed Rail (Crewe to Manchester and West Midlands to Leeds)
Working Draft Environmental Statement Volume 2: LA11

Water body name and location ¹⁹⁵	Designation	Q95 value (m ³ /s) ¹⁹⁶	Receptor value	Parent WFD water body name and identification number ¹⁹⁷	Current WFD Status/ Objective ¹⁹⁸
Tributary of Smithy Brook 3 WR-01-362- E7	Ordinary watercourse	<0.002	Low	Rother, Doe Lea to Don GB104027057772	Moderate Good by 2027
Tributary of Smithy Brook 4 WR-01-362- F8	Ordinary watercourse	<0.002	Low	Rother, Doe Lea to Don GB104027057772	Moderate/Good by 2027
Tributary of Smithy Brook 5 WR-01-362- F8	Ordinary watercourse	<0.002	Low	Rother, Doe Lea to Don GB104027057772	Moderate/Good by 2027
Tributary of the County Dike 1 WR-01 362-H8 Channel diversion WR-01 362-l8	Ordinary watercourse	<0.002	Low	Rother, Doe Lea to Don GB104027057772	Moderate/Good by 2027
Tributary of the County Dike 2 WR-01 362-l8	Ordinary watercourse	<0.002	Low	Rother, Doe Lea to Don GB104027057772	Moderate/Good by 2027
Tributary of the County Dike 3 WR-01 362-l8	Ordinary watercourse	<0.002	Low	Rother, Doe Lea to Don GB104027057772	Moderate/Good by 2027
Woodall Pond north drain WR-01 362-l8	Minor ditch	n/a	Low	Rother, Doe Lea to Don GB104027057772	Moderate/Good by 2027
County Dike WR-01 363a-C8	Ordinary watercourse	<0.002	Low	Rother, Doe Lea to Don GB104027057772	Moderate/Good by 2027
Tributary of the county Dike 4 WR-01 363a-C7	Ordinary watercourse	<0.002	Low	Rother, Doe Lea to Don GB104027057772	Moderate/Good by 2027
Tributary of the County Dike 5 WR-01 363a-C7	Ordinary watercourse	<0.002	Low	Rother, Doe Lea to Don GB104027057772	Moderate/Good by 2027
Canal (disused) WR-01 363a-C6 open water section	Canal	n/a	Low	Rother, Doe Lea to Don GB104027057772	Moderate/Good by 2027

High Speed Rail (Crewe to Manchester and West Midlands to Leeds)
Working Draft Environmental Statement Volume 2: LA11

Water body name and location ¹⁹⁵	Designation	Q95 value (m ³ /s) ¹⁹⁶	Receptor value	Parent WFD water body name and identification number ¹⁹⁷	Current WFD Status/ Objective ¹⁹⁸
WR-01 363a-C7 tunnel					
Cherry Tree Road drain WR-01 363a-D6	Minor ditch	n/a	Low	Rother, Doe Lea to Don GB104027057772	Moderate/Good by 2027
Tributary of Pigeon Bridge Brook 1 WR-01 363a-E6	Ordinary watercourse	<0.002	Moderate	Pigeon Bridge Brook from source to River Rother GB104027057730	Moderate/Good by 2027
Tributary of Pigeon Bridge Brook 2 WR-01 363a-E6	Ordinary watercourse	<0.002	Moderate	Pigeon Bridge Brook from source to River Rother GB104027057730	Moderate/Good by 2027
Pigeon Bridge Brook WR-01 363a-E6	Ordinary watercourse	<0.002	Moderate	Pigeon Bridge Brook from source to River Rother GB104027057730	Moderate/Good by 2027
Tributary of Pigeon Bridge Brook 3 WR-01 363a-E6	Ordinary watercourse	<0.002	Moderate	Pigeon Bridge Brook from source to River Rother GB104027057730	Moderate/Good by 2027
Tributary of Pigeon Bridge Brook 4 WR-01 363a-F6	Ordinary watercourse	<0.002	Moderate	Pigeon Bridge Brook from source to River Rother GB104027057730	Moderate/Good by 2027
Tributary of Pigeon Bridge Brook 5 WR-01 363a-F6	Ordinary watercourse	<0.002	Moderate	Pigeon Bridge Brook from source to River Rother GB104027057730	Moderate/Good by 2027
Tributary of Ulley Brook 1 WR-01 363a-G5	Ordinary watercourse	<0.002	Low	Ulley Brook from source to River Rother GB104027057740	Good/ Good by 2015
Tributary of Ulley Brook 2 WR-01 363a-G5	Ordinary watercourse	<0.002	Low	Ulley Brook from source to River Rother GB104027057740	Good/ Good by 2015
Tributary of Ulley Brook 3 WR-01 363a-G5	Ordinary watercourse	<0.002	Low	Ulley Brook from source to River Rother GB104027057740	Good/ Good by 2015
Hawke Brook	Ordinary watercourse	0.01	Low	Hawke Brook from source to Doe Lea	Moderate/Good by 2027

High Speed Rail (Crewe to Manchester and West Midlands to Leeds)
Working Draft Environmental Statement Volume 2: LA11

Water body name and location ¹⁹⁵	Designation	Q95 value (m ³ /s) ¹⁹⁶	Receptor value	Parent WFD water body name and identification number ¹⁹⁷	Current WFD Status/ Objective ¹⁹⁸
WR-01-361b-l5 and l4				GB104027057320	
Tributary of the Hawke Brook 3 WR-01-361b-l5	Ordinary watercourse	<0.002	Low	Hawke Brook from source to Doe Lea GB104027057320	Moderate/Good by 2027
River Doe Lea WR-01 361b-l4	Main river	0.07	High	Doe Lea from Hawke Brooke to River Rother GB104027057301	Moderate/Good by 2027
Erin Road drain WR-01 361b-l3	Minor ditch	n/a	Low	Doe Lea from Hawke Brooke to River Rother GB104027057301	Moderate/Good by 2027
Erin Road drain WR-01 361b-l3	Minor ditch	n/a	Low	Doe Lea from Hawke Brooke to River Rother GB104027057301	Moderate/Good by 2027
Cottage Close drain 1 WR-01 361b-l3	Minor ditch	n/a	Low	Doe Lea from Hawke Brooke to River Rother GB104027057301	Moderate/Good by 2027
Cottage Close drain 2 WR-01 361b-l3	Minor ditch	n/a	Low	Doe Lea from Hawke Brooke to River Rother GB104027057301	Moderate/Good by 2027
Pools Brook WR-01-361b-l2	Ordinary watercourse	0.01	High	Pools Brook from source to Doe Lea GB104027057310	Good/ Good by 2015
River Rother WR-01-362L1-C8	Main river	0.3	Very High	Rother, Spittal Brook to Doe Lea GB104027057771	Moderate/Good by 2027
River Rother secondary channel (within land potentially required during construction of the Proposed Scheme to the south of Staveley IMD)	Main river	0.3	Very High	Rother, Spittal Brook to Doe Lea GB104027057771	Moderate/Good by 2027

High Speed Rail (Crewe to Manchester and West Midlands to Leeds)
Working Draft Environmental Statement Volume 2: LA11

Water body name and location ¹⁹⁵	Designation	Q95 value (m ³ /s) ¹⁹⁶	Receptor value	Parent WFD water body name and identification number ¹⁹⁷	Current WFD Status/ Objective ¹⁹⁸
WR-01-362L1-C8					
Hall Lane drain 1 WR-01 362L1-C7	Minor ditch	n/a	Low	Rother, Spittal Brook to Doe Lea GB104027057771	Moderate/Good by 2027
Hall Lane drain 2 WR-01 362L1-C7	Minor ditch	n/a	Low	Rother, Spittal Brook to Doe Lea GB104027057771	Moderate/Good by 2027
Hall Lane drain 3 WR-01 362L1-B7	Minor ditch	n/a	Low	Rother, Spittal Brook to Doe Lea GB104027057771	Moderate/Good by 2027
Hall Lane drain 4 WR-01 362L1-C7	Minor ditch	n/a	Low	Rother, Spittal Brook to Doe Lea GB104027057771	Moderate/Good by 2027
Hall Lane drain 5 WR-01 362L1-C7	Minor ditch	n/a	Low	Rother, Spittal Brook to Doe Lea GB104027057771	Moderate/Good by 2027
Hall Lane drain 6 WR-01 362L1-C7	Minor ditch	n/a	Low	Rother, Spittal Brook to Doe Lea GB104027057771	Moderate/Good by 2027
Hall Lane drain 7 WR-01 362L1-C7	Minor ditch	n/a	Low	Rother, Spittal Brook to Doe Lea GB104027057771	Moderate/Good by 2027
Chesterfield canal at Staveley IMD (under restoration) WR-01-362L1-B7	Canal	n/a	High	Rother, Spittal Brook to Doe Lea GB104027057771	Moderate/Good by 2027
Tributary of the River Rother 6 WR-01-362L1-C5	Ordinary watercourse	<0.002	Low	Rother, Spittal Brook to Doe Lea GB104027057771	Moderate/Good by 2027

Abstractions and permitted discharges (surface water)

- 15.3.6 There are no licensed surface water abstractions in the study area.
- 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.
- 15.3.8 There are 27 consented discharges to surface waters within the study area, one of which is within the land required for the Proposed Scheme. These have been assessed as being receptors of low value.

Groundwater

- 15.3.9 The geology of the study area is described in Section 10, Land quality, and the superficial and bedrock hydrogeology is summarised in Table 37. Unless stated otherwise, the geological groups listed would all be crossed by the Proposed Scheme. Table 37: also identifies the receptor values attributed to each groundwater receptor based on the methodologies set out in the SMR.

Table 37: Summary of geology and hydrogeology in the study area

Geology ¹⁹⁹	Distribution	Formation description	Aquifer classification	WFD body (ID) and current overall status ²⁰⁰	WFD status objective ²⁰¹	Receptor value
Superficial deposits						
Alluvium (Fluvial Deposits)	Deposits in the Staveley area and to the south of Netherthorpe	Clays, organic clays, peat, silts, sands and gravels	Secondary A	Not assessed by the Environment Agency	Not assessed by the Environment Agency	Moderate
Head (Mass Movement Deposits)	Deposits around the Staveley area and between Woodall and Wales	Gravelly clay	Secondary (undifferentiated)	Not assessed by the Environment Agency	Not assessed by the Environment Agency	Low

¹⁹⁹ In recent years the British Geological Survey has revised the nomenclature used to describe the geological materials present in Great Britain, with the publication of a series of lithostratigraphic framework reports. Some of these reports cover an entire geological period e.g. the Carboniferous and others cover a single group e.g. the Triassic Mercia Mudstone. The nomenclature used in these reports supersede the nomenclature introduced in the 1980s. While some traditional names have been retained by this process, many new names have also been generated, and many geological maps have not yet been updated. Some stratigraphic units have been renamed twice in the last 35 years. To reflect this, the previous name used for geological units (if different) is shown in brackets.

²⁰⁰ As stated in the 2015 River basin management plan

²⁰¹ As stated in the 2015 River basin management plan

High Speed Rail (Crewe to Manchester and West Midlands to Leeds)
Working Draft Environmental Statement Volume 2: LA11

Geology ¹⁹⁹	Distribution	Formation description	Aquifer classification	WFD body (ID) and current overall status ²⁰⁰	WFD status objective ²⁰¹	Receptor value
Bedrock						
Cadeby Formation (Zechstein Group)	150m to the east of the M1 at Barlborough	Oolitic compact and granular well bedded dolomitic limestone. Mudstone interbeds present at the base of the unit. Reef- limestone present at the top of the unit	Principal	Idle Torne – Magnesian Limestone (GB40401G300600) Poor	Good by 2027	High
Basal Permian Sands (Rotliegendes Group)	Approximately 100m to the east of the M1 near Barlborough	Yellow to brown evenly graded fine to medium false-bedded loosely cemented Sand and Sandstone	Principal	Idle Torne – Magnesian Limestone (GB40401G300600) Poor	Good by 2027	High
Pennine Middle Coal Measures – Mudstone, siltstone and sandstone	The majority of the Study area	Interbedded mudstone/siltstone/sandstone with coal seams	Secondary A	Don and Rother Millstone Grit and Coal Measures (GB40402G992300) Poor	Good by 2027	Moderate
Pennine Middle Coal Measures Oaks Rock – Sandstone	Intermittently crosses the M1 between Barlborough and Wales	Light brown fine grained sandstone, which has been split into two components separated by thin dirt partings and locally by a mudstone bed up to 3m thick.	Secondary A	Don and Rother Millstone Grit and Coal Measures (GB40402G992300) Poor	Good by 2027	Moderate
Pennine Middle Coal Measures – Mexborough Rock - sandstone	Located to the west of the M1 Junction 31 between Aston Park, Netherthorpe and Ulley Beeches. Smaller outcrop east of the M1 near to	Grey and green medium to coarse sandstone, with local micaceous beds, purple shale bands and iron staining on discontinuity surfaces.	Secondary A	Don and Rother Millstone Grit and Coal Measures (GB40402G992300) Poor	Good by 2027	Moderate

Geology ¹⁹⁹	Distribution	Formation description	Aquifer classification	WFD body (ID) and current overall status ²⁰⁰	WFD status objective ²⁰¹	Receptor value
	Vessey Close Farm					

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 37, is outlined briefly as follows:

- head deposits have been classified as Secondary (undifferentiated) aquifers by the Environment Agency. Undifferentiated aquifers have previously been defined as both aquifers and unproductive strata in different locations due to the variable characteristics of the rock type. In this case, the head deposits are capable of supporting water supplies at a local scale and they have therefore been classified as moderate value receptors; and
- alluvium has been classified as a Secondary A aquifer by the Environment Agency. It may be capable of supporting water supplies at a local rather than regional scale and may also form an important source of baseflow to rivers. They have therefore been classified as a moderate value receptor.

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 37, is outlined briefly as follows:

- the Cadeby Formation including the Basal Permian Sands have been classified as a Principal aquifer by the Environment Agency. These aquifers are capable of supporting water supplies on a regional scale and provide an important source of baseflow to rivers. They have therefore been assessed as a high value receptor; and
- the Pennine Middle Coal Measures Formation (including local unnamed sandstone bands) has been classified as a Secondary A aquifer by the Environment Agency. This also includes the key sandstone units of the Mexborough Rock and Oaks Rock. This aquifer may be capable of supporting water supplies at a local rather than regional scale and may also form an important source of baseflow to rivers. The aquifer 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 37. 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.

Abstractions 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 are no¹⁶ private groundwater abstraction licences registered in the study area.
- 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. 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 is one²⁰² consented discharge 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 identified 20 features within the study area that had potential to be springs. Access was possible to inspect three of these features. All three were verified as being minor land drainage features of low value.
- 15.3.19 The remaining 17 potential spring features that have yet to be inspected are assumed to be high value receptors on a precautionary basis. Five of the potential spring features yet to be inspected are within the land or on the boundary of the land required for the Proposed Scheme including one on Woodall Common, one north-west of Woodall, one north of Norwood, one south of Wales Bar and one at Engine House Plantation.
- 15.3.20 There are 26 ponds within the land required for the Proposed Scheme. The nature and relative value of these features, the magnitude of the impacts that the Proposed Scheme would have on them, and the mitigation proposed, are outlined in Section 7, Ecology and biodiversity.

Water dependent habitats

- 15.3.21 The following nature conservation sites within the study area are potentially groundwater dependent:
- Crabtree Wood site of special scientific interest (SSSI), located north-east of Barlborough and approximately 1.3km east of the land required for construction of the Proposed Scheme. Designated for its botanical interest associated with base rich water flushes. Further details of the ecology of this site, including the reporting

²⁰² The number of abstractions and 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.

on the effects and associated other mitigation, are provided in Section 7, Ecology and biodiversity; and

- Nor Wood and Locks local wildlife site (LWS) is located north-east of Norwood and is partially crossed by the Proposed Scheme. This feature is yet to be surveyed to determine groundwater dependency. However, as Nor Wood and Locks LWS contains a number of water courses and water bodies, it is assumed on a precautionary basis that some groundwater dependency may exist. This feature is assumed to be of ecological importance. Further details of the ecology of this site, including the reporting on the effects and associated other mitigation, are provided in Section 7, Ecology and biodiversity.

15.3.22 The following nature conservation sites are potentially dependent on surface water flows, for example periodic flooding from a watercourse:

- Norbriggs Flash local nature reserve (LNR), covering an area of approximately 38.2ha. Habitats that have a water dependency include open water, old meanders of the River Doe Lea, reed beds and marginal aquatic vegetation;
- Doe Lea Flash LWS, a lowland swamp habitat receiving contributions from surface water flows;
- Poolsbrook Flash LWS, a lowland swamp habitat receiving contributions from surface water; and
- Netherthorpe Flash LWS, covering an area of approximately 4.7ha, is noted for its lowland swamp.

15.3.23 Further details of the ecology of these sites, including the reporting on the effects and associated other mitigation, are provided in Section 7, Ecology and biodiversity.

Existing baseline - flood risk and land drainage

15.3.24 The Environment Agency's Flood map for planning (rivers and sea)²⁰³ has been used to scope the baseline flood risk for flooding from main rivers and ordinary watercourses. These plans define Flood Zone 2 (land assessed as having between a 1 in 100 (1%) and 1 in 1,000 (0.1%) annual probability of river flooding) and Flood Zone 3 (land assessed as having a 1 in 100 (1%) or greater annual probability of river flooding).

15.3.25 The updated Flood map for surface water²⁰⁴ 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 dataset²⁰⁵. The British Geological Survey's (BGS) Groundwater flooding susceptibility data set²⁰⁶, has been used to assess the future risk of groundwater flooding.

²⁰³ Environment Agency, *Flood map for planning*. Available online at: <https://flood-map-for-planning.service.gov.uk/>

²⁰⁴ Environment Agency (2018), *Long term flood risk map for England*. Available online at: <https://flood-warning-information.service.gov.uk/long-term-flood-risk/map?easting=402498&northing=282043&address=100070518535>

²⁰⁵ Environment Agency (2018), *Long term flood risk map for England*. Available online at: <https://flood-warning-information.service.gov.uk/long-term-flood-risk/map?easting=402498&northing=282043&address=100070518535>

²⁰⁶ British Geological Survey, *BGS groundwater flooding*. Available online at: <http://www.bgs.ac.uk/products/hydrogeology/groundwaterFlooding.html>

15.3.26 The following reports were used to help determine the baseline flood risk within the study area:

- Chesterfield, Bolsover and North East Derbyshire SFRA (2009)²⁰⁷;
- Rotherham Metropolitan Borough Council SFRA (2008)²⁰⁸;
- Rotherham Metropolitan Borough Council SFRA Level 2 and Flood Risk Toolkit (2011)²⁰⁹;
- Rotherham LFRMS (2014)²¹⁰; and
- Derbyshire County Council LFRMS (2014)²¹¹.

River flooding

15.3.27 The study area includes substantial areas of floodplain (Flood Zone 2 and 3) associated with the River Rother and the River Doe Lea. Other floodplains that would be crossed by the route of the Proposed Scheme include those associated with Hawke Brook, Pools Brook and Pigeon Bridge Brook. Table 38 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 38: River flood risk sources and receptors

Source	Location description and figure/coordinate ²¹²	Receptor potentially affected	Receptor value/ sensitivity to flooding
Hawke Brook	Hawke Brook WR-01-362 B6	M1	Very high
		B6419 Bolsover Road	Moderate
		Disused railway	Low
		Agricultural land	Moderate
Pigeon Bridge Brook	Pigeon Bridge Brook WR-01-363a G5	Agricultural land	Moderate
		Woodland	Low
		A618 Mansfield Road	Moderate
River Doe Lea	River Doe Lea at Staveley WR-01-361b I3	M1	Very high
		Erin Road	Moderate
		Commercial development at Markham Vale	Moderate
		Agricultural Land	Moderate

²⁰⁷ Chesterfield, Bolsover and North East Derbyshire SFRA (2009) Chesterfield Borough Council, Bolsover District Council and NE Derbyshire District Council

²⁰⁸ Rotherham Metropolitan Borough Council (RMBC) Strategic Flood Risk Assessment (SFRA) (2008) Jacobs

²⁰⁹ Rotherham Metropolitan Borough Council (RMBC) Strategic FRA Level 2 and Flood Risk Toolkit (SFRA) (2011) Jacobs

²¹⁰ Rotherham MBC Local flood risk management strategy (2014) Rotherham Metropolitan Borough Council

²¹¹ Derbyshire County Council Local flood risk management strategy (2014) Derbyshire County Council

²¹² This is the location at which the source intersects the Proposed Scheme, as indicated by the grid coordinates on the relevant Volume 2: LA11 Map Book figure (in this case WR-01)

High Speed Rail (Crewe to Manchester and West Midlands to Leeds)
Working Draft Environmental Statement Volume 2: LA11

Source	Location description and figure/coordinate ²¹²	Receptor potentially affected	Receptor value/ sensitivity to flooding
		Wetland habitat	Low
		A619 Worksop Road	Moderate
		Residential properties off the A619 Worksop Road	High
		Residential properties at Riverdale Park	High
		Residential properties at Bent Lane	High
		Sports ground	Low
Pools Brook	Pools Brook	Disused railway	Low
	WR-01-361b-l2	Wetland habitat	Low
River Rother and tributary	River Rother at Staveley WR-01-362-C1	Works Road	Moderate
		Active rail infrastructure	Moderate
		Disused rail infrastructure	Low
		Chesterfield canal	Low
		Unused urban land	Low
		Hall Lane and the A6192 Fan Road	Moderate
		Disused quarry and works buildings	Low
		Farndale Road	Moderate

Surface water flooding

15.3.28 There are numerous areas that are susceptible to surface water flooding within the study area. The key sources and receptors with potential to be affected are shown in Table 39. The value of these receptors, based on Table 57 of the SMR, is also indicated.

Table 39: Surface water flood risk sources and receptors

Source	Location description and figure/coordinate ²¹³	Receptor potentially affected	Receptor value
Tributary of Hawke Brook	Tributary of Hawke Brook WR-01-362-B6	Caravan site	Very high
		Agricultural land	Moderate
		Woodland	Low
	Romeley Wood inverted siphon	Agricultural land	Moderate

²¹³ This is the location at which the source intersects the Proposed Scheme, as indicated by the grid coordinates on the relevant Volume 2: LA11 Map Book figure (in this case WR-01)

High Speed Rail (Crewe to Manchester and West Midlands to Leeds)
Working Draft Environmental Statement Volume 2: LA11

Source	Location description and figure/coordinate ²¹³	Receptor potentially affected	Receptor value
Surface water flow path at Romeley Wood inverted siphon (tributary of Doe Lea)	WR-01-362-C6	B6419 Bolsover Road	Moderate
Surface water flow path at Robinson's Lumb culvert (tributary of Smithy Brook 1)	Robinson's Lumb culvert	M1	Very high
	WR-01-362-D7	Agricultural land	Moderate
Surface water flow paths at Ingdale Wood culvert (tributary of Smithy Brook 2 and 3)	Ingdale Wood culvert WR-01-362-E7	M1	Very high
		Agricultural land	Moderate
		Woodland	Low
Surface water flow path at Thompson's Holt culvert (tributary of Smithy Brook 4)	Thompson's Holt culvert WR-01-362-F8	M1	Very high
		Woodland	Low
Surface water flow path at Hawke Wood culvert (tributary of Smithy Brook 5)	Hawke Wood culvert WR-01-362-F8	M1	Very high
		Woodland	Low
		Ingdale Farm	High
Surface water flow path along tributary of County Dike 1	Woodall Bottoms drop inlet culvert to Nor Wood viaduct WR-01-362-H8 and WR-01-363a-C8	Woodall services access road	Moderate
		Agricultural land	Moderate
		Woodland	Low
Surface water flow path at Nor Wood north and south culverts (tributary of County Dike 5 and 6)	Norwood north and south culverts WR-01-363a-C7	Agricultural land	Moderate
		Woodland	Low
Surface water flow path along tributary of Pigeon Bridge Brook at Fiddle Neck viaduct	Fiddles Neck viaduct WR-01-363a-F6	M1	Very high
		Woodland	Low
		Agricultural land	Moderate
Surface water flow path along tributary of Ulley Brook 1 at Netherthorpe culvert	Netherthorpe culvert WR-01-363a-G5	M1	Very high
		Woodland	Low
		Agricultural land	Moderate
Surface water flow path at Oxcroft south culvert	Oxcroft south culvert WR-01-361b	Agricultural land	Moderate

Artificial water bodies

- 15.3.29 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 Pebley Reservoir, Harthill Reservoir, Killamarsh Pond and Poolsbrook Reservoir. Poolsbrook Reservoir, which is located 460m to the south of the route, is the only artificial water body with potential to affect flood risk of relevance to the Proposed Scheme. However, as this is a large

raised reservoir, subject to the requirements of reservoir safety legislation²¹⁴, the inundation risk posed by this reservoir is considered negligible.

Groundwater flooding

- 15.3.30 Information related to historical incidents of groundwater flooding in the Staveley to Aston area are outlined in the Chesterfield, Bolsover and North-East Derbyshire SFRA and the RMBC SFRA. In the relevant areas of the Proposed Scheme covered by the Chesterfield, Bolsover and North-East Derbyshire SFRA and the RMBC SFRA there is no recorded history of groundwater flooding.
- 15.3.31 The BGS Groundwater flooding susceptibility data set indicates that there is some potential for groundwater flooding to occur at the southern end of the study area around Staveley. Potential groundwater flooding at this location is associated with the River Rother floodplain where the Proposed Scheme is underlain by alluvium and head deposits. There is further limited potential for groundwater flooding route-wide where the underlying geology consists of bedrock sandstone layers.

Land drainage

- 15.3.32 Existing topography, soils and land drainage systems within the study area are described in Section 4, Agriculture, forestry and soils. The rivers and watercourses within the area are connected to an extensive network of existing open drains. Subsurface drainage systems are also likely to be present in fields used for agriculture. The land drainage function of these systems, which is important for crop productivity, is potentially sensitive to increases in water levels within the receiving watercourses.

15.4 Effects arising during construction

Avoidance and mitigation measures

- 15.4.1 The principal strategy adopted to limit the temporary and permanent effects of the Proposed Scheme is through avoidance of sensitive receptors wherever reasonably practicable. Where receptors could not be avoided, mitigation measures have been incorporated where appropriate and reasonably practicable, to limit the potential effects. Section 16 of the draft Code of Construction Practice (CoCP)²¹⁵ includes a range of mitigation measures that aim to reduce construction impacts insofar as is reasonably practicable. The avoidance and mitigation measures that are of particular relevance to water resources and flood risk during construction are described in the following sections of this report.

Water resources and WFD

- 15.4.2 The avoidance of sensitive receptors has reduced the risks associated with the Proposed Scheme not complying with the requirements of the WFD. Examples of this strategy include:
- avoidance of channels and floodplain areas, where reasonably practicable – the route of the Proposed Scheme would avoid passing along river or stream

²¹⁴ Gov.uk (2014) Reservoirs Owner and Operator Requirements. Available at: <https://www.gov.uk/guidance/reservoirs-owner-and-operator-requirements>

²¹⁵ Supporting document: Draft Code of Construction Practice

valleys, such as that of the River Rother and Pigeon Bridge Brook and their associated floodplains. Instead it would pass over these larger watercourses on viaducts spanning the floodplain, with piers set back from the channel;

- avoidance, where reasonably practicable, of water dependent habitats, including natural springs that can play a key role in the hydrology and hydrogeology of such ecosystems; and
- avoidance, where reasonably practicable, of major public water supplies and smaller licensed and unlicensed abstractions of surface water and groundwater.

- 15.4.3 The presence of any unregistered private water supplies, their function and the means of protecting or if necessary replacing them will 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: LA11 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: a tributary of the Smithy Brook at Thompson's Holt culvert, a tributary of Ulley Brook at Netherthorpe culvert, Hawke Brook at Oxcroft North culvert; and the River Doe Lea at Staveley. The aim will be to design these with equivalent hydraulic capacity to the existing channel. 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 condition²¹⁶.
- 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 three diversions proposed within this study area:
- diversion of approximately 120m of a tributary of Smithy Brook at the entrance to Ingdale Wood culvert;
 - diversion of approximately 940m of a tributary of County Dike eastwards at the toe of Woodall embankment, with the diversion extending insofar as Woodall Pond where the channel connects back into the pond; and
 - diversion of approximately 120m of a tributary of Ulley Brook at Aston.
- 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.

²¹⁶ '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

- 15.4.8 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.
- 15.4.9 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.
- 15.4.10 Permanent culverts proposed on the smaller watercourse crossings within this study area include: Romeley Wood inverted siphon; Robinson's Lumb culvert; Ingdale Wood culvert; Thompson's Holt culvert; Hawke Wood culvert; Woodall Bottoms drop inlet culvert; Nor Wood South culvert; Nor Wood North culvert; Netherthorpe culvert; Oxcroft South culvert; Oxcroft North culvert; Seymour culvert and Pools Brook drop inlet 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 inverted siphons have been avoided wherever reasonably practicable. The exceptions being Romeley Wood inverted siphon on a tributary of Smithy Brook and two drop inlet culverts, one located on a tributary of County Dike and a second on Pools Brook;
 - culvert lengths have been reduced insofar as is reasonably practicable; and
 - invert levels will be set below the firm bed of the watercourse to allow a natural substrate to develop along the bed of the culvert.
- 15.4.11 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.

- 15.4.12 Existing groundwater abstraction boreholes or monitoring points would be protected from physical damage, insofar as reasonably practicable, including appropriate decommissioning of abandoned boreholes in order to prevent pollution pathways. If boreholes are to be decommissioned and replaced with alternatives, the contractors would follow the latest good practices. This principle would also be applicable to springs potentially affected by the Proposed Scheme, although additional measures may be required to mitigate temporary construction impacts. Wherever reasonably practicable, the design will aim to recreate affected spring features nearby.
- 15.4.13 Measures would 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-off²¹⁷ 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.
- 15.4.14 The exact requirements will be refined and method of mitigation will be designed following ground investigation at foundations, tunnels or cutting locations.

Flood risk and land drainage

- 15.4.15 The design of the Proposed Scheme will aim to mitigate permanent impacts on flood risk and land drainage as follows:
- the floodplain avoidance strategy would ensure that the impacts on flood flows within rivers and streams, and their floodplains, would be limited to those associated with the intermediate pier structures on the viaducts (M1 motorway North, Nor Wood, Wales Bar, Fiddle Neck and Staveley IMD South chord) and the increased footprint of the railway embankment along the Staveley spur between Seymour culvert and Pools Brook drop inlet culvert. The Proposed Scheme includes replacement floodplain storage areas to replace losses associated with the piers and the encroachment of the railway embankment into the River Doe Lea floodplain;
 - the temporary works shown on Map Series CT-05 in the Volume 2: LA11 Map Book have been informed by a detailed consideration of the flood risk

²¹⁷ Impermeable barrier preventing water flow

constraints and have sought to avoid flood zones wherever reasonably practicable;

- provision has been made to pass surface water runoff and land drainage flows beneath sections of raised embankment that would cross surface water flow paths where reasonably practicable. This 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 Agency²¹⁸;
- 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 would pass in cutting, drainage measures would 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 would also be drained to the catchments to which this water would naturally drain, avoiding transfer of water from one water body to another, which could increase flood risk or impact on land drainage systems; and
- measures would be introduced to reduce any potentially significant effects on groundwater flood risk insofar as is reasonably practicable, including the incorporation of passive hydraulic bypasses at cuttings and other below ground structures. These could for example comprise a 'blanket' of permeable material such as gravel.

15.4.16 The nominated undertaker will, insofar as reasonably practicable, ensure that flood risk is managed throughout the construction period and will consider flooding issues when planning sites and storing materials. If necessary, temporary provision 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:

²¹⁸ Environment Agency (2016) Adapting to Climate Change. Advice for Flood and Coastal Erosion Risk Management Authorities

- 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.

15.4.17 In accordance with the Section 16 of the draft CoCP, monitoring would also be undertaken in consultation with the Environment Agency and, where applicable, the LLFA, to ensure that temporary structures are installed, maintained and removed in accordance with the relevant environmental approvals and that impact on existing land drainage systems are managed appropriately.

Assessment of impacts and effects

15.4.18 This section describes the significant effects following the implementation of the avoidance and mitigation measures. The majority of the potential temporary impacts on the water environment during construction would be avoided or mitigated by the working methods outlined in the draft CoCP. The mitigation embedded into the design has focused on reducing permanent impacts resulting from the presence of the Proposed Scheme to as low a level as is reasonably practicable.

Temporary effects – Water resources and WFD

Surface water

15.4.19 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

15.4.20 The proposed cuttings in the study area would intersect the Pennine Middle Coal Measures (including local unnamed sandstone bands) including the Mexborough Rock and Oaks Rock of which all are classified as Secondary A aquifers. Whilst there are likely to be minor localised impacts, the implementation of the measures outlined in the draft CoCP is likely to result in any impacts on the overall status of these aquifers not being significant.

- 15.4.21 Where the cuttings could affect local receptors, such as groundwater abstractions or springs, this is reported in the sections below.

Abstractions

- 15.4.22 The assessment has not identified any temporary significant effects on groundwater abstractions.

Groundwater - surface water interactions

- 15.4.23 The assessment has not identified any temporary significant effects on groundwater - surface water interactions within the study area.

Water dependent habitats

- 15.4.24 Given the distance from the land required for construction of the Proposed Scheme to Crabtree Wood SSSI, there would be negligible hydrological impact on the designated water dependent features (base-rich flush habitats). The assessment of effects and associated other mitigation for this water dependent habitat is provided in Section 7, Ecology and biodiversity.

- 15.4.25 Shallow groundwater flow may provide baseflow to Nor Wood and Locks LWS. Earthworks associated with Woodall embankment and Wales embankment have the potential to affect localised groundwater quality and flow. The temporary dewatering of viaduct piers could also result in loss of groundwater feeding this feature, resulting in minor hydrological impact. The assessment of effects and associated other mitigation for water dependent habitats are provided in Section 7, Ecology and Biodiversity.

Temporary effects - Flood risk and land drainage

- 15.4.26 Construction of the M1 motorway North viaduct, Nor Wood viaduct, Wales Bar viaduct, the Staveley spur through Poolsbrook, Staveley IMD South chord viaduct and Staveley IMD no.1 retaining wall would require temporary working within flood zones. In addition, temporary site access along a 350m length of engineered channel (River Rother secondary channel) identified by the Environment Agency as a formal flood defence asset could be required to construct Staveley IMD. In all cases, construction sequencing and temporary works design will be carefully considered and assessed in terms of potential impacts on flood risk. Method statements detailing how these works 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 Proposed Scheme would result in replacement of the existing River Doe Lea culvert, in the vicinity of Poolsbrook, with a shorter length of underbridge (River Doe

Lea underbridge) and construction of an associated channel realignment. This has the potential to enhance the hydromorphology of the River Doe Lea, which is a high value receptor. This would potentially result in a permanent moderate significant beneficial effect, which would be significant.

- 15.4.29 The proposed drop inlet culvert at Pools Brook is likely to have a minor impact on the hydromorphology of Pools Brook, which is a high value receptor. This would potentially result in a permanent moderate adverse effect, which would be significant.

Groundwater

Aquifers

- 15.4.30 It is currently anticipated that implementation of the avoidance and mitigation measures would ensure that there are no permanent significant effects related to the impact of the proposed cuttings on water levels and quality in the aquifers intercepted by the Proposed Scheme. Where the impacts of the cuttings on the aquifers could affect additional local receptors that rely on the groundwater resource, for example springs and abstractions, the impacts on these have been assessed below.

Abstractions

- 15.4.31 The assessment has not identified any permanent significant effects on groundwater abstractions.

Groundwater – surface water interactions

- 15.4.32 The potential spring feature north-west of Woodall would be permanently lost due to the construction of Woodall embankment. Until the nature of this feature has been confirmed by a site survey, it has been assumed to be a high value receptor and its loss would, therefore, potentially result in a major adverse effect, which is significant.

Water dependent habitats

- 15.4.33 Given the distance from the land required for construction of the Proposed Scheme to Crabtree Wood SSSI, there would be negligible hydrological impact on the designated water dependent features (base-rich flush habitats). The assessment of effects and associated other mitigation for this water dependent habitat is provided in Section 7, Ecology and biodiversity.
- 15.4.34 Shallow groundwater flow may provide baseflow to Nor Wood and Locks LWS. The permanent changes to groundwater flow or quality associated with viaduct piers or embankments could result in a reduction of groundwater feeding this feature, which results in a negligible hydrological impact. The assessment of effects and associated other mitigation for this water dependent habitat is provided in Section 7, Ecology and biodiversity.
- 15.4.35 The earthworks required to construct the Staveley spur will involve widening the footprint of the existing railway embankment within the floodplain of the River Doe Lea. This has the potential to affect the hydrological conditions within local surface water dependent habitats.
- 15.4.36 The Norbriggs Flash LNR is located approximately 1km downstream of where the Proposed Scheme interacts with the River Doe Lea and Pools Brook. As such it is

considered sufficiently downstream of the Proposed Scheme so any hydrological impact will be negligible. The assessment of effects and associated other mitigation for water dependent habitats are provided in Section 7, Ecology and biodiversity.

15.4.37 The Doe Lea Flash LWS and Poolsbrook Flash LWS are adjacent to the Proposed Scheme as it passes through the River Doe Lea floodplain. There is potential for the widening of the railway embankment to cause water levels to increase during flood events having a moderate hydrological impact in terms of water levels to these water dependent habitats. However, the Proposed Scheme will cause a total loss of these sites. The assessment of effects and associated other mitigation for water dependent habitats are provided in Section 7, Ecology and biodiversity.

15.4.38 Netherthorpe Flash LWS is located approximately 300m of where the Proposed Scheme interacts with the River Doe Lea and Pools Brook. There is potential for the widening of the railway embankment to cause water levels to increase during flood events. This could have a minor hydrological impact. The assessment of effects and associated other mitigation for water dependent habitats are provided in Section 7, Ecology and biodiversity.

Permanent effects - Flood risk and land drainage

15.4.39 The earthworks required to construct the Staveley spur will involve widening the footprint of the existing railway embankment within the floodplain of the River Doe Lea. The Proposed Scheme makes provision for a replacement floodplain storage area to mitigate the loss of flood storage. There are three residential properties to the south-east of the Staveley spur railway embankment, one at The Grove and another two at Staveley Road, which may be affected. 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 high value receptors cannot be discounted. This minor impact would result in a moderate adverse effect, which is significant.

Other mitigation measures

15.4.40 Additional mitigation measures to further reduce the temporary and permanent impacts of construction stage activities, where there is potential for the Proposed Scheme to result in significant effects are described in the sections below.

Surface water

15.4.41 An existing culvert along Pools Brook has been identified that could potentially be removed allowing re-naturalisation of the existing channel. This has the potential to mitigate any significant effect caused by the drop inlet culvert under the disused mineral railway.

Groundwater

15.4.42 A survey of the potential spring north-west of Woodall that is likely to be lost due to the construction of Woodall embankment will be undertaken to determine its value and to identify whether further mitigation is required. If the feature is confirmed to be a spring, measures would be implemented to mitigate the effect on the spring feature and to ensure that any adverse effects would be mitigated.

Flood risk and land drainage

- 15.4.43 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, caused by the encroachment of the Staveley spur railway 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 insofar as reasonably practicable.

Summary of likely residual significant effects

- 15.4.44 In the absence of the other mitigation measures set out above, the Proposed Scheme would potentially result in residual significant effects as follows:
- a major adverse effect related to the permanent loss of a potential spring feature north-west of Woodall due to the construction of Woodall embankment, which is significant;
 - a moderate adverse effect related to the replacement of the existing culvert on Pools Brook with a drop inlet culvert, which is significant;
 - a moderate beneficial effect has been identified related to the replacement of the existing River Doe Lea culvert in the vicinity of Poolsbrook with a shorter length of underbridge (River Doe Lea underbridge) and associated channel realignment, which is significant; and
 - a moderate adverse effect has been identified related to the widening of the footprint of the existing railway embankment within the floodplain of the River Doe Lea. This has the potential to increase the risk of flooding to high value receptors, which is significant.
- 15.4.45 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 would have a negligible impact on the water environment.

- 15.5.4 A summary of the route-wide WFD compliance assessment process is provided in Volume 3: Route-wide effects. This describes the ongoing assessment process and how measures will be embedded into the design that are specifically designed to ensure that the Proposed Scheme complies with the requirements of the WFD, where reasonably practicable. It is currently anticipated that the Proposed Scheme will be compliant with WFD legislation.

Assessment of impacts and effects

- 15.5.5 There are considered to be no significant adverse effects related to water resources and flood risk arising from operation of the Proposed Scheme.

Other mitigation measures

- 15.5.6 There are considered to be no further measures required to mitigate adverse effects on surface water resources, groundwater resources or flood risk.

Summary of likely residual significant effects

- 15.5.7 The assessment shows that there would be no residual significant effects on surface water, groundwater or flood risk during operation of the Proposed Scheme.

Monitoring

- 15.5.8 Volume 1, Section 9 sets out the general approach to monitoring of water resources and flood risk during operation of the Proposed Scheme.
- 15.5.9 There are no area-specific requirements for monitoring water resources and flood risk during operation of the Proposed Scheme.

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