HS2

October 2018

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

Working Draft Environmental Statement

Volume 2: Community Area report

LA17: Stourton to Hunslet

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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

List of figures

List of tables

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 Figure 1.

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

The working draft ES comprises the following documents:

Non-technical summary

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

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

Glossary of terms and list of abbreviations

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

Volume 1: Introduction and methodology

This provides:

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

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

Volume 2: Community area reports and map books

These cover the following community areas:

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

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

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

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

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

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

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

Volume 3: Route-wide effects

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

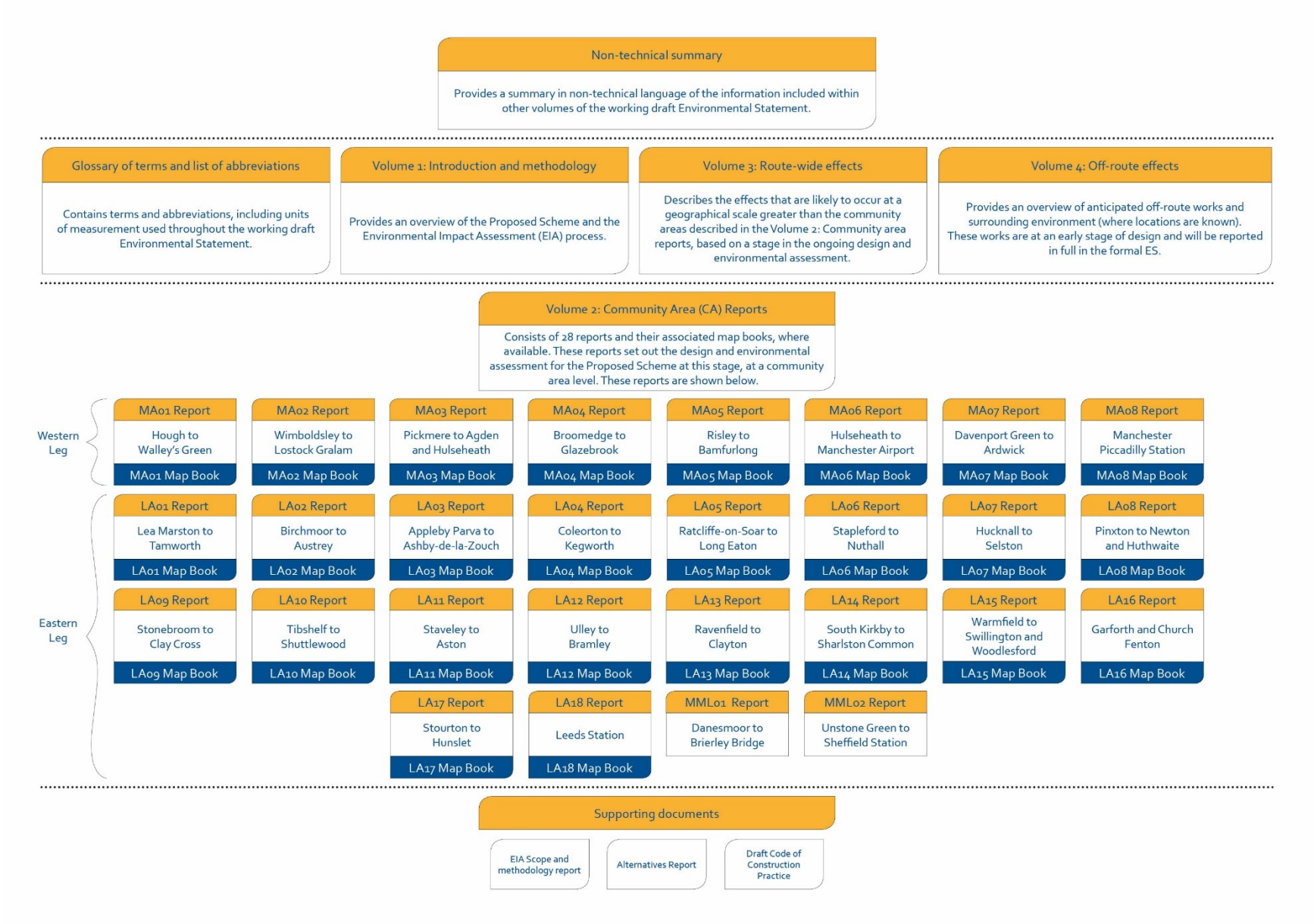
Volume 4: Off-route effects

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

Supporting documents

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

Figure 1: Structure of the working draft Environmental Statement



1 Introduction

1.1 Introduction to HS2

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

1.1.2 HS2 would 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 would 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 initial construction works on Phase One commenced in 2017.

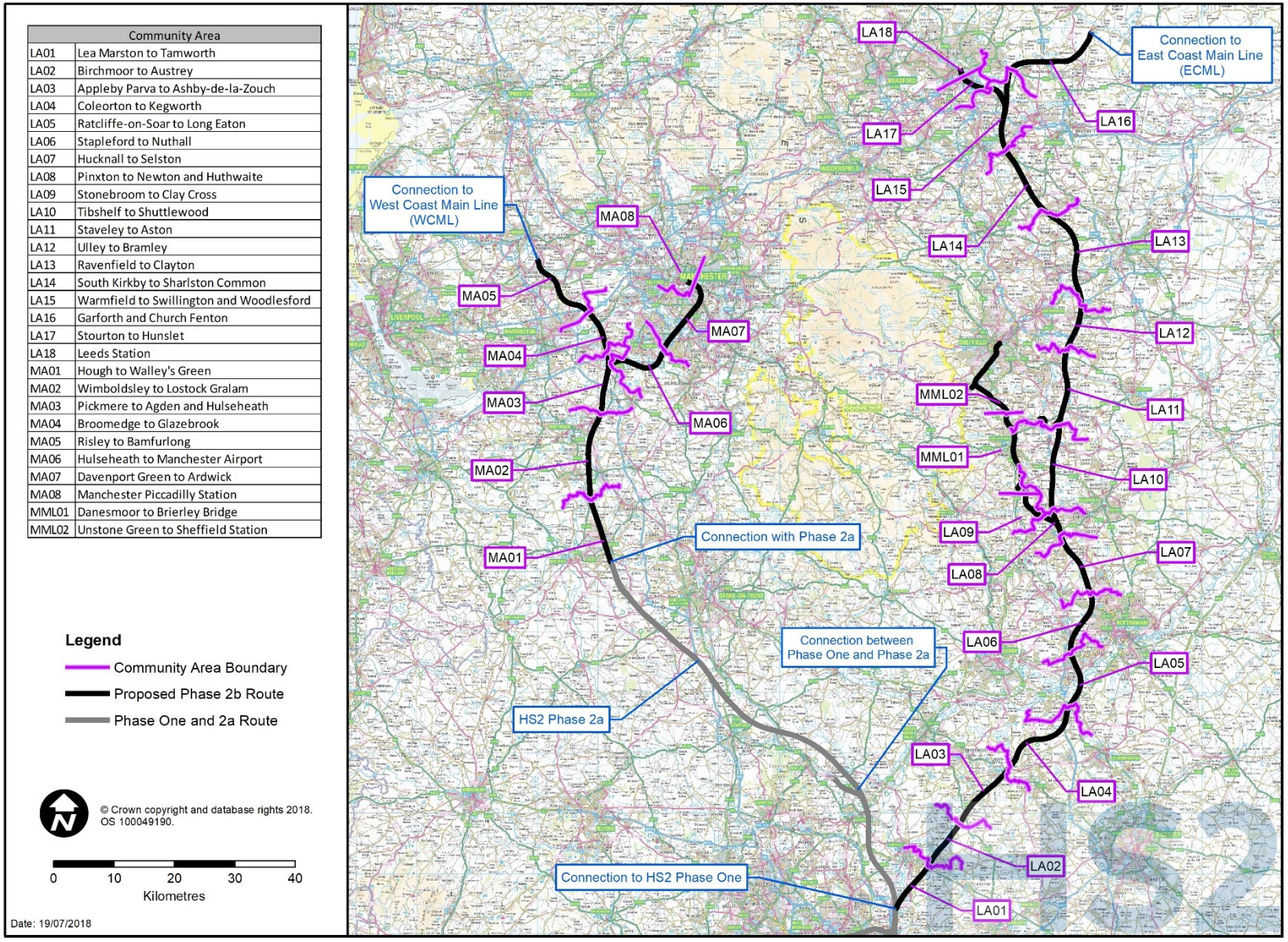
1.1.3 Phase Two of HS2 will extend the route from Phase One in the West Midlands to the north-west to Manchester (approximately 80km (50 miles) with connections to the West Coast Main Line (WCML) at Crewe and Golborne, and to the north-east to Leeds with a connection to the Erewash Valley Line and Midland 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 Stourton to Hunslet area (CA number LA17) which is located on the eastern leg of the Proposed Scheme.

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



1.2 Purpose and status of this report

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

1.3 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;
- Section 3: consultation and stakeholder engagement; and
- Sections 4 to 15: an assessment of the following environmental topics:
  - agriculture, forestry and soils (Section 4);

[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

- 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 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 Environmental Impact Assessment (EIA) Scope and Methodology Report (SMR)[3].

1.3.4 The maps relevant to the Stourton to Hunslet area are provided in a separate corresponding document entitled Volume 2: LA17 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: LA17 Map Book). There is some flexibility during detailed design to alter the horizontal and vertical alignments and other details within the limits shown on the plans and sections submitted to Parliament and as set out in the Bill, and this flexibility is included within the scope of the environmental assessment. Further explanation is provided in Volume 1, Section 1.

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

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 Stourton to Hunslet area (LA17) would be approximately 7.2km in length, and would lie wholly within the local authority area of Leeds City Council (LCC). The route of the Proposed Scheme in the area would comprise a section of the HS2 Leeds spur approximately 5.3km in length, plus the separate 310m long Leeds East viaduct and 1.6km long Leeds East rolling stock depot (RSD). The Proposed Scheme would not pass through any local parishes.

2.1.2 The southern boundary of the area is located on the western side of Bullough Lane, to the south of the M1, whilst the northern boundary is approximately 200m north of the M621 Junction 4.

2.1.3 As shown in Figure 3, the Warmfield to Swillington and Woodlesford area (LA15) lies to the south-east, the Leeds Station area (LA18) lies to the north-west and the Garforth and Church Fenton area (LA16) lies to the north-east of the Stourton to Hunslet area.

Settlement, land use and topography

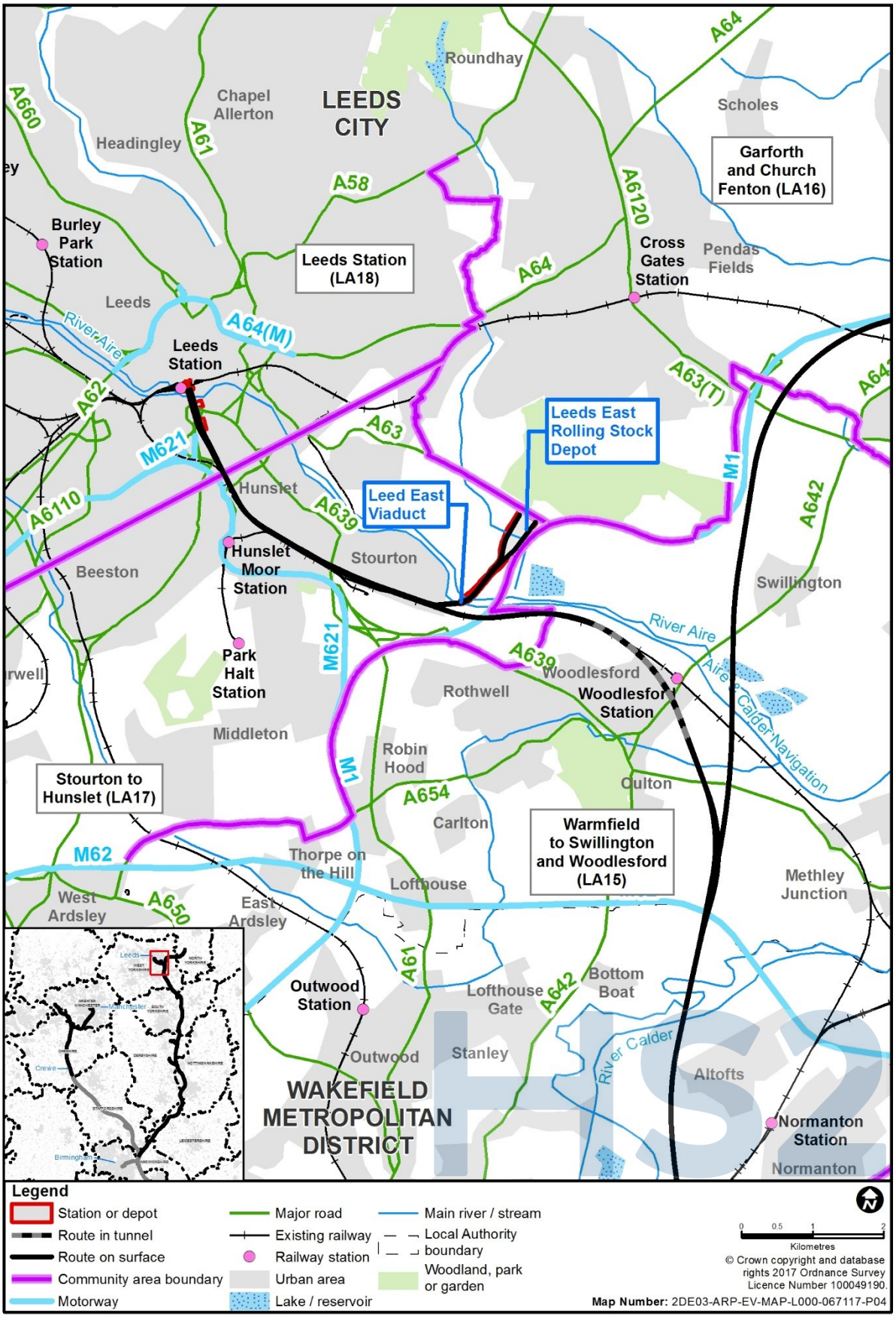
2.1.4 The Stourton to Hunslet area is predominantly urban in nature, comprising a mix of residential and industrial areas. The eastern extent comprises some areas of green space (e.g. the western edge of Rothwell Country Park) and agricultural land situated north of Rothwell and to the east of the M1. West of the M1, the areas surrounding Stourton and Hunslet are more commercial, characterised by a number of industrial estates and retail parks.

2.1.5 The residential areas of Belle Isle and Middleton, Hunslet and Beeston, to the south and west, are all influenced by historical and present-day industry. Stourton is principally an industrial and commercial area.

2.1.6 The area is dominated by road and rail infrastructure (such as the M1, the M621 and the Hallam Line), which crosses the Stourton to Hunslet area, with the M1 forming the gateway to Leeds from the east.

2.1.7 The River Aire valley is the dominant topographic feature that defines the eastern portion of the Stourton to Hunslet area, to the north of Rothwell. The Aire & Calder Navigation and the River Aire provide a green urban network of spaces and places.

Figure 3: Stourton to Hunslet community area context map



2.1.8 The area ranges in height between 25m above Ordnance Datum (AOD) and 35m AOD. The surrounding valley sides to the north, west and south beyond the study area rise gently to between 50m AOD and 130m AOD; it is in this slightly more elevated area where the majority of the settlements are located.

Key transport infrastructure

2.1.9 The M1 crosses the eastern section of the Stourton to Hunslet area to the north of Rothwell. The A639 Leeds Road/ Wakefield Road passes through the area in a south-east to north-west orientation connecting Oulton, Woodlesford and Rothwell to Leeds city centre through Hunslet. The B6481 Pontefract Road links the M1 Junction 44 and A639 in Hunslet through the Stourton industrial estate.

2.1.10 The A63 Pontefract Lane runs to the north between the M1 Junction 45 and the A61 in Leeds city centre. Where the M621 Junction 4 joins the A61 Hunslet Distributor Road, which is part of the Leeds Inner Ring Road, is a key transport connection for travel in and out of the centre of Leeds.

2.1.11 The Aire & Calder Navigation and the River Aire form a narrow corridor that weaves north-west to south-east through the Stourton to Hunslet area, from Leeds city centre to the eastern end of the Stourton to Hunslet area. The existing Hallam Line follows a route from west to east through the Stourton to Hunslet area, from Leeds Station, to Woodlesford. The existing Hallam Line also provides access for freight services, including access to the Freightliner Ltd Leeds Terminal.

2.1.12 Bus routes and bus stops primarily serve the local urban areas which comprise a mix of residential, commercial and industrial uses. A park and ride facility is also provided close to the M1 Junction 45 at Temple Green.

2.1.13 There are three promoted public rights of way (PRoW) in the area, which all follow the same route alongside the Aire & Calder Navigation: the Trans Pennine Trail (Leeds Link); the Paulinus Pilgrimage and Heritage Way; and St. Bernard's Way. These routes also continue through the Stourton to Hunslet area. The corridor also includes the National Cycle Network (NCN) National Route 67, Leeds Core Cycle Network 8 Rothwell to Leeds city centre and canal towpaths.

Socio-economic profile

2.1.14 The Stourton to Hunslet area lies fully within the LCC area, where the professional, scientific and technical sector accounts for the largest proportion of businesses (17%), with the construction (10%), and business administration and support services (10%) sectors also accounting for relatively large proportions[4].

2.1.15 The LCC area is a local employment hub within the region, providing approximately 443,000 jobs[5]. According to the Office for National Statistics Business Register and Employment Survey 2016, the top five sectors in terms of share of employment in LCC

[4] Office for National Statistics – Business Register and Employment Survey – Employment (2016). Office for National Statistics, London. Available at: https://www.nomisweb.co.uk
[5] Annual Population Survey (2016), NOMIS. Available at: http://www.nomisweb.co.uk

area were: health (13%); business administration and support services (12%); professional, scientific and technical (11%); education (9%); and retail (7%).

2.1.16 According to the Annual Population Survey (2016)[6], the employment rate[7] within the LCC area was 74% (376,000 people). 34% of the LCC area residents aged 16-64 were qualified to National Vocational Qualification Level 4 (NVQ4) and above, while 10% of LCC area residents had no qualifications.

Notable community facilities

2.1.17 Notable community facilities in the Stourton to Hunslet area include a number of food and drink establishments, places of worship, medical centres, dentists, nursing homes, schools and community centres.

2.1.18 Leeds Specialist Autism Services is a support centre located in the Junction 7 Business Park on Wakefield Road, adjacent to the route of the Proposed Scheme. The facility provides various forms of support to adults aged 18 and over on the autism spectrum, their families and carers.

Recreation, leisure and open space

2.1.19 Rothwell Country Park is a Yorkshire Wildlife Trust site located north-east of the settlement of Rothwell and accessed from Bullough Lane. The park includes an extensive network of footpaths and is also accessible via the Bullough Lane underbridge from the Trans Pennine Trail and cycle route alongside the Aire & Calder Navigation.

2.1.20 Within Stourton there is a café and small area of green space on Skelton Grange Road. Further to the north on Thwaite Lane are the recreational facilities of Stourton Boathouse rowing club and Thwaite Mills Museum.

2.1.21 Within Hunslet there is the Hunslet Community Sports Pitches and Club, which comprises a number of outdoor pitches and two club buildings. The club offers a range of sporting activities for juniors and seniors, and is accessed from The Oval and Hillidge Road. The club also includes a café and is available for private hire. The club also owns the Hunslet Parkside Amateur Rugby League Football Club (ARLFC) Pitch 1, which is a full size rugby pitch with associated car park located off Beza Street, south of the existing Hallam Line.

2.1.22 Mecca Bingo is a purpose built bingo hall located on Balm Road and is open daily with afternoon and evening sessions, plus a morning session on Saturdays. Additional leisure facilities include a bar and restaurant.

2.1.23 Public houses and hotel facilities along the route of the Proposed Scheme include: The Queens at Stourton, at the junction of the A639 Wakefield Road and Queen Street, with car parking, private hire facilities and hotel rooms; and the Station Hotel, which is a public house and hotel situated on Hillidge Road with a car park to the rear and a small outdoor seating area.

[6] Annual Population Survey, (2016), NOMIS; Available online at: http://www.nomisweb.co.uk
[7] The proportion of working age (16-64 year olds) residents that is in employment

Policy and planning context

Planning framework

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

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

- Leeds Core Strategy (2014)[8];
- Natural Resources and Waste Local Plan (2013)[9];
- Policies Map for Leeds (2016)[10];
- Aire Valley Leeds Area Action Plan (2017)[11];
- Saved Policies of the Leeds Unitary Development Plan (2001) and Unitary Development Plan Review (2006)[12]; and
- West Yorkshire Transport Strategy 2014 (2017)[13].

2.1.26 Emerging policies are not generally included within this report unless a document has been submitted to the Secretary of State for examination. This is the case with the Leeds Site Allocations Plan[14], which was submitted to the Secretary of State on the 5th of May 2017.

Committed development

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

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

2.1.29 Where there are committed developments that are considered likely to be constructed between 2023 and 2033, i.e. at the same time as the Proposed Scheme, they would be considered as receptors for the operation of HS2, but also potentially to

[8] Leeds City Council. (2014). Leeds Core Strategy. Available online at: http://www.leeds.gov.uk/council/Pages/Core-Strategy-Introduction-Page.aspx
[9] Leeds City Council. (2013). Adopted Natural Resources and Waste Local Plan – Leeds Local Development Framework. Available online at http://www.leeds.gov.uk/council/Pages/Natural%20Resources%20and%20Waste%20Local%20Plan.aspx
[10] Leeds City Council, (2016), Local Development Framework Policies Map Incorporating saved UDP Review Policies and Adopted Natural Resources and Waste Plan. Available online at: http://www.leeds.gov.uk/council/Pages/Policies-map.aspx
[11] Leeds City Council, (2017), Air Valley Leeds Area Action Plan. Available online at: http://www.leeds.gov.uk/council/Pages/Aire-Valley-Leeds-Area-Action-Plan.aspx
[12] Leeds City Council, (2001 and 2006), Leeds Unitary Development Plan (2001) and Unitary Development Plan Review (2006). Available online at: http://www.leeds.gov.uk/council/Pages/Unitary-Development-Plan.aspx
[13] West Yorkshire Combined Authority, (2017), Transport Strategy 2040. Available online at: https://www.westyorks-ca.gov.uk/transport/transport-strategy/
[14] Leeds City Council, (2017), Site Allocations Plan. Available online at: https://www.leeds.gov.uk/your-council/planning/site-allocations-development-plan-document-(ldf)

give rise to cumulative impacts with the Proposed Scheme during construction. Any cumulative impacts and likely significant effects will be reported in the formal ES.

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

Ongoing design development

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

- development of the layout of tracks and buildings within the Leeds East RSD, plus connection to the HS2 Leeds spur;
- realignment of the Hallam Line between Bullough Lane and Pontefract Road, through a new crossing under the M1 to the south;
- review of the proposed lengths and heights of highways crossing structures;
- review of the proposed length and height of the viaduct and any other crossing structures over the Aire & Calder Navigation and River Aire;
- identification of temporary and permanent watercourse and utility crossings and diversions;
- refinement of any realignment of roads and PRoW crossings over the Proposed Scheme;
- refinement of any realignments of roads and PRoW potentially impacted upon due to the Proposed Scheme;
- refinement of drainage features required for rail and modified highways;
- refinement of maintenance access routes and access to balancing ponds;
- identification of any required replacement floodplain storage areas;
- additional environmental features required to mitigate likely significant environmental effects;
- identification of accommodation works and crossings to provide for private means of access;
- refinement of construction compound locations and site haul routes; and
- refinement of auto-transformer station locations.

2.2 Description of the Proposed Scheme

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

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

2.2.3 In general, features are described from south to north along the route, and east to west for features that cross the Proposed Scheme.

Overview

2.2.4 The Proposed Scheme through the Stourton to Hunslet area (LA17) would be approximately 7.2km long, and would lie wholly within the local authority area of LCC. The route of the Proposed Scheme in the area would comprise a section of the HS2 Leeds spur, approximately 5.3km in length, the Leeds East viaduct and the Leeds East rolling stock depot (RSD).

2.2.5 The route of the Proposed Scheme would extend westwards from the boundary with the Warmfield to Swillington and Woodlesford area, which is located along the western side of Bullough Lane, to the south/east of the M1 and to the west of Rothwell Country Park. The Proposed Scheme would continue west under the M1 through Stourton and north-west on to Hunslet. The northern boundary, which is shared with the Leeds Station area (LA18), is located approximately 200m north of junction 4 of the M621. The Stourton to Hunslet area also contains the Leeds East RSD.

2.2.6 This section of the route of the Proposed Scheme is illustrated on maps CT-06-623b to CT-06-626a in the Volume 2: LA17 Map Book.

2.2.7 All dimensions in the sections below are approximate.

2.2.8 In the Stourton to Hunslet area, the Proposed Scheme would be made up of a section of the HS2 Leeds spur (referred to as the route of the Proposed Scheme) and the Leeds East RSD.

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

2.2.10 In general, features are described along the route of the Proposed Scheme from south to north and from east to west as they cross the route of the Proposed Scheme, as shown on Map Series CT-06 in the Volume 2: LA17 Map Book.

Rothwell Country Park cutting to Aire & Calder embankment

2.2.11 The route of the Proposed Scheme would continue from the boundary with the Warmfield to Swillington and Woodlesford area (LA15), west under the M1, just north of Junction 44, and towards the Aire & Calder Navigation embankment.

2.2.12 This section of the route of the Proposed Scheme is illustrated on maps CT-06-623b in the Volume 2: LA17 Map Book.

2.2.13 Key features of this 1.1km section would include:

- continuation of Rothwell Country Park cutting from the boundary with the Warmfield to Swillington and Woodlesford area (LA15), 1.1km in length (including the M1 crossing), up to 5m in depth and a maximum 96m in width, within the Stourton to Hunslet area. Landscape mitigation planting, both north and south of the route of the Proposed Scheme, would help integrate the HS2 Leeds spur into the surrounding landscape and offer visual screening to receptors to the north and south, as well as along the railway corridor. The landscape mitigation planting would also help maintain ecological connectivity along both sides of the HS2 Leeds spur (see Volume 2: Map CT-06-623b, C7 to G6);
- retaining walls to provide structural support to the Proposed Scheme, as follows:
  - Network Rail retaining wall No.1, 800m in length, up to 10.7m in height and located south of the realigned conventional Hallam Line west of the M1 J44-45 Network Rail overbridge (see Volume 2: Map CT-06-623b, D7 to H5);
  - Rothwell Country Park retaining wall, 350m in length and up to 7.8m in height. The wall would be located to the south of the route of the Proposed Scheme between Bullough Lane underbridge and the M1 (see Volume 2: Map CT-06-623b, D7 to F6);
  - Network Rail retaining wall No.2, 250m in length and up to 10.7m in height located to the north of the realigned conventional Hallam Line, west of the M1 J44-45 Network Rail overbridge (see Volume 2: Map CT-06-623b, G6 to H5);
  - Network Rail retaining wall No.3, 200m in length and up to 9.7m in height located south of the realigned conventional Hallam Line, east of the M1 J44-45 Network Rail overbridge (see Volume 2: Map CT-06-623b, H5 to I6); and
  - Network Rail retaining wall No.4, 40m in length and up to 9.6m in height located north of the realigned conventional Hallam Line, east of the M1 J44-45 Network Rail overbridge (see Volume 2: Map CT-06-623b, H5 to I6).
- M1 Junction 44-45 HS2 overbridge - modifications to the existing NR/M1 Bridge (10m above track level) to accommodate the route of the Proposed Scheme to cross under the M1 (see Volume 2: Map CT-06-623b, H6);
- M1 Junction 44-45 Network Rail overbridge, 26m in length, up to 0.9m above ground level and 7m above track level, to carry the M1 over the realigned conventional Hallam Line to the south of the route of the Proposed Scheme (see Volume 2: Map CT-06-623b, H5);
- a pumping station east of the existing NR/M1 Bridge and between the route of the Proposed Scheme and the Aire & Calder Navigation, with an access road from Bullough Lane. Landscape mitigation planting has been proposed around

the pumping station to provide a visual screening for receptors in all direction and landscape integration (see Volume 2: Map CT-06-623b, G6); and

- grassland habitat creation located to both the east and west of the M1 crossing, north of the realigned Hallam Line and south of the Leeds spur, to provide replacement habitat.

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

2.2.15 Construction of this section would be managed from the Rothwell Country Park cutting, M1 crossing and Aire & Calder Navigation embankment satellite compounds. These compounds are described in Section 2.3 and shown on Map CT-05-623b in the Volume 2: LA17 Map Book.

Aire & Calder Navigation embankment to Stourton embankment

2.2.16 The route of the Proposed Scheme would continue onto the Aire & Calder Navigation embankment, west of the M1, before moving onto the Stourton embankment, which includes the section where the Proposed Scheme passes over Pontefract Road.

2.2.17 This section of the route of the Proposed Scheme is illustrated on maps CT-06-623b to CT-06-624 in the Volume 2: LA17 Map Book.

2.2.18 Key features of this approximately 1.9km section would include:

- Aire & Calder Navigation embankment, up to 445m in length, with landscape mitigation planting to the north and south to help integrate the Proposed Scheme into the surrounding landscape, maintain ecological connectivity and provide visual screening of the HS2 Leeds spur, for receptors to the north and south;
- Stourton embankment, 1.5km in length, with landscape mitigation planting, to the north and south to help integrate the Proposed Scheme into the surrounding landscape and provide visual screening of the HS2 Leeds spur, for receptors to the north and south. The landscape mitigation planting would also help maintain ecological connectivity along both banks of the HS2 Leeds spur;
- Pontefract Road underbridge, 100m in length and up to 7m in height;
- Leeds East viaduct, up to 310m in length and 11m in height;
- retaining walls to provide structural support to the Proposed Scheme, as follows:
  - Aire & Calder Navigation retaining wall No.1, 290m in length and up to 9.7m in height located west of the M1 between the realigned conventional Hallam Line and route of the Proposed Scheme, before connecting into the Stourton embankment retaining wall No.1 (see Volume 2: Map CT-06-623b, I6 to J6);

- Aire & Calder Navigation flood wall and retaining wall No.2, 470m in length and up to 6m in height located south of the route of the Proposed Scheme, adjacent to the Aire & Calder Navigation (see Volume 2: Map CT-06-624, A5 to C5);

- Aire & Calder Navigation retaining wall No.3, 565m in length and up to 5m in height located south of the route of the Proposed Scheme, supporting access track between the HS2 tracks and the Aire & Calder Navigation (see Volume 2: Map CT-06-623b, H6, to Map CT-06-624, C6);

- Stourton embankment retaining wall No.1, 1.5km in length and up to 9.3m in height, located south of the route of the Proposed Scheme, between the HS2 Leeds spur and the Hallam Line, from the Aire & Calder Navigation retaining wall No.1 to the Leeds cutting (see Volume 2: Map CT-06-624, B5 to Map CT-06-625, B6);

- Stourton embankment retaining wall No.2, 860m in length and up to 9.3m in height, located to the north of the route of the Proposed Scheme, between the Leeds East viaduct and to the west of the Pontefract Road underbridge (see Volume 2: Map CT-06-624, C5 to G5); and

- Stourton embankment retaining wall No.3, 120m in length located and up to 5.3m in height, located to the north of the route of the Proposed Scheme, between Stourton embankment retaining wall No.2 and Leeds cutting (see Volume 2: Map CT-06-624, J6).

- a railway drainage balancing pond, located to the west of the M1 south of the realigned conventional Hallam Line adjacent to the M1 Junction 44. Landscape and habitat mitigation would be provided to visually screen the pond, from receptors in all directions, and provide replacement habitats (see Volume 2: Map CT-06-624, A5 to B5);

- HS2 access road, located south of the route of the Proposed Scheme, would be provided from Pontefract Road for access to the drainage pond and M1 J44-45 Network Rail overbridge (see Volume 2: Map CT-06-624, A5 to C5);

- HS2 access road, located north of the route of the Proposed Scheme, would be provided from Haigh Park Road for access to the drainage pond and M1 Junction 44 to 45 HS2 overbridge (see Volume 2: Map CT-06-624, A6 to C7);

- a railway drainage balancing pond, located north of the route of the Proposed Scheme between Haigh Park Road and the River Aire. An area of ecological grassland and woodland habitat would be provided to screen the pond and integrate it into the local landscape with replacement habitats (see Volume 2: Map CT-06-624, C6 to D6);

- a relocated highway balancing pond, south of the route of the Proposed Scheme and north-west of Pontefract Road underbridge, with landscape mitigation located around the entire pond, to provide habitat integration and visual screening for nearby receptors, in all directions (see Volume 2: Map CT-06-624, G6);

- closure of Haigh Park Road, on both sides of the overbridge, at the point where it crosses the route of the Proposed Scheme. Turning heads would be provided to facilitate vehicle access on the retained section of Haigh Park Road both sides of the route of the Proposed Scheme (see Volume 2: Map CT-06-624, C6);
- closure of the CEMEX works access road as it is located within the land required for the Proposed Scheme; and
- closure of Rothwell Footpath 1 due to it falling fully within the land required for the Proposed Scheme. Users would be diverted along the realigned Queen Street and Pontefract Road, reducing the length of the footpath journey by 100m (see Volume 2: Map CT-06-625, A8 to C6).

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

2.2.20 Construction of this section would be managed from the Aire & Calder Navigation embankment and Pontefract Road satellite compounds. These compounds are described in Section 2.3 and shown on Map CT-05-624 in the LA17 Map Book.

Leeds cutting

2.2.21 The route of the Proposed Scheme would continue north-west along the full length of the Leeds cutting to the end of the Stourton to Hunslet area.

2.2.22 This section of the route of the Proposed Scheme is illustrated on maps CT-06-625 to CT-06-626a in the Volume 2: LA17 Map Book.

2.2.23 Key features of this approximately 2.3km section would include:

- Leeds cutting, 2.3km in length, up to 52m in width and 12m in depth (see Volume 2: Map CT-06-625, B6, to Map CT-06-626a, F4). Areas of landscape planting to the north and south of the route of the Proposed Scheme would provide landscape mitigation, visual screening (for receptors to both the north and south of the route of the Proposed Scheme) and habitat connectivity;
- retaining walls to provide structural support to the Proposed Scheme, as follows:
  - Leeds cutting retaining wall No.1, including a flood wall, 2.3km in length and up to 16m in height, located to the south of the route of the Proposed Scheme, between Stourton embankment in the east and Leeds embankment in the west (see Volume 2: Map CT-06-625, B6, to Map CT-06-626a, F4); and
  - Leeds cutting retaining wall No.2, 2.3km in length and up to 16m in height, from track bed to the top of the cutting, located to the north of the route of the Proposed Scheme, between Stourton embankment to the east and Leeds embankment to the west, which is also a feature within the Leeds Station area (LA18) (see Volume 2: Map CT-06-625, B6, to Map CT-06-626a, F4).

- realignment of the A639 Wakefield Road, immediately adjacent to the east side of its existing alignment at ground level, crossing the route of the Proposed Scheme on the A639 Wakefield Road overbridge. As a result of this realignment, Queen Street and Westbury Place North would also require junction realignment to maintain their connections with the A639 Wakefield Road (see Volume 2: Map CT-06-625, C5 to C6);
- the A639 Wakefield Road overbridge, comprising a 24.5m long span over the HS2 Leeds East rolling stock depot connection, an 22.2m long span over the HS2 Leeds spur and two spans, each 22.1m in length, over the conventional Hallam Line, up to 4m above ground level and 7m above track level (see Volume 2: Map CT-06-625, C5 to C6);
- landscape mitigation planting would be provided north and south of the route of the Proposed Scheme, adjacent to the A639 Wakefield overbridge, in order to mitigate for that lost during construction, provide visual screening for receptors to both the north and south and maintain ecological connectivity;
- Pepper Road overbridge, with a 38.8m long span over the HS2 Leeds spur and a 16.2m long northern span over the conventional Hallam Line, up to 4m above ground level and 7m above track level (see Volume 2: Map CT-06-625, E5 to E6);
- the Hunslet auto-transformer station to the north of the HS2 Leeds spur, east of Balm Road (see Volume 2: Map CT-06-625, H6);
- Balm Road overbridge, with a 30.3m long span over the HS2 Leeds spur and a 16.2m long northern span over the conventional Hallam Line, up to 4m above ground level and 7m above track level (see Volume 2: Map CT-06-625, H4 to I6);
- Beza Street overbridge, with a 23.1m long span over the HS2 Leeds spur and a 6.75m length northern span over the conventional Hallam Lines, up to 1.9m above ground level and 7m above track level (see Volume 2: Map CT-06-626a, B3 to B5);
- Hillidge Road overbridge, 23.2m in length, up to 1.5m above ground level and 7m above track level (see Volume 2: Map CT-06-626a, C4);
- realignment of Church Street and Hillidge Road, 30m north of its existing alignment at ground level (see Volume 2: Map CT-06-626a, B5 to D5);
- A61 Hunslet Distributor Road South overbridge, 19m in length, up to 3.3m above ground level and 7m above track level (see Volume 2: Map CT-06-626a, D4);
- A61 Hunslet Distributor Road overbridge, 19m in length, up to 2m above ground level and 7m above track level (see Volume 2: Map CT-06-626a, D4 to E4);
- M621 Junction 4 from Junction 3 overbridge, 19m in length, up to 2.4m above ground level and 7m above track level (see Volume 2: Map CT-06-626a, E4);

- a balancing pond for railway drainage, and access road, north of the route of the Proposed Scheme between Church Street, Beza Street and Balm Road (see Volume 2: Map CT-05-626a, A5 to B5). There would be landscape mitigation planting to the south and west of the pond to provide screening, and creating an area of open public space to integrate the balancing pond whilst providing replacement habitats;
- a railway pumping station and access road, north of the route of the Proposed Scheme between Church Street, Beza Street and Balm Road. Landscape mitigation planting has been proposed around the pumping station to provide a visual screening for receptors in all directions and to provide landscape integration (see Volume 2: Map CT-06-626a, B5);
- a balancing pond for railway drainage, and access road,, north of the route of the Proposed Scheme between Hillidge Road and the A61 Hunslet Distributor Road South overbridge (see Volume 2: Map CT-06-626a, D4 to D5). There would be landscape mitigation planting to the south and west of the pond to provide screening, and creating an area of open public space to integrate the balancing pond whilst providing replacement habitats; and
- a railway pumping station and access road, north of the route of the Proposed Scheme between Hillidge Road and the A61 Hunslet Distributor Road South overbridge. Landscape mitigation planting has been proposed around the pumping station to provide a visual screening for receptors in all direction and to provide landscape integration (see Volume 2: Map CT-06-626a, B4).

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

2.2.25 Construction of this section would be managed from the Aire & Calder main compound. This compound is described in Section 2.3 and shown on Map CT-05-625 and 626a in the Volume 2: LA17 Map Book.

Leeds East rolling stock depot

2.2.26 The Leeds East RSD (Volume 2: Map CT-06-623b-R1) would serve as an operational and maintenance hub. Activities would include light and heavy maintenance, where train servicing (plus interior and exterior cleaning) would take place on the Proposed Scheme's rolling stock. The operation of the Leeds East RSD is described further in Section 2.4.

2.2.27 The Leeds East RSD would be 1.6km in length, south-west of the M1 junction 45, in an area between the A63 to the north, the M1 to the east, Yorkshire Water Treatment Works to the west and the River Aire to the south. The features of the Leeds East RSD would include:

- a gatehouse and access road, which would extend into an internal road network and lead to the main buildings with associated car parking;

- operational buildings, which would include a depot switching station and smaller buildings, such as a utility meter room, a pumping station and cleaner storage and plant room;
- stabling yards where trains would be cleaned and stabled overnight, with each stabling track having capacity to hold two 200m train sets;
- maintenance shed including workshops where all maintenance on the trains would take place;
- power supply room and a wheel lathe, where trains would have their wheels re-profiled to maintain safe high speed running capability; and
- accommodation buildings containing offices, training centre, cleaners and train crew facilities, plus a depot control room to manage train movements within the depot.

2.2.28 Specific design elements of the Leeds East RSD would include:

- a carriage washing machine plant located along the access into the depot; and a connection to the HS2 Leeds spur comprising the 310m long Leeds East viaduct over the Aire & Calder Navigation, River Aire and Trans Pennine Trail;
- Knowsthorpe Lane closure where it crosses the Leeds East RSD and is utilised as a secondary access/egress to the Leeds East RSD;
- Wyke Beck culvert, to carry Wyke Beck under the Leeds East RSD;
- Main Effluent Channel culvert on tributary of Wyke Beck, to carry the Yorkshire Water Main Effluent Channel under the Leeds East RSD; and
- Knowsthorpe Lane culvert on unnamed tributary of Wyke Beck, to carry an unnamed tributary of Wyke Beck under the Leeds East RSD.

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

2.2.30 Construction of this section would be managed from the Leeds East RSD satellite compound. This compound is described in Section 2.3 and shown on Map CT-624-R1 in the Volume 2: LA17 Map Book.

Demolitions

2.2.31 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.

2.2.32 At this stage of the design development, it is anticipated that demolition of three existing residential properties, 25 commercial/business properties and 17 other structures would be required to construct the permanent features in the Stourton to Hunslet 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 Stourton to Hunslet 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 LCC once the construction works in that area are complete.

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

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

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

Code of Construction Practice

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

2.3.7 In addition, HS2 Ltd has produced a Community Engagement Framework[15] which sets out how HS2 Ltd and its contractors, as well as their sub-contractors, would undertake community engagement during the construction of the HS2 project. The framework is being implemented on Phase One of HS2 and is applicable to all phases of HS2.

2.3.8 The objectives of the framework include:

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

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

Overview of the construction process

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

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

[15] 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

- 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 would 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.

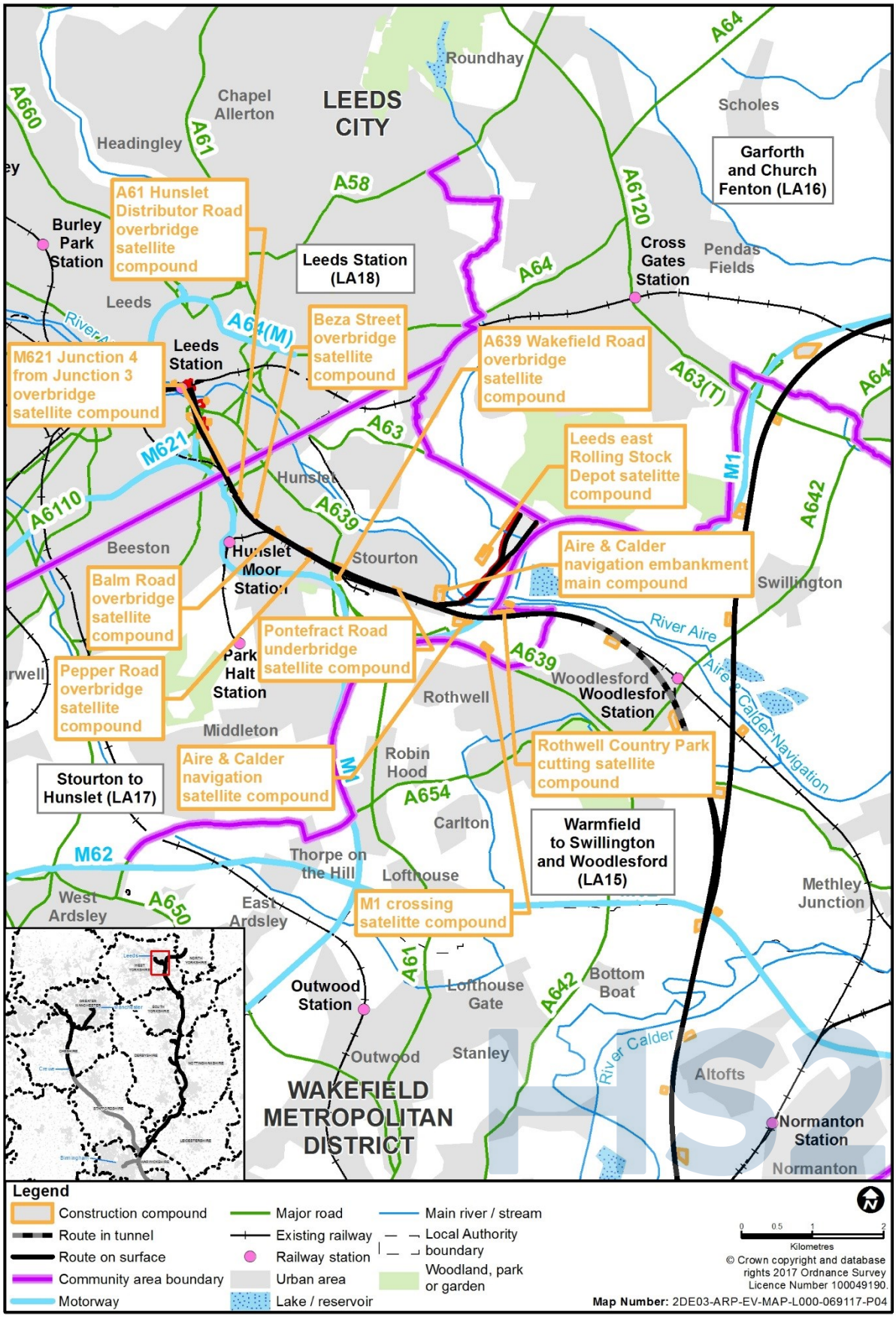
2.3.17 Satellite compounds would be used as the base to manage specific works along a section of the route. Depending on the nature and extent of the works to be managed, these satellite compounds could include office accommodation for staff, local storage for plant and materials, car parking for staff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

2.3.18 One main civil engineering compound, the Aire & Calder Navigation embankment main compound, would be located in the Stourton to Hunslet area. This would manage the ten civil engineering satellite compounds in the Stourton to Hunslet area.

2.3.19 Ten civil engineering satellite compounds would be located in the Stourton to Hunslet area. Following the completion of civil engineering works, three of these compounds would remain and be used as railway installation satellite compounds. These compounds for railway systems installation works would be managed from the Sherburn railhead main compound, in the Garforth and Church Fenton area (LA16).

2.3.20 The locations of construction compounds in the Stourton to Hunslet area are shown on Figure 4. Map Series CT-05 (in the Volume 2: LA17 Map Book) shows in detail the locations of the construction compounds described below.

Figure 4: Location of construction compounds in the Stourton to Hunslet area



2.3.21 Figure 5 and Figure 6 show the management relationship for civil engineering works compounds and Figure 7 for the railway installation works. Details of the works associated individual compounds are provided in subsequent sections of this report.

2.3.22 In the Stourton to Hunslet area there would be no workers' accommodation due to the proximity of the works area to Leeds City Centre, where it is assumed that there would be a sufficient supply of accommodation for construction staff.

2.3.23 Soil stripped as part of the works, prior to it being used when the land is reinstated, would be stored for the duration of construction. The location of topsoil 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-05-623b to CT-05-626a, in the Volume 2: LA17 Map Book.

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

Construction traffic routes, site haul routes and transfer nodes

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

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

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

2.3.28 Areas of land are also required for the storage, loading and unloading of bulk earthworks materials that are moved to and from the site on public roads. These areas would allow transfer of material between road vehicles and site vehicles during construction to balance traffic movements on the road network. These areas are referred to as transfer nodes and are shown on Maps CT-05-623b to CT-05-626a in the Volume 2: LA17 Map Book.

Construction compounds

2.3.29 This section provides a summary of the civil engineering works to be managed from the construction compounds in the Stourton to Hunslet area, as illustrated in Figure 5 and Figure 6, and railway systems works as illustrated in Figure 7. 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).

2.3.30 In the Stourton to Hunslet area there would be no workers' accommodation required due to the proximity of the works area to Leeds City Centre, where it is assumed that there would be a sufficient supply of accommodation for construction staff.

Figure 5: Construction compounds for civil engineering works

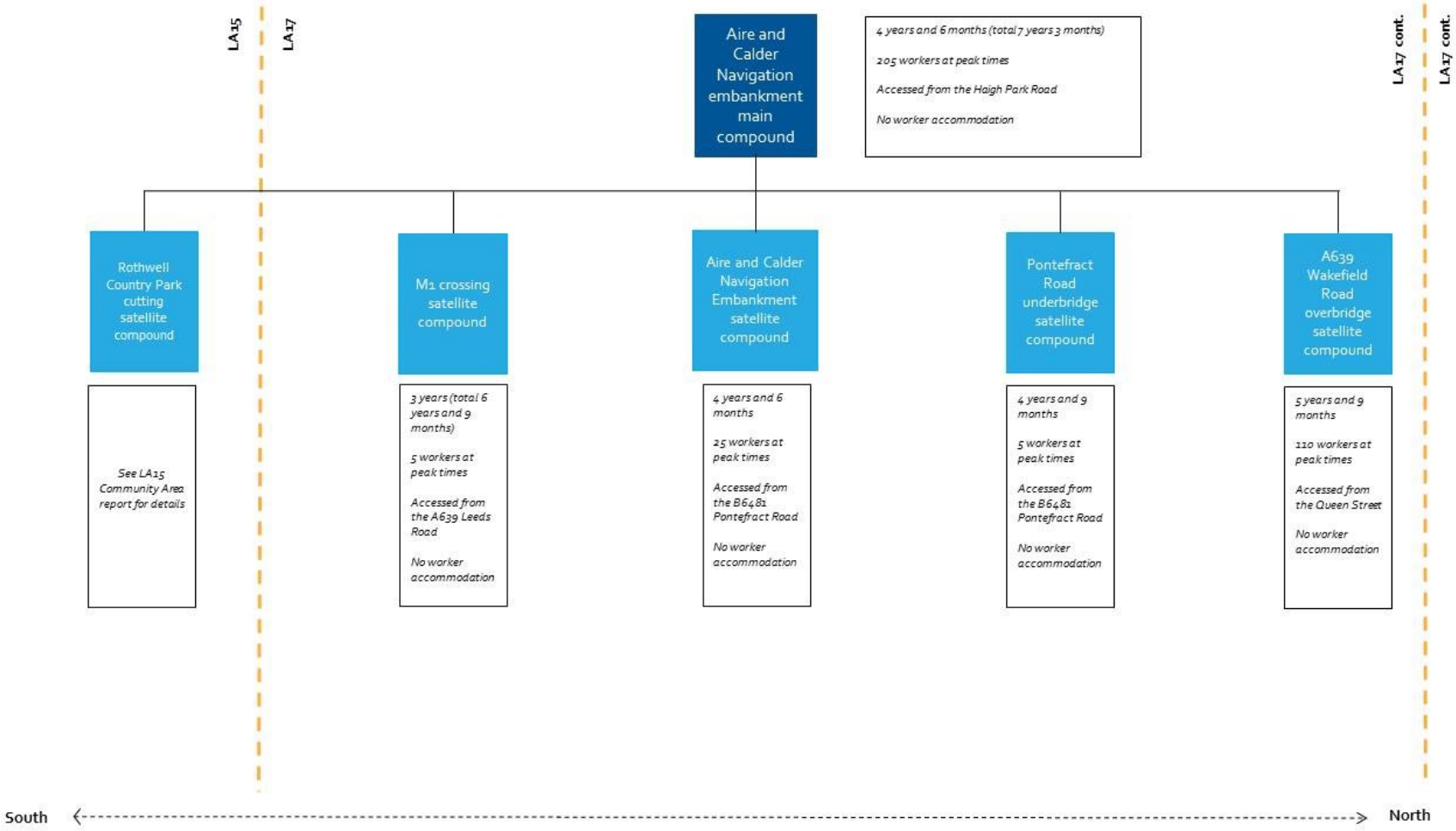


Figure 6: Construction compounds for civil engineering works.

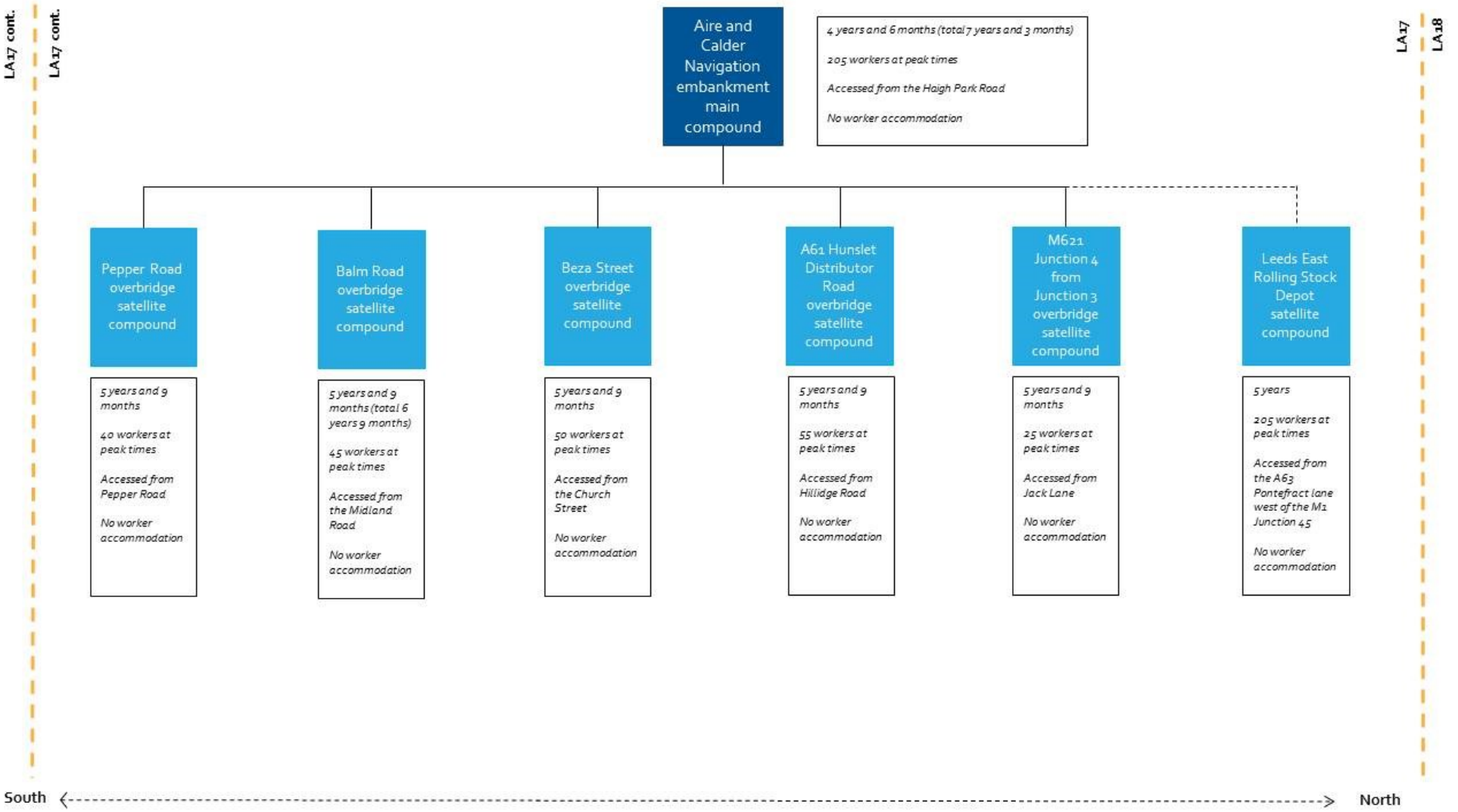
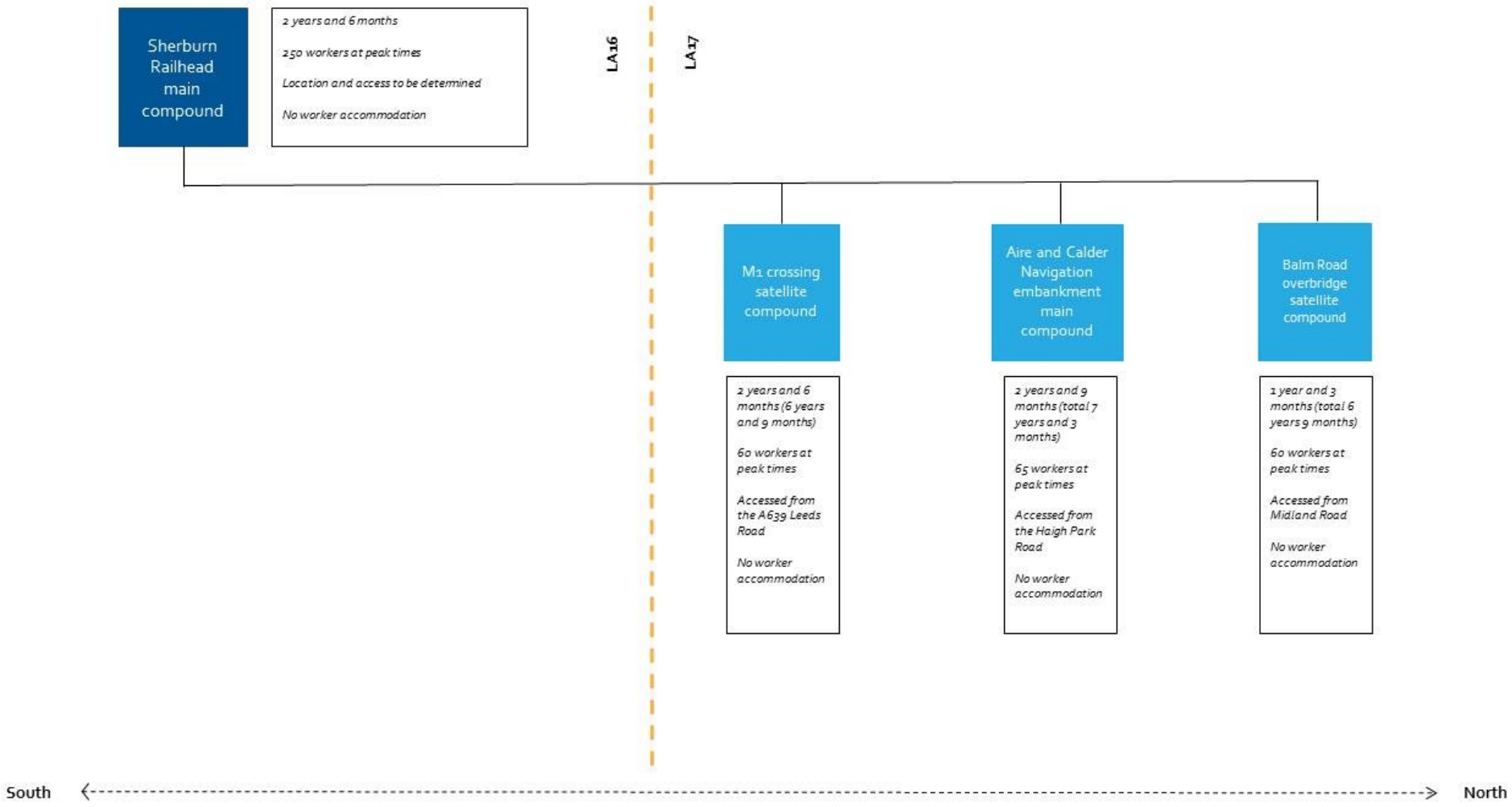


Figure 7: Construction compounds for railway systems installation works.



Aire & Calder Navigation embankment main compound

2.3.31 This compound would be used to manage civil engineering and railway systems works and provide main compound support to 10 satellite compounds in the Stourton to Hunslet area, as illustrated in Figure 5, Figure 6 and Figure 7 (see also Volume 2: Map CT-05-624, C6-8 to D6-8), for the civil engineering works. The compound would be used for civil engineering works for four years and six months. On completion of civil engineering works, the compound would remain as a satellite compound for railway systems installation works for a period of two years and nine months as illustrated in Figure 8.

2.3.32 The works to be managed from this compound would require demolition of the buildings and structures described in Table 1.

Table 1: Demolitions required as a result of the works to be managed from the Aire & Calder Navigation embankment main compound

Description	Location	Feature resulting in the demolition
Other		
Pylon	North west of M1 Junction 44, off Pontefract Road	Stourton embankment

2.3.33 The compound would also be used to manage sections of the construction of the following earthworks:

- a section of the Aire & Calder Navigation embankment, the Aire & Calder Navigation embankment retaining walls No.1 and No.3, the Aire & Calder Navigation flood wall and retaining wall No.2 and the HS2 access road, which would take approximately one year and six months to complete; and
- a section of Stourton embankment and Stourton embankment retaining walls No.1 and No.2, which would take two years and nine months to complete.

2.3.34 The works to be managed from this compound would require vehicle and pedestrian access through Haigh Park Road underbridge to be permanently closed.

2.3.35 It is expected that a number of utilities works would be required and managed from this compound.

2.3.36 Key railway systems installation works to be managed from this compound would include crossover connections and trackform for the Leeds East rolling stock depot which would take two years and nine months to complete.

Rothwell Country Park cutting satellite compound

2.3.37 This compound consists of two units split either side of the Aire & Calder Navigation. It is also split across the boundary with the Warmfield to Swillington and Woodlesford area (LA15) (see Volume 2: Map CT-05-623b, F7/8 to G6/7). As the compound supports civil engineering works within LA15, it is reported within the Volume 2: Community area report LA15, Warmfield to Swillington and Woodlesford.

M1 crossing satellite compound

2.3.38 This compound would be used to manage civil engineering works, as illustrated in Figure 5 and Figure 7 (see also Volume 2: Map CT-05-623b, G2/3 to H2/3).

The compound would be used for civil engineering works for three years. On completion of civil engineering works, the compound would remain as a satellite compound for railway systems installation works for a period of two years and six months as illustrated in Figure 8.

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

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

- improvements to the existing NR/M1 Bridge to create the M1 Junction 44-45 HS2 overbridge, which would take approximately one year to complete; and
- the new M1 Junction 44-45 Network Rail overbridge, which would take approximately two years and three months to complete.

2.3.41 The compound would also be used to manage sections of the construction of the Rothwell Country Park cutting, west of Bullough Lane, and Rothwell Country Park retaining wall and Network Rail retaining walls No.1 to No.4, which would take approximately two years and three months to complete.

2.3.42 The M1 crossing would be constructed using standard construction techniques. To maintain safe operation of the motorway it would be necessary to undertake the works under a number of stages of traffic management. The construction of the motorway crossings in this area would be coordinated in so far as is reasonably practicable to reduce the overall duration of disruption to the motorway. The traffic management would be likely to include speed restrictions for safety, use of the hard shoulders for the diversions of the main carriageway, and reduced lane widths in the northbound and southbound direction. Additional night-time closures are also likely to be required to enable installation of the deck over the carriageways and modifications to the motorway signage.

2.3.43 It is expected that a number of utilities works would be required and managed from this compound.

2.3.44 Key railway systems installation works to be managed from this compound would include crossover connections, Bullough Lane auto-transformer station (located within the Warmfield to Woodlesford and Swillington area) and trackform for the Leeds East rolling stock depot which would take two years and six months to complete.

2.3.45 This compound would also be used to manage a transfer node (Rothwell Country Park 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 A639 Leeds Road and via site haul routes (Volume 2: Map CT-05-623, F2).

Aire & Calder Navigation embankment satellite compound

2.3.46 This compound would be used to manage civil engineering works, as illustrated in Figure 5 (see also Volume 2: Map CT-05-624, A4/5 to B4/5).

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

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

- a section of the Aire & Calder Navigation embankment, the Aire & Calder Navigation embankment retaining walls No.1 and No.3, the Aire & Calder Navigation flood wall and retaining wall No.2 and the HS2 access road, which would take approximately one year and six months to complete; and
- a section of Stourton embankment and Stourton embankment retaining walls No.1 and No.2, which would take two years and three months to complete.

2.3.49 Construction of the Aire & Calder Navigation retaining wall No.3 may require construction work activity from the watercourse.

2.3.50 It is expected that a number of utilities works would be required and managed from this compound.

Pontefract Road underbridge satellite compound

2.3.51 This compound would be used to manage civil engineering works, as illustrated in Figure 5 (see also Volume 2: Map CT-05-624, H6 to I6).

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

2.3.53 The compound would be used to manage the construction of the B6481 Pontefract Road underbridge, which would take approximately two years and six months to complete.

2.3.54 A temporary batching plant would be located west of the B6481 Pontefract Road and north of the route of the Proposed Scheme, Pontefract Road underbridge batching plant, to provide concrete supply to the construction works across the Proposed Scheme (see Volume 2: Map CT-05-624, H6 to I6).

2.3.55 The works to be managed from this compound would require the temporary prohibition or restriction of traffic along the B6481 Pontefract Road. Traffic prohibitions or restrictions may also be required for some sections of the underbridge works on to the adjacent road network. The access road to the Cemex site would be permanently closed as it is located within the land required for the Proposed Scheme and would therefore become redundant.

2.3.56 Non-motorised user access along the B6481 Pontefract Road would be maintained through the construction works, with possible diversions assessed and described in the formal ES.

2.3.57 The works to be managed from this compound would require an existing balancing pond to be relocated.

2.3.58 It is expected that a number of utilities works would be required and managed from this compound.

A639 Wakefield Road overbridge satellite compound

2.3.59 This compound would be used to manage civil engineering works, as illustrated in Figure 5 (see also Volume 2: Map CT-05-625, B5/6 to C5/6). The compound consists of two units with one north and one south of the route of the Proposed Scheme.

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

Table 2: Demolitions required as a result of the works to be managed from the A639 Wakefield Road overbridge satellite compound

Description	Location	Feature resulting in the demolition
Residential		
Flat above The Queens at Stourton Public House	Wakefield Road, Stourton, Leeds	A639 Wakefield Road overbridge and realignment of the A639 Wakefield Road
Commercial		
Public House	The Queens at Stourton, Wakefield Road, Stourton, Leeds	A639 Wakefield Road overbridge and realignment of the A639 Wakefield Road
Building materials manufacturing facility	Pontefract Road, Stourton, Leeds	Stourton embankment
Industrial unit	Adjacent to south of The Queens at Stourton, Wakefield Road, Stourton, Leeds	A639 Wakefield Road overbridge
Three business units (including Leeds Specialist Autism Services)	Junction 7 office complex, off Wakefield Road, opposite Queen Street junction, Stourton, Leeds	Leeds cutting
Industrial facility	North side of existing Hallam Line, Pepper Road, Hunslet, Leeds	Leeds cutting
Other		
Three outbuildings	Within wooded area to north of existing Hallam Line and east of Wakefield Road overbridge, Stourton, Leeds	A639 Wakefield Road overbridge
Outbuilding	Wakefield Road, Stourton, Leeds	A639 Wakefield Road overbridge
Pylon	Pontefract Road, Stourton, Leeds	Stourton embankment
Outbuilding	Pontefract Road, Stourton, Leeds	Stourton embankment
Outbuildings	On northern side of existing Hallam Line, associated with industrial facility off Queen Street, Leeds	Stourton embankment

2.3.61 The compound would be used to manage the construction of the A639 Wakefield Road overbridge, which would take approximately two years and nine months to complete.

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

- Stourton embankment and Stourton embankment retaining wall No.3, which would take approximately three years and three months to complete; and
- a section of Leeds cutting and Leeds cutting retaining walls No.1 (including flood wall) and No.2, which would take approximately three years and three months to complete.

2.3.63 The works to be managed from this compound would require the permanent realignment of the A639 Wakefield Road for 300m, 30m to the east of its existing alignment, plus junction amendments to Queens Road and Westbury Place North, which would take approximately two years and nine months to complete. The new overbridge would be constructed offline[16].

2.3.64 The works to be managed from this compound would require the permanent closure of Rothwell Footpath 1, with connectivity replaced by pedestrian access along the B6481 Pontefract Road and Queen Street. Non-motorised user access, including from non-definitive footpath Leeds City 9, would be maintained through provision of a temporary diversions.

2.3.65 It is expected that a number of utilities works would be required and managed from this compound.

Pepper Road overbridge satellite compound

2.3.66 This compound would consist of two units, one north and one south of the route of the Proposed Scheme, and would be used to manage civil engineering works, as illustrated in Figure 6 (see also Volume 2: Map CT-05-625, E5 and E6).

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

Table 3: Demolitions required as a result of the works to be managed from the Pepper Road overbridge satellite compound

Description	Location	Feature resulting in the demolition
Commercial		
Four industrial / business units	North side of existing Hallam Line, Pepper Road, Hunslet, Leeds	Pepper Road overbridge / Leeds cutting
Other		
Two industrial outbuildings	North side of existing Hallam Line, Pepper Road, Hunslet, Leeds	Leeds cutting
Electricity sub-station	Pepper Road, Hunslet, Leeds	Pepper Road Overbridge satellite compound

2.3.68 The compound would be used to manage the construction of Pepper Road overbridge, which would take approximately one year and nine months to complete.

2.3.69 The compound would also be used to manage the construction of the earthworks associated with a section of Leeds cutting and Leeds cutting retaining walls No.1

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

(including flood wall) and No.2, which would take approximately three years and three months to complete.

2.3.70 The works to be managed from this compound would require Pepper Road traffic to be temporarily diverted onto the adjacent road network for the duration of these works.

2.3.71 Non-motorised user access at Pepper Road overbridge, including from non-definitive footpath Leeds City 9, would be maintained by the provision of a temporary realignment immediately to the west of the current alignment through provision of a temporary overbridge.

2.3.72 It is expected that a number of utilities works would be required and managed from this compound.

Balm Road overbridge satellite compound

2.3.73 This compound would be used to manage civil engineering works, as illustrated in Figure 6 and Figure 7 (see also Volume 2: Map CT-05-625, G6 to H6). The compound would be used for civil engineering works for five years and nine months. Concurrently, the compound would be used as a satellite compound for railway systems installation works for a period of one year and three months as illustrated in Figure 8.

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

Table 4: Demolitions required as a result of the works to be managed from the Balm Road overbridge satellite compound

Description	Location	Feature resulting in the demolition
Commercial		
Rail freight maintenance facility	Adjacent to the Balm Road and Midland Road junction, Hunslet	Balm Road overbridge and Leeds cutting
Other		
Telecommunications mast	Adjacent to bingo hall, Balm Road, Hunslet, Leeds	Leeds cutting
Electricity sub-station	Adjacent to bingo hall, Balm Road, Hunslet, Leeds	Leeds cutting
Electricity sub-station	Adjacent to Bridge House, Balm Road, Hunslet, Leeds	Leeds cutting

2.3.75 The compound would be used to manage the construction of Balm Road overbridge, which would take approximately one year and three months to complete.

2.3.76 The compound would be used to manage the construction of the earthworks associated with a section of Leeds cutting and Leeds cutting retaining walls No.1 (including flood wall) and No.2, which would take approximately three years and three months to complete.

2.3.77 The works to be managed from this compound would require Balm Road traffic to be temporarily diverted on to the adjacent road network for the duration of these works.

2.3.78 Non-motorised user access at Balm Road overbridge, including from non-definitive footpath Leeds City 4 and 10, would be maintained by the provision of a temporary realignment, immediately to the west of the current alignment, through the provision of a temporary overbridge.

2.3.79 The works to be managed from this compound would include the diversion of an existing contained watercourse.

2.3.80 It is expected that a number of utilities works would be required and managed from this compound.

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

Beza Street overbridge satellite compound

2.3.82 This compound would be used to manage civil engineering works, as illustrated in Figure 6 (see Volume 2: Map CT-05-626a, B5).

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

Table 5: Demolitions required as a result of the works to be managed from the Beza Street overbridge satellite compound

Description	Location	Feature resulting in the demolition
Commercial		
Bingo hall	Immediately west of the northern span of the Balm Road overbridge, Hunslet, Leeds	Leeds cutting
Automotive repair centre	North of bingo hall, off Balm Road, Hunslet, Leeds	Leeds cutting
Two industrial/commercial buildings	Balm Road Industrial Park, Beza Street / Church Street, Hunslet, Leeds	Beza Street overbridge satellite compound
Two industrial/commercial buildings	M1 Industrial Estate, Church Street, Hunslet, Leeds	Leeds cutting
Two commercial buildings	Beza Street, adjacent to north of crossing over existing Hallam Line, Hunslet, Leeds	Leeds cutting
Other		
Electricity sub-station	North of bingo hall, Balm Road, Hunslet, Leeds	Leeds cutting

2.3.84 The compound would be used to manage the construction of Beza Street overbridge, which would take approximately two years to complete.

2.3.85 The compound would be used to manage the construction of the earthworks associated with a section of Leeds cutting and Leeds cutting retaining walls No.1 (including flood wall) and No.2, which would take approximately three years and three months to complete.

2.3.86 The works to be managed from this compound would require Beza Street traffic to be temporarily diverted onto the adjacent road network for the duration of these works.

2.3.87 Non-motorised user access at Beza Street overbridge, including from non-definitive footpaths Leeds City 1 and 2, would be maintained by the provision of a temporary realignment, immediately to the west of the current alignment, through the provision of a temporary overbridge.

2.3.88 It is expected that a number of utilities works would be required and managed from this compound.

A61 Hunslet Distributor Road overbridge satellite compound

2.3.89 This compound would be used to manage civil engineering works, as illustrated in Figure 6 (see Volume 2: Map CT-05-626a, C4/5 to D4/5).

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

Table 6: Demolitions required as a result of the works to be managed from the A61 Hunslet Distributor Road overbridge satellite compound

Description	Location	Feature resulting in the demolition
Residential		
Flat above Station Hotel	Hillidge Road, Hunslet, Leeds	Church Street and Hillidge Road realignment, plus temporary site haul route
Residential property	Hillidge Road, adjacent to north of crossing over existing Hallam Line, Hunslet, Leeds	Leeds cutting
Commercial		
Station Hotel	Hillidge Road, Hunslet, Leeds	Church Street and Hillidge Road realignment, plus temporary site haul route
Commercial / office building	The Courtyard, Church Street, Hunslet, Leeds	Church Street and Hillidge Road realignment, plus temporary site haul route
Automotive maintenance centre	Opposite Station Hotel, Hillidge Road, Hunslet, Leeds	Leeds cutting
Car auction centre	Located between the A61 and Hillidge Road, Hunslet, Leeds	A61 Hunslet Distributor Road overbridge satellite compound

2.3.91 The compound would be used to manage the construction of:

- Hillidge Road overbridge, which would take approximately one year and nine months to complete;
- A61 Hunslet Distributor Road South overbridge, which would take approximately one year and three months to complete; and
- A61 Hunslet Distributor Road overbridge, which would take approximately one year and three months to complete.

2.3.92 The compound would also be used to manage the construction of the earthworks associated with a section of Leeds cutting and Leeds cutting retaining walls No.1

(including flood wall) and No.2, which would take approximately three years and three months to complete.

2.3.93 The works to be managed from this compound would require Hillidge Road, A61 Hunslet Distributor Road South and A61 Hunslet Distributor Road traffic to be temporarily diverted onto the adjacent road network for the duration of these works.

2.3.94 The works to be managed from this compound would require the permanent realignment of Church Street and Hillidge Road, 30m to the north of their existing alignment, which would take six months to complete.

2.3.95 Non-motorised user access at Hillidge Road overbridge, including from non-definitive footpaths Leeds City 2 and 3, would be maintained by the provision of a temporary realignment immediately to the west of the current alignment through provision of a temporary overbridge.

2.3.96 Non-motorised user access at A61 Hunslet Distributor Road South overbridge would be maintained by the provision of a temporary realignment immediately to the east of the current alignment through provision of a temporary overbridge.

2.3.97 Non-motorised user access at A61 Hunslet Distributor Road overbridge would be maintained by the provision of a temporary realignment immediately to the east of the current alignment through provision of a temporary overbridge.

2.3.98 It is expected that a number of utilities works would be required and managed from this compound.

M621 Junction 4 from Junction 3 overbridge satellite compound

2.3.99 This compound would be used to manage civil engineering works, as illustrated in Figure 6 (see also Volume 2: Map CT-05-626a, E4).

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

Table 7: Demolitions required as a result of the works to be managed from the M621 Junction 4 from Junction 3 overbridge satellite compound

Description	Location	Feature resulting in the demolition
Commercial		
Car hire centre	Pottery Road, Hunslet, Leeds	Leeds cutting

2.3.101 The compound would be used to manage the construction of the M621 Junction 4 from Junction 3 overbridge, which would take approximately one year and six months to complete.

2.3.102 The compound would be used to manage the construction of the earthworks associated with a section of Leeds cutting and Leeds cutting retaining walls No.1 (including flood wall) and No.2, which would take approximately three years and three months to complete.

2.3.103 The works to be managed from this compound would require the M621 Junction 4 Southbound Exit Slip Road to be temporarily diverted onto the adjacent road network for the duration of these works.

2.3.104 Non-motorised user access at M621 Junction 4 from Junction 3 overbridge, including the non-definitive footpath Leeds City 42, would be maintained by the provision of a temporary realignment immediately to the west of the current alignment through provision of a temporary overbridge.

2.3.105 It is expected that a number of utilities works would be required and managed from this compound.

Leeds East Rolling Stock Depot satellite compound

2.3.106 This compound would be used to manage civil engineering works, as illustrated in Figure 6 (see also Volume 2: Map CT-05-623b, H3 to H5).

2.3.107 The Leeds East RSD compound would manage the construction of:

- the Leeds East RSD, including earthworks, which would take approximately four years and six months to construct; and
- the Leeds East viaduct over the Aire & Calder Navigation, the River Aire and Trans Pennine Trail, which would take approximately one year and nine months to build.

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

Table 8: Demolitions required as a result of the works to be managed from the Leeds East Rolling Stock Depot satellite compound

Description	Location	Feature resulting in the demolition
Other		
Outbuilding	Located to the south of Knowsthorpe Lane, north of the M1	Leeds East rolling stock depot
Outbuilding	Located next to Haigh Park Road approximately 100m north of the Hallam line railway underpass, Haigh Park Road, Stourton, Leeds	Aire & Calder Navigation embankment main compound

2.3.109 Knowsthorpe Lane would require permanent closure where it is crossed by the Leeds East RSD, whilst the Trans Pennine Trail (Footpath 1 and Rothwell Bridleway 9) would require a temporary diversion during construction.

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

- permanent realignment of a tributary of the River Aire, to pass under the depot, via Wyke Beck Culvert, which would take six months to complete;
- permanent realignment of a tributary of the River Aire, to pass under the Depot via Main Effluent Channel Culvert, which would take six months to complete; and
- permanent realignment of Knowsthorpe culvert tributary of the River Aire, to pass under the depot, which would take one year and 3 months to complete.

2.3.111 Temporary or permanent diversions of utilities would be required as a result of the works to be managed from this compound. These will be reported in the formal ES.

2.3.112 The compound would be used to manage the works to raise a 400kV National Grid overhead power line along its existing alignment to cross the route of the Proposed Scheme, which would take one year to complete.

2.3.113 This compound would also be used to manage a transfer node (Leeds East RSD 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 A63 Pontefract Lane and via site haul routes (Volume 2: Map CT-05-623b).

Construction waste and material resources

2.3.114 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.

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

2.3.116 Local excess or shortfall of excavated material within the Stourton to Hunslet 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

2.3.117 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

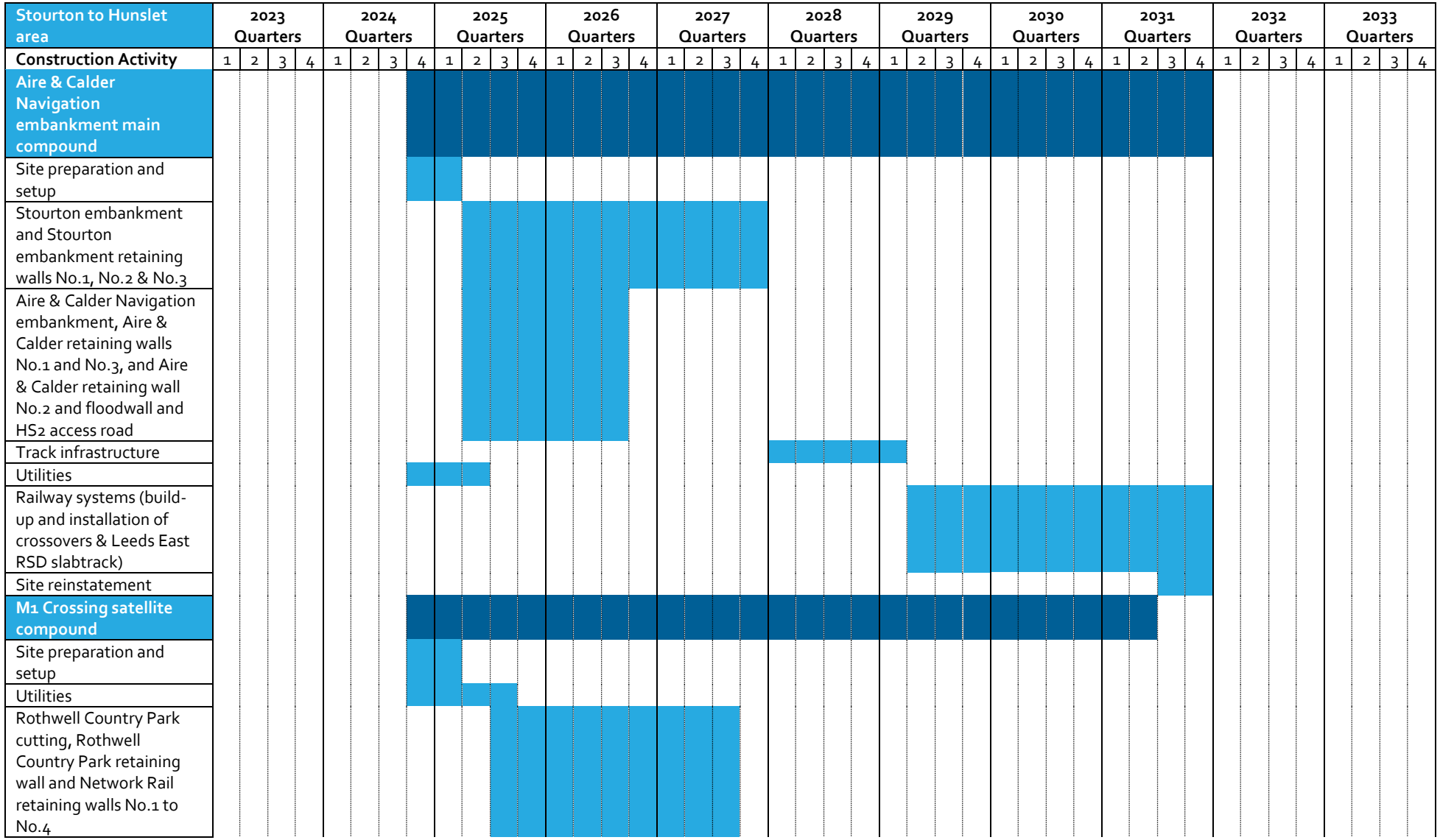
2.3.118 A construction programme illustrating indicative periods for each of the core construction activities described above is provided in Figure 8. Construction durations referred to in the following sections of this report are based on this indicative programme.

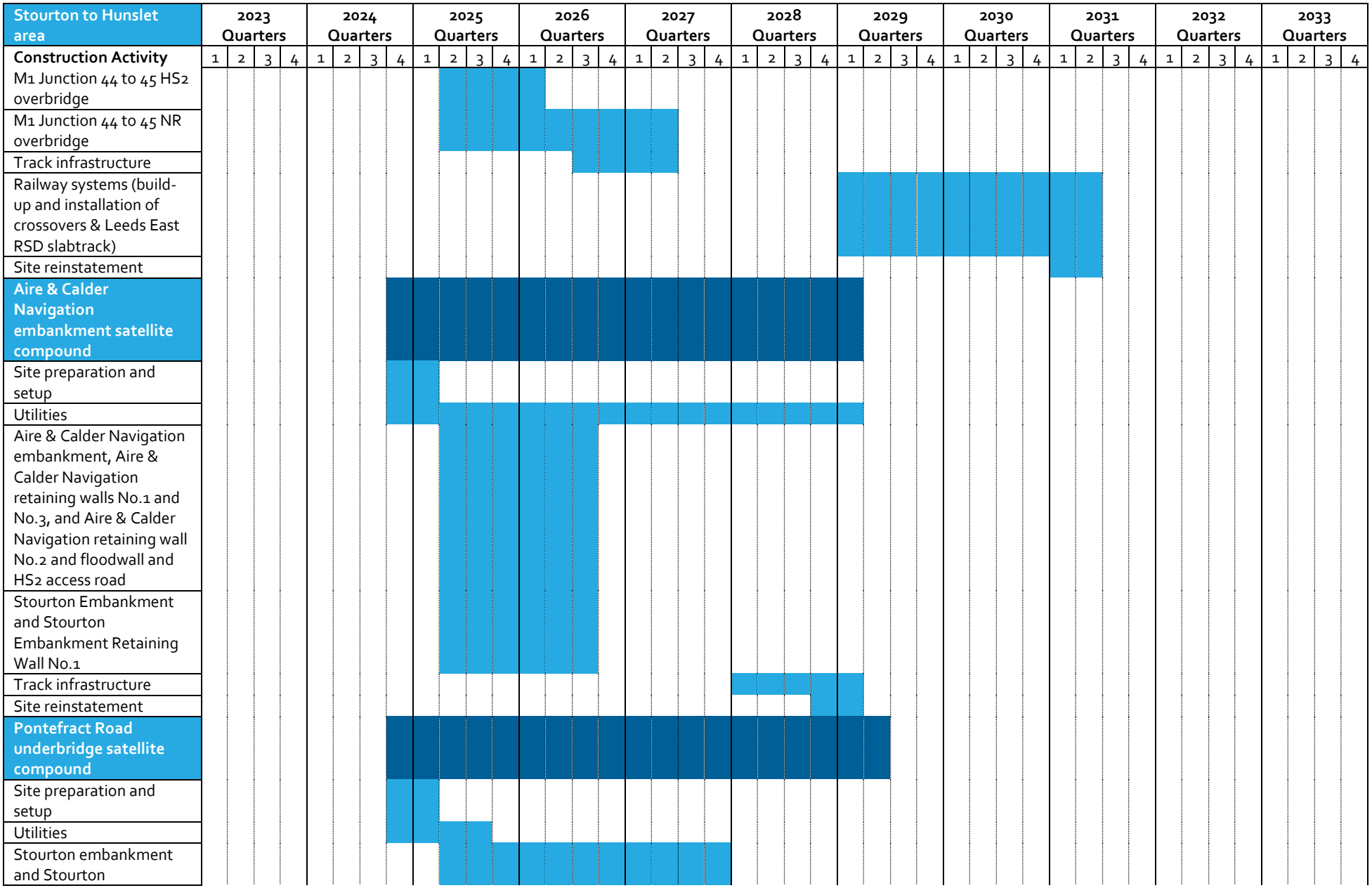
Monitoring during construction

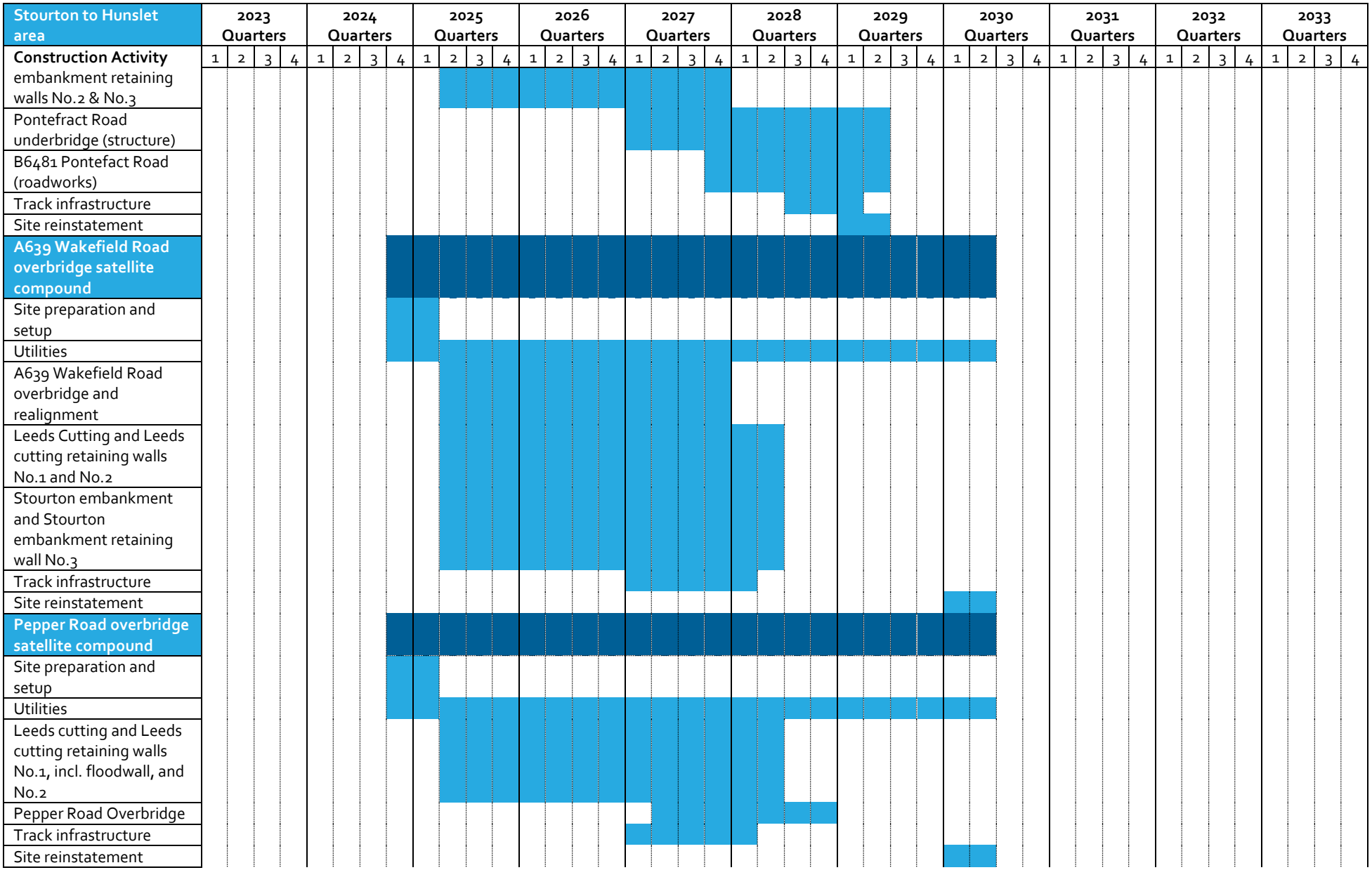
2.3.119 The appointed contractor would be required to undertake the necessary monitoring for each environmental topic to comply with the requirements of the CoCP, the relevant LEMP and any additional consent requirements. Any actions that may be necessary for compliance would be reported to the nominated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

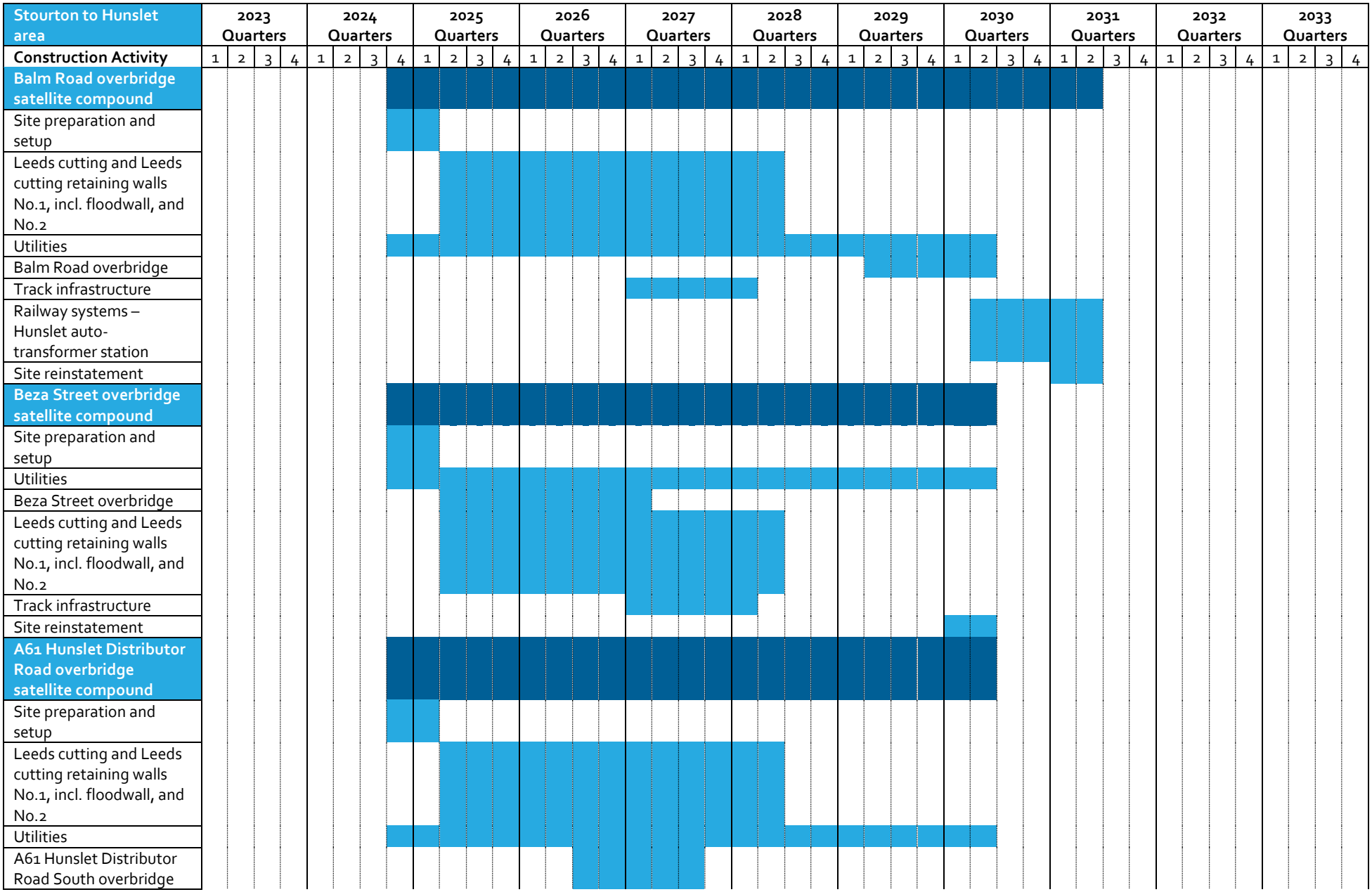
2.3.120 The CoCP and the relevant LEMP would set out inspection and monitoring procedures to assess the effectiveness of measures to prevent or reduce environmental effects during construction. Relevant local authorities and consenting authorities, such as the Environment Agency, would be consulted on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

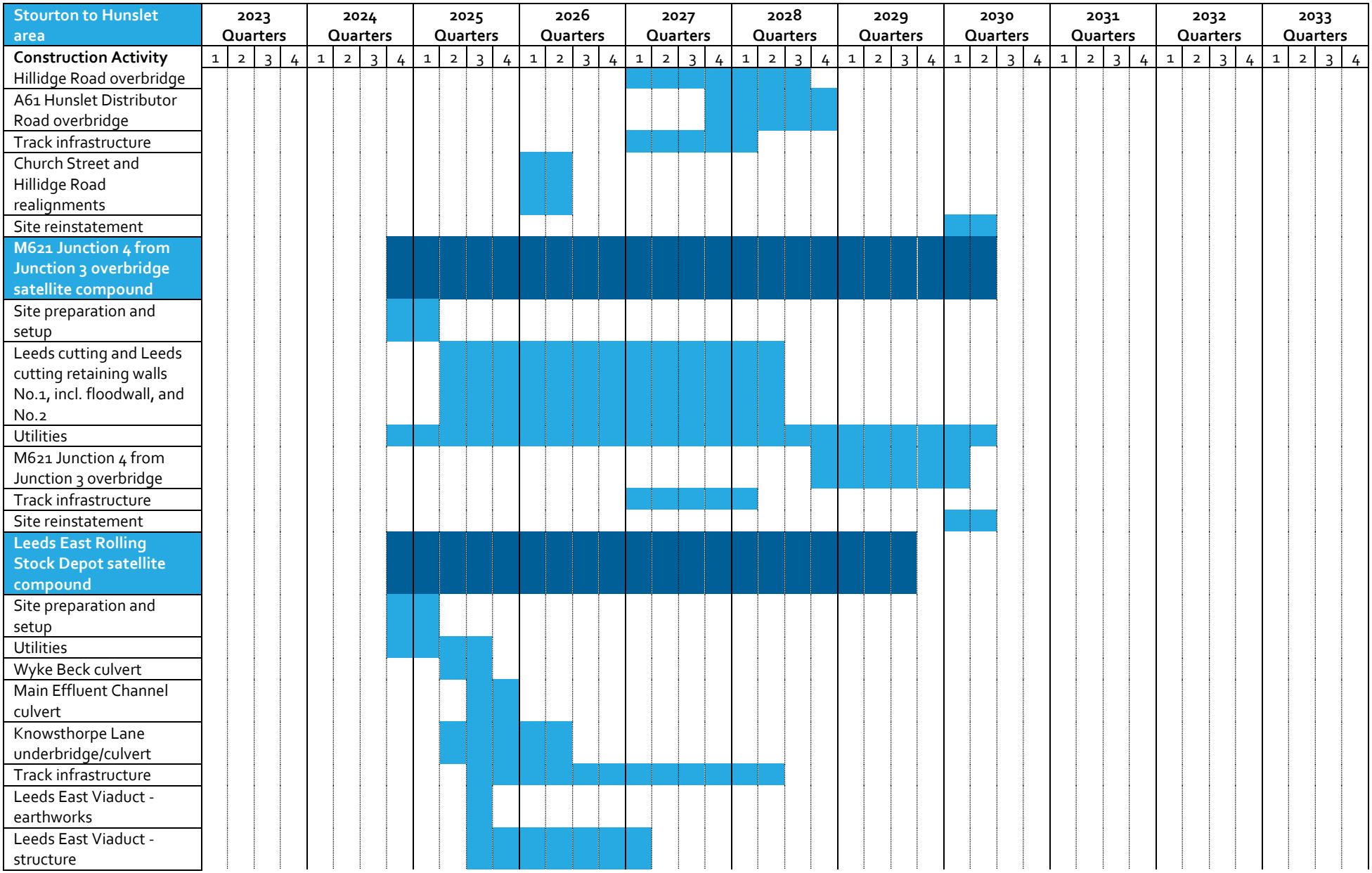
Figure 8: Indicative construction programme between 2023 and 2033




Stourton to Hunslet area
2023 Quarters
2024 Quarters
2025 Quarters
2026 Quarters
2027 Quarters
2028 Quarters
2029 Quarters
2030 Quarters
2031 Quarters
2032 Quarters
2033 Quarters
1 2 3 4
Construction Activity
M1 Junction 44 to 45 HS2 overbridge
M1 Junction 44 to 45 NR overbridge
Track infrastructure
Railway systems (build-up and installation of crossovers & Leeds East RSD slabtrack)
Site reinstatement
Aire & Calder Navigation embankment satellite compound
Site preparation and setup
Utilities
Aire & Calder Navigation embankment, Aire & Calder Navigation retaining walls No.1 and No.3, and Aire & Calder Navigation retaining wall No.2 and floodwall and HS2 access road
Stourton Embankment and Stourton Embankment Retaining Wall No.1
Track infrastructure
Site reinstatement
Pontefract Road underbridge satellite compound
Site preparation and setup
Utilities
Stourton embankment and Stourton


Stourton to Hunslet area
2023 Quarters
2024 Quarters
2025 Quarters
2026 Quarters
2027 Quarters
2028 Quarters
2029 Quarters
2030 Quarters
2031 Quarters
2032 Quarters
2033 Quarters
1 2 3 4
Construction Activity
embankment retaining walls No.2 & No.3
Pontefract Road underbridge (structure)
B6481 Pontefact Road (roadworks)
Track infrastructure
Site reinstatement
A639 Wakefield Road overbridge satellite compound
Site preparation and setup
Utilities
A639 Wakefield Road overbridge and realignment
Leeds Cutting and Leeds cutting retaining walls No.1 and No.2
Stourton embankment and Stourton embankment retaining wall No.3
Track infrastructure
Site reinstatement
Pepper Road overbridge satellite compound
Site preparation and setup
Utilities
Leeds cutting and Leeds cutting retaining walls No.1, incl. floodwall, and No.2
Pepper Road Overbridge
Track infrastructure
Site reinstatement


Stourton to Hunslet area
2023 Quarters
2024 Quarters
2025 Quarters
2026 Quarters
2027 Quarters
2028 Quarters
2029 Quarters
2030 Quarters
2031 Quarters
2032 Quarters
2033 Quarters
Construction Activity
1 2 3 4
Balm Road overbridge satellite compound
Site preparation and setup
Leeds cutting and Leeds cutting retaining walls No.1, incl. floodwall, and No.2
Utilities
Balm Road overbridge
Track infrastructure
Railway systems – Hunslet auto-transformer station
Site reinstatement
Beza Street overbridge satellite compound
Site preparation and setup
Utilities
Beza Street overbridge
Leeds cutting and Leeds cutting retaining walls No.1, incl. floodwall, and No.2
Track infrastructure
Site reinstatement
A61 Hunslet Distributor Road overbridge satellite compound
Site preparation and setup
Leeds cutting and Leeds cutting retaining walls No.1, incl. floodwall, and No.2
Utilities
A61 Hunslet Distributor Road South overbridge


Stourton to Hunslet area
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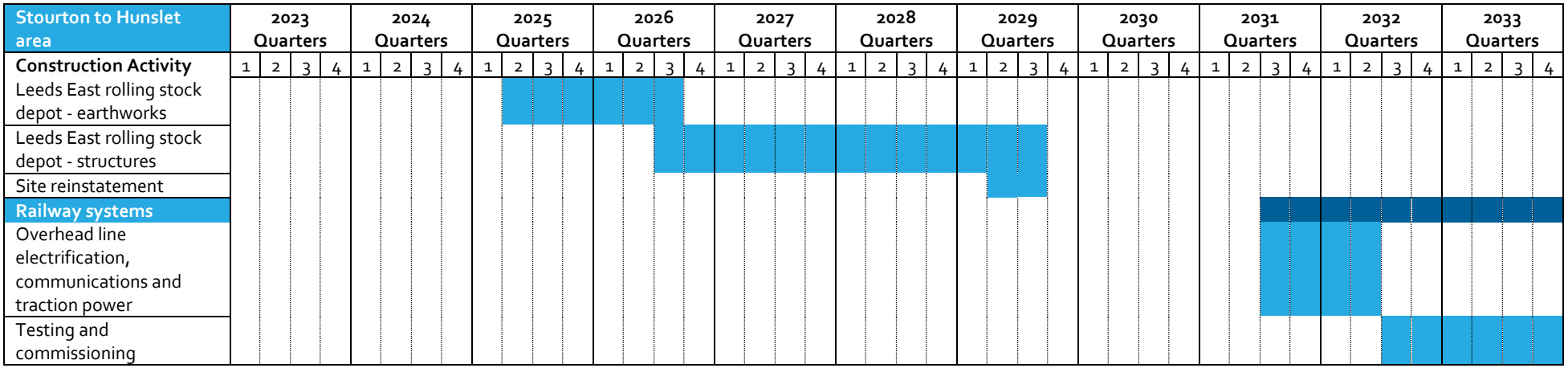
2030 Quarters
2031 Quarters
2032 Quarters
2033 Quarters
1 2 3 4
Construction Activity
Hillidge Road overbridge
A61 Hunslet Distributor Road overbridge
Track infrastructure
Church Street and Hillidge Road realignments
Site reinstatement
M621 Junction 4 from Junction 3 overbridge satellite compound
Site preparation and setup
Leeds cutting and Leeds cutting retaining walls No.1, incl. floodwall, and No.2
Utilities
M621 Junction 4 from Junction 3 overbridge
Track infrastructure
Site reinstatement
Leeds East Rolling Stock Depot satellite compound
Site preparation and setup
Utilities
Wyke Beck culvert
Main Effluent Channel culvert
Knowsthorpe Lane underbridge/culvert
Track infrastructure
Leeds East Viaduct - earthworks
Leeds East Viaduct - structure


Stourton to Hunslet area
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2025 Quarters
2026 Quarters
2027 Quarters
2028 Quarters
2029 Quarters
2030 Quarters
2031 Quarters
2032 Quarters
2033 Quarters
1 2 3 4
Construction Activity
Leeds East rolling stock depot - earthworks
Leeds East rolling stock depot - structures
Site reinstatement
Railway systems
Overhead line electrification, communications and traction power
Testing and commissioning

2.4 Operation of the Proposed Scheme

Introduction

2.4.1 This section describes the operational characteristics of the Proposed Scheme in the Stourton to Hunslet 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 five trains per hour each way passing through the Stourton to Hunslet 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 infrastructure maintenance depot (IMD) in the Staveley to Aston area (LA11). Further information on the Staveley IMD can be found in Volume 2: Community area report LA11: Staveley to Aston.

Operational waste and material resources

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

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

Monitoring during operation

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

2.4.10 Relevant local authorities and consenting authorities, such as the Environment Agency, will be consulted on the monitoring procedures to be implemented 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 Stourton to Hunslet 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 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 Stourton to Hunslet area, and environmental receptors including: the Aire and Calder Navigation Canal; Halton Moor Local Nature Reserve; Temple Newsam Estate Wood Local Wildlife Site; Middleton Park shaft mounds Scheduled Monument; Grade II* listed Garden Gate public house; and Grade II* listed Hunslet Mill.

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 2b engagement and consultation

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

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

Engagement 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 SMR were received, as a result of which changes were made to the SMR. These are set out in the SMR Consultation Summary Report published alongside this working draft ES, and will be used to inform the assessment methodologies applied for the formal ES.

Consultation on the working draft ES and ongoing engagement

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

3.2.4 These consultations and wider feedback from ongoing stakeholder engagement will continue to be considered as part of the ongoing design of the Proposed Scheme and assessment and identification of mitigation opportunities for the Stourton to Hunslet 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 Stourton to Hunslet area since the initial preferred route announcement in November 2016, and which are informing the Proposed Scheme, are:

- temporary and permanent land requirements during construction and operation;
- refining the location of balancing ponds and environmental mitigation to minimise the loss of agricultural land;
- provision of access to severed of community amenities;
- retention or realignment of public rights of way (PRoW), including the Trans Pennine Trail, which is affected by the Proposed Scheme;
- temporary or permanent changes to road access;
- issues around traffic during construction;
- impacts on access to local community facilities;
- impacts to local businesses;

- impact on rail freight connectivity and maintenance depots; and
- location and potential impact of the Leeds East rolling stock depot.

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 Stourton to Hunslet 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' groups, such as Hunslet Carr Residents Association, and non-motorised user groups, such as Leeds Local Access Forum, Leeds Cycling Campaign, Leeds Ramblers and representatives of the equestrian community.

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 but also through the www.gov.uk/hs2 website. Documents have been made available online and in community libraries. Members of local communities and other interested parties have been invited to engage on issues pertinent to the working draft ES and the development of the Proposed Scheme design.

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

Table 10: Engagement to date with community stakeholders

Stakeholder	Area of focus
Rothwell Tenants and Residents Association	Meeting to discuss the route of the Proposed Scheme, construction and logistics, and impacts around Rothwell.
Hunslet Carr Residents Association	Meeting to discuss the route of the Proposed Scheme, construction and logistics, and impacts around Hunslet Carr.

Stakeholder	Area of focus
Leeds Local Access Forum (LLAF)	Meeting to discuss the route of the Proposed Scheme in relation to local PRoW and access, and schedule of engagement.
Leeds Cycling Campaign	Meeting to discuss the route of the Proposed Scheme in relation to local PRoW and access, and schedule of engagement.
Leeds Ramblers	Meeting to discuss the route of the Proposed Scheme in relation to local footpaths and access, and schedule of engagement.
LLAF Equestrian representative	Meeting to discuss the route of the Proposed Scheme in relation to local PRoW and access, and schedule of engagement.

Local authorities and parish councils

3.4.6 Direct engagement has been offered to and undertaken with Leeds City Council (LCC) and other local authorities within the Stourton to Hunslet area. The purpose of this engagement is to collate local baseline information and knowledge to inform the design and assessment, identify and understand local issues and concerns, provide access to wider stakeholders and communities and provide a mechanism for ongoing dialogue and discussion on the assessment and design development.

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

3.4.8 Key issues identified during engagement with the local authorities include those summarised in Table 11.

Table 11: Engagement to date with local authorities

Stakeholder	Area of focus
Leeds City Council (LCC)	General introductory and project update meetings, including briefings to Council leaders. Discussion on the needs of the local authority, including approach to engagement with stakeholders.
	Meeting with technical leads to collate data and discuss key assessment topics including: air quality; community and equality issues; ecology; flood risk; drainage and water; historic environment; landscape and visual issues; land quality; road diversions and realignments; socio-economics; sound, noise and vibration; traffic and transport; utilities; and waste and material resources.
	Transport Assessment Scoping Report and Modelling.
	Seeking information related to planned and committed developments.
	Access to land owned by LCC.
West Yorkshire Combined Authority (WYCA)	Meeting to discuss transport assessment scoping and autumn traffic surveys, and the Transport Assessment Modelling Working Group.
WYCA and LCC combined meetings	Ongoing engagement to discuss local public transport impacts in relation to HS2 and integrating transport in central Leeds.

3.4.9 Councils will continue to be engaged as part of the design development of the Proposed Scheme with ongoing dialogue on key topics such as highways, PRoW and the draft Code of Construction Practice (CoCP)[17].

Expert, technical and specialist groups

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

- Animal and Plant Health Agency;
- Biological Records Centre;
- British Geological Survey;
- Campaign to Protect Rural England;
- Canal & River Trust;
- Coal Authority;
- Country Land and Business Association;
- Department for Environment, Food and Rural Affairs;
- emergency services;
- English Heritage;
- Environment Agency;
- Equality and Human Rights Commission;
- Fera Science Ltd;
- Forestry Commission;
- Highways England;
- Historic England;
- Homes England;
- Inland Waterways Association;
- Leeds City Region Enterprise Partnership;
- National Farmers' Union;
- National Trust;
- Natural England;
- Network Rail;

[17] Supporting document: Draft Code of Construction Practice

- NHS Leeds South and East Clinical Commissioning Group;
- Public Health England;
- The Ramblers;
- Royal Agricultural Society;
- Royal Society for the Protection of Birds;
- The Trans Pennine Trail;
- utilities companies relevant to this area;
- West Yorkshire Archaeology Advisory Service;
- West Yorkshire Bat Group;
- West Yorkshire Health Protection Team;
- Woodland Trust; and
- Yorkshire Wildlife Trust.

3.4.11 A key purpose of this engagement has been to obtain detailed specialist baseline information to inform the working draft ES and the design development of the Proposed Scheme. Organisations with a specialist interest, for example the Canal & River Trust's interest in canals and waterways, have informed individual technical assessments such as the flooding and drainage assessments.

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

Utilities

3.4.13 Engagement is also ongoing with utility companies and statutory stakeholders such as BT Openreach, CityFibre, GeneSys, Northern Gas Networks, Northern Powergrid, Sky Telecommunication Services, Virgin Media, and Yorkshire Water to establish what infrastructure exists in the Stourton to Hunslet area and how it may need to be modified as part of the Proposed Scheme.

Directly affected individuals, major asset owners and businesses

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

3.4.15 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 Stourton to Hunslet area, information events were held at The Met Hotel, Leeds on 4 June 2018, The Oulton Institute on 4 July 2018 and Normanton Golf Club on 11 July 2018. Facilities were available at the

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

3.4.16 Engagement has been undertaken with major asset owners including Freightliner to discuss the interfaces between their respective property and the Proposed Scheme.

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

4 Agriculture, forestry and soils

4.1 Introduction

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

4.1.2 Engagement with farmers and landowners has commenced and is ongoing. The purpose of the engagement has been to obtain baseline information on the scale and nature of the farm and forestry operations and related farm-based uses, and to provide farmers and landowners with the opportunity to raise issues and discuss mitigation in relation to the Proposed Scheme. Engagement undertaken with farmers and landowners will be documented in a farm pack for each farm holding within a Phase 2b Farmers and Growers Guide[18].

4.1.3 Maps showing the location of the key environmental (Map Series CT-10), 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: LA17 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)[19].

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

4.2.3 The quality of agricultural land in England and Wales is assessed according to the Agricultural Land Classification (ALC)[20] 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

[18] 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
[19] Supporting document: HS2 Phase 2b Environmental Impact Assessment Scope and Methodology Report
[20] 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 forms 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 would 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 Stourton to Hunslet 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 Stourton to Hunslet 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)[21]. Superficial deposits of alluvium underlie the parts of the study area within the vicinity of the River Aire and comprise variable proportions of clay, sand and gravel.

4.3.3 River Terrace Deposits of clay, sand and gravel are mapped across the valley footslopes in the west of the study area. Glaciofluvial sand and gravel is mapped across higher ground, north of the A639 in the south.

4.3.4 The bedrock geology is of Carboniferous-age, of the Pennine Coal Measures Group. The Pennine Coal Measures Group (of which the Pennine Lower and Middle Coal Measures Formations are components) includes interbedded grey mudstones, siltstones and pale grey sandstones with numerous coal seams.

4.3.5 The Pennine Lower Coal Measures Formation is mapped across most of the study area, from north-west of Woodlesford to Hunslet. Narrow bands of mainly sandstone are mapped intercepting the main bedrock and are aligned roughly east to west.

4.3.6 In the east of the study area, to the south-east of the M1, the bedrock is of the Pennine Middle Coal Measures Formation, which includes an outcrop of Thornhill Rock sandstone.

Topography and drainage

4.3.7 The main topographical feature in this study area is the broad valley of the River Aire, which is at around 20m above Ordnance Datum (AOD).

4.3.8 The River Aire has cut into the underlying mudstone, siltstone and sandstone forming generally shallow to moderate slopes on its southern valley side. Most of the slopes are shallower than 7 degrees and not limiting to agricultural land quality. Altitudes fall from around 60m AOD towards the channel of the River Aire along relatively uniform slopes. The valley bottom extends northwards and includes a number of water bodies created from former gravel pits.

4.3.9 The Environment Agency's Flood Map for Planning (rivers and sea)[22] has been used to scope the baseline flood risk for flooding from main rivers and ordinary watercourses. Land at risk of flooding is present throughout the study area within the valley and floodplains of the River Aire. The land is classed as Flood Zones 2 and 3[23]. Further details are provided in Section 15, Water resources and flood risk.

Description and distribution of soil types

4.3.10 The broad characteristics of the soils likely to be present in the study area are described by the Soil Survey of England and Wales[24] and their general distribution is shown on the National Soil Map[25]. Soils possessing similar characteristics are amalgamated into soil associations.

[21] British Geological Survey (2018). Geology of Britain viewer. Available online at: http://mapapps.bgs.ac.uk/geologyofbritain/home.html
[22] Environment Agency (2018). Flood Map for Planning. Available online at: https://flood-map-for-planning.service.gov.uk/
[23] 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.
[24] 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.
[25] Cranfield University (2001), *The National Soil Map of England and Wales 1:250,000 scale.* Cranfield University: National Soil Resources Institute.

4.3.11 There is one known soil association in this study area: the Rivington 1 association, mapped to the north of Rothwell. Its presence has been confirmed by published soil survey data[26]. The remainder of the study area is mapped as urban land.

4.3.12 Rivington 1 soils comprise either well drained sandy loam or sandy silt loam topsoil overlying sandstone or extremely stony sandy loam. Soil profiles are well drained, of Wetness Class[27] (WC) I.

Soil and land use interactions

Agricultural land quality

4.3.13 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.

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

4.3.15 Climate within this area does not in itself place any limitation on agricultural land quality. However, the interactions of climate with soil characteristics are important in determining the wetness and droughtiness[28] limitations of the land.

4.3.16 The local agro-climatic data have been interpolated from the Meteorological Office's standard 5km grid point dataset[29] for two points within the study area. The data show climate in the area to be cool and moderately dry. The number of field capacity days[30] (FCDs), when the moisture deficit[31] is zero, ranges from 149 to 153 days per annum. This is about average for lowland England (150 days). Moisture deficits, which give an indication of the liability of soils to droughtiness in summer, are moderate to moderately small.

4.3.17 Site factors such as flood risk are considered to be limiting to agricultural land quality in much of the area within the broad valley of the River Aire and are likely to be to Subgrade 3b.

4.3.18 The main physical limitations that result from interactions between soil, climate and site factors are soil wetness, soil droughtiness and a localised susceptibility to erosion. 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

[26] ADAS (1994), *Agricultural Land Classification Report, Leeds UDP, topic 738, November 1994. Job No 139/94*
[27] 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.
[28] 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
[29] Meteorological Office (1989), *Gridpoint Meteorological data for Agricultural Land Classification of England and Wales and other Climatological Investigations*.
[30] 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.
[31] 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.

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

4.3.19 Soils of the Rivington 1 association comprising either well-drained, sandy loam or sandy silt loam topsoil over sandy loam subsoil or sandstone, are mostly likely to be limited by droughtiness, the severity of which will be influenced by the depth to bedrock.

4.3.20 Where the bedrock is at great depth, the limitation is likely to be slight, to Grade 2. As the soils become shallower, the capacity for water storage reduces, and the droughtiness limitation would increase to Subgrade 3a or Subgrade 3b. Detailed ALC mapping shows that Rivington 1 soils are of Subgrade 3a quality alongside the M1, north-east of Junction 44.

4.3.21 As set out in the SMR, the sensitivity of BMV land in the study area is determined relative to the abundance of such land in the area, set as a 4km corridor centred on the route of the Proposed Scheme. Department for Environment, Food and Rural Affairs (Defra) predictive mapping[32] shows there is a high likelihood of encountering BMV agricultural land in the locality, which makes such land a resource of low sensitivity in this study area.

4.3.22 The preceding assessment of agricultural land quality attributed to the soil associations is based on interpretation of publicly available data and will be confirmed by detailed soil survey, as will 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

4.3.23 Soil fulfils a number of functions and services for society in addition to those of food and biomass production, which are central to social, economic and environmental sustainability. These are outlined in sources such as the Soil Strategy for England[33] and the Government's White Paper, The Natural Choice: securing the value of nature[34], 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.

[32] Defra (2005), *Likelihood of Best and Most Versatile Agricultural Land*.
[33] Defra (2009), *Soil Strategy for England.*
[34] HM Government (2011), *The Natural Choice: securing the value of nature.*

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

4.3.25 The floodplains of the River Aire 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

4.3.26 Agricultural land in the study area is exclusively in arable cultivation, in small to medium irregularly-shaped fields.

4.3.27 Woodland in the study area is found at Rothwell Country Park, and alongside the Hallam Line, the River Aire and the Aire & Calder Navigation. Other than for amenity and recreational purposes, it is not known whether any of the woodlands affected by the Proposed Scheme are managed commercially.

4.3.28 There are no environmental designations in the study area which influence agricultural land use.

Number, type and size of holdings

4.3.29 The only holding with agricultural land in the Stourton to Hunslet area has been assessed as part of the Warmfield to Swillington and Woodlesford area (LA15) due to the location of the main farm unit.

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)[35] would avoid or reduce environmental impacts during construction. Those measures that are particularly relevant to agriculture, forestry and soils are set out in the draft CoCP and relate to:

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

[35] Supporting document: Draft Code of Construction Practice

- the provision of a method statement within the farm pack for stripping, handling, storing and replacing agricultural and woodland soils to reduce risks associated with soil degradation on areas of land to be returned to agriculture and woodland following construction, based on detailed soil survey work to be undertaken prior to construction. This would include any remediation measures necessary following the completion of works. Where they occur, there would 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 land required to construct the Proposed Scheme (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, measures would be incorporated to avoid or mitigate adverse impacts on agriculture, forestry and soils.

4.4.4 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.

4.4.5 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.

Assessment of impacts and effects

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

4.4.7 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

4.4.8 Interpretation of publicly available data shows that the Proposed Scheme is likely to require approximately 27ha of agricultural land within the Stourton to Hunslet area during the construction phase, of which approximately 24ha (89%) are likely to be classified as BMV land (Subgrade 3a). This is a high magnitude of impact on BMV land.

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

4.4.10 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

4.4.11 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.

4.4.12 Successful soil handling is dependent upon movements being undertaken under appropriate weather and ground conditions using the appropriate equipment. The principles of soil handling are well established and set out in advisory material such as Defra's Code of Practice for the Sustainable Use of Soils[36]. These principles would be followed throughout the construction period.

4.4.13 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.

Permanent effects of construction

Impacts on agricultural land

4.4.14 Interpretation of publicly available data shows that the land required for the Proposed Scheme would likely require approximately 14ha of agricultural land permanently within the Stourton to Hunslet area, all of which (100%) is likely to be classified as BMV land (Subgrade 3a). This is a high magnitude of impact on BMV land.

4.4.15 As BMV land in this local area is a receptor of low sensitivity, it is currently anticipated that the likely effect of the Proposed Scheme on BMV land following construction would be moderate adverse, which would be significant.

Impacts on forestry land

4.4.16 It is currently not known if any areas of commercial forestry land would be required for the Proposed Scheme in this study area.

Other mitigation measures

4.4.17 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.

Summary of likely residual significant effects

4.4.18 Although the extent of land required permanently by ALC grade is unknown, current indications based on publicly available information are that the effect on BMV agricultural land would be moderate adverse in the Stourton to Hunslet area, both temporarily during construction and permanently from construction, which would be significant. The amount of land required by ALC grade will be assessed and reported in the formal ES.

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

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

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 farm buildings have been identified within approximately 100m of the route of the Proposed Scheme.

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 Stourton to Hunslet 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 Stourton to Hunslet area. Oxides of nitrogen (NOx) including nitrogen dioxide (NO_2), fine particulate matter[37] (PM_{10}, $PM_{2.5}$) 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 Leeds City Council (LCC) 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 and the key construction and operational features of the Proposed Scheme can be found in the Volume 2: LA17 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, Introduction and Methodology, Section 8, and the Scoping Methodology Report (SMR)[38].

5.2.2 The study areas for the air quality assessment have been determined on the basis of where impacts on local air quality may occur[39]:

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

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

[37] $PM_{2.5}$ and PM_{10} 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.
[38] Supporting document: HS2 Phase 2b Environmental Impact Assessment Scope and Methodology Report
[39] 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-on-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 Stourton to Hunslet area are emissions from road vehicles, commercial and agricultural activities. The main roads within the area are the M1, the M621, the A61 Hunslet Distributor Road/South Accommodation Road, the A63 Pontefract Lane and the A639 Leeds Road/Wakefield Road.

5.3.2 There are 12 industrial installations (regulated by the Environment Agency) with permits for emissions to air, relevant to the Stourton to Hunslet area; namely Cross Green Polymer Manufacturers, Stourton Dairy, Knostrop Clinical Waste Incinerator, Knostrop Sewage Treatment Works, EMR Knowsthorpe Way, Veolia Leeds Recycling and Energy Recovery Facility, Knostrop Industrial Waste Treatment, Greencore Frozen Foods, Valley House, Carbon8 Aggregates Limited, Knostrop Treatment Works and Skelton Grange Landfill Site. 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)[40], for the baseline year of 2017. The data are estimated for 1km grid squares for NOx, NO2, PM10 and PM2.5. Background concentrations are within the air quality standards for all pollutants within the Stourton to Hunslet area.

Local monitoring data

5.3.4 There is one local authority continuous monitoring station within the Stourton to Hunslet area for monitoring NO2 concentrations. This is located on Jack Lane in Hunslet. Measured concentrations in 2016 exceeded the NO2 air quality standard[41].

5.3.5 There are also two local authority diffusion tube sites within the Stourton to Hunslet area for monitoring NO2 concentrations. These are located on Woodhouse Hill Road and co-located at the Jack Lane continuous monitoring station. Measured concentrations in 2016 were within the NO2 air quality standard at Woodhouse Hill Road, but exceeded the NO2 air quality standard at Jack Lane.

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

Air quality management areas

5.3.6 There are no air quality management areas (AQMAs) within the Stourton to Hunslet area.

Receptors

5.3.7 Several locations in the Stourton to Hunslet 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 the construction or operation of the Proposed Scheme.

5.3.8 Most of the receptors which may be affected by the Proposed Scheme are residential, in the areas of Belle Isle and Hunslet. Other receptors include educational facilities, care homes and hospitals.

5.3.9 There are no statutory designated ecological sites within the Stourton to Hunslet area. Non-statutory designated ecological sites within the Stourton to Hunslet area are Rothwell Colliery Leeds Nature Area (Rothwell Country Park) and Stourton Works Lagoon Leeds Nature Area. Further details of 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)[42]. 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 would be implemented. These include:

- contractors being required to manage dust, air pollution, odour and exhaust emissions during construction works;
- inspection and visual monitoring, undertaken in consultation with the local authorities, to assess the effectiveness of the measures taken to control dust and air pollutant emissions;
- cleaning (including watering) of vehicle routes and designated vehicle waiting areas to suppress dust;
- the use of water spray systems on demolition sites to dampen down fugitive dust;

[42] Supporting documents: Draft Code of Construction Practice.

- keeping soil stockpiles away from sensitive receptors where reasonably practicable, also taking into account the prevailing wind direction relative to sensitive receptors;
- the use of enclosures to contain dust emitted from construction activities; and
- soil spreading, seeding and planting of completed earthworks as soon as reasonably practicable following completion of earthworks.

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 NO_2, PM10 and PM2.5 concentrations.

Construction dust effects

5.4.5 The risks of demolition of existing buildings, earthworks, construction of new structures and trackout[43] have been assessed for their risk to have an effect on dust soiling, human health[44] and ecological sites. There are residential and ecological receptors located within the Stourton to Hunslet area.

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

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

Construction traffic effects

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

5.4.9 The following roads would likely provide the primary access for construction vehicles in this area: the M1, the M621, the A63 Pontefract Lane, the A639 Leeds

[43] 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.
[44] Human health effects relate mainly to short-term exposure to particles of size between 2.5µm to 10µm, measured as PM10.

Road/Wakefield Road, the A61 Hunslet Distributor Road/South Accommodation Road, the B6481 Pontefract Road, Queen Street, Pepper Road, Middleton Road, Winrose Grove, Belle Isle Road, Balm Road, Moor Road, Beza Street, Church Street, Haigh Park Road, Hillidge Road and Sussex Avenue. An increase in traffic flows as a result of construction traffic, realignments, temporary closures or diversions is anticipated on these routes and on the wider road network. A detailed assessment of air quality impacts from traffic emissions in the area as a result of the Proposed Scheme will be undertaken and reported in the formal ES.

Permanent effects

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

Other mitigation measures

5.4.11 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

5.4.12 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 and changes in road alignment.

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

Operational traffic effects

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

Other mitigation measures

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

Summary of likely residual significant effects

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

Monitoring

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

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

6 Community

6.1 Introduction

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

6.1.2 The assessment draws on information gathered from engagement with the users and operators of community facilities including Leeds City Council (LCC), Leeds Ramblers, Leeds Cycling Campaign, Leeds Local Access Forum and Hunslet Carr Residents Association. The purpose of this engagement has been to understand how 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: LA17 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)[45].

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 would 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.

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

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

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

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

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

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

6.2.10 At this stage, it has not been possible to complete surveys of public open spaces in this area; therefore, for the working draft ES an assumption has been made about the level of sensitivity on a case by case basis. This will be adjusted, as appropriate, on the basis of survey results to inform the formal ES.

6.3 Environmental baseline

6.3.1 The Proposed Scheme through the Stourton to Hunslet area (LA17) would be approximately 7.2km in length, and would lie wholly within the LCC local authority area. The route of the Proposed Scheme in the area would comprise an approximately 5.3km-long section of the HS2 Leeds spur, plus the separate 310m long Leeds East viaduct and 1.6km long Leeds East RSD.

6.3.2 The route of the Proposed Scheme would extend from Bullough Lane in Rothwell Country Park, passing under the M1 towards Stourton and onto Hunslet. The northern boundary of the area is located approximately 200m north of Junction 4 of the M621.

6.3.3 The southern extent of the Stourton to Hunslet area largely comprises green space and agricultural land situated north of the settlements of Rothwell, Woodlesford and Oulton. North of the M1 and the A639, the areas surrounding Stourton and Hunslet are more commercial, characterised by a number of industrial estates and retail parks.

Rothwell and surrounds

6.3.4 Rothwell is reported in the report for the Warmfield to Swillington and Woodlesford area (LA15). However, the community resources below fall partially within both LA15 and LA17 and are therefore reported in both.

6.3.5 Rothwell Country Park is a Yorkshire Wildlife Trust site located north-east of Rothwell, accessed from Bullough Lane. The site is bordered to the north by the Hallam Line. The park includes an extensive network of footpaths and is also accessible via the Bullough Lane underbridge from the Trans Pennine Trail and cycle route alongside the Aire & Calder Navigation.

6.3.6 There are three promoted PRoW in the area, which all follow the same section of the Aire & Calder Navigation: the Trans Pennine Trail (Leeds Link); the Paulinus Way; and St. Bernard's Way. These routes also continue through the Stourton to Hunslet area.

Stourton

6.3.7 Stourton is a largely industrial area located approximately 3km south-east of Leeds city centre. The area is bordered by the River Aire to the north-east, the M1 to the south-east and the M621 to the south-west. Pontefract Road and the Hallam Line pass through Stourton.

6.3.8 Stourton comprises approximately ten residential properties, including one which would be on the route of the Proposed Scheme. The area is dominated by several large industrial sites, including Waterside Industrial Estate, Navigation Park, Stourton Business Park, and the Freightliner Ltd Leeds Terminal on Valley Farm Way. Community facilities in Stourton include a café and a small area of green space on Skelton Grange Road. Further to the north on Thwaite Lane is the Stourton Boathouse rowing club and community centre, Thwaite Mills Museum and a narrowboat mooring site at Orchard Marina.

6.3.9 The Queens at Stourton is a public house and hotel located at the junction of the A639 Wakefield Road and Queen Street. The facility offers food and drink, car parking, private hire facilities and hotel rooms.

6.3.10 Leeds Specialist Autism Services is a support centre located in the Junction 7 Business Park on the A639 Wakefield Road. The facility provides various forms of support to adults on the autism spectrum, their families and carers.

Hunslet

6.3.11 Hunslet is an inner city urban area located approximately 1.5km south-east of Leeds city centre. The area is bordered by the River Aire to the east, the Hallam Line to the south and the M621 to the west. The A639 Wakefield Road and the A61 both pass through Hunslet, across the route of the Proposed Scheme. The route of the Proposed Scheme would be to the west of Hunslet, in a cutting immediately adjacent to the north side of the existing Hallam Line.

6.3.12 Hunslet comprises approximately 6,000 residential properties, including some which would be on the route of the Proposed Scheme. Community facilities in the study area

include four medical centres, two dentists, three nursing homes, four schools and six community centres.

6.3.13 Hunslet Parkside Amateur Rugby League Football Club (ARLFC) Pitch 1 is a full size rugby pitch with associated car park. The facility is located on Beza Street, between the A61 to the south and the Hallam Line to the north.

6.3.14 The Hunslet Club and Hunslet Community Sports Pitches and Club are two adjacent facilities offering a range of sporting activities. There are two club buildings, a number of outdoor grass and hard surface pitches, and two car parks. Access is available from The Oval and Hillidge Road, and the pitches are bordered by residential properties to the north and south.

6.3.15 Mecca Bingo is a purpose-built bingo hall located on Balm Road. The hall includes seating for 1,555 and 50 e-bingo terminals.

6.3.16 Station Hotel is a public house and hotel situated on Hillidge Road. The facility includes a car park to the rear and a small outdoor seating area.

6.4 Effects arising during construction

Avoidance and mitigation measures

6.4.1 The draft Code of Construction Practice (CoCP)[46] includes a range of provisions that would help mitigate community effects associated with construction within this area, including:

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

[46] Supporting document: Draft Code of Construction Practice

Assessment of impacts and effects

Temporary effects

Residential properties

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

Community facilities

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

Recreational facilities

6.4.4 The construction of Leeds cutting and associated works to Hillidge Road and Beza Street would require some of the land associated with Hunslet Parkside ARLFC Pitch 1 on Beza Street. The car park and a grassed area north of the pitch, together comprising approximately 40% of the total site, would be required during construction for approximately four years and six months. During this time the pitch would remain open and accessible to users, however the car park would be closed. This would result in a minor adverse effect, which would not be significant.

Open space and PRoW

6.4.5 The construction of the Rothwell Country Park cutting would require land from Rothwell Country Park on Bullough Lane. The northern edge of the park (approximately 10%) would be temporarily required during construction for approximately four years and one month. Access to the remainder of the park would be maintained throughout construction and the facility would remain open. Following construction this land would be returned back to use. This would result in a minor adverse effect, which would not be significant.

6.4.6 The construction of the Leeds East viaduct would result in the temporary severance of three promoted PRoW which follow the same section of the Aire & Calder Navigation; the Trans Pennine Trail (Leeds Link), Paulinus Way and St. Bernard's Way. Proposed mitigation and an assessment of the likely effects will be reported in the formal ES.

Permanent effects

Residential properties

6.4.7 The construction of Leeds cutting and the A639 Wakefield Road overbridge would require the demolition of one residential property on Queen Street. This residential property would be permanently lost.

6.4.8 The construction of the Proposed Scheme under Hillidge Road and the associated works to Hillidge Road overbridge would require the demolition of two residential properties on Hillidge Road. These residential properties would be permanently lost.

Community facilities

6.4.9 The construction of Leeds cutting and the A639 Wakefield Road overbridge would require the demolition of the Leeds Specialist Autism Services located within the Junction 7 Offices on the A639 Wakefield Road. Services offered at this facility include

autism awareness training, social skills workshops, autism specific counselling, employment support and community outreach support. The loss of this facility would result in a major adverse effect, which would be significant.

Recreational facilities

6.4.10 The construction of Leeds cutting and the A639 Wakefield Road overbridge would require the demolition of The Queens at Stourton public house and hotel on the corner of the A639 Wakefield Road and Queens Road. The nearest alternative pubs are The Crooked Clock on Sussex Avenue and Parnaby Tavern public house on Middleton Road, both within 1km of The Queens. The loss of this facility would result in a moderate adverse effect, which would be significant.

6.4.11 The construction of the Leeds cutting would require the demolition of Mecca Bingo on Balm Road. The hall seats 1,555 people and provides daily afternoon and evening sessions, plus a morning session on Saturdays. Additional facilities include a 211 space car park, disabled access, a hearing loop, cash machine, bar and restaurant. The nearest alternative bingo halls are Mecca Bingo on New York Street and Luda Lounge on Albion Street, both located within the city centre, approximately 3km from Mecca Bingo on Balm Road. The loss of this facility would result in a moderate adverse effect, which would be significant.

6.4.12 The construction of the Leeds cutting and the associated works to Hillidge Road overbridge would require the demolition of Station Hotel, a public house on Hillidge Road. The nearest alternative pubs are Gardener's Arms on Beza Street, Garden Gate on Whitfield Place and George IV on Grove Road, all within 1km of Station Hotel. The loss of this facility would result in a moderate adverse effect, which would be significant.

Open space and PRoW

6.4.13 The construction of the Leeds cutting and the associated works to Hillidge Road and Church Street would require the loss of some of the outdoor space at Hunslet Club on Hillidge Road. One of the playing pitches and part of the outdoor space located adjacent to Hillidge Road would be required permanently. Together these spaces comprise approximately 10% of the total outdoor space at Hunslet Club. Both the pitch and outdoor space would be unusable for their intended purpose; however, the club building and other pitches would remain usable. This would result in a major adverse effect, which would be significant.

Other mitigation measures

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

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

Summary of likely residual significant effects

6.4.16 Land required for the construction of the Proposed Scheme is likely to result in permanent residual significant adverse effects on the following resources:

- demolition of Leeds Specialist Autism Services on the A639 Wakefield Road;
- demolition of the Queens at Stourton public house on Stourton Street;
- demolition of Mecca Bingo on Balm Road;
- demolition of Station Hotel public house on Hillidge Road; and
- loss of one playing pitch and outdoor space at Hunslet Club on Hillidge Road.

Cumulative effects

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

6.4.18 No cumulative effects have been identified at this time. Any combination 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 a community, such that they change the experience of a considerable proportion of people within that community.

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

Monitoring

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

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

7 Ecology and biodiversity

7.1 Introduction

7.1.1 This section of the report identifies the predicted impacts and likely significant effects on species and habitats identified to date in the Stourton to Hunslet 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, Leeds City Council (LCC) and Yorkshire 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: LA17 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 the SMR[47].

7.2.2 In the absence of field surveys and a 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.

7.3.2 Land required for, and adjacent to, the Proposed Scheme in the Stourton to Hunslet area mainly consists of urban development with habitats broadly categorised as agricultural land, woodland, grassland, scrub and floodplain. The Proposed Scheme in

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

this area would follow the existing Hallam line and the terrain is generally flat. The route of the Proposed Scheme would cross the M1 and run alongside the River Aire, and the Aire & Calder Navigation. These watercourses would be crossed by the connection between the HS2 Leeds spur and the Leeds East rolling stock depot (RSD), which is bounded to the east by the M1.

7.3.3 Statutory and non-statutory designated sites are shown on Map Series CT-10 in the Volume2: LA17 Map Book.

Designated sites

7.3.4 There is one statutory designated site of international importance that is relevant to the assessment in the Stourton to Hunslet area. The Humber Estuary Ramsar, Special Area of Conservation (SAC) and Special Protection Area (SPA) is a multi-designated site located 38km east of the Proposed Scheme from the Stourton to Hunslet area.

7.3.5 The Humber Estuary Ramsar, SAC, and SPA cover an area of respectively 37,988ha, 36,657ha and 37,630ha. It is the largest macro-tidal estuary on the British North Sea coast and is designated for its component intertidal and coastal habitats and species. The estuary is internationally important for a number of wetland birds, and other species. The land required for the Proposed Scheme in the Stourton to Hunslet area is within the catchment of this site, connected by the River Aire, a tributary of the River Humber.

7.3.6 There is one nationally important site of special scientific interest (SSSI) that is relevant to the assessment in the Stourton to Hunslet area. The Humber Estuary SSSI, covering an area of approximately 37,000ha, is designated for its component intertidal and coastal habitats and species. The estuary is nationally important for a number of wetland birds. This SSSI is located approximately 38km east of the land required for the Proposed Scheme within the Stourton to Hunslet area. The land required for the Proposed Scheme in this area is within the Impact Risk Zone for this SSSI relevant to railway infrastructure as identified by Natural England[48].

7.3.7 For the following sites, citations provided by relevant organisations have been used in the descriptions, and where citations are outstanding, publically available sources of information have been used. Details of site interest features and reasons for designation will be included in the formal ES.

7.3.8 There is one Local Nature Reserve (LNR) of potential relevance to the assessment in the Stourton to Hunslet area, which is of district/borough value. Halton Moor LNR, covers an area of 11.2ha. The site comprises a riparian corridor along Wyke Beck, amenity grassland and planted immature woodland habitat. The LNR is located 1.1km north-west of the land required for the Proposed Scheme, to the north of the A63.

7.3.9 There is one Local Wildlife Site (LWS) of potential relevance to the assessment in the Stourton to Hunslet area, which is of county/metropolitan value. Temple Newsam Estate Wood LWS, covers an area of 20.9ha and is designated for its native bluebell

[48] 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.

cover and woodland. The LWS is located 85m north of the land required for the Proposed Scheme, to the north of the A63.

7.3.10 There are two Leeds Nature Areas (LNA) of potential relevance to the assessment, each of which is of district/borough value:

- Rothwell Colliery LNA (Rothwell Country Park), covering an area of 46.8ha. The site contains a mosaic habitat of grassland, woodland, pond and scrub. The LNA is located south of the existing Hallam Line, partially within the land required for construction of the Proposed Scheme; and
- Stourton Works Lagoon LNA, covering an area of 3.5ha. The site contains lagoon and grassland habitat. The LNA is located east of the B6481 Pontefract Road, adjacent to the land required for construction of the Proposed Scheme.

7.3.11 There are no Ancient Woodland Inventory Sites (AWIS) of potential relevance to the assessment in the area.

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

Habitats

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

Woodland

7.3.14 In addition to the aforementioned woodlands, there are 12 other areas of lowland deciduous woodland (likely to qualify as habitats of principal importance[49]), which would be within or partly within the land required for construction of the Proposed Scheme. These include woodland areas at the following locations:

- alongside the existing Hallam Line;
- the River Aire; and
- the Aire & Calder Navigation.

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

Grassland

7.3.16 Grassland areas that are not designated sites occur within the land required for construction of the Proposed Scheme. This would include the grassland between the existing Hallam Line and the Aire & Calder Navigation east of the M1, plus within the areas that would be in the Leeds East RSD, Aire & Calder Navigation embankment main compound and Aire & Calder Navigation embankment satellite compound. These grasslands may qualify as habitat of principal importance and local Biodiversity Action Plan (BAP)[50] habitat. On a precautionary basis, pending the findings of field

[49] Section 41 (41) of the Natural Environment and Rural Communities Act 2006
[50] Leeds City Council Biodiversity Action Plan. Available online at: https://www.leeds.gov.uk/docs/Leeds%20BAP%20combined.pdf

surveys (which may identify these as unimproved grasslands), these grasslands are considered to be of up to district/borough value.

Hedgerows

7.3.17 In addition to hedgerows forming part of designated sites, additional hedgerows in the Stourton to Hunslet area are likely to qualify as a habitat of principal importance and a local BAP habitat. Some may also meet the wildlife and landscape criteria to be 'important' hedgerows as defined in the Hedgerows Regulations 1997[51]. In addition, these hedgerows could also provide commuting corridors for wildlife and nesting and feeding habitat. On a precautionary basis, pending the findings of field surveys, the hedgerow network is considered to be of up to district/borough value.

Watercourses

7.3.18 The River Aire, Aire & Calder Navigation, Wyke Beck and several smaller watercourses would be crossed by the route of the Proposed Scheme or the Leeds East RSD and its connection to the HS2 Leeds spur. The River Aire, Aire & Calder Navigation and Wyke Beck may qualify as habitats of principal importance. On a precautionary basis, pending the findings of field surveys, these watercourses are considered to be of up to county/metropolitan value. The smaller watercourses are considered to be of up to district/borough value.

Water bodies

7.3.19 There are three ponds that would be located partially or wholly within the land required for the Proposed Scheme[52]. The ponds may qualify as habitats of principal importance[53] (e.g. if the habitat 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.

7.3.20 Skelton Lake, which has an area of 17ha, is part of a proposed Royal Society for the Protection of Birds (RSPB) reserve[54], which covers a wider area of 32.9ha. The wetland habitats support assemblages of breeding, passage and wintering birds. The lake is located 150m north of the land required for construction of the Proposed Scheme. Due to the habitats and species likely to be present, this area is considered to be up to district/borough value.

Ancient and veteran trees

7.3.21 Pending the results of the field surveys, it is possible that ancient and veteran trees could be present within land required for construction of the Proposed Scheme. On a precautionary basis, pending the findings of field surveys, ancient and veteran trees are considered to be of up to district/borough value.

[51] *Statutory Instrument 1997 No. 1160* Hedgerows Regulations 1997
[52] Ponds have been identified through local records, aerial imagery and field surveys conducted to date
[53] Section 41 (41) of the Natural Environment and Rural Communities Act 2006
[54] Identified by Leeds City Council during stakeholder engagement meeting on 12 February 2018

Protected and notable species

7.3.22 A summary of the likely value of fauna species of relevance to the assessment (excluding any features of species interest for which the sites described above are designated) is provided in Table 12.

Table 12: Species potentially relevant to the assessment within the Stourton to Hunslet area

Resource/feature	Value	Rationale
Bats	Up to regional	There is suitable habitat for both roosting and foraging bats along the route of the Proposed Scheme. The woodland, hedgerows, grassland and arable fields that occur along the River Aire, the Aire & Calder Navigation, the existing Hallam Line and Rothwell Colliery LNA are likely to be used by a range of bat species for foraging and commuting. Trees and buildings have been identified with potential to support roosting at several locations within 100m of the land required for the Proposed Scheme. Records confirm there are at least 10 species of bat recorded in West Yorkshire: brown long-eared bat, noctule, common pipistrelle, soprano pipistrelle, Nathusius' pipistrelle, Leisler's bat, Daubenton's bat, Natterer's bat, whiskered bat and Brandt's bat.
Otter	Up to county / metropolitan	Yorkshire Wildlife Trust reports otter as being present on the River Aire within Leeds. Habitat suitable for this species is present along the River Aire, Aire & Calder Navigation, Wyke Beck, smaller watercourses and drainage ditches.
Water vole	Up to county / metropolitan	There are unconfirmed reports of water vole present in Wyke Beck at Halton Moor LNR. Habitat suitable for this species is present along Wyke Beck, smaller watercourses and drainage ditches.
Great crested newt	Up to county / metropolitan	Habitat suitable for this species is present along the route of the Proposed Scheme, including one pond south of the B6481 Pontefract Road and two ponds in Rothwell Colliery LNA.
Birds	Up to county / metropolitan	A range of typical urban breeding and wintering birds are expected to be present, together with some woodland species and species associated with rivers and smaller watercourses such as Schedule 1 kingfisher. Suitable habitats are present in Rothwell Colliery LNA, along the existing Hallam Line and in the area of land required for the proposed Leeds East RSD.
White-clawed crayfish	Up to county / metropolitan	LCC BAP indicates that Wyke Beck and the Aire catchment supports white-clawed crayfish. Suitable habitat for white-clawed crayfish is likely to be present in Wyke Beck and smaller watercourses.
Aquatic invertebrates	Up to district / borough	Suitable habitat for aquatic invertebrates is likely to be present in the River Aire, Wyke Beck and smaller watercourses.

Resource/feature	Value	Rationale
Terrestrial invertebrates	Up to district / borough	Suitable habitat for terrestrial invertebrates is likely to be present, such as localised areas of poor-semi improved and ruderal planting and where undisturbed grassland is present on motorway verges and brownfield sites.
Fish	Up to district / borough	There are records in the river catchments affected by the Proposed Scheme of European bullhead and brown trout. Suitable habitat for notable fish species is likely to be present within the River Aire, Wyke Beck and along with smaller watercourses and water bodies.
Reptiles	Up to district / borough	Suitable habitat is present for common reptiles, including grassland and scrub adjacent to the existing Hallam Line, west of the M1, along the River Aire and Wyke Beck and in Rothwell Colliery LNA.

7.4 Effects arising during construction

Avoidance and mitigation measures

7.4.1 The following measures have been included as part of the design of the Proposed Scheme (in addition to the landscape planting shown on the Map Series CT-06 in the Volume 2: LA17 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 Leeds East viaduct and a temporary construction access road over the River Aire and the Aire & Calder Navigation would reduce direct effects to these watercourses and allow free passage for wildlife along the rivers and their banks beneath them;
- new woodland habitat creation and landscape mitigation planting would contribute towards replacing the losses of non-ancient woodland (e.g. Rothwell Colliery LNA and alongside the existing Hallam Line), and help maintain connectivity between remaining woodlands;
- 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;
- provision of new grassland habitats, including some species-rich grasslands to contribute towards replacement of grassland losses (e.g. Leeds East RSD and alongside the existing Hallam Line);
- avoidance of encroachment where possible and retention of woodland for integration into proposed landscape mitigation planting alongside the existing Hallam Line between Pepper Road and the A639 Wakefield Road and at the junction where the A61 joins the M621; and
- avoidance of encroachment and retention of grassland and trees where possible for integration into proposed landscape mitigation planting east of Westbury Grove.

7.4.2 The assessment assumes implementation of the measures set out within the draft Code of Construction Practice (CoCP)[55,56], 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

7.4.5 The land required for the Proposed Scheme is connected to the Humber Estuary Ramsar, SAC and SPA by the River Aire, a tributary of the River Humber. This site is geographically distant, being located 38km to the east of the land required for the Proposed Scheme. It is expected that this distance and the implementation of measures in the draft CoCP would ensure there are no effects to the Humber Estuary Ramsar, SAC and SPA. Having consideration to the nature of the Proposed Scheme and the distance between the land required to construct the Proposed Scheme and the receptors, these sites have been scoped out of the Habitats Regulations Assessment process.

[55] All construction will be undertaken in accordance with the Code of Construction Practice. The CoCP will also contain generic control measures and standards to be implemented throughout the full duration of the construction phase.
[56] Supporting document: Draft Code of Construction Practice

7.4.6 The land required for the Proposed Scheme is located within the Natural England Impact Risk Zone for Humber Estuary SSSI. However, due to the distance between the Proposed Scheme and the SSSI, and having regard to the measures in the draft CoCP to control impacts on the River Aire, there would be no significant effects.

7.4.7 Construction of the Rothwell Country Park cutting and a temporary site haul route would result in the permanent loss of 3.5ha (7.5%) of Rothwell Colliery LNA in the Stourton to Hunslet area. These may alter hydrological conditions that could lead to the permanent changes in potential groundwater dependent habitat within Rothwell Colliery LNA. In addition, this would result in the loss of 3.2ha (6.8%) of Rothwell Colliery LNA in the Warmfield to Swillington and Woodlesford area (reported in the Volume 2: Community area report LA15, Warmfield to Swillington and Woodlesford). Overall, this would be a permanent loss of 6.7 ha (14.3%) of Rothwell Colliery LNA and would be a permanent adverse effect on site integrity that would be significant at the district/borough level.

Habitats

Woodland

7.4.8 Construction would result in the loss of 5.6ha of woodland from the Stourton to Hunslet area. The permanent loss of these woodlands would result in an effect that would be significant up to the district/borough level. If the ongoing review identifies the presence of additional ancient woodland the effects would be significant up to the county/metropolitan level.

Grassland

7.4.9 Construction of the Proposed Scheme would result in the loss of grassland outside the designated sites, including: 1.9ha located between the existing Hallam Line and the Aire & Calder Navigation east of the M1; 3.2ha from the land required for the Aire & Calder Navigation embankment main compound and satellite compound; and within land required for the Leeds East RSD. 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 the district/borough level.

Hedgerows

7.4.10 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

7.4.11 The Leeds East RSD connection to the route of the Proposed Scheme would cross the River Aire and the Aire & Calder Navigation on a viaduct north of the M1. Whilst impacts to these watercourses would be avoided and/or reduced through the

implementation of measures in the draft CoCP the construction of the Aire & Calder Navigation retaining wall No.3 would result in a permanent adverse effect that would be significant up to county/metropolitan level.

7.4.12 The construction of culverts for Wyke Beck, Knowsthorpe Lane surface drain and the Main Effluent Channel within the Leeds East RSD would result in the permanent loss of habitat and create severance of Wyke Beck and its associated drainage channels. This would be a permanent effect that would be significant at up to the county/metropolitan level.

7.4.13 Land required for construction of the Proposed Scheme would result in the permanent loss of sections of other smaller watercourses, including minor tributaries and ditches of Wyke Beck, and severance of smaller unnamed watercourses where these are culverted. This habitat loss and fragmentation would result in an adverse effect that would be significant up to district/borough level.

Water bodies

7.4.14 Three ponds would be lost within the area of the land required for construction of the Proposed Scheme. The loss of these ponds would result in an effect that would be significant up to county/metropolitan level, if it is confirmed through field surveys that these ponds supports great crested newts or other priority species. The provision of replacement ponds would reduce this loss to a level that is not significant.

Ancient and veteran trees

7.4.15 It is assumed that any ancient and veteran trees within the land required for construction of the Proposed Scheme in the Stourton to Hunslet area would be permanently lost. Ancient and veteran trees are an irreplaceable resource and their potential loss would result in a permanent adverse effect that is significant at county/metropolitan level in each case.

Species

Bats

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

Otter

7.4.17 The construction of the Leeds East viaduct over the River Aire and the Aire & Calder Navigation would seek to avoid loss of habitat along the river corridor. Indirect effects from construction activities may result in disturbance to this species during the construction period, and prevent individuals from moving along the river corridor. However, it is anticipated that these indirect effects would be controlled through

measures in the draft CoCP. Habitat loss would affect several smaller watercourses crossed by the route of the Proposed Scheme, including Wyke Beck. On a precautionary basis, in the absence of further survey information, impacts to otter would result in an adverse effect on the conservation status of this species that would be significant up to the county/metropolitan level.

Water vole

7.4.18 The construction of Leeds East viaduct over the River Aire and Aire & Calder Navigation would seek to avoid loss of habitat along the river corridor. Indirect effects from construction activities may result in disturbance to this species during the construction period, and prevent individuals from moving along the river corridor. However, it is anticipated that these indirect effects would be controlled through measures in the draft CoCP. Habitat loss would result to several smaller watercourses crossed by the route of the Proposed Scheme, including the Wyke Beck. On a precautionary basis, in the absence of further survey information, impacts to water vole would result in an adverse effect on the conservation status of this species that would be significant up to the county/metropolitan level.

Great crested newt

7.4.19 It has been assumed that the three 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 a pond supporting great crested newts could result in the isolation and severance of breeding populations of great crested newts across this area. Where great crested newts are present, two new ponds would be created for every one pond lost within the land required for construction of the Proposed Scheme; this would contribute towards reducing the effects to not significant. Suitable terrestrial habitat would be required around all new ponds created, along with links to encourage dispersal (e.g. by incorporating existing habitat or creating new habitat), and this would require further development. In the absence of the full mitigation, the loss of the ponds and surrounding land would result in a permanent adverse effect on the conservation status of great crested newts that would be significant at up to the county/metropolitan level.

Birds

7.4.20 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 urban but with some farmland and woodland species. These may include kingfisher, which is a Schedule 1 species. On a precautionary basis, in the absence of further survey information, it has been assumed that construction of the Proposed Scheme, would result in a permanent adverse effect that would be significant up to the county/metropolitan level.

White-clawed crayfish

7.4.21 Land required for the Proposed Scheme would result in the loss of habitat for white-clawed crayfish within smaller watercourses, including Wyke Beck. On a precautionary basis, in the absence of further survey information, it has been assumed that the

construction of the Proposed Scheme would result in permanent adverse effects that would be significant up to the county/metropolitan level.

Terrestrial invertebrates

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

Aquatic invertebrates

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

Fish

7.4.24 There are records of fish from the main watercourses (River Aire, the Aire & Calder Navigation and Wyke Beck) including species such as European bullhead (listed on Annex II of the EC Habitats Directive) and brown trout. The connection to the Leeds East RSD, from the route of the Proposed Scheme, would pass over the River Aire and the Aire & Calder Navigation on a viaduct. Indirect impacts to the watercourses would be controlled through measures set out in the draft CoCP. However, other smaller watercourses would be affected by the land required for construction of the Proposed Scheme, and may require assessment under the Water Framework Directive (WFD)[57]. On a precautionary basis, in the absence of further survey information, it has been assumed that construction of the Proposed Scheme would result in permanent adverse effects that would be significant at up to the district/borough level.

Reptiles

7.4.25 Suitable habitat is likely to be present for reptiles, including grass snake near the River Aire and common lizard and slow worm in grassland and scrub habitats within the land required for the Proposed Scheme. On a precautionary basis, in the absence of further survey information, it has been assumed that this would result in permanent adverse effects that would be significant at up to the district/borough level.

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

7.4.27 Indirect effects from changes in air quality, such as that arising from increased levels of construction traffic, will be considered for sites within 200m of construction routes where habitats are considered to be sensitive to air quality changes. These effects will be reported in the formal ES.

[57] EU Water Framework Directive. Available online at: http://ec.europa.eu/environemt/water/water-framework/index_en.html

Other mitigation measures

7.4.28 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:

- provision of woodland habitat and landscape mitigation planting to replace those lost, and/or enhancement of remaining woodlands including at Rothwell Colliery LNA and along the existing Hallam Line;
- consideration of, and if required, the development of appropriate hydrological mitigation measures at Rothwell Colliery LNA, in consultation with the Environment Agency;
- provision of new ponds for those lost, especially where they support great crested newts;
- provision of additional hedgerows which would offset the losses and maintain the connectivity of the network;
- options for creation of new species rich grassland habitat (including translocation where appropriate) to offset grassland losses, including at the Leeds East RSD;
- options for enhancement of sections of Wyke Beck to mitigate/compensate habitat loss;
- 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;
- provision of additional ponds (on a two to one basis where existing ponds supporting great created newts are lost) and suitable terrestrial habitat around these ponds with habitat links to allow dispersal; and
- consideration of the need for inclusion of structures to reduce severance effects on bats.

7.4.29 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 13.

Table 13: Residual significant effects on ecological resources/features during construction

Resource/feature	Residual effect	Level at which the effect would be significant
Rothwell Colliery LNA	Permanent adverse effect on site integrity due to loss of 3.5ha (7.5%) and hydrological effects within Stourton to Hunslet area.	Up to district/borough
Woodland	Permanent adverse effect due to loss of 5.6ha of woodland outside designated sites.	Up to district/borough
Grassland	Permanent adverse effect due to loss of 5.1 ha of grasslands within designated sites and Leeds RSD.	Up to district/borough
Hedgerows	Permanent loss of hedgerows.	Up to district/borough
Watercourses	Permanent adverse effect on Aire & Calder Navigation due to Aire & Calder Navigation retaining wall No.3. Permanent adverse effect on Wyke Beck, Knowsthorpe Lane surface drain and the Main Effluent Channel and associated drainage channels due to culverting.	Up to county/metropolitan
Ancient and veteran trees	Permanent loss of individual trees.	Up to district/borough
Bats	Potential permanent adverse effect on conservation status due to loss of roosts, foraging habitat and fragmentation.	Up to regional
Otter	Potential for permanent adverse effect due to loss of suitable habitat for this species.	Up to county/metropolitan
Water vole	Potential for permanent adverse effect due to loss of suitable habitat for this species.	Up to county/metropolitan
Great crested newt	Loss of three ponds and surrounding terrestrial habitat which may support great crested newts.	Up to county/metropolitan
Birds	Permanent adverse effects through the loss of foraging and nesting opportunities for a range of woodland, wetland and grassland bird species, including Schedule 1 kingfisher.	Up to county/metropolitan
White-clawed crayfish	Potential for permanent adverse effect on conservation status due to loss of suitable habitat for this species.	Up to county/metropolitan
Terrestrial invertebrates	Potential for permanent adverse effect on conservation status due to loss of suitable habitat.	Up to district/borough
Aquatic invertebrates	Potential for permanent adverse effect on conservation status due to loss of suitable habitat.	Up to district/borough
Fish	Potential for permanent adverse effect on conservation status due to loss of suitable habitat.	Up to district/borough
Reptiles	Permanent adverse effects through loss of habitat for reptiles.	Up to district/borough

7.5 Effects arising during operation

Avoidance and mitigation measures

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

Assessment of impacts and effects

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

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

7.5.4 Barn owls are at risk of colliding with trains 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 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 plan[58] which has been developed to provide measures that would be implemented to reduce the effects of the Proposed Scheme to a level that is not significant. This is likely to include seeking opportunities to provide barn owl nest boxes and where feasible habitat enhancement opportunities at least 3km from the Proposed Scheme in consultation with 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 14.

[58] Currently in development for Phase One of HS2

Table 14*:* 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 collisions with trains.	Up to regional
Barn owl	Potential permanent adverse effect on conservation status due to collisions 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 Stourton to Hunslet area.

8 Health

8.1 Introduction

8.1.1 This section identifies the communities within the Stourton to Hunslet area (LA17) 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 the health issues in the Stourton to Hunslet area that may not be identified solely through a review of publicly available data. Engagement with key public health bodies will continue as part of the development of the Proposed Scheme.

8.1.3 This section deals specifically with impacts and effects at a local level within the Stourton to Hunslet 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 (Map Series CT-10), key construction (Map Series CT-05) and key operational (Map Series CT-06) features of the Proposed Scheme are provided in the Volume 2: LA17 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)[59].

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.

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

8.2.4 The health determinants of relevance within the Stourton to Hunslet area are:

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

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 Stourton to Hunslet area

8.3.1 The south-eastern extent of the Stourton to Hunslet area largely comprises green space and agricultural land, while the areas surrounding Stourton and Hunslet are characterised by inner city urban and industrial land-uses. As reported in Section 14, Traffic and transport, there is a network of public footpaths and a number of public rights of way (PRoW) within the vicinity of the Proposed Scheme, which provide walking routes within and around Leeds 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.

Rothwell and surrounds

8.3.3 Rothwell is located south of the route of the Proposed Scheme and comprises approximately 10,000 residential properties. The nearest residential properties would be located approximately 650m from the route.

8.3.4 There are a number of community facilities within Rothwell which fall within the Stourton to Hunslet area and provide recreational opportunities for the general public. Such facilities include Rothwell Country Park and a number of PRoW.

Stourton

8.3.5 Stourton is a largely industrial area on the outskirts of Leeds bordered by the River Aire to the north-east, the M1, the A639 Leeds Road and Bullough Lane to the south-east and the M621 to the south-west. The area is dominated by industrial sites with approximately ten residential properties, of which the nearest would be on the route of the Proposed Scheme. Community facilities in the area include a rowing club and community centre. In addition, a small area of green space on Skelton Grange Road provides recreation opportunities for the general public.

8.3.6 Leeds Specialist Autism Services is a support centre located in the Junction 7 Business Park on the A639 Wakefield Road. The facility provides various forms of support to adults aged 18 and over on the autism spectrum, their families and carers.

Hunslet

8.3.7 Hunslet is an inner city urban area located approximately 1.5km south-east of Leeds city centre; land use is predominantly residential and commercial. Hunslet comprises approximately 6,000 residential properties, the nearest of which would be on the route of the Proposed Scheme.

8.3.8 Commercial facilities include City South Retail Park, Penny Hill Shopping Centre and Beza Road Industrial Estate. Community facilities include a church, medical centres, nursing homes, schools and community centres. There are a number of outdoor sports pitches associated with the Hunslet Club which provide recreational opportunities for the general public.

Demographic and health profile of the Stourton to Hunslet area

8.3.9 The local communities in the Stourton to Hunslet area have a range of population densities, increasing in density with proximity to Leeds.

8.3.10 Data provided by the Office for National Statistics[60] for the local authority area of Leeds City Council (LCC), show that this population has a broadly similar health status compared with the national (England) averages.

8.3.11 The population has similar levels of deprivation to the national average, with regard to the combined indices of multiple deprivation[61], and the health domain (a sub-set of the indices of multiple deprivation).

8.3.12 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 Stourton to Hunslet 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; and
- incorporating landscape design and screening into the design.

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

8.4.3 HS2 Ltd would require its contractors to comply with the environmental management regime for the Proposed Scheme, which would include the measures set out in the draft Code of Construction Practice (CoCP)[62], 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.

[60] 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.
[61] 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
[62] Supporting document: Draft Code of Construction Practice

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

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

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

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

Assessment of impacts and effects

Neighbourhood quality

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

8.4.8 The construction of the Proposed Scheme 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 Stourton to Hunslet area, taking account of mitigation measures contained in the CoCP. Therefore, it is not expected that dust emissions around construction sites would contribute to adverse impacts on neighbourhood quality.

8.4.12 The construction of the Proposed Scheme would have temporary and permanent 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 Stourton to Hunslet 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 heavy goods vehicles (HGVs), would be present on a number of roads in this area, as reported in Section 14, Traffic and transport.

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

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

Access to services, health and social care

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

8.4.19 The Stourton to Hunslet area is urban in nature, with a large range of shops and services, with a broad selection, availability and capacity offering greater than average community resilience to changes in access and accessibility to such amenities and facilities during construction. The potential for health effects associated with reduced access to shops and services will be assessed 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 HGVs, 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 Stourton to Hunslet area, where community facilities are permanently lost or where the usability of land is compromised. This includes the following:

- the demolition of the Junction 7 Offices on the A639 Wakefield Road, where the Leeds Specialist Autism Services are located due to the construction of Leeds cutting and the A639 Wakefield Road overbridge;
- the demolition of The Queens at Stourton public house and hotel on the corner of the A639 Wakefield Road and Queens Road due to the construction of Leeds cutting and the A639 Wakefield Road overbridge;
- the demolition of Mecca Bingo on Balm Road due to construction of the Leeds cutting and associated site haul routes;
- the demolition of Station Hotel, a public house on Hillidge Road due to the construction of the Proposed Scheme under Hillidge Road and the associated works to Hillidge Road overbridge; and

- the loss of one of the playing pitches and part of the outdoor space associated with the Hunslet Club on Hillidge Road due to the construction of the Proposed Scheme under Hillidge Road and the associated works to Hillidge Road and Church Street. Both the pitch and outdoor space would be unusable; however, the club building and other pitches would remain usable.

8.4.23 As reported in Section 14, Traffic and transport, the route of the Proposed Scheme would intersect with a number of PRoW in the Stourton to Hunslet 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 HGVs, would be present on local roads. This could obstruct or deter pedestrians and cyclists from using these routes. Health effects associated with these impacts, including consideration of levels of use and available alternative routes for active travel and recreation, will be assessed in the formal ES.

Social capital

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

"In general terms, social capital represents social connections and all the benefits they generate. Social capital is also associated with civic participation, civic-minded attitudes and values which are important for people to cooperate, such as tolerance or trust."[63]

8.4.26 There is moderate evidence for a link between social capital and health and wellbeing outcomes. A change in social capital has the potential to influence health effects that are gained through social contact and support, social participation, reciprocity and trust. Adverse effects on health from changes in social capital could be experienced as a reduction in wellbeing or as physiological effects on the body's hormonal and immune systems, with increased susceptibility to mental and physical illness.

8.4.27 The size of the temporary construction workforce may be substantial. 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 Stourton and Hunslet. The duration of the works at each site ranges from approximately four years and six months to seven years and one month. The presence of construction workers is likely to be noticeable, with construction vehicles

[63] Office for National Statistics- Measuring Social Capital. Available online at: http://webarchive.nationalarchives.gov.uk/20160105160709/http://www.ons.gov.uk/ons/dcp171766_371693.pdf

using local roads to access compounds and workers using facilities such as shops, restaurants and public houses.

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. However, within a larger urban context, such as in the Stourton to Hunslet area, the construction workforce is unlikely to have an impact upon social dynamics, and the associated impact upon social capital.

8.4.29 The draft CoCP includes a commitment to produce and implement a community engagement framework and provide appropriately experienced community relations personnel. HS2 Ltd will engage with local authorities and community representatives to identify measures aimed at fostering and maintaining good relationships between the workforce and local communities. Any measures identified will be included within the community engagement framework as appropriate.

8.4.30 The Community section of the formal ES will include an assessment of impacts resulting from the loss of residential properties. The loss of five properties is identified as the threshold for a significant Community effect. In some cases, the Community assessment may identify significant impacts below this threshold, for example where the demolitions make up a significant proportion of a very small community.

8.4.31 The health assessment considers changes to the social environment and loss of social networks experienced by the remaining community following the loss of residential properties. For this to have an adverse impact on overall levels of social capital, the loss of homes would need to make up a sizeable proportion of the local community, with the potential to result in the direct loss of contacts in the local area and/or a noticeable reduction in the number of people using local facilities. This will be judged on a case-by-case basis, taking account of the size of the community and its characteristics. Therefore, not all of the significant effects identified in the Community section will result in adverse health and wellbeing effects.

8.4.32 In the Stourton to Hunslet area, no health effects are anticipated on the remaining community, where three residential properties would be demolished as a result of the Proposed Scheme. Effects on residents directly impacted by demolitions are assessed in Volume 3, Section 7, Health.

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 Stourton to Hunslet area will be reported in the formal ES.

Assessment of impacts and effects

Neighbourhood quality

8.5.2 Operational noise would not be likely to cause any significant impacts at residential and non-residential receptors, as reported in Section 13, Sound, noise and vibration. The permanent features of the Proposed Scheme may be visible from 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.

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 Stourton to Hunslet 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, Leeds City Council (LCC) and West Yorkshire Archaeology Advisory Service. 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: LA17 Map Book. Only designated heritage assets within the Stourton to Hunslet area are shown on Maps CT-10-430b to CT-10-432a. Non-designated heritage assets have also been assessed as part of this work, although they are not illustrated on these maps.

9.1.4 A gazetteer of designated and non-designated heritage assets with accompanying maps will be included in the formal ES. The formal ES will also include a Historic Landscape Characterisation Report, which will identify historic landscape character areas potentially affected by the Proposed Scheme.

9.1.5 Assets have been identified in this section of the report using their National Heritage List for England (NHLE) or Historic Environment Record (HER) name and number (numbers prefixed WYHER). 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)[64], including the method for determining the value of a heritage asset and magnitude of impact (Tables 19 and 20 in the SMR, respectively).

9.2.2 The assessment focuses on the extent to which the Proposed Scheme would affect designated and non-designated heritage assets. Impacts on assets as a result of the Proposed Scheme would occur largely through the physical removal and alteration of heritage assets and changes to their setting.

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

9.2.3 The study area within which a detailed assessment of all assets, designated and non-designated, has been carried out is defined as the land required for the Proposed Scheme plus 250m. This is referred to in the remainder of this assessment as the 250m 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. 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.

9.2.9 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.

9.2.10 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 National Heritage List for England (NHLE) (Historic England register of designated heritage assets);
- West Yorkshire Historic Environment Record; and
- historic maps and aerial photography.

9.3.2 In addition to collating documentary baseline data, site visits have been undertaken.

Designated assets

9.3.3 There are no designated heritage assets located partially or wholly within the land required for the Proposed Scheme.

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

- a scheduled monument of high value: Middleton Park shaft mounds (NHLE 1017758);
- two Grade II* listed buildings of high value: The Garden Gate Public House (NHLE 1255677) and Hunslet Mill (NHLE 1256253);
- a Grade II listed building of high value: Hunslet Cemetery (NHLE 1001678) which is also a Grade II registered park and garden of moderate value (NHLE 1001678); and
- 29 Grade II listed buildings of moderate value, including eight in Hunslet Cemetery, six in the Thwaite Mills complex (Thwaite Mill itself is labelled NHLE 1313492) and four in the Victoria Flax Mills complex (Victoria Works Range is labelled NHLE 1256251).

Non-designated assets

9.3.5 The site of a post-medieval burial ground on Hillidge Road, a non-designated asset of high value, lies wholly or partially within the land required for the Proposed Scheme.

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

- railways and former railways, including the Hallam Line, the North Midland Railway, Middleton Railway and the East & West Yorkshire Union Railway;
- railway structures including Bullough Lane underbridge, the B6481 Pontefract Road underbridge, Pepper Road overbridge, Balm Road overbridge, the railway corridor and retaining walls to the siding which formerly linked Hunslet Engine Works to the Hallam Line, and the bridge abutments and retaining walls of the Hallam Line cutting;

- the sites of former railway structures and buildings included Stourton engine shed and wagon repairing shop, Stourton Station and Hunslet Station;
- the Aire & Calder Navigation;
- The Queens at Stourton on the A639 Wakefield Road, Stourton, (a public house) and Station Hotel, Hillidge Road;
- former industrial buildings, including a brass foundry (76B Hillidge Road), a clothing manufacturers on Hillidge Road and an engineering works on Pepper Road;
- the site of Hunslet Union Workhouse to the west of Hillidge Road;
- a dwelling at 76 Hillidge Road;
- the separate sites of successive versions of Thorpe Hall in Thorpe Stapleton (WYHER 1147 and Thorpe Hall ironworks (WYHER 14749));
- the sites of former industrial enterprises, including a brickworks to the west of Hillidge Road (WYHER 15995), Tenter Croft Pottery (WYHER 12128) and a chemical works at Haigh Park, Rothwell (WYHER 15997);
- the sites of inns (Anchor Inn, Bullough Lane; Stourton Arms, B6481 Pontefract Road);
- the below-ground remains of wagonways and tramways; and
- the remains of past quarrying activities, including coal and ironstone pits (WYHER 5212) and Rothwell Colliery (WYHER 15905).

9.3.7 Non-designated heritage assets located partially or wholly in the 250m study area:

- public buildings, former public buildings and the sites of public buildings including public houses (The Sun, Church Street, WYHER 16136; Parnaby Tavern, Pepper Road and the Railway Inn, Balm Road), schools (34 Lupton Street, WYHER 16141; Hunslet National School) and chapels (Hunslet Gospel Hall);
- dwellings and the sites of dwellings including Haigh Farm Cottages, Bullough Lane; Haigh Park; Haigh Cottage, Leeds Road and Grove House, Pepper Road;
- former flax mills including Balm Road Mill (WYHER 3728) and Larchfield Mills (WYHER 10367), and the site of a tenter field beside the B6481 Pontefract Road;
- current industrial premises and works, former industrial premises and works and the sites of industrial premises and works, including Hudswell, Clarke & Co Ltd, Jack Lane; Woodhouse Hill Glass Works (WYHER 16001); Hunslet Crown Glass Manufactory, Hillidge Road; North Midland Glass Works, Balm Road; Hunslet Chemical Works, Balm Road; Leeds Steel Works, Pepper Road; Vulcan Foundry (WYHER 15996); Pontifex House, Pepper Road (formerly Manns Patent Steam Cart and Wagon Company) and Skelton Grange power station (WYHER 6149); and

- the sites of former potteries, brickfields and brickyards, including Robinson & Sons (Jack Lane Pottery) (WYHER 12124) and Hunslet New Pottery (Taylor's Pottery) (WYHER 12119).

Historic environment overview

9.3.8 The bedrock geology of the Stourton to Hunslet area is formed largely of beds of coal (the Pennine Lower Coal Measures); along the course of the River Aire, which flows through the area, the coal is overlain by clay, sands and gravels. This geology has shaped how the area has been used by animals and humans since Mesolithic times.

9.3.9 Evidence for Palaeolithic activity in West Yorkshire is scarce, possibly because much of the county at this time was at the edge of, or under, glacial ice. However, around 9,500BC a period of dramatic environmental change began in Britain. Climatic warming led to a rise in sea levels and a change in vegetation patterns. Open landscapes were replaced by forests of beech and pine, and species such as arctic hare and reindeer gave way to boar and deer. These changes encouraged the development of Mesolithic hunter-gatherer societies, and the subsequent emergence of the early agricultural societies of the Neolithic.

9.3.10 Evidence from these periods is usually characterised by discoveries of stone or flint tools. In West Yorkshire, the Mesolithic period is the better understood of the two, and can produce collections of several hundred artefacts. Neolithic evidence is mostly confined to isolated stone axes, such as that found in gravels below a site close to Great Wilson Street in Leeds. However, a Neolithic pit excavated in nearby Rothwell, and the suggestion that a site near Skelton Moor Farm, just to the north-west of the Leads East rolling stock depot, contained a mortuary enclosure (an area where bodies were stored after death) are indications that Neolithic peoples had a more settled presence in the area than chance discoveries might suggest.

9.3.11 The Bronze Age which followed is often characterised by the emergence of a range of new objects in metal, such as the spearhead found in the River Aire at Thwaite Gate and the sword found during coal-mining operations at Temple Newsam, immediately north of the Stourton to Hunslet area. Although the period is also generally defined by the physical evidence it left for land division, settlement and disposal of the dead, no such evidence has been found within the Stourton to Hunslet area. The extensive field systems which had been laid out across swathes of West Yorkshire by the time of the Late Iron Age are rarely encountered in river valleys such as that which flows through the area. These remained unenclosed areas where seasonal grazing and hay cropping took place.

9.3.12 Much of Britain came under Roman control after 43AD, but it was not until around 71AD that the Brigantian territories, within which the Stourton to Hunslet area lies, followed suit. Military roads were an essential part of the colonisation, and there is conjectural evidence that the Roman road from Manchester to Tadcaster passed through what was later to become Leeds[65]. This suggestion is bolstered by the

[65] This is known as Roman Road 712 (WYHER 3538)

discovery in 1819 of what was termed a Roman ford at Dock Street. It is even possible that Roman *Cambodunum* (thought to be a fort) lay within the bounds of the later city.

9.3.13 Direct evidence of Romano-British occupation immediately east of Bullough Lane is provided by the remains of an enclosure discovered at Rothwell Haigh Colliery in the 1970s. This featured a well containing wooden objects, animal parts and a human skull, a collection hinting at a ritual function.

9.3.14 Following the Roman withdrawal of the 5th century a number of independent kingdoms began to emerge. West Yorkshire lay within Elmet until 617, when it was annexed by King Edwin of Northumbria. Leeds would have lain at the heart of Elmet, although written sources are silent on this subject until the early 8th century. The place was significant enough to be mentioned in the 11th century biography of St Cathróe of Metz, who had been taken in *c*. 842 "to the city of Loidis, which is the boundary between the Northmen and the Cumbrians".

9.3.15 By the 9th century Leeds lay within the Danelaw, a shifting area of England under Scandinavian influence and control. Many of today's towns and villages have their origins in this period, or the years of unified Anglo-Saxon rule which followed. Leeds and Hunslet are recorded in the Norman Domesday Book of 1086, and the place-names of Skelton Grange, Thorpe Stapleton and Temple Newsam, all of which also appear in the Domesday Book, survived into the 20th century. Temple Newsam had been gifted to the Knights Templar military order in 1155, and the site of their preceptory (an administrative headquarters) survived until it was subsumed by open-cast coal mining in the late 20th century.

9.3.16 In the medieval period the Stourton to Hunslet area lay in open countryside. Although predominantly agricultural, the proximity of the area to Leeds encouraged the development of other industries. Coal had been extracted in a piecemeal fashion for centuries, generally with bell pits, a technique used to exploit shallow seams. The processing of cloth is hinted at by place-name references to tenter fields, places where cloth was spread out to dry. Later there were flax mills, potteries and brickfields.

9.3.17 The area's rapidly improving transport links were important aids to the growth of these industries. By 1704, initial work to form the Aire & Calder Navigation had been completed and in 1840 the North Midland Railway opened, with stations at Stourton and Hunslet. The surrounding area's expanding network of quarries and coal mines was linked to the canal and railway by wagonways, and later by the East and West Yorkshire Union Railway.

9.3.18 These industries generated sustained demand for steam locomotives, and Hunslet became an important centre of locomotive manufacture. Jack Lane was home to a number of locomotive manufacturers, the most famous and long-lived of all being the Hunslet Engine Company. Its departure from the area in 1995 was part of a process of national economic change which saw the decline of many of the area's traditional industries, especially coal mining. Rothwell Haigh Colliery shut in the early 1980s and the coal-fired Skelton Grange Power Station ceased generation in 1995.

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)[66] sets out the measures that would be adopted, insofar as reasonably practicable, to control effects on heritage assets. These include:

- management measures that would 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 2km study area as a result of changes to their settings.

9.4.4 No significant effects are currently expected to occur as a result of temporary impacts on designated and non-designated heritage assets.

Permanent effects

9.4.5 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.

9.4.6 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.

9.4.7 The site of Thorpe Hall (WYHER 1147), a non-designated heritage asset of low value, lies immediately south of Knowsthorpe Lane. The site probably dates to the 11th century, and a stone-built tower house on the site survived in ruinous condition until the early 20th century. The below-ground remains of the hall potentially contain evidence from which an understanding of the area's manorial past could be derived. The construction of the Leeds East rolling stock depot would result in the removal of

[66] Supporting document: Draft Code of Construction Practice

all below-ground remains of the hall. This would constitute a high magnitude of impact and a moderate adverse effect.

9.4.8 The Queens at Stourton on the A639 Wakefield Road, a non-designated heritage asset of low value, would be demolished. The heritage value of this public house, which was built in the c. 1870s, lies in the evidence it provides for the 19th century growth of Stourton into an industrial and residential suburb of Leeds. Its demolition to allow construction of the A639 Wakefield Road overbridge and realignment of the A639 Wakefield Road would constitute a high magnitude of impact and a moderate adverse effect.

9.4.9 Station Hotel on Hillidge Road, a non-designated heritage asset of low value, would be demolished. The heritage value of this public house, which was built in the c. 1950s, lies in the evidence it provides for the post-war rebuilding of Hunslet. It is also an important reminder that Hunslet once possessed a railway station. Its demolition to allow the realignment of Church Street would constitute a high magnitude of impact and a moderate adverse effect.

9.4.10 The site of Thorpe Hall ironworks, Thorpe Stapleton (WYHER 14749), a non-designated heritage asset of low value, lies immediately north of Knowsthorpe Lane and is a separate site to Thorpe Hall (WYHER 1147, see above). The site comprises a former ironworks, shown on the 1st edition Ordnance Survey map of 1850, and a collection of buildings and fishponds labelled as Thorpe Hall on the 1893 1:2,500 Ordnance Survey map. The collection of buildings may have replaced the tower house of Thorpe Hall (WYHER 1147) during the medieval period. The below-ground remains of the ironworks, Thorpe Hall, its outbuildings and its fishponds potentially contain evidence from which an understanding of the area's manorial and industrial past could be derived. The construction of the Leeds East rolling stock depot would result in the removal of these remains. This would constitute a high magnitude of impact and a moderate adverse effect.

9.4.11 The fragmented boundary walls to a former engineering works on Pepper Road, non-designated heritage assets of low value, would be demolished. The engineering works is first shown on the 1908 25 inch Ordnance Survey map, where it is labelled as containing gasometers. Use of the site as Pepper Road overbridge satellite compound would require the demolition of the boundary walls, which provide evidence of the area's industrial past. This would constitute a high magnitude of impact and a moderate adverse effect.

9.4.12 The retaining walls and bridge abutments which form the northern edge of the Hallam Line cutting between Balm Road overbridge and the A61 overbridge are non-designated heritage assets of low value. These would be demolished to allow formation of Leeds Cutting retaining wall 1. The walls and abutments date from the construction of the North Midland Railway in 1840 and provide evidence for the historic development of railways in Leeds. Their demolition would constitute a high magnitude of impact and a moderate adverse effect.

9.4.13 Numbers 76 and 76B Hillidge Road, non-designated heritage assets of low value, would be demolished to allow construction of the route of the Proposed Scheme. These comprise a dwelling and a former brass foundry, probably associated with each

other (the dwelling perhaps being the foundry manager's house). Both are first shown on the 1921 25 inch Ordnance Survey map and provide evidence of the area's manufacturing past. Their demolition would constitute a high magnitude of impact and a moderate adverse effect.

9.4.14 The former factory of a clothing manufacturers on Hillidge Road (now occupied by an auctioneers), a non-designated heritage asset of low value, would be demolished to allow formation of the A61 Hunslet Distributor Road overbridge satellite compound. The building first appears on the 1908 25 inch Ordnance Survey map and provides evidence of the area's manufacturing past. Its demolition would constitute a high magnitude of impact and a moderate adverse effect.

9.4.15 The site of a post-medieval burial ground, a non-designated heritage asset of high value which lies beside the A61 in Hunslet, may be impacted on by works associated with construction of the A61 Hunslet Distributor Road South Overbridge. An archaeological watching brief in 2007 of works associated with improvements to the A61[67] (WYHER 11325) recorded the disturbed parts of a grave. The possibility is noted, therefore, that much if not all of the burial ground may already have been removed during previous road construction works. The burial ground is shown on the 1850 1:1,056 Ordnance Survey map, and marked as disused on the 1891 1:500 Ordnance Survey map. It is possible the burial ground related to Hunslet Union Workhouse, which lay to the north and operated between 1760 and 1903. Construction of the Proposed Scheme may remove the remaining part of the burial ground. This would constitute a high magnitude of impact and a major adverse effect.

9.4.16 The site of Hunslet Union Workhouse, a non-designated heritage asset of low value to the west of Hillidge Road, may be impacted on by formation of the A61 Hunslet Distributor Road overbridge satellite compound. Hunslet Union Workhouse operated between 1760 and 1903 and originally served the township of Hunslet. However, in 1869 the Hunslet Union was formed by the addition of the parishes of Middleton, Osmondthorpe, Oulton-with-Woodlesford, Rothwell, Temple Newsam and Thorpe Stapleton. The remains of the workhouse may provide evidence of how the authorities afforded shelter and employment for the destitute of Hunslet and surrounding area. Removal of these remains would constitute a high magnitude of impact and a moderate adverse effect.

9.4.17 The railway corridor and retaining walls to the siding which formerly linked Hunslet Engine Works on Jack Lane to the Hallam Line are non-designated heritage assets of low value. These would be partially removed to allow formation of the route of the Proposed Scheme. The assets have a group value with the remaining parts of the works, principally the railway tracks which remain embedded in the surface of Jack Lane and the Grade II listed Hunslet Engine Company Offices (NHLE 1375028), a building which lies in the adjoining Leeds Station area and would not be physically impacted on. Together, these elements provide physical evidence of Hunslet's important locomotive manufacturing past. The partial removal of the railway corridor

[67] On-Site Archaeology, 2008, Leeds Inner Ring Road: Archaeological Watching Brief, unpublished report

and retaining walls to the siding would constitute a high magnitude of impact and a moderate adverse effect.

9.4.18 The site of a brickworks (WYHER 15995), a non-designated heritage asset of low value, lies to the west of Hillidge Road. The brickworks are first shown on the 1891 1:500 Ordnance Survey map. The below-ground remains of the works could provide evidence of the Hunslet's industrial past and 19th century expansion. Their removal during formation of the A61 Hunslet Distributor Road overbridge satellite compound would constitute a high magnitude of impact and a moderate adverse effect.

9.4.19 No significant effects are currently expected to occur as a result of permanent impacts on the setting of designated or non-designated heritage assets.

Other mitigation measures

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

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

Summary of likely residual significant effects

9.4.21 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.

9.4.22 As no specific mitigation measures have yet been identified in relation to the heritage assets described above, the residual effects are the same as those reported under permanent effects.

9.5 Effects arising from operation

Avoidance and mitigation measures

9.5.1 The following measures have been incorporated into the design of the Proposed Scheme, which would reduce the impacts and effects on heritage assets as shown on the CT-06 Map Series within the Volume 2: LA17 Map Book:

- noise mitigation measures have been included within the Proposed Scheme to reduce potential impacts on identified assets; and
- landscape planting could increasingly reduce impacts on the setting of the designated assets within the Stourton to Hunslet area as it matures.

Assessment of impacts and effects

9.5.2 The assessment considers the Proposed Scheme once operational and all effects are considered to be permanent.

9.5.3 During the operation of the Proposed Scheme no further ground works are anticipated, and as such there would be no further physical impacts on heritage assets arising from the operation of the Proposed Scheme.

9.5.4 Impacts on heritage assets due to changes in their settings arising from the presence of the Proposed Scheme are reported as permanent construction effects and are not repeated in detail here, although they would continue throughout the operation of the Proposed Scheme.

9.5.5 No significant effects to the setting of heritage assets would occur as a result of operation of the Proposed Scheme.

Other mitigation measures

9.5.6 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

9.5.7 As no mitigation beyond that described has been identified, it is currently anticipated that the residual effects would be the same as those reported in the assessment of effects during operation.

Monitoring

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

9.5.9 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 Stourton to Hunslet area (LA17) 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, Leeds City Council (LCC), the Environment Agency, Fera Science Ltd (FSL)[68] 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), 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: LA17 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)[69].

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 sensitive receptors within the roadways reduces the risk of an impact occurring to very

[68] Formerly known as the Food and Environment Research Agency.
[69] Supporting document: HS2 Phase 2b Environmental Impact Assessment Scope and Methodology Report

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.

10.2.6 A CSM approach has been used to provide an understanding of the types of contaminants that may be present, the likely sources and/or pathways by which contamination can spread and the potential receptors (i.e. people and the wider environment) that could be affected. It indicates the types of impacts that existing contamination may be having at present and may have during and after construction.

10.2.7 The minerals assessment is based upon the mineral resources[70] identified on published Mineral Plans, and existing planning or licensed areas. Any inference of minerals provided by geological maps/reports is excluded (except where these are covered by a published mineral plan).

10.2.8 The geo-conservation assessment is based upon publicly available local geological trust records.

10.3 Environmental baseline

Existing baseline

10.3.1 Baseline data has been collected from a range of sources including Ordnance Survey mapping, the BGS, Coal Authority, Public Health England, the Environment Agency, Natural England, Fera Science Ltd and the APHA records, as well as web sources such as local geological trusts.

Geology

10.3.2 This section describes the underlying ground conditions within the Stourton to Hunslet area. Recent changes in lithostratigraphic classifications by the BGS have been incorporated where appropriate[71].

10.3.3 Table 15 provides a summary of the geology (made ground, superficial and bedrock units) underlying the Proposed Scheme in the study area.

[70] Defined in the SMR as "*mineral body including aggregates, salt, coal and other hydrocarbons, Petroleum Extraction Development Licences (PEDLs), Shale Prospective Areas (SPAs)*".
[71] British Geological Survey, (2014), Lithostratigraphy of the Pennine Coal Measures. Available online at: http://www.bgs.ac.uk/lexicon/lexicon.cfm?pub=PMCM

Table 15: Summary of the geology underlying the land quality study area

Geology	Distribution	Formation description	Aquifer classification
Made Ground			
Made Ground	The majority of the area has been previously developed in some form, and there are therefore likely to be deposits of made ground across the entire study area.	Artificial ground comprising variable deposits of reworked natural and man-made materials.	None
Superficial			
Alluvium	Alluvial deposits are present beneath a large part of the proposed Leeds East rolling stock depot and the area north of the B6481 Pontefract Road, running north-west to south-east roughly following the route of the River Aire.	Clay, sand and gravel	Secondary A
River terrace deposits	Deposits are present in the western part of the study area with the exception of Woodhouse Hill and the northern part of the proposed Leeds East rolling stock depot. Deposits are not present east of the M1.	Clay, sand and gravel	Secondary A
Head	Small linear area in the south of the study area, between the M1 and Rothwell Country Park.	Gravelly clay	Secondary (undifferentiated)
Glaciofluvial deposits	Area around A639 Leeds Road in the south-eastern extent of the study area.	Sand and gravel	Secondary A
Bedrock			
Pennine Middle Coal Measures Formation	Band running north-east to south-west through Woodhouse Hill and small areas in the south-eastern extent of the study area through Bell Hill and Rothwell Haigh.	Interbedded mudstone, siltstone and sandstone with coal seams	Secondary A
Pennine Lower Coal Measures Formation	Majority of the study area.	Interbedded mudstone, siltstone and sandstone with coal seams	Secondary A

Made ground

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

10.3.5 There are likely to be significant deposits of made ground across the majority of the study area. The depth and nature of fill or reworked ground would depend on historical land uses. There is evidence of historical and authorised landfilling within the area, which may comprise more significant deposits of made ground. Colliery spoil heaps are also present.

10.3.6 Made ground is recorded on the BGS geological map of the area. This includes small areas of made, infilled and worked ground across the study area, associated with more discrete historical land uses.

10.3.7 Farm burial or pyre sites associated with the 2001 outbreak of foot and mouth disease are very unlikely to be present within the study area due to its predominantly urban setting. The APHA Foot and Mouth Disease (FMD) County Status maps[72] show high risk, at risk and FMD free counties during the 2001-2002 outbreak. According to the maps the study area falls within an FMD free area. However, older unrecorded sites may be present from the 1967 outbreak. Similarly, records and anecdotal reports of anthrax-infected cattle burials have also been found, generally relating to burials over 50 to 100 years ago. In all cases, the records do not provide an exact location for the burial or pyre sites and other, unrecorded sites may be present.

Superficial geology

10.3.8 Alluvial deposits comprising variable proportions of clay, sand and gravel underlie the parts of the study area within the vicinity of the River Aire. This includes the majority of the area north of the Proposed Scheme from Woodlesford to the B6481 Pontefract Road, and includes the site of the proposed Leeds East rolling stock depot (RSD).

10.3.9 River terrace deposits comprising clay, sand and gravel are present beneath the western part of the study area, with the exception of the Woodhouse Hill area, and also in the northern part of the proposed Leeds East RSD. Deposits are not present east of the M1.

10.3.10 Small pockets of glaciofluvial deposits comprising sand and gravel, and head deposits, comprising unsorted gravelly clay, are present in the south-eastern extent of the study area, immediately north of the M1 and along the route of the A639 extending to the south-east from the M1.

Bedrock geology

10.3.11 The bedrock geology in this area comprises the Pennine Lower and Middle Coal Measures Formations, comprising cyclical layers of interbedded mudstone, siltstone and sandstone with numerous coal seams. Many of the coal seams within the study area have historically been mined by shallow, deep (>30m below ground level) and open cast methods.

10.3.12 The Pennine Lower Coal Measures underlie the majority of the study area, with the Middle Coal Measures limited to the south-eastern edge of the study area, beneath Bell Hill, Rothwell Haigh, and Woodhouse Hill.

10.3.13 The Pennine Middle Coal Measures Formation comprises numerous coarsening upwards cycles of mudstones through to sandstones, though only a small area outcrops within the study area. The notable sandstone unit within the Pennine Middle Coal Measures Formation is the Thornhill Rock. This is described as a pale blue and grey to yellow medium to coarse massive sandstone with ironstone nodules and shaley sandstones observed near the base of the unit. Historically, the Thornhill Rock has been used for building and grinding stones.

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

10.3.14 The Pennine Lower Coal Measures Formation comprises numerous coarsening upwards cycles, usually starting with a coal and ending with a sandstone unit. The notable sandstone unit in the study area within the Pennine Lower Coal Measures Formation is the Emley Rock, which is described as a massive sandstone with frequent mudstone interbeds and outcrops in the southern part of the study area. Notable coal seams in the study area within the Pennine Lower Coal Measures Formation include the:

- Flockton Thin and Thick Coals;
- First, Second and Third Brown Metal Coals;
- Middleton Eleven Yard, Little and Main Coals;
- Beeston Coal; and
- Blocking Coal.

10.3.15 The study area is punctuated by a number of normal faults which have a general north-east to south-west trend.

Radon

10.3.16 Radon is a radioactive gas formed by the radioactive decay of naturally occurring uranium in rocks and soils. The occurrence of radon gas is shown in the BGS Radon Potential Dataset[73].

10.3.17 The majority of the study area lies within a lower probability radon area, where less than 1% of homes are estimated to be at or above the action level of 200 becquerels per cubic metre of air (Bq/m3) for residential properties.

10.3.18 There are six discrete areas where 1-3% of homes are estimated to have radon levels at or above the action level. These coincide with sandstone units noted in the Pennine Lower and Middle Coal Measures bedrock including:

- sandstone units at the south-eastern edge of the study area beneath Bell Hill and Rothwell Haigh from the M1 to John O'Gaunts;
- an area within, and extending north from, the Knostrop Sewage Works;
- the Thornhill Rock sandstone at Woodhouse Hill;
- an area to the east of Hunslet Green to Gibraltar Island Road;
- an area to the south of M621 Junction 4 to Turnstall Road, west of the M1; and
- an area around Jack Lane between the A61 and the northern boundary of the study area.

[73] 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.

Groundwater

10.3.19 As defined by the Environment Agency, the bedrock within the study area is classified as a Secondary A aquifer.

10.3.20 Within the superficial deposits, the alluvium, river terrace deposits, and glaciofluvial deposits are also classified as Secondary A aquifers. Head is classified as a Secondary (undifferentiated) aquifer.

10.3.21 There are no groundwater abstractions licensed for public water supply within 1km of land required for the Proposed Scheme and no groundwater source protection zones. There are two private groundwater abstraction licences registered within 1km of land required for the Proposed Scheme.

10.3.22 Information obtained from the local authorities indicates that there are no unlicensed private groundwater abstractions registered within 1km of land required for the Proposed Scheme. Unregistered private groundwater supplies may also be present.

10.3.23 Details of the licensed abstractions are provided in Section 15, Water resources and flood risk.

10.3.24 Further information on the groundwater in the Stourton to Hunslet area is provided in Section 15, Water resources and flood risk.

Surface water

10.3.25 The River Aire (main river) and the Aire & Calder Navigation (canal) are the most significant watercourses within the study area and run adjacent to the route of the Proposed Scheme at the eastern end of the study area. The WFD status and objective for the River Aire is Moderate, and Good for the Aire & Calder Navigation.

10.3.26 Wyke Beck (main river) flows in a southerly direction across the site of the proposed Leeds East RSD, joining the River Aire to the east of the M1 via a culvert under the M1. The WFD status for Wyke Beck is Moderate, with an objective of Good by 2027.

10.3.27 There are numerous unnamed drains and streams within the study area, the majority in the central and eastern sections of the study area all draining into the River Aire. Two ordinary watercourses intersect the Leeds East RSD: all of which are currently culverted under the M1.

10.3.28 There are no licensed surface water abstractions located within the study area. No private water supplies from surface water sources have been identified within the study area. The site is not within an Environment Agency Drinking Water Protection Area – Surface water Safeguard Zone.

10.3.29 Further information on surface water in the Stourton to Hunslet area is provided in Section 15, Water resources and flood risk.

Current and historical land use

10.3.30 Current potentially contaminative land uses within the study area include numerous industrial sites, predominantly in the north-western part of the Stourton to Hunslet area. Key sites within the study area are:

- sidings and a railway freight maintenance depot in the northern end of the study area, north and south of the existing Hallam Line;
- concrete and asphalt works between the B6481 Pontefract Road and the existing Hallam Line in the central section of the area;
- an active petrol station west of the A639 Wakefield Road, adjacent to the route of the Proposed Scheme;
- active sewage works adjacent to the west of the proposed Leeds East RSD; and
- numerous industrial facilities and associated car-parking and infrastructure, including printing works and heavy engineering and metal processing works.

10.3.31 Historical land uses identified within the study area with the potential to have caused contamination include landfill sites, open cast, shallow and deep mining sites and numerous industrial sites. Infilled pits and ponds may have been filled with a variety of waste materials, but have not been licensed. The key historical potentially contaminative sites are:

- extensive open cast excavations and landfilling within the Leeds East RSD area and north of the Proposed Scheme between the M1 and Woodlesford, north of the River Aire;
- probable shallow mineworkings (<30m below ground level (bgl)) predominantly, but not exclusively, in the east of the study area;
- Skelton Grange Power Station (now demolished) adjacent to the proposed Leeds East RSD;
- sewage works, adjacent to the proposed Leeds East RSD;
- chemical works, copper works and concrete and asphalt works within land required for the Proposed Scheme;
- foundries, metal works, engineering, railway and goods related sites throughout the area; and
- various mixed industrial estates, tanneries, printing works, depots and garages.

10.3.32 Further details of the current and historical contaminative land uses within the study area are summarised in Table 16 to Table 18 below.

Table 16: Current and historical landfill sites located within the study area

Name and Area Reference	Location	Description
Skelton Grange Power Station (historic landfill)	Knostrop, Leeds, West Yorkshire. Within land required for the Proposed Scheme.	First waste received 31st December 1945, no date for last waste received. Site Operator Central Electricity Generating Board. No recorded licence number. Accepted inert and industrial waste.
No.1 Lagoon (historic landfill)	Knostrop STW, Leeds, West Yorkshire. Within land required for the Proposed Scheme.	First waste received 31st December 1930, no date for the last waste received. The site operator and licence number are not stated. The landfill accepted inert and industrial waste and liquids/ sludge.
IMI Yorkshire Alloys Limited (historic landfill)	Haigh Park Road, Stourton, Leeds, West Yorkshire. Within land required for the Proposed Scheme.	First waste received on 1st February 1982, no date for the last waste received. The site operator is not stated. The Environment Agency states the licence number as 65247. The landfill accepted industrial and special waste (waste that has hazardous properties and is defined in the Special Waste Regulations 1996; such properties may be flammable, irritant, toxic, harmful, carcinogenic or corrosive), and liquids/ sludge. The Environment Agency states that this landfill shows evidence of having leachate control measures.
Yorkshire Imperial Metals (historic landfill)	Haigh Park Road, Stourton, Leeds, West Yorkshire.	No dates for the first and last waste received are provided. The site operator information is not stated. The licence number is recorded as 65105. The landfill accepted industrial waste.
Haigh Park Road (historic landfill)	Stourton, Leeds, West Yorkshire	First waste received on 1st February 1982, no date for the last waste received. The site operator and licence number are not stated. The landfill accepted industrial and special waste (waste that has hazardous properties and is defined in the Special Waste Regulations 1996; such properties may be flammable, irritant, toxic, harmful, carcinogenic or corrosive), and liquids/ sludge. The Environment Agency states that this landfill shows evidence of having leachate control measures.
Small Lagoon (historic landfill)	Haigh Park Road, Stourton, Leeds, West Yorkshire. Within land required for the Proposed Scheme.	First waste received on 31st December 1989 and last waste received on 30th June 1990. The site operator and licence number are not stated. The landfill accepted inert and commercial waste.
Land at junction of Pepper Road/Pepper Lane (historic landfill)	Hunslet, Leeds, West Yorkshire. Outside land required for the Proposed Scheme.	First waste received on 31st October 1983 and last waste received on 30th April 1984. The site operator and licence number are not stated. The landfill accepted inert and commercial waste.
Hunslet Grange	Hunslet, Leeds, West Yorkshire	1980s landfill following demolition of Hunslet Grange flats. Considered likely to be predominantly building demolition wastes, however not confirmed at this stage.

Table 17: Current and historical mining, mineral sites and colliery spoil sites located within the study area

Name and Area Reference	Location	Description
Rothwell Haigh colliery. Colliery, mine shafts, spoil heap.	Rothwell Haigh country park. South of the route of the Proposed Scheme, west of Woodlesford. Located both within and outside of the land required for the Proposed Scheme.	Deep mining. Mine shafts. Spoil heaps. Above ground infrastructure no longer remains. Large spoil tip adjacent to the east of the Stourton to Hunslet area, now Rothwell Country Park.
Waterloo Main Colliery	North-west of the M1, between the M1 and Knostrop sewage works; mostly south of the A63. Within the land required for the Proposed Scheme.	Colliery, numerous shafts. Above ground infrastructure removed for open cast workings. Infilled and partly redeveloped as Temple Newsam Park & Ride facility.
Mine shafts	Across study area. Predominantly but not exclusively in the eastern half of the study area. Sites located both within and outside of the land required for the Proposed Scheme.	Shafts for shallow and deep coal mining.
Unlicensed mining.	In the area of the proposed Leeds East RSD. Sites located both within and outside of the land required for the Proposed Scheme.	Likely open cast mining across area.
Probable shallow mine workings.	Across study area. Predominantly but not exclusively in the eastern half of the site. Located both within and outside of the land required for the Proposed Scheme.	Probable workings shown in swathes across much of the area depicting areas of anticipated coal <30m depth, but with no records of existing mining.

Table 18: Current and historical industrial sites identified with a high risk of potential contamination located within the study area

Name and Area Reference	Location	Description
Foundries, iron and steel works, and metal manufacturing and plating works.	Throughout the study area, primarily within the land required for the Proposed Scheme and to the north of the route of the Proposed Scheme.	Historical heavy industry with some remaining operational. Some sites now redeveloped, no records of development history or any remedial actions identified.
Petrol filling stations.	Three in the study area. The nearest is adjacent to the route of the Proposed Scheme, by the A639 Wakefield Road and Queen Street junction. The other two are on the B6481 Pontefract Road near the Thwaite Lane junction and on the corner of Church Street and The Oval at Hunslet Green.	Historical and current use.

Name and Area Reference	Location	Description
Brickworks and sand and gravel pits	Northern part of the area including areas to the north-west of Hunslet Green north and south of the A61, and various areas roughly within the region bound by the Aire & Calder Navigation to the north-east, the Hallam Line to the south and the A639 Wakefield Road to the north-west. Sites located both within and outside of the land required for the Proposed Scheme.	The excavated areas have been inferred from historical maps and have since been redeveloped. Information regarding the characteristics of the fill material has not been identified.
Cement, concrete, asphalt and chemical works	Within the land required for the Proposed Scheme and to the north in the area between the Leeds East viaduct and the A639 Wakefield Road.	Large industrial sites with long history of use starting with sand and gravel pits, concrete works, copper works, then chemical works, concrete and asphalt works.
Various mixed industrial estates, tannery, printing, depots, garages and engineering workshops	From the M1 to the north-western end of the Stourton to Hunslet area. Sites located both within and outside of the land required for the Proposed Scheme.	Numerous small and large sites, mixed industrial developments. Typically, more to the north of the Proposed Scheme, although some sites also present to the south.
Railway lines, goods yards and engine sheds	Along and adjacent to the Hallam Line. Sites located both within and outside of the land required for the Proposed Scheme.	Various sidings, sheds and works present throughout the study area.
Sewage works	North-west of proposed Leeds East RSD, extending into the land required for the Proposed Scheme.	Settling tanks and outflow are within the study area.
Skelton Grange Power Station (site of)	North-west of proposed Leeds East RSD, extending into the land required for the Proposed Scheme.	Former power station, now demolished. Site not redeveloped.

10.3.33 Contaminants commonly associated with sites in Table 16 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.

10.3.34 Contaminants associated with sites in Table 17 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.

10.3.35 Contaminants commonly associated with industrial sites in Table 18 could include metals, semi-metals, asbestos, organic and inorganic compounds.

Other regulatory data

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

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

10.3.38 There were numerous minor pollution incidents and four significant pollution incidents reported within the Stourton to Hunslet area. Reported incidents comprised oils and chemicals impacting on surface water.

10.3.39 Environment Agency data indicates that there are five discharge consents within the study area, though none of these are to groundwater. Further details on the groundwater in the Stourton to Hunslet area can be found in Section 15, Water resources and flood risk. The majority of the discharge consents to surface water within the study area relate to sewage or trade discharges to the River Aire.

10.3.40 There are numerous local authority pollution prevention and control permits in the study area. There are three sites with integrated pollution prevention and control permits ('Environmental Permits') in the study area, all food industry sites.

10.3.41 There are no nationally significant ecological designations, as defined in the land quality section of the SMR[74], located within the study area. However, the route of the Proposed Scheme does pass through the Impact Risk Zone[75] of the Humber Estuary SSSI. The Humber Estuary SSSI covers an area of approximately 37000ha and is designated for its estuary and the associated saline lagoons, sand dunes and standing waters. It is located approximately 38km east of the eastern boundary of the Stourton to Hunslet area.

Mining/mineral resources

10.3.42 There are a range of mining and mineral resources located within the study area that have the potential to be affected by the Proposed Scheme. These can include sand, gravel, clay, stone, and coal, which can be protected via local or county level mineral plans and by the Coal Authority, as well as other forms of petroleum hydrocarbons such as shale gas and oil which are regulated by the Oil & Gas Authority (OGA) via the issue of Petroleum Exploration Development Licences (PEDLs).

Mineral plans

10.3.43 LCC is responsible for the overall mineral and waste local plans for the study area. The Natural Resources and Waste Development Plan Document (NRWDPD) was adopted in January 2013 and sets out the LCC policies aimed at controlling mineral related developments within the borough up to the year 2026.

[74] Sensitive ecological receptors are defined as national designations such as SSSIs.
[75] 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.

10.3.44 There are no specific safeguarded mineral extraction sites within the Stourton to Hunslet area (i.e. protected existing mineral extraction sites).

Sand and gravel deposits

10.3.45 The majority of the Stourton to Hunslet area is within a mineral safeguarding area (MSA) for sand and gravel associated with river terrace and sub-alluvial deposits from the River Aire. The MSA includes the majority of the area from the M1 to the north-western boundary of the study area. The proposed Leeds East RSD area is not within the MSA.

Coal mining

10.3.46 The entire study area is located within the MSA Resource Area for shallow (<30m) coal from the Pennine Lower Coal Measures. The study area has also been subject to deeper coal mining (>30m).

10.3.47 BGS mapping shows numerous coal seams subcropping within the study area, and many of these have been exploited by shallow, deep and open cast mining methods. Notable historic collieries within the study area include Waterloo Main and Rothwell Haigh.

10.3.48 Coal Authority Unlicensed Areas are recorded in the northern part of the study area, including an area between the M1 and Knostrop sewage works within the proposed Leeds East RSD area, and a larger area to the east of the M1, east of the Stourton to Hunslet area. Historical mapping shows some of these areas have been worked by open cast methods.

10.3.49 Coal Authority data also show extensive areas of Probable Shallow Workings (PSW) within the study area. In the west of the study area, two bands of PSW cross the study area perpendicular to the route of the Proposed Scheme, one approximately in line with the A61, the other from Hunslet Carr to Thwaite Gate. In the centre of the study area, areas of PSW are located in the vicinity of the M1, extending to the east along the alignment of the current rail corridor. PSW are also shown in the north of the study area, in the vicinity of the proposed Leeds East RSD.

10.3.50 The Coal Authority data also identify 47 recorded mine entries within the study area, and of these 12 are shown to have been either filled, capped or removed by open cast mining. The greatest density of mine entries is in the area of the proposed Leeds East RSD. It is likely that unrecorded mine entries also exist within the study area.

10.3.51 Development high risk areas are identified by the Coal Authority north and south of the River Aire corridor, beneath and parallel to the route of the Proposed Scheme and also beneath the Leeds East RSD; these risks being associated with the former open cast and shallow workings. Underground workings are shown beneath the majority of the proposed Leeds East RSD and much of the eastern and central sections of the study area east of the M621/A639 junction. Additional smaller areas of underground workings are shown west of this, including areas to the west of the A639 and north of Hunslet Moor railway station.

Petroleum Exploration Development Licences /Hydrocarbons

10.3.52 The south-eastern part of the Stourton to Hunslet area is in PEDL area 275 (onshore award, 14th round), including the area to the south of the existing Hallam Line, around and to the east of the M1, including Rothwell Haigh. It is considered possible that the study area is within an area where hydrocarbon resources could be identified and extracted in the future.

Geo-conservation resources

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

Receptors

10.3.54 The sensitive receptors that have been identified within the study area are summarised in Table 19. A definition of receptor sensitivity is given in the SMR.

Table 19: Summary of sensitive receptors

Issue	Receptor type	Receptor description	Receptor sensitivity
Land contamination	People	Residents at existing properties, schools, play areas, parks, public open space. Commercial/retail/ industrial properties	High Moderate/Low
	Groundwater	Secondary A Aquifers (superficial alluvium and river terrace deposits and Coal Measures bedrock) Secondary (undifferentiated)	Moderate Low
	Surface waters	River Aire (WFD status moderate) Aire and Calder Navigation (WFD status good) Wyke Beck (WFD status moderate) Two ordinary watercourse tributaries of the River Aire (WFD status moderate)	Moderate
	Built environment	Underground structures and buried services	Low
	Natural environment	Natural environment receptors, ecology. Impact Risk Zone of the Humber Estuary SSSI	High
Impacts on mining/mineral and petroleum (gas) sites (severance and sterilisation)	Mining/mineral sites	Mineral safeguarding areas for: River terrace and sub-alluvial sand and gravel deposits associated with the historical course of the River Aire; and shallow coal from the Pennine Lower Coal Measures. PEDL (area 275) - south-eastern part of the Stourton to Hunslet area	Medium High

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)[76]. The draft CoCP sets out the measures and standards of work that would be applied to the construction of the Proposed Scheme and includes requirements to ensure the effective management and control of work in contaminated areas.

10.4.2 The requirements in the draft CoCP relating to work in contaminated areas would ensure the effective management and control of the work. These requirements include:

- methods to control noise, waste, dust, odour, gases and vapours (Sections 5, 7, 11, 13, 14 and 15);
- methods to control spillage and prevent contamination of adjacent areas (Sections 5, 11 and 16);
- the management of human exposure for both construction workers and people living and working nearby (Sections 5, 7, 11, 13 and 14);
- methods for the storage and handling of excavated materials (both contaminated and uncontaminated) (Sections 6, 7, 11 and 15);
- management of any unexpected contamination found during construction (Sections 11 and 15);
- a post-remediation permit to work system (Section 11);
- storage requirements for hazardous substances such as oil (Sections 5, 11 and 16);
- traffic management to ensure that there is a network of designated site 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

[76] Supporting document: Draft Code of Construction Practice

assessment of potentially contaminated sites would be undertaken in accordance with Environment Agency CLR11[1] and British Standards BS10175[2].

10.4.4 Where significant contamination is encountered, a remedial options appraisal would be undertaken to define the most appropriate remediation techniques. Where appropriate, this appraisal would be undertaken based on multi-criteria attribute analysis that considers environmental, resource, social and economic factors in line with the framework set out by the Sustainable Remediation Forum UK[77]. The preferred option would then be developed into a remediation strategy.

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

Assessment of impacts and effects

10.4.6 Construction of the Proposed Scheme in this area would require earthworks, utility diversions, deep foundations, grouting and ground stabilisation and other activities, including the construction of the various viaducts and road infrastructure works. These aspects of the Proposed Scheme, along with other construction features, are shown on the Map Series CT-05 in the Volume 2: LA17 Map Book.

Land contamination

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

[1] Environment Agency, (2004), *CLR11 Model Procedures for the Management of Land Contamination*.
[2] British Standard, (2011), *BS10175+A2:2017 Investigation of Potentially Contaminated Sites*.
77 Sustainable Remediation Forum UK, (2010), *A Framework for Assessing the Sustainability of Soil and Groundwater Remediation.*

- 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 20. 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.

10.4.11 In the Stourton to Hunslet area, 134 sites remain following initial screening to go through to detailed risk assessment and require CSMs. These sites are grouped in the following way for ease of assessment:

- Group A: General mixed industrial sites located within the land required for the construction of Proposed Scheme; vertical alignment proposed comprises embankments;
- Group B: General mixed industrial sites located within the land required for the construction of Proposed Scheme; vertical alignment proposed comprises cuttings;
- Group C: General mixed industrial sites not located within the land required for construction of Proposed Scheme (proximity zones 2 and 3);
- Group D: Mining - collieries and shafts. Waterloo colliery and Rothwell Haigh colliery, associated infrastructure and shafts. Numerous shafts outside of the main colliery site, predominantly in the eastern half of the Stourton to Hunslet Area. All within and adjacent to the land required for construction of the Proposed Scheme;
- Group E: Landfill - colliery spoil, slag heaps or sludge lagoons. Backfilled open cast mining sites within and adjacent to the land required for the Proposed Scheme;
- Group F: Landfills - Hunslet grange, Yorkshire alloys, 'historic landfills', 'refuse tips' located within and adjacent to the land required for construction of the Proposed Scheme;
- Group G: Cemeteries / burial grounds, within and adjacent to the land required for construction of the Proposed Scheme; and
- Group H: Probable shallow workings - Probable workings defining areas of shallow (<30m deep) coal shown in swathes across the study area covering areas of shallow not recorded as mined but which may have been mined in the past.

Table 20: Summary of baseline CSM for sites which may pose a contaminative risk for the Proposed Scheme

Area reference[78]	Area name	Human health risk	Ground water risk	Surface water risk	Ecosystem risk	Buildings risk
On site[79]						
Group A: 680,681,703,755,759,761,897,1065,1078,1421,2039,2050,2430	Group A: General mixed industrial (proposed embankments)	Moderate	Moderate	Moderate	Very low	Moderate
Group B 489, 518, 525, 544, 548, 574, 580, 596, 599, 601, 607, 610, 643, 763, 800, 802, 804, 811, 818, 821, 825, 826, 829, 859, 877, 880, 890, 894, 935, 946, 950, 951, 953, 965, 982, 1039, 2040, 2049, 2431, 2437, 2446	Group B: General mixed industrial (proposed cuttings)	Moderate	Moderate	Moderate/low	Very low	Moderate
Off site[80]						
Group C: 59, 516, 545, 555, 557, 558, 604, 605, 657, 669, 720, 747, 799, 847, 886, 895, 903, 937, 944, 945, 989, 1053, 1079, 1080, 2017, 2032, 2045, 2047, 2417, 2433, 2434, 2438, 2444, 2445	Group C: General mixed industrial sites (proximity zones 2 and 3).	Moderate/low	Moderate	Moderate	Very low	Moderate
On and adjacent to the site						
Group D: 71, 768, 1014, 1899, 1902, 1904, 1905, 1907, 1908, 1910, 1911, 1912, 1915, 1916, 1921, 1922, 1926, 1927, 1929, 1964, 1987	Mining - collieries and shafts .	Moderate/low	Moderate	Moderate/low	Very low	Moderate/low
Group E: 764, 765, 1075, 1076, 1427, 1431, 1456, 1463, 1464, 2447, 2448	Group E: Landfill: colliery spoil, slag heaps or sludge lagoons.	Moderate/low	Moderate	Moderate	Very low	Moderate/low

[78] Each potentially contaminated site is allocated a unique reference number
[79] 'On site' is within the area of land required for construction of the Proposed Scheme.
[80] 'Off site' is beyond the land required for construction of the Proposed Scheme but within 250m of it.

Area reference[78]	Area name	Human health risk	Ground water risk	Surface water risk	Ecosystem risk	Buildings risk
Group F: 613, 1021, 1022, 1023, 1025, 1040, 2418	Group F: Landfills: general	Moderate	Moderate	Moderate/low	Very low	Moderate
Group G: 53, 1037, 2416	Group G: Cemeteries / burial grounds.	Low	Moderate/low	Low	Very low	Moderate/low
Group H	Probable shallow workings	Low to moderate/low	Moderate/low	Low	Very low	Low to moderate/ low

Temporary effects

10.4.12 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.

10.4.13 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.

10.4.14 A worsening risk at the construction stage compared to baseline would result in a negative effect, and conversely, an improvement would result in a positive effect. The assessment assumes that contamination would be controlled through the general measures in the draft CoCP. Once updated, this would also include mining related contamination.

10.4.15 All of the sites set out in Table 20 have been assessed for the change in impact associated with the construction stage of the work.

10.4.16 Table 21 presents the summary of the resulting construction effects that have been found to be significant. All other sites referenced in Table 20 were found to have non-significant effects.

Table 21: Summary of construction CSM effects

Name and area ref[81]	Receptor	Main baseline risk	Main construction risk	Temporary effect
Group D: – collieries and shafts. 71, 768, 1014, 1899, 1902, 1904, 1905, 1907, 1908, 1910, 1911,	Human health (direct contact, ingestion, inhalation of vapours from contaminated soils, waters and	Moderate/low	High	Moderate adverse effect

[81] Each potentially contaminated site is allocated a unique reference number

Name and area ref[81]	Receptor	Main baseline risk	Main construction risk	Temporary effect
1912, 1915, 1916, 1921, 1922, 1926, 1927, 1929, 1964, 1987	inhalation of ground gases on site)			
	Human health (direct contact, ingestion and inhalation of vapours from contaminated soils, waters and inhalation of ground gases offsite)	Moderate/low	High	Moderate adverse effect
	Controlled waters – surface water	Moderate/low	High	Moderate adverse effect
	Property (direct contact with contaminated soil and water, exposure of property to gases/vapours)	Low	Moderate	Moderate adverse effect
Group E: Landfill: colliery spoil, slag heaps or sludge lagoons.. 764, 765, 1075, 1076, 1427, 1431, 1456, 1463, 1464, 2447, 2448	Human health (direct contact, ingestion, inhalation of vapours from contaminated soils, waters and inhalation of ground gases on site)	Moderate/low	High	Moderate adverse effect
	Human health (direct contact, ingestion and inhalation of vapours from contaminated soils, waters and inhalation of ground gases offsite)	Moderate/low	High	Moderate adverse effect
	Controlled waters – surface water	Moderate	Very high	Moderate adverse effect
	Property (exposure of property to gases/vapours)	Moderate/low	High	Moderate adverse effect
Probable mine workings	Human health (direct contact, ingestion, inhalation of vapours from contaminated soils, waters and	Moderate/low	High	Moderate adverse effect

Name and area ref[81]	Receptor	Main baseline risk	Main construction risk	Temporary effect
	inhalation of ground gases on site)			
	Human health (direct contact, ingestion and inhalation of vapours from contaminated soils, waters and inhalation of ground gases offsite)	Moderate/low	High	Moderate adverse effect
	Controlled waters – groundwater and surface water	Moderate/low	High	Moderate adverse effect
	Property (exposure of property to gases and vapours)	Moderate/low	High	Moderate adverse effect

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

10.4.18 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 WDES, 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

10.4.19 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.

10.4.20 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 land required to construct the Proposed Scheme. As noted above, a worsening would result in negative effects and an improvement would result in positive effects.

10.4.21 There are no post construction stage significant effects identified in the study area.

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 Additional site-specific permanent remediation measures, which could focus on source removal, pathway breakage or receptor protection, would be developed during the detailed design stage if required. These measures would make sure 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

10.4.24 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[82] or isolation that may occur during the construction phase of the Proposed Scheme, possibly continuing through to its operation.

10.4.25 The study area lies within a MSA for sand and gravel and a MSA for coal.

Temporary effects

10.4.26 Temporary adverse effects may occur where construction compounds are proposed within the MSA. In such cases, there would be a temporary sterilisation of the resource during construction works, but this is not considered to represent a significant effect and the resource would not be lost permanently.

10.4.27 The majority of the study area is already heavily developed, as such the Proposed Scheme is not considered likely to have a significant effect on the resource compared to the baseline in these areas.

10.4.28 The area of the proposed Leeds East RSD is not developed, but is known to have been extensively mined. As such there is unlikely to be significant residual resource in this area which would be impacted by the Proposed Scheme.

Permanent effects

10.4.29 The majority of effects on mining and mineral sites would be permanent.

10.4.30 The study area lies within a MSA for sand and gravel and a MSA for coal. The south-eastern part of the study area is within PEDL area 275.

10.4.31 The effects of construction of the Proposed Scheme on the sand and gravel or coal MSAs would be permanent where underlain by the footprint of the permanent works, with a strip of mineral becoming sterilised. However, as a proportion of the total MSAs, the effect on the MSAs are considered minor and therefore not significant. Mitigation measures (if any) would be discussed in advance of the works with the Mineral Planning Authority, SCC and the mineral owner.

[82] In this context, severance refers to the Proposed Scheme splitting an actual or proposed mining/mineral site into two or more areas, such that separate accesses would be required to work the whole site.

10.4.32 The effects of construction of the Proposed Scheme on the PEDL would be negligible. 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.

10.4.33 The majority of the study area is already heavily developed, as such the Proposed Scheme is not considered likely to have a significant effect on the resource compared to baseline in these areas.

10.4.34 The area of the proposed Leeds East RSD is not developed, but is known to have been extensively mined. As such there is unlikely to be significant residual resource in this area which would be impacted by the Proposed Scheme.

10.4.35 Mitigation measures (if any) would be discussed in advance of the works with the Mineral Planning Authority, LCC and the mineral owner.

10.4.36 Table 22 reports the assessment of permanent effects from construction on the mining and mineral resources identified.

Table 22: Summary of effects for mining and mineral resources

Site name	Status	Description	Sensitivity/ value	Magnitude of impact	Effect and significance (Y/N)
Sand and gravel deposits	MSA	MSA for sand and gravel extraction	Medium	Negligible	Negligible
Coal deposits	MSA	MSA for coal	Medium	Negligible	Negligible
PEDL Area 275	Licensed by UK Oil and Gas Authority	Licence to search and bore for and get petroleum	High	Negligible	Negligible

10.4.37 There would be negligible effects on the mining and mineral resources, which are not significant.

Geo-conservation sites

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

Other mitigation measures

10.4.39 At this stage, no additional measures are considered necessary to mitigate risks from land contamination during the construction stage beyond those that are set out in the draft CoCP and/or instigated as part of the site-specific remediation strategies that would be developed at the detailed design stage if required. These measures would ensure that risks to people, property and environmental receptors 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 ground gas and leachate.

10.4.40 Mitigation of the effects on mineral resources could include extraction of the resource in landscaping areas within the Proposed Scheme adjacent to, rather than beneath the structural footprint of the Proposed Scheme, which would require good founding

conditions. A plan would be discussed in advance of the construction works with the landowner, the mineral planning department at LCC, 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

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

10.5 Effects arising from operation

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

Avoidance and mitigation measures

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

Assessment of impacts and effects

10.5.3 The Proposed Scheme within this area would include the Leeds East RSD. Fuel and oil storage tanks, auto-transformer stations, feeder stations and sub-stations can, in principle, be a source of contamination through accidental discharge or leaks of coolant. However, in common with other modern infrastructure development, secondary containment appropriate to the level of risk would be included in the installed design.

10.5.4 The operation of the trains may give rise to minor contamination through leakage of hydraulic or lubricating oils. However, such leakage or spillage is expected to be very small and unlikely to result in significant contamination.

Other mitigation measures

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

Summary of likely residual significant effects

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

Monitoring

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

11 Landscape and visual

11.1 Introduction

This section of the report presents the assessment of the likely significant landscape and visual effects identified to date within the Stourton to Hunslet 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 Leeds City Council (LCC) has been undertaken and will continue as the design of the Proposed Scheme progresses. 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: LA17 Map Book shows the locations of key environmental features (Map Series CT-10) and the key construction (Map Series CT-05) and operational (Map Series CT-06) features of the Proposed Scheme. It also shows the locations of landscape and visual impact mitigation measures (Map Series CT- 06) and viewpoints that would potentially be significantly affected at the construction (Map Series LV-03) and operation (Map Series LV-04) phases and Landscape Character Areas (LCA) that would potentially be significantly affected at the construction and operation phases (Map Series LV-02).

11.1.5 A separate, but related, assessment of effects on the setting of heritage assets is reported in Section 9, Historic environment.

11.2 Scope, assumptions and limitations

11.2.1 The scope, key assumptions and limitations for the landscape and visual assessment are set out in full in Volume 1, Section 8 and the Scope and Methodology Report (SMR)[83].

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

11.2.3 At this stage it has not been possible to complete surveys of all publicly accessible land in this area; therefore, for this working draft ES, assumptions have been made about the level of sensitivity and magnitude of change on a case by case basis. These will be adjusted, as appropriate, on the basis of survey results to inform the formal ES.

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

11.2.4 The extent of the study area has been informed by construction and operational phase zones of theoretical visibility (ZTVs). The ZTVs have been produced in line with the methodology described in the SMR[84] 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. Professional judgement will be used to further refine the study area to focus on likely significant effects.

11.2.5 Tall construction plant (for example cranes and piling rigs) is excluded from the ZTV for the construction phase, as there is a great degree of variability in the extent and timeframes of the visibility of construction activity and plant. Overhead line equipment rarely gives rise to significant effects if it is the only element visible and has, therefore, been excluded from the ZTV. This will give a better indication of the possible spread of significant effects to aid the assessment.

11.2.6 Landscape and visual receptors within approximately 500m of the route of the Proposed Scheme have been assessed as part of the study area. Long distance views of up to 2km have been considered at settlement edges, such as at Beeston, Belle Isle, Middleton, Halton and Cross Green.

11.2.7 This assessment is based on preliminary design information and makes reasonable worst case assumptions on the nature of potentially significant effects where these can be substantiated. It is based on information known at present. The assessment of visual effects during construction covers the situation in winter of peak activity. The assessment of operational visual effects covers the situation in winter and summer of year 1 and summer of year 15. The assessment of landscape effects is undertaken for the construction phase and for the operational phase at both year 1 and year 15. The landscape assessment does not consider seasonal variations e.g. winter/summer, since these do not affect character. Likely significant landscape and visual effects for year 30 will be reported in the formal ES

11.2.8 Professional judgements on landscape value are summarised in the baseline descriptions and judgements on landscape susceptibility and sensitivity are summarised as part of the assessment of effects on each significantly affected LCA. Full judgements on value, susceptibility and sensitivity will be provided in the formal ES.

11.2.9 The assessment has been carried out on the basis that the 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.

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

11.3 Environmental baseline

Existing baseline

Landscape baseline

11.3.1 The study area is defined by the flat landform of the broad Aire valley which ranges in height between 25m above Ordnance Datum (AOD) and 35m AOD. The surrounding valley sides to the north, west and south beyond the study area rise gently to between 50m AOD and 130m AOD; it is in this slightly more elevated area where the majority of the settlements are located.

11.3.2 The character area is urban consisting of residential areas, industrial and commercial areas and some small areas of open green space. The residential areas of Belle Isle and Middleton, Hunslet and Beeston, to the south and west, are all influenced by historical and present-day industry. Stourton, located centrally, and extending to the south-east within the study area, is principally an industrial and commercial area.

11.3.3 Road and rail infrastructure, including the M621 and M1, have a significant presence visually and are audible within much of the study area. The Hallam Line bisects the study area and follows a south-easterly route through the central part of the study area from Leeds Station converging with the River Aire and Aire & Calder Navigation at the M1 Junction 44 and continuing east parallel with the watercourses.

11.3.4 The River Aire and Aire & Calder Navigation form a relatively narrow corridor that weaves north-west to south-east through the industrial centre of the study area from Leeds city centre. The Aire & Calder Navigation and the River Aire form an important green infrastructure corridor as identified in the Aire Valley Leeds Area Action Plan[85]. The Yorkshire and Humber Green Infrastructure Mapping Project[86] also identifies the 'Aire corridor' as being regionally important.

11.3.5 Within the study area, three long distance paths (the Trans Pennine Trail (Leeds Link)[87], St. Bernard's Way[88] and Paulinus Way[89]) all follow the same route along the Aire & Calder Navigation and River Aire corridor. The corridor also includes the National Cycle Network (NCN) National Route 67[90], Leeds Core Cycle Network 8 Rothwell to Leeds city centre[91] and the Aire Valley towpath.

11.3.6 Important and notable landmarks include the 123m high wind turbine at Knostropp and Leeds Recycling and Energy Recovery Facility. From elevated views the extensive

[85] Leeds City Council, Aire Valley Leeds Area Action Plan, Adopted November 2017. Available online at: https://www.leeds.gov.uk/your-council/planning/aire-valley-area-action-plan
[86] Rotherham Metropolitan Borough Council, REB05b Yorkshire and the Humber Green Infrastructure Mapping Project: Corridor descriptions. Available online at: http://www.rotherham.gov.uk/corestrategyexamination/downloads/file/360/reb05b_yorkshire_and_the_humber_green_infrastructure_mapping_project_corridor_descriptions
[87] The Long Distance Walkers Association, Trans Pennine Trail – Leeds Link. Available online at: https://www.ldwa.org.uk/ldp/members/show_path.php?menu_type=S&path_name=Trans+Pennine+Trail+-+Leeds+Link
[88] The Long Distance Walkers Association, St. Bernard's Way. Available online at: https://www.ldwa.org.uk/ldp/members/show_path.php?menu_type=S&path_name=St.+Bernard%92s+Way
[89] The Long Distance Walkers Association, Paulinius Way. Available online at: https://www.ldwa.org.uk/ldp/members/show_path.php?menu_type=S&path_name=Paulinus+Way
[90] Sustrans, National Route 67 map. Available online at: https://www.sustrans.org.uk/ncn/map/route/route-67
[91] Leeds City Council, West Park to Leeds City Centre Core Cycle Route. Available online at: https://www.leeds.gov.uk/docs/West%20Park%20to%20City%20Centre%20Cycle%20Route.pdf

industrial areas are visible, as are the movement of traffic on the motorway and movement of the wind turbine blades. The spire of St Mary the Virgin church in Hunslet is an important local landmark.

11.3.7 The LCAs have been determined as part of an integrated process of environmental characterisation, informed by a review of historic landscape mapping and the outcome from other topics, including ecological assessments. These LCAs will be refined, as appropriate, upon review of available historic landscape characterisation data and will be included in the formal ES. Use has been made of published landscape character assessments and a wide range of supporting GIS data, aerial photography and Ordnance Survey mapping, plus desk study and fieldwork. Landscape character assessments reviewed include the relevant National Landscape Character Areas[92], the Leeds Landscape Assessment[93] and Landscape Character Review[94].

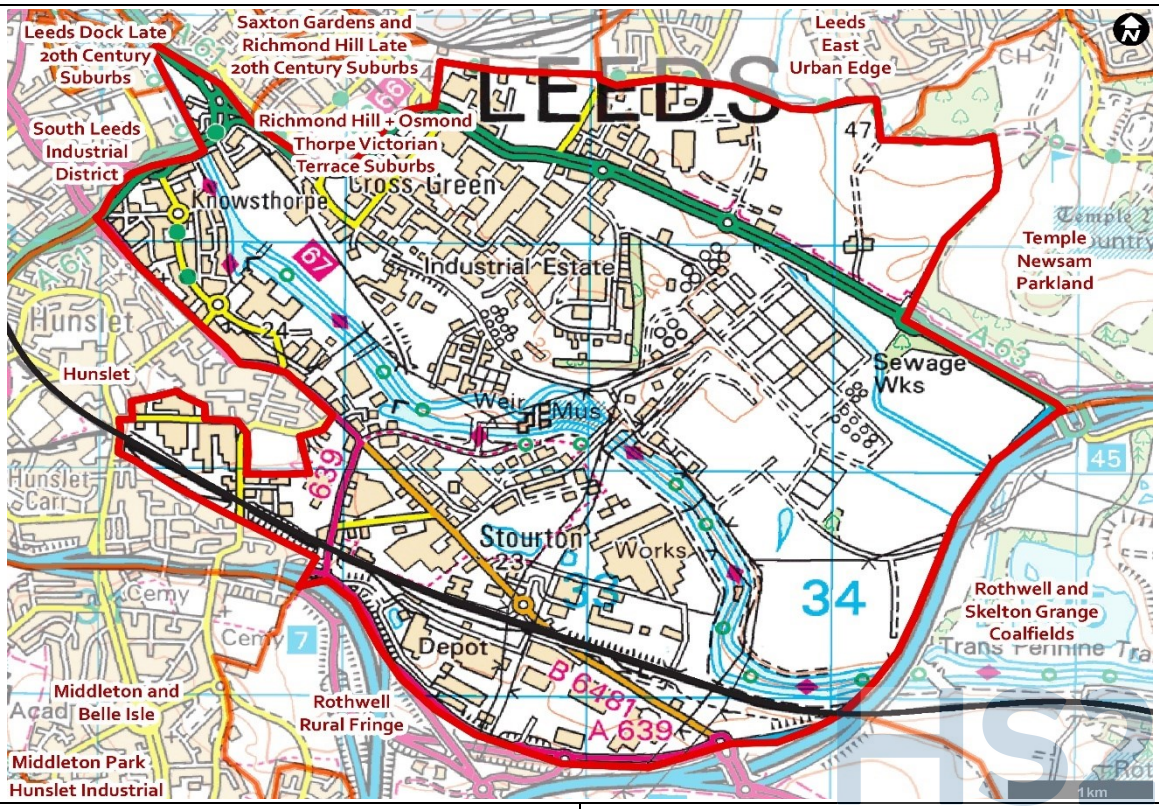
11.3.8 The published LCAs have been adapted for this assessment to provide LCAs of an appropriate and consistent scale. Minor amendments have also been made to some published LCA boundaries to reflect existing conditions.

11.3.9 For the purposes of this assessment, the Stourton to Hunslet study area has been subdivided into six LCAs. These LCAs are draft and subject to review in consultation with local planning authorities. Full descriptions of all LCAs will be provided in Volume 5 of the formal ES. Four of the six LCAs would not be significantly affected by the Proposed Scheme as there would be no physical changes to landscape characteristics and/or the LCAs would be at a distance from the Proposed Scheme. A summary of the two LCAs that would be significantly affected within the Stourton to Hunslet area is provided in Table 23.

[92] 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
[93] Leeds City Council (1994), *Leeds Landscape Assessment*. Available online at: http://www.leeds.gov.uk/docs/CD11-15%20LA%20Composite%20version.pdf
[94] Leeds City Council (2011), *Landscape Character Review*. Available online at: http://www.leeds.gov.uk/docs/CD11-14%20Leeds%20Landscape%20Review%20Maps%202011.pdf

Table 23: Summary of significantly affected LCAs

South East Leeds Industrial



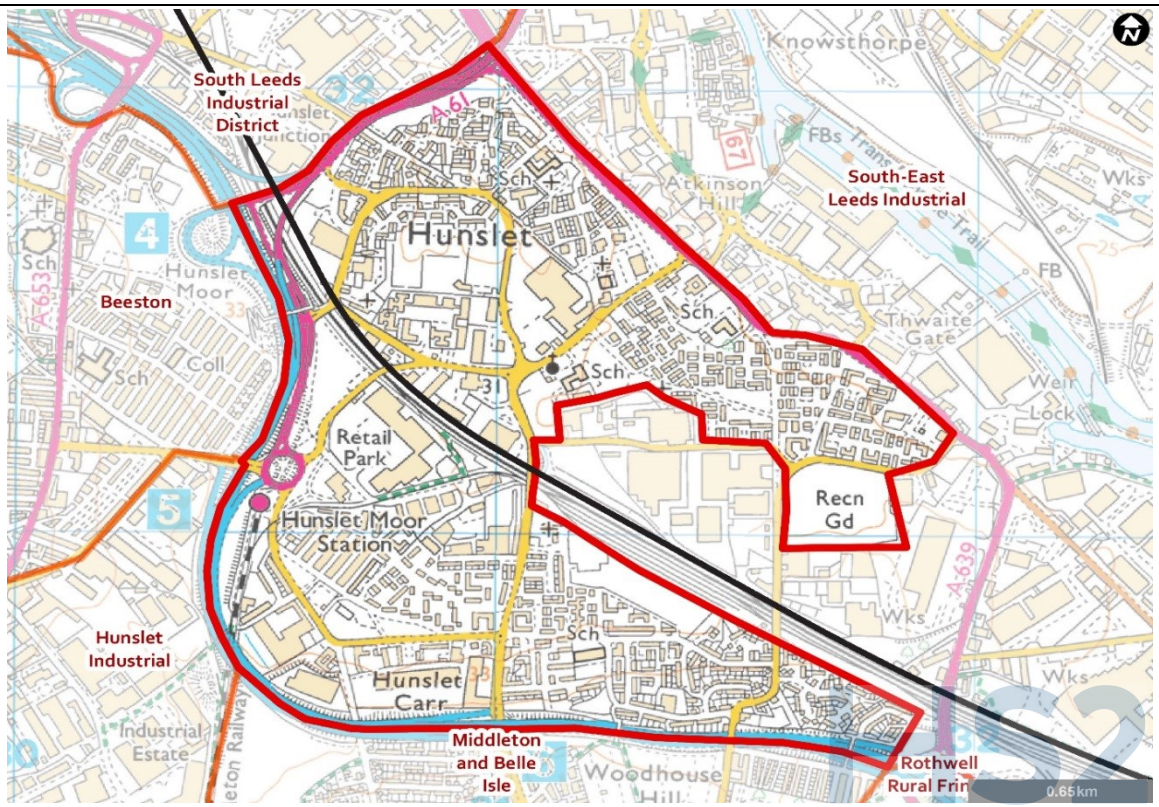
An area largely characterised by industry and infrastructure

Linear, well treed corridor along watercourses

South East Leeds Industrial LCA, which includes the Cross Green and Stourton Industrial Estates, is located within the broad Aire valley. Industrial development is a key feature of the valley floor, generally of a medium to large scale with an irregular and fragmented layout. The Hallam Line is located in a cutting or on an embankment and is notable for the mature trees and shrubs along its alignment. The River Aire and Aire & Calder Navigation are water transport assets running largely parallel to the railway, and these linear features contribute to green infrastructure and the ecological network. The Trans Pennine Trail, St. Bernard's Way, Paulinus Way, NCN National Route 67, Leeds Core Cycle Network 8 Rothwell to Leeds city centre and canal towpaths are located along the waterways and link into the wider PRoW network. Stourton was previously the site of an industrial village; however, little historical influence remains. Thwaites Mills Watermill Museum (Grade II listed) provides some historic value, although the mill is enclosed by woodland which gives it a degree of separation from its surroundings. There is a lack of distinctiveness and low scenic quality due to the degraded quality of much of the urban landscape, major infrastructure routes including the M621, the M1 and the Hallam Line, industrial development, the wind turbine at Knostropp and overhead power lines. Tranquillity is low due to the prevalence of noise from industrial processes and vehicle traffic although there are pockets of more tranquil areas with a sense of place along the River Aire and Aire & Calder Navigation corridor.

The value of this LCA is low-medium due to the low scenic quality and low sense of tranquillity; however, recreational and ecological value is present along the river and canal corridor.

Hunslet



Varied, largely indistinct development interspersed with large areas of green space	Busy main roads with indistinct modern commercial development and landmark church spire at St Mary's
	

Hunslet LCA is located within the Aire valley, 1km south-east of Leeds city centre. It has an inner city urban character with a fragmented and indistinct settlement pattern of finer grain residential development interspersed with coarser grain, large commercial/leisure development. The LCA is dominated and bound by the M621 to the south and west, and the A61 Hunslet Distributor Road to the north and north-west. The Hallam Line, notable for the mature trees and shrubs along its alignment, is located in a deep cutting and bisects the LCA. Larger retail units located alongside the Hallam Line, including Mecca Bingo, Hunslet Green retail centre and a car auction building, largely screen the railway line. Hillidge Road overbridge, Beza Street overbridge and Balm Road overbridge provide connectivity over the Hallam Line. Tree cover is largely limited to the railway and road corridors and property boundaries, gardens and green space. The historic Middleton Railway is located on the western periphery but its influence on character is limited. Tranquillity within the LCA is low due to the prevalence of traffic and railway noise, and surrounding industrial processes. The low lying location and dense development pattern limit even middle distance views, providing little sense of place. There are low scenic qualities due to the erosion of historic industrial character and its replacement with indistinct industrial and residential development. However, the historic Middleton Railway and the landmark spire of St Mary's church are positive remnants of the historic character and the frequency of recreational space provides localised sense of openness and recreational value.

The value of this LCA is low-medium due to the low scenic quality and few cultural features; however, frequent open spaces provide recreational value.

Visual baseline

11.3.10 A summary description of the distribution and types of receptors most likely to be affected is provided below. The viewpoints are numbered to identify their locations and are shown on the viewpoint location maps (see Volume 2: LA17 Map Book, Map Series LV-03 and LV-04). In each case, the middle number (xxx.**xx**.xxx) identifies the type of receptor that is present in this area – 1: Protected views (none within this area), 2: Residential, 3: Recreational[95], 4: Transport, 5: Hotels/healthcare/education and 6: Employment.

11.3.11 The residential developments within the study area are the predominantly low rise terrace and semi-detached housing estates, with a small number of high-rise residential buildings, located within Hunslet and the settlements of Beeston, Belle Isle and Halton Moor. Views obtained by residents in Hunslet are generally near to middle distance urban views depending on location and intervening development. The main road infrastructure is a component of the residential views. Residential views from the settlement edges of Beeston and Belle Isle on the Aire valley sides are elevated, giving longer distance views across south Leeds, and include the industrial areas within the Aire valley.

11.3.12 The Trans Pennine Trail, St. Bernard's Way, Paulinus Way, the NCN Route 67, the Leeds Core Cycle Network 8 Rothwell to Leeds city centre and the Aire Valley towpath are located along the Aire & Calder Navigation and River Aire. Users of recreational footpaths and cycleways, generally have near distance views, contained by surrounding industrial development, with medium distance views along the waterways.

11.3.13 Road users travelling on urban roads and secondary roads mostly have near distance views restricted by the dense urban development pattern. M1 and M621 road travellers have occasional long distance views from elevated sections of the motorway infrastructure. The high overbridges, over the deep Hallam Line cutting at Hillidge Road, Balm Road, Pepper Road and Beza Street, and the elevated M621 footbridge, allow medium distance elevated views both east and west along the Hallam Line and provide for more open views, although for only a short section of the travellers' route.

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.

[95] 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.

11.4.2 The effects associated with the peak construction stage in this area are generally considered to be medium-term, based on the indicative construction programme in Section 2.3. It is currently anticipated that the peak civil engineering stage in this area would be undertaken between the start of 2025 and the end of 2029. 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)[96] to avoid or reduce landscape and visual effects, where reasonably practicable, during construction, include the following:

- avoidance of unnecessary tree and vegetation removal, and protection of existing trees in accordance with BS 5837: Trees in relation to design, demolition and construction[97];
- use of well-maintained hoardings and fencing;
- prevention of damage to the landscape features adjacent to the construction sites due to movement of construction vehicles;
- designing lighting to avoid unnecessary intrusion onto adjacent buildings and other land uses; and
- replacement of any trees intended to be retained which may die as a consequence of nearby construction works.

11.4.5 Implementation of these measures has been taken into account in the assessment of the construction effects.

Assessment of temporary impacts and effects

11.4.6 The most apparent changes to the landscape and to the views experienced by visual receptors during construction would relate to the presence of construction plant, compounds and soils and material storage and stockpiling. Key construction activities that would give rise to the most apparent changes to landscape and visual receptors are: the excavation of cuttings; erection of viaducts; construction of embankments and retaining walls; and demolition of buildings and structures. This would result in the removal of existing landscape elements, including trees and other vegetation, and the closure and diversion of existing public highways and PRoW.

11.4.7 Other key changes include: construction of overbridges and underbridges; construction of an auto-transformer station; construction works for the Leeds East rolling stock depot (RSD); construction of pumping stations and balancing ponds; a partial realignment of the existing Hallam Line; diversion of overhead power lines;

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

utility diversions; and the presence of a main compound, satellite compounds and transfer nodes.

Landscape assessment

11.4.8 Based on the current design it is anticipated that the two LCAs set out in Table 24 would be significantly affected during construction of the Proposed Scheme.

Table 24: Summary description and assessment of effects on LCAs

South East Leeds Industrial	**Low-medium susceptibility and sensitivity**
Susceptibility to change: The low scenic quality of the modern commercial and industrial buildings imparts a low to medium susceptibility to change arising from the Proposed Scheme. The construction and demolition works include the following: the Leeds cutting, Stourton embankment, Stourton embankment retaining walls No.1, No.2 and No.3, Aire and Calder Navigation embankment, Aire & Calder Navigation retaining walls No.1 and No.3, Aire & Calder Navigation flood wall and retaining wall No.2, Hunlset auto- transformer station, Leeds East viaduct, the Leeds East RSD and balancing ponds, the demolition of large industrial buildings, warehouses and a number of road overbridges. The scale and prominence of the construction and demolition works would noticeably alter the landscape character, creating a linear corridor of construction and demolition works alongside the Hallam Line, River Aire and the Aire & Calder Navigation, changing the landscape pattern and grain and temporarily affecting pedestrian and vehicular connectivity. The removal of railway embankment vegetation and riverside vegetation would further emphasise the works and the industrial character of the area. Construction works would adversely affect a substantial part of the LCA and would not be in keeping with existing landscape character. There would therefore be a medium magnitude of change and a moderate adverse effect.	Level of effect: Moderate adverse (significant)
Hunslet	**Low-medium susceptibility and sensitivity**
Susceptibility to change: The mix of small scale residential areas, larger scale industrial development and linear infrastructure impart a low to medium susceptibility to change arising from the Proposed Scheme. The demolition and construction works include the following: the Leeds cutting retaining walls No.1 and No.2, Leeds cutting and two new balancing ponds and the demolition of Mecca Bingo, retail park, car auction buildings and works associated with the replacement of a number of road overbridges, including the M621 east-bound on-slip road. The scale and prominence of the works, including demolition, would noticeably alter the landscape character of the relatively small LCA, creating a linear corridor of construction works along the Hallam Line, changing the landscape pattern and grain and temporarily reducing pedestrian and vehicular connectivity. The removal of railway and highway embankment vegetation would also be noticeable. Construction works would adversely affect a substantial part of the LCA and would not be in keeping with existing landscape character. There would therefore be a high magnitude of change and a major adverse effect.	Level of effect: Major adverse (significant)

Visual assessment

Introduction

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

11.4.10 Where a viewpoint represents multiple types of receptor, the assessment is based on the most sensitive receptors. Effects on other receptor types with lower sensitivity would be lower than those reported.

11.4.11 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 The construction phase potential significant visual effects based on the current design of the Proposed Scheme are described in Table 25 below. Viewpoint locations are shown in Map Series LV-03 in the Volume 2: LA17 Map Book

Table 25: Construction phase significant visual effects

Views west and south-east from the Trans Pennine Trail, St. Bernard's Way, Paulinus Way, National Cycle Network Route 67 and the Leeds Core Cycle Network 8 Rothwell to Leeds City centre (VP 461-03-002, (Map LV-03-461b and LV-03-461-R1b) and VP 462-03-007 (Map LV-03-462))	**High sensitivity receptors**
Users of the recreational routes along the River Aire and Aire & Calder Navigation would experience a series of views towards the demolition and construction works when progressing along the towpaths and PRoW. Views would include construction of the Leeds East RSD and Leeds East viaduct, the Aire & Calder Navigation retaining walls No.1 and No.3, Aire and Calder Navigation embankment, Aire & Calder Navigation flood wall and retaining wall No.2 and Stourton embankment retaining wall No1 and No. 2. This would include the realignment of the overhead power line and extensive tree and vegetation clearance along the river and canal corridor, changing the well treed, semi enclosed character of the corridor and opening up views. The existing industrial development, M1 motorway viaduct and overhead power lines are already detracting features within existing views and these will become more visible. However, the screening effects of retained existing riverside vegetation and the meandering river corridor would limit these effects to a short section of the recreational routes. The scale of the construction works would be highly visible in near distance views and substantially change the River Aire corridor character and skyline. There would therefore be a high magnitude of change and major adverse effect.	Level of effect: Major adverse (significant)
Views from Pontefract Road, north-west and south-east of the Proposed Scheme (VP 462-04-002 and VP 462-04-004 (Map LV-03-462))	**Medium-low sensitivity receptors**
Travellers on Pontefract Road, travelling north-west or south-east, would experience a series of views towards the construction works for the Stourton embankment and the Pontefract Road underbridge. This is an urban view characterised by infrastructure and industrial and commercial buildings. The demolition and clearance of the Cemex site, associated small industrial buildings, works associated with the Pontefract Road underbridge, and extensive clearance of embankment vegetation would result in a marked change to key characteristics of the view. These activities during construction would not be untypical of works within the industrial character of views;	Level of effect: Moderate adverse (significant)

however, they would form a series of new components that would be highly visible in near distance views and substantially change the skyline in mid-distance views for the road travellers. There would therefore be a medium magnitude of change and moderate adverse effect.	
View east from the A639 Wakefield Road and representative views from residences on Westbury Place North. Views north from residences on Pepper Road, Leasowe Avenue, Leasowe Road and from residences near Telford Terrace. View east and north-east from Beza Street recreation ground (VP 463-02-005, VP 463-02-010 (Map LV-03-463), VP 464-02-005, VP 464-03-006 and VP 464-02-004 (Map LV-03-464))	**High sensitivity receptors**
Occupants of residential properties and users of the recreation ground, located south of the Hallam Line, would have views towards the construction and demolition works for the Leeds cutting, new overbridges at the A639 Wakefield Road, Pepper Road, Beza Street, Balm Road and Hillidge Road. Travellers on the A639 Wakefield Road and local roads would experience a series of views towards construction works for the overbridges, associated road works and experience a change of views due to road diversions. The construction works would be partially filtered by embankment vegetation on the southern side of the Hallam Line and within open spaces adjoining the railway line and would be largely filtered during summer months. However, the extent and scale of the construction works would extend across much of the view, opening up the current, largely enclosed character, and substantially changing near and middle distance views. There would therefore be a medium magnitude of change and moderate adverse effect.	Level of effect: Moderate adverse (significant)
View south from residences on Hillidge Road and representative of residences which include three storey flats. View west and north-west from Church Street view from north-west to south-east from the M621 footbridge, PRoW 235.11 (VP 465-02-009 (Map LV-03-465a), VP 464-02-008 (Map LV-03-465a and LV-03-464) and VP 465-03-005 (Map LV-03-465a))	**Medium sensitivity receptors**
Occupants of residential properties and users of the footbridge would have views towards the construction and demolition works for the Leeds cutting and Leeds cutting retaining walls No.1 and No.2, A61 Hunslet Distributor Road south overbridge, A61 Hunslet Distributor Road overbridge, M621 Junction 4 from Junction 3 overbridge, and Hillidge Road and Beza Street overbridges. The demolition of car auction buildings and other premises on Hillidge Road, and the clearance of the linear embankment vegetation, would open up further views towards the construction works for the A61 distributor overbridges and M621 overbridge and Hillidge Road overbridge. Footpath users on the M621 would also have elevated middle and long distance views of the construction works for the Leeds viaduct and HS2 Leeds station and works associated with the A61 distributor overbridges and M621 overbridge. Construction of the Leeds cutting, balancing ponds and the realignments to Church Street and Hillidge Road and associated demolitions would be highly visible in views from residential properties on Church Street with the scale of the construction works substantially changing the key characteristics of the view. There would therefore be a high magnitude of change and major adverse effect.	Level of effect: Major 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 to help achieve earlier landscape and visual integration. However, not all landscape and visual effects can be mitigated due to the visibility of construction activity and the sensitivity of surrounding receptors. No other mitigation measures are considered practicable during construction.

Summary of likely residual significant effects

11.4.14 The temporary residual significant effects during construction remain as described above. These effects would be temporary and reversible in nature lasting only for the duration of the construction works. These residual effects would generally arise from the widespread presence of construction activity and construction plant within the landscape and viewed by surrounding residents and users of PRoW within the study area.

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

- major adverse effects in relation to one LCA;
- moderate adverse effects in relation to one LCA;
- major adverse visual effects on views from two residential viewpoint locations;
- major adverse visual effects on three recreational viewpoint locations;
- moderate adverse visual effects on views from four residential viewpoint locations;
- moderate adverse visual effects on views from one recreational viewpoint location; and
- moderate adverse visual effects on views from two transport viewpoint locations.

11.5 Permanent effects arising from operation

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

Avoidance and mitigation measures

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

- the route of the Proposed Scheme within the Hallam Line cutting and widening of the cutting to reduce impacts on the landscape character and mitigate views of the movement of trains and overhead line equipment, where reasonably practicable;
- design of earthworks to tie in the engineering earthworks for the Aire & Calder Navigation and Stourton embankments into their 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;

- compensatory woodland planting in areas of loss, using the same species composition and planting types (and appropriate planting density), such as woodland planting to compensate for the partial loss along the road and Hallam Line corridors and to provide habitat connectivity, enhanced landscape/green infrastructure connectivity, as well as connectivity of historic landscape features, where reasonably practicable, and to visually soften embankments and viaduct abutments; and
- landscape enhancement at the balancing ponds in Hunslet and in Stourton, south of the River Aire and Aire & Calder Navigation. Woodland and scrub planting would be proposed along the route of the Proposed Scheme to reinstate the wooded rail corridor.

Assessment of impacts and effects

11.5.3 The likely effects on landscape and visual receptors during operation of the Proposed Scheme relate to the presence of new structures and elements in the landscape including the Leeds cutting, Stourton embankment, Stourton embankment retaining walls No.1, No.2 and No.3, Aire & Calder Navigation retaining walls No.1 and No.3, Aire & Calder Navigation embankment, Aire & Calder Navigation flood wall and retaining wall No.2, the Leeds East viaduct, the Leeds East RSD, balancing ponds and overhead line equipment.

Landscape assessment

11.5.4 Based on the current design, it is currently anticipated that the LCAs described in Table 26 would be significantly affected during operation of the Proposed Scheme.

Table 26: Operational phase significant landscape effects

South East Leeds Industrial	**Low-medium susceptibility and sensitivity**
Susceptibility to change: The low scenic quality of the modern commercial and industrial buildings imparts a low to medium susceptibility to change arising from the Proposed Scheme. **Year 1:** The Proposed Scheme, including the following elements, would permanently alter the local landscape pattern: widened Leeds cutting, the Aire & Calder Navigation embankment, Stourton embankment, Aire & Calder Navigation retaining walls No.1 and No.3, Aire & Calder Navigation flood wall and retaining wall No.2, Stourton embankment retaining walls No.1, No.2 and No.3, Hunslet auto-transformer feeder station, the Leeds East RSD, Leeds East viaduct and balancing ponds. Overhead line equipment and movement of trains would be highly perceptible on the embankments, increasing the concentration of large scale infrastructure. The Proposed Scheme would result in noticeable changes in key characteristics including landform, vegetation and landscape pattern and would alter a localised part of the character within the sensitive River Aire and Aire & Calder Navigation corridor. The Hunslet auto-transformer station would not alter the LCA characteristics. The large scale of the Leeds East RSD would extend industrial development and infrastructure into the eastern part of the LCA and alter landform, landscape pattern and land cover. However, the addition of these large elements would result in changes across only a proportion of the LCA. The land parcels left undeveloped following demolitions would further alter the landscape pattern and grain. Proposed mitigation planting would not have matured to integrate the Proposed Scheme into the surrounding LCA. There would therefore be a medium magnitude of change and a moderate adverse effect.	Level of effect: Moderate adverse (significant)

Year 15: The widened railway corridor and the Leeds East RSD would continue to notably alter the landform and to a lesser extent the landscape pattern of the eastern part of the LCA. Landscape mitigation planting along the route of the Proposed Scheme and in proximity to the Leeds East RSD would assist with integration into the landscape by the summer of year 15. The medium magnitude of change and moderate adverse effect would remain.	Moderate adverse (significant)
Hunslet	**Low-medium susceptibility and sensitivity**
Susceptibility to change: The mix of small scale residential areas, larger scale industrial development and linear infrastructure impart a low to medium susceptibility to change arising from the operation of the Proposed Scheme. **Year 1:** The Proposed Scheme, including the following elements, would permanently alter the landform and landscape pattern: the Leeds cutting, Leeds cutting retaining walls No.1 and No.2 and new balancing ponds. These structures, together with the overhead line equipment, would form prominent elements of the LCA and increase the concentration of large scale infrastructure. However, in the west of the LCA the Proposed Scheme would be in a deep cutting which would screen the overhead line equipment. The presence of overhead line equipment would result in changes to landscape character across only a small proportion of the LCA. The land parcels left undeveloped following demolitions would further alter the landscape pattern and grain. Proposed mitigation planting would not have matured to integrate the Proposed Scheme into the surrounding LCA. There would therefore be a medium magnitude of change and a moderate adverse effect.	Level of effect: Moderate adverse (significant)
Year 15: Due to the maturing vegetation present in the landscape, effects would reduce to non-significant by year 15.	Level of effect: Non-significant

Visual assessment

Introduction

11.5.5 The following section describes the likely significant effects on visual receptors during operation year 1 and year 15. Effects at operation year 30 will be reported in the formal ES. The assessment has been undertaken for the winter period, in line with best practice guidance, to ensure a robust assessment. However, in some cases, visibility of the operational Proposed Scheme may be reduced during summer when vegetation, if present in a view, would be in leaf.

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 27 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: LA17 Map Book.

Table 27: Operational phase significant visual effects

View west from the Trans Pennine Trail, including St. Bernard's Way, Paulinus Way and NCN National Route 67 and the Leeds Core Cycle Network 8 Rothwell to Leeds city centre. VP View south-east from the Trans Pennine Trail and adjoining routes) (VP 461-03-002 (Map LV-04-461b and LV-04-461-R1b), VP462-03-007 (Map LV-04-462))	**High sensitivity receptors**
Year 1 – winter and summer: Walkers and cyclists on the PRoW next to this short section of the Aire & Calder Navigation and the River Aire near the M1 would experience substantial alteration to near and middle distance views as a result of the introduction of the highly visible Leeds East RSD, Leeds East viaduct, Aire & Calder Navigation embankment, Aire & Calder Navigation retaining walls No.1 and No.3 and the Aire & Calder Navigation flood wall and retaining wall No.2. Mitigation planting would not provide any visual integration at this stage. At year 1 winter and summer, there would therefore be a high magnitude of change and a major adverse effect.	Level of effect: Major adverse (Significant)
Year 15 -Summer Landscape mitigation planting on the Aire & Calder Navigation embankment, adjacent to the Hallam Line and also in the site adjacent to Haigh Park Road, north of the viaduct, would have partly matured and would provide partial screening of the embankments. The Leeds East viaduct, overhead line equipment and movement of trains would remain as new highly visible components against the skyline. The magnitude of change would therefore reduce to medium and there would be a moderate adverse effect.	Level of effect: Moderate adverse (Significant)
View south-east from residences on Hillidge Road and representative of residences which includes three storey flats. View north-west and west from Church Road. View from north-west to south-east from the M621 footbridge. (VP 465-02-009, VP464-02-008, VP 465-03-005 (Map LV-04-465a))	**High sensitivity receptors**
Year 1 – winter and summer: Occupants of residential properties and users of the footpath on the M621 footbridge would experience noticeable changes to near and middle distance views as a result of the Proposed Scheme. The Leeds cutting would be partially seen, but would be a small change to the view for residents. The overhead line equipment and movement of trains would be screened from view in the approximately 15m deep cutting. However, the Leeds cutting, overhead line equipment and the movement of trains would be seen from the elevated M621 footbridge. The balancing ponds on Hillidge Road and Church Street would be seen by occupiers of residential properties and users of the M621 footbridge. Land parcels left undeveloped following demolitions would be highly visible across the majority of views and would be uncharacteristic features. The landscape mitigation planting would not contribute to any visual integration or enclosure at this stage. At year 1 winter and summer, 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 planting present in the view, 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 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 and will be reported within the formal ES.

Summary of likely residual significant effects

11.5.9 In many cases, significant effects would reduce over time as the proposed mitigation planting matures and reaches its designed intention. However, the following likely residual significant effects would remain following year 15 of operation:

- moderate adverse landscape effects in relation to one LCA; and
- moderate adverse visual effects in relation to two recreational viewpoint locations.

Monitoring

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

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 Stourton to Hunslet area. The assessment considers existing businesses, community organisations, local employment and local economies, including planned growth and development.

12.1.2 Engagement with Leeds City Council (LCC) 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: LA17 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 (SMR)[98].

12.2.2 The assessment of in-combination effects will draw upon the findings of other technical disciplines (for example air quality, sound, noise and vibration, landscape and visual and traffic and transport). Likely significant in-combination effects on socio-economic receptors and resources will be reported in the formal ES.

12.2.3 Businesses may experience 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

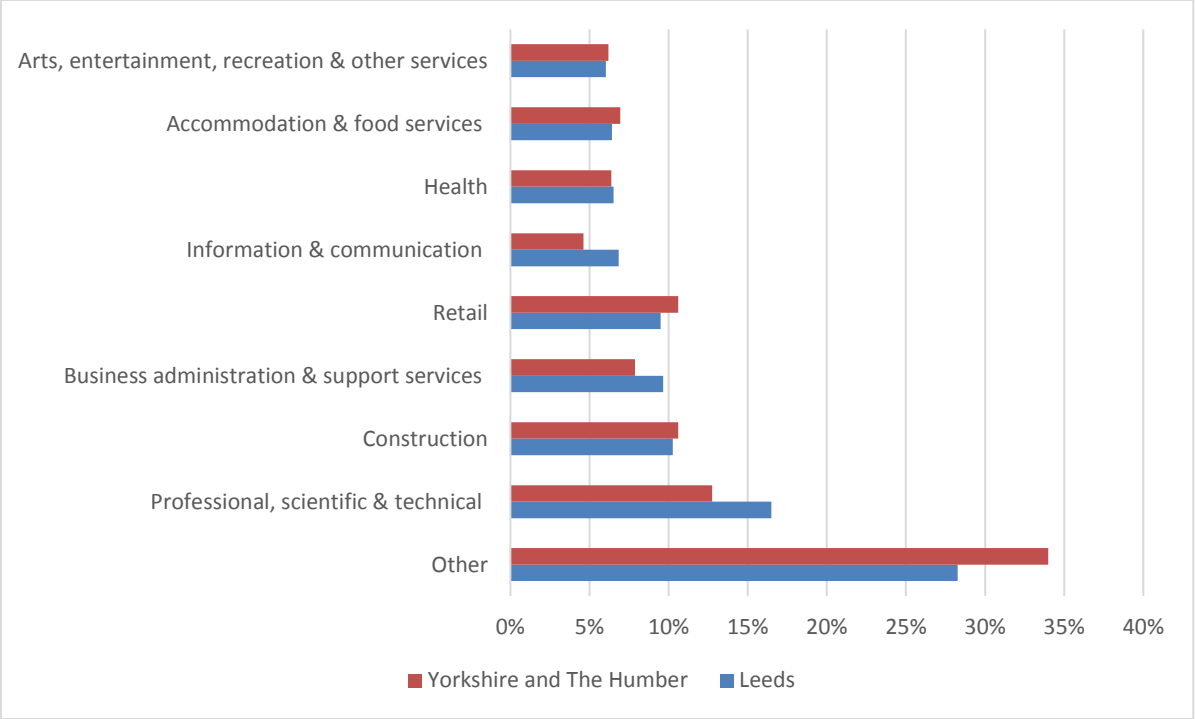
12.3.1 The following provides a brief overview of employment, economic structure, labour market and business premises availability within the Stourton to Hunslet area. Stourton to Hunslet lies within the administrative area of LCC. It also falls entirely within the Leeds City Region Local Enterprise Partnership (LEP) area[99] and the Yorkshire and the Humber region.

[98] Supporting document: HS2 Phase 2b Environmental Impact Assessment Scope and Methodology Report
[99] Leeds City Region Local Enterprise Partnership – Strategic Economic Plan (2016). Available online at: http://www.the-lep.com/LEP/media/New/SEP%20documents/SEP-2016-2036-FINAL.pdf

Business and labour market

12.3.2 Within the LCC area, the professional, scientific and technical sector accounts for the largest proportion of businesses (17%), with the construction (10%), and business administration and support services (10%) sectors also accounting for relatively large proportions. This is shown below in Figure 9. For comparison, within the Yorkshire and the Humber region, professional, scientific and technical sector (13%) accounts for the largest number of businesses, with retail (11%), and construction (11%) also accounting for relatively large numbers of businesses[100].

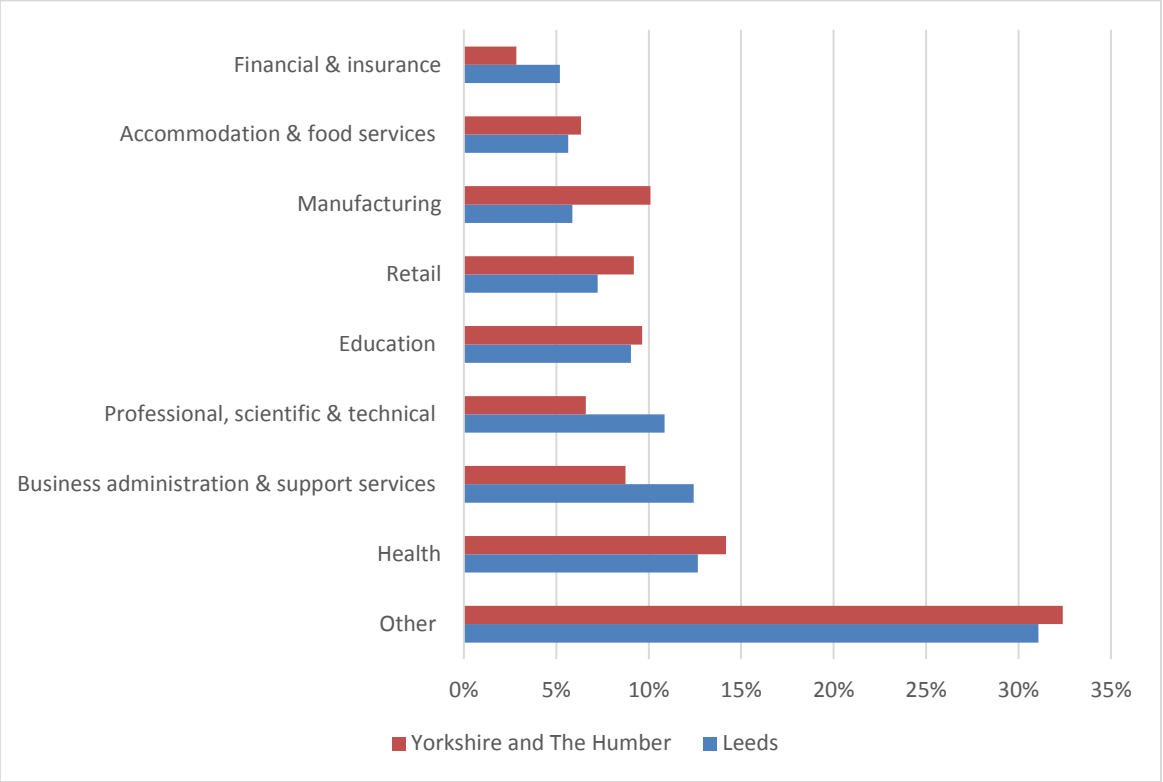
Figure 9: Business sector composition in LCC area and the Yorkshire and the Humber Region [101]



12.3.3 In 2016, approximately 443,000 people worked in the LCC area[102], representing both employed residents and commuters living outside the area. According to the Office for National Statistics Business Register and Employment Survey 2016, the top five sectors in terms of share of employment in the LCC area were: health (13%); business administration and support services (12%); professional, scientific and technical (11%); education (9%); and retail (7%). 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 10[103].

[100] Office for National Statistics – UK Business Counts – Local Units (2017). Office for National Statistics, London. Available online at: https://www.nomisweb.co.uk
[101] "Other" includes: Transport & storage (including postal); Manufacturing; Property; Wholesale; Financial & insurance; Motor trades; Education; Agriculture, forestry & fishing; Mining, quarrying & utilities; and Public administration & defence
[102] Office for National Statistics – Business Register and Employment Survey – Employment (2016). Office for National Statistics, London. Available online at: https://www.nomisweb.co.uk –this number includes both residents and non-residents of LCC who work within its boundaries
[103] Office for National Statistics – Business Register and Employment Survey – Employment (2016). Office for National Statistics, London. Available online at: https://www.nomisweb.co.uk –this number includes both residents and non-residents of LCC who work within its boundaries

Figure 10: Employment by Industrial Sector in the LCC area and the Yorkshire and the Humber Region [104]



12.3.4 According to the Annual Population Survey (2016)[105], the employment rate[106] within the LCC area was 74% (376,000 people), representing both residents employed within the area and those working outside it. These are comparable with the recorded rates for Yorkshire and the Humber region (72%) and England (74%). In 2016, the unemployment rate[107] in the LCC area was 5%. This is comparable with the rate in Yorkshire and the Humber region (5%) and England (5%).

12.3.5 According to the Annual Population Survey (2016)[108], 34% of the LCC residents aged 16-64 were qualified to National Vocational Qualification Level 4 (NVQ4) and above, compared to 31% in the Yorkshire and Humber region and 38% in England. In contrast, 10% of LCC residents had no qualifications, which was in line with the Yorkshire and the Humber region (10%) and higher than the rest of England (8%).

[104] "Other" includes Construction; Information & communication; Arts, entertainment, recreation & other services; Transport & storage (inc postal); Wholesale; Public administration & defence; Mining, quarrying & utilities; Motor trades; Property; and Agriculture, forestry & fishing
[105] Annual Population Survey (2016), NOMIS. Available online at: http://www.nomisweb.co.uk
[106] The proportion of working age (16-64 year olds) residents that is in employment.
[107] 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.
[108] Annual Population Survey (2016), NOMIS. Available online at: http://www.nomisweb.co.uk

Property

12.3.6 A review of employment land supply identified 844 hectares in the LCC area[109]; this is set against a maximum forecast employment land requirement of 526 hectares for B2 / B8 (Industry / Warehousing) and 706,250m² for B1 (Office). The average vacancy rate for industrial and warehousing property in the LCC area in October 2017 has been assessed as 15%, based on marketed space against known stock[110].

12.4 Effects arising during construction

Avoidance and mitigation measures

12.4.1 The draft Code of Construction Practice (CoCP)[111] 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);
- monitor and manage flood risk and other extreme weather events that may affect socio-economic resources during construction (Section 13);
- site specific traffic management measures including requirements relating to the movement of traffic from business and commercial operators of road vehicles, including goods vehicles (Section 14); and
- maintaining access to businesses for the duration of construction works where reasonably practicable (Section 14).

Assessment of impacts and effects

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

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

[109] Leeds Local Development Framework Authority Monitoring Report (2016) (page 12) available online at: http://www.leeds.gov.uk/docs/2016%20AMR%20Final%20vash.pdf
[110] Vacant space is based on marketed space identified from Estates Gazette data (EGi); stock data is taken from information supplied by the valuation office (VOA).
[111] Supporting document: Draft Code of Construction Practice

- 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 Stourton to Hunslet 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 in the Stourton to Hunslet area. Isolation effects will be reported in the formal ES.

Construction employment

12.4.5 It is currently expected that the Aire & Calder Navigation embankment main compound and 10 satellite compounds will be located in the Stourton to Hunslet area. These sites could result in the creation of up to 2,230 person years of construction employment opportunities[112], broadly equivalent to 230 full-time jobs[113], which, depending on skill levels required and the skills of local people, are potentially accessible to residents in the locality and to others living further afield. The impact of the direct construction employment creation has been considered as part of the route-wide assessment (see Volume 3: Route-wide effects).

12.4.6 Direct construction employment could also lead to opportunities for local businesses to supply the Proposed Scheme or to benefit from expenditure by 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 that would be used for the construction of the Proposed Scheme, are reported in groups/clusters, 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.

[112] 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.
[113] Based on the convention that 10 employment years is equivalent to one full time equivalent job.

12.4.9 Overall, 39 business accommodation units or sites in the study area would experience direct impacts as a result of the Proposed Scheme. These 39 units or sites, together, form 18 defined resources, comprising:

- Pontefract Road, Stourton, Leeds (one business unit engaged in the manufacture of articles of concrete, cement, and plaster);
- Freightliner, adjacent to the Balm Road and Midland Road junction, Hunslet (one transportation and storage unit);
- Junction 7 Business Park / Junction 7 office complex, off Wakefield Road, opposite Queen Street junction, Stourton, Leeds (four industry/business services units);
- North side of existing Hallam line, Pepper Road, Hunslet, Leeds (four industry/business services units);
- North side of existing Hallam line, south-east of Pepper Road (two business units consisting of: one materials manufacturing unit and one retail warehouse unit);
- Balm Road Industrial Park, Balm Road / Beza Street / Church Street, Hunslet, Leeds (seven business units consisting of: three industry/business services unit, one waste disposal unit, two retail warehouse units and one betting office);
- M1 Industrial Estate, Church Street, Hunslet, Leeds (four business units consisting of: two industry/business services units, one training unit and one car dealer);
- Located between the A61 and Hillidge Road, Hunslet, Leeds (three business units consisting of: two industry/business services units and one café unit);
- The Courtyard, Church Street, Hunslet, Leeds (four industry/business services units);
- Pontefract Road (road haulier);
- The Queens at Stourton, Wakefield Road, Stourton, Leeds (public house);
- Adjacent to south of The Queens at Stourton, Wakefield Road, Stourton, Leeds (electrical contractor);
- Beza Street, Hunslet, Leeds (printing supplies manufacturer);
- Beza Street, Hunslet, Leeds (property and maintenance contractor);
- Hillidge Road, Hunslet, Leeds (automotive dealer);
- Hillidge Road, Hunslet, Leeds (public house);
- Pottery Road, Hunslet, Leeds (automotive office and rental); and
- Intermezzo Drive (construction materials manufacturer).

12.4.10 Of the defined resources, only two of the resources that experience direct impacts are subject to potentially significant effects on business activities and employment. Table 28 sets out the resources which could potentially experience significant direct effects.

Table 28: Resources which could potentially experience significant direct effects

Resource	Description of business activity
Building materials manufacturer, Pontefract Road	Manufacture of articles of concrete, cement, and plaster
Freightliner Maintenance – Rail freight maintenance company, Midland Road	Transportation and storage

Impact magnitude

12.4.11 The magnitude of impact focuses on the number of jobs that would be affected by the Proposed Scheme, either through displacement or possible job loss. It also considers the implications of this impact in relation to the scale of economic activity and opportunity in the area.

Sensitivity

12.4.12 The sensitivity of resources considers the following:

- availability of alternative, suitable premises;
- size of the local labour market;
- skill levels and qualifications of local people; and
- levels of unemployment.

Significance of effects

12.4.13 Taking account of the sensitivity of the resource and the magnitude of impact, it is currently expected that the significance of the resultant effects would be as set out in Table 29.

Table 29: Significance of effects on resources

Resource	Impact magnitude	Sensitivity	Significance of effect
Building materials manufacturer, Pontefract Road	Moderate	High	Major adverse - significant
Freightliner Maintenance – Rail freight maintenance company, Midland Road	Moderate	High	Major adverse - significant

12.4.14 The construction of the Proposed Scheme would require the demolition of buildings and the acquisition of employment land at the building materials manufacturer's site on Pontefract Road. This resource is deemed to be sensitive to this particular location as it is a rail-fed aggregates depot which cannot easily be relocated. This resource draws upon a specific local labour market and therefore provides economic opportunities for those seeking skilled manual employment in the south of Leeds. As such, the resource is considered to be highly sensitive to this displacement. The effect on this resource, and its employees, is assessed to be major adverse and therefore significant.

12.4.15 The construction of the Proposed Scheme would also require the demolition of buildings and the acquisition of employment land at the Freightliner Maintenance site on Midland Road. This resource is deemed to be sensitive to this particular location as rail connectivity is imperative to the viability of the business and it cannot be easily relocated. This resource draws upon a specific local labour market and therefore provides economic opportunities to those seeking skilled manual employment in the south of Leeds. As such, the resource is considered to be highly sensitive to this displacement. The effect on this resource, and its employees, is assessed to be major adverse and therefore significant.

12.4.16 An estimated 800 jobs would either be displaced or possibly lost in the wider Stourton to Hunslet area. There is a reasonable probability that businesses would be able to relocate to places that would still be accessible to residents within the travel to work area due to the general availability of vacant premises. However, there may be cases where alternative locations are problematic and the businesses may be unable to relocate on a like-for-like basis within the area. The impact on the local economy from the loss and/or relocation of jobs is considered to be relatively modest in the context of the total number of people employed in the LCC area (approximately 443,000 jobs), and the scale of economic activity in the area.

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

Other mitigation measures

12.4.18 Businesses displaced by the Proposed Scheme would be compensated in accordance with the Compensation Code. HS2 Ltd recognises the importance of businesses, displaced from their existing premises, being able to relocate to suitable alternative premises and at this stage it assumes that it would, therefore, adopt a policy to offer additional support over and above statutory requirements to facilitate this process as it has done on Phases One and 2a.

12.4.19 The construction of the Proposed Scheme offers considerable opportunities to businesses and residents along the line of route in terms of supplying goods and services and obtaining employment. HS2 Ltd at this stage assumes that it would, therefore, adopt a policy to work with its suppliers to build a skilled workforce that promotes further economic growth across the UK as it has done on Phases One and 2a.

Summary of likely residual significant effects

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

12.5 Effects arising from operation

Avoidance and mitigation measures

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

Assessment of impacts and effects

Resources with direct effects

12.5.2 It is currently expected that no resources would experience significant direct socio-economic effects during the operation of the Proposed Scheme.

In-combination effects

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

Operational employment

12.5.4 Operational employment would be created at locations along the route including stations, train crew facilities and infrastructure/maintenance depots. Within the Stourton to Hunslet area the Leeds East rolling stock depot would be located, with initial estimates suggesting gross direct employment of approximately 350 jobs[114].

12.5.5 The Proposed Scheme would contribute significantly to the creation of wider development opportunities in the Leeds area.

12.5.6 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.

12.5.7 The impact of operational employment creation has been assessed and reported at a route wide level in Volume 3: Route-wide effects.

Other mitigation measures

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

Summary of likely residual significant effects

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

Monitoring

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

12.5.11 There are no area-specific requirements for monitoring socio-economic effects during the operation of the Proposed Scheme in the Stourton to Hunslet area.

[114] Gross direct employment figure provided by HS2 Ltd.

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 Stourton to Hunslet area on:

- 'residential receptors': people, primarily where they live, in terms of individual dwellings and on a wider community basis including any shared community open areas[115]; and
- ' non-residential receptors'[116]:
  - community facilities including schools, hospitals, places of worship and 'quiet areas[117]; and
  - commercial properties such as hotels.

13.1.2 The methodology for the assessment of likely significant noise and vibration effects was developed in alignment with Government noise policy[118], planning policy, planning practice guidance on noise (PPGN)[119] and EIA Regulations as described in the Scope and Methodology Report[120] (SMR).

13.1.3 Engagement has been undertaken with Leeds City Council (LCC) 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 Stourton to Hunslet area showing the location of the key environmental features (Map Series CT-10), key construction features (Map Series CT-05), key operational features (Map Series CT-06) and operational sound, noise and / or vibration impacts and proposed noise mitigation (Map Series SV-01), can be found in the Volume 2: LA17 Map Book. Map Series SV-01 also presents key 'non-residential receptors'. These receptors will be reviewed and developed further to

[115] '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.
[116] Non-residential receptors with multiple uses would be assessed either based on the most noise sensitive use or would be subject to multiple assessments as appropriate.
[2] 'quiet areas' are defined as either Quiet Areas as identified under the Environmental Noise Regulations 2007 (as amended) or are resources which are prized for providing tranquillity as noted in the National Planning Policy Framework 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.
[118] Noise Policy Statement for England, (2015) Department for Environment, Food & Rural Affairs (Defra)
[119] Department for Communities and Local Government (DCLG) (2014), Planning Practice Guidance – Noise. Available online at: https://www.gov.uk/guidance/noise--2
[120] Supporting document: HS2 Phase 2b Environmental Impact Assessment Scope and Methodology Report

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, Sections 8 and 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 mixture of residential, commercial and industrial premises in a predominantly urban setting. The sound environment is dominated by local and distant road traffic, railway traffic, overflying aircraft on approach to Leeds Bradford Airport and local neighbourhood sources.

13.3.3 Several main roads contribute to the sound environment of the Stourton to Hunslet area, including: the M1; the M621; the A639 (Leeds Road and Wakefield Road); the A61 (including the A61 Hunslet Distributor Road and the A61 Hunslet Distributor Road South); and the A653 (Meadow Lane, Great Wilson Street, Dewsbury Road, Parkfield

Street). One railway line contributes to the sound environment within the area: the Hallam Line.

13.3.4 Sound levels close to these main transportation routes are high during the daytime, but 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 noise levels and how these may change in the future. This will include any changes firstly due to national trends such as road traffic growth and the progressive electrification of road vehicles and secondly due to area specific changes caused either by local committed development and / or noise reduction provided in Important Areas identified in Defra's Noise Action Plans for Agglomerations[121], Roads[122] or Railways[123]. HS2 Ltd will engage with the Competent Authorities responsible for the relevant Important Areas. Map Series SV-01 (Volume 2: LA17 Map Book) shows any noise Important Areas in the Stourton to Hunslet 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 CoCP. The assessment focuses on the initial identification of communities that may be affected by construction noise. The formal ES will include the assessment of likely significant effects from construction noise and/or vibration on individual receptors and communities.

13.4.2 The assessment takes account of people's sensitivity to noise during the day, evening and night. More stringent criteria are applied during evening and night-time periods, compared to the busier and more active daytime period.

Avoidance and mitigation measures

13.4.3 The assessment assumes the implementation of the principles and management processes set out in the noise and vibration section of the draft CoCP[124] (Section 13), which are:

- best practicable means (BPM) as defined by the Control of Pollution Act 1974 (CoPA) and Environmental Protection Act 1990 (EPA), which would be applied during construction activities to minimise noise (including vibration) at neighbouring residential properties and other sensitive receptors[125];

[121] Noise Action Plan: Agglomerations (large urban areas) (2014) Department for Environment, Food & Rural Affairs
[122] Noise Action Plan: Roads (including major roads) (2014) Department for Environment, Food & Rural Affairs
[123] Noise Action Plan: Railways (including major railways) (2014) Department for Environment, Food & Rural Affairs
[124] Supporting document: Draft Code of Construction Practice
[125] Including local businesses and quiet areas designated by the local authority.

- 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 would seek to obtain prior consent from the relevant local authority under Section 61 of the CoPA for the proposed construction works. The consent application would set out BPM measures to minimise construction noise and vibration, including control of working hours, and provide a further assessment of construction noise and vibration, including confirmation of noise insulation/temporary re-housing provision;
- contractors would undertake and report such monitoring as is necessary to assure and demonstrate compliance with all noise and vibration commitments. Monitoring data would be provided regularly to, and be reviewed by, the nominated undertaker and made available to the local authorities; and
- contractors would be required to comply with the terms of the 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.

Assessment of impacts and effects

13.4.6 Potential construction airborne noise significant effects could occur at the communities, or those parts of the communities, that are nearest to the Proposed Scheme in the following locations, as a result of the construction works illustrated on Map Series CT-05 (Volume 2: LA17 Map Book):

- Woodhouse Hill in Belle Isle, Leeds, arising from construction activities such as demolition, road realignment and landscape bund construction; and

- Hunslet / Hunslet Carr in Leeds, arising from construction activities such as demolition, cutting formation, balancing pond construction, overbridge construction, retaining wall, road realignment and landscaping construction.

13.4.7 Map Series SV01 (Volume 2: LA17 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):

- Hunslet Methodist Church in Hunslet Carr;
- Hunslet St Mary's Church of England Primary School in Hunslet;
- St Mary the Virgin Church in Hunslet; and
- Copper Hill Care Home in Hunslet.

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:

- Sussex Avenue, Pepper Road, Middleton Road and Winrose Grove, between A639 (Low Road) and Belle Isle Road;
- Midland Road, Balm Road and Belle Isle Road between Pepper Road and Belle Isle;
- Church Street and Hillidge Road between A639 (Low Road) and Beza Street; and
- Moor Road, between Balm Road and the A61.

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

Other mitigation measures

13.4.11 Further work is being undertaken to confirm the likely significant effects and identify any site-specific mitigation, or amendment to construction routes considered necessary in addition to the general measures set out in the draft CoCP. Any site-specific mitigation will be presented in the formal ES and would include an estimate of the number of properties that may qualify for noise insulation or temporary re-housing under provisions set out in the draft CoCP.

Summary of likely residual significant effects

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

13.4.13 Non-residential receptors identified at this stage as potentially subject to construction noise or vibration effects will be further considered, where necessary, on a receptor-by-receptor basis. Any likely significant effects will be reported in the formal ES.

13.5 Effects arising from operation

Assumptions and limitations

Local assumptions

13.5.1 The assessment of the effects of noise and vibration from the operation of the Proposed Scheme is based on the envisaged design as described in Section 2 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 Stourton to Hunslet area.

13.5.2 Passenger services would start at or after 05:00 from the terminal stations and in this area, with Phase One and Phase Two in operation, would progressively increase to five trains per hour in each direction on the main lines with an operating speed of between 120kph and 200kph. This number of services is assumed to operate every hour from 07:00 to 21:00. The number of services would progressively decrease after 21:00 and the last service would arrive at terminal stations by midnight. Further information is presented in Volume 1 , Section 4.

13.5.3 The Leeds East rolling stock depot (RSD) would operate throughout the day and night, but with the majority of operations occurring during the night. Night-time operations that generate noise would be reduced to a practical minimum. Passenger trains would be prepared and dispatched to Leeds station from approximately 05:00, before passenger services start each day at approximately 05:30. Trains would return to Leeds East RSD during the evening as passenger services decrease on the operational railway, with the last train expected to arrive back from service at approximately 00:30. Trains would arrive at Leeds East (RSD) during the night for routine inspections and maintenance. Trains would undergo planned maintenance (generally inside maintenance sheds) during the daytime. Where night-time inspections identify urgent maintenance, that maintenance would be undertaken that night, if necessary.

Avoidance and mitigation measures

13.5.4 The development of the Proposed Scheme alignment has sought to reduce noise impact insofar as reasonably practicable.

13.5.5 Envisaged avoidance and mitigation measures that apply route-wide are described in Volume 1, Section 9.

Airborne noise

13.5.6 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. Overall it is assumed that proven international technology

would reduce noise emissions by approximately 3dB at 360kph (225mph) compared to the current minimum European standards[126].

13.5.7 Noise effects would be reduced along the route of the Proposed Scheme by engineering structures and landscape earthworks provided to avoid or reduce significant visual effects.

13.5.8 As required by statute, noise insulation measures would be offered for qualifying buildings as defined in the Noise Insulation (Railways and Other Guided Transport Systems) Regulations 1996 ('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 where[127] noise from the use of the Proposed Scheme measured outside a dwelling exceeds the Interim Target defined by the World Health Organization's (WHO) Night Noise Guidelines for Europe[128] or the maximum noise level criteria[129] defined in the SMR. Noise insulation is designed to avoid residents experiencing any residual significant effect on health and quality of life resulting from noise inside their dwelling.

13.5.9 The Leeds RSD would be designed and operated to control noise and vibration and hence avoid significant effects.

Ground-borne noise and vibration

13.5.10 Significant ground-borne noise or vibration effects would be avoided or reduced through the design of the track and track-bed.

Assessment of impacts and effects

13.5.11 Map Series SV-01 (Volume 2: LA17 Map Book) indicates the likely long-term daytime noise level (defined as the equivalent continuous sound level from 07:00 to 23:00 or $L_{pAeq,day}$) from HS2 operations alone. The contours are shown in 5dB steps from 50dB to 70dB. With the train flows described in Volume 1, the night-time noise level (defined as the equivalent continuous noise level from 23:00 to 07:00 or $L_{pAeq,night}$) from the Proposed Scheme would be approximately 10dB lower than the daytime sound level. The 50dB contour, therefore, indicates the distance from the Proposed Scheme at which the night time noise level would be 40dB. This contour represents where adverse noise effects may start to be observed during the day (with respect to annoyance) and night (with respect to sleep disturbance). With regard to sleep disturbance the assessment also takes account of the maximum noise levels generated by each train pass by as defined in the SMR.

13.5.12 The potential for noise effects that are considered significant on a community basis in areas between the 50dB and 65dB daytime noise contours, or 40dB and 55dB night-time contours, is dependent on the baseline in that area and the change in level

[126] Technical Specification for Interoperability (TSI) Noise – EU Commission Regulation No 1304/2014
[127] Following Government's National Planning Practice Guidance. Available online at: https://www.gov.uk/government/collections/planning-practice-guidance
[128] World Health Organization (2010), *Night time Noise Guidelines for Europe*
[129] Dependent on the number of train passes

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

13.5.13 A summary of the likely significant effects identified on a precautionary basis is presented at the end of this section.

13.5.14 Likely significant airborne noise or vibration effects arising from permanent changes to existing roads, will be reported in the formal ES.

13.5.15 Likely significant noise or vibration effects arising from the operation of Leeds RSD will be reported in the formal ES.

Other mitigation measures

13.5.16 Further work is being undertaken to confirm the extent, location and type of the noise mitigation to be included within the design of the Proposed Scheme, which will be reported in the formal ES.

Summary of likely residual significant effects

13.5.17 Mitigation, including landscape earthworks, described in Volume 1, Section 9, Section 2.2 and presented in Map Series SV-01 (Volume 2: LA17 Map Book) and Map Series CT-06 (Volume 2: LA17 Map Book), would substantially reduce the potential airborne noise effects that would otherwise arise from the Proposed Scheme. It is anticipated that the mitigation would avoid likely significant adverse effects due to airborne operational noise on the majority of receptors and communities.

13.5.18 Taking account of the avoidance and mitigation measures this initial assessment has identified no airborne noise effects with the potential to be considered significant on a community basis due to increased noise levels forecast to arise from the operation of the Proposed Scheme in line with the SMR.

13.5.19 The initial assessment indicates that, the forecast noise from long-term railway operation would not 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.

13.5.20 The initial assessment indicates that there are no significant effects identified at any non-residential receptors in this area as a result of operational noise.

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

13.5.22 HS2 Ltd will continue to seek reasonably practicable measures to further reduce or avoid these significant effects. In doing so HS2 Ltd will continue to engage with stakeholders to fully understand the potentially affected receptor, its use and the benefit of the measures.

Monitoring

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

13.5.24 Operational noise and vibration monitoring would be carried out at different times during the lifetime of the Proposed Scheme at a combination of carefully selected monitoring locations including: adjacent or attached to moving vehicles; at fixed positions or in the vicinity of individual assets; and locations within the surrounding areas and communities alongside the railway corridor.

13.5.25 The expected noise and vibration performance of the Proposed Scheme, operational noise and vibration measurement data, associated asset information, description of corrective actions, results of measured performance compared to expected conditions, and monitoring reports would be shared with the relevant local authorities at appropriate intervals.

14 Traffic and transport

14.1 Introduction

14.1.1 This section considers the likely impacts on all forms of transport and the potential likely significant effects identified to date on transport users arising from the construction and operation of the Proposed Scheme through the Stourton to Hunslet area.

14.1.2 Engagement with Highways England, Leeds City Council (LCC) and West Yorkshire Combined Authority (WYCA) 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: LA17 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)[130].

14.2.2 The study area for traffic and transport includes the urban areas of Stourton, Belle Isle and Hunslet (immediately south of Leeds city centre).

14.2.3 The study area also includes all roads potentially affected by the Proposed Scheme including the M1 and the M621, which are the only strategic roads in the area. It also includes the following local roads: the A61/Hunslet Distributor Road/South Accommodation Road; the A63 Pontefract Lane; the A639 Leeds Road/Wakefield Road/Thwaite Gate; the B6481 Pontefract Road; Haigh Park Road; Westbury Place North; Queen Street; Pepper Road; Sussex Avenue; Middleton Road; Winrose Grove; Moor Road; Midland Road; Beza Street; Balm Road/Belle Isle Road; Church Street and Hillidge Road.

14.2.4 The potential effects on traffic and transport have been assessed qualitatively, based on the Proposed Scheme design, proposed construction routes, initial estimates of construction traffic and professional judgement.

14.2.5 No quantitative assessment has been undertaken at this stage. A quantitative assessment will be presented in the formal ES.

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, LCC and WYCA (including

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

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 LCC and Highways England as appropriate. Assessment of the 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 (2% to 3%) 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 November 2017 and April 2018 to establish their nature and usage by non-motorised users (pedestrians, cyclists and equestrians). The surveys included PRoW and roads that would cross the route of the Proposed Scheme, and any additional PRoW and roads that may be affected by the Proposed Scheme. The majority of the PRoW surveys were undertaken during the weekend, at times when recreational use is expected to be highest, but where routes are likely to be used for non-leisure uses, such as commuting, surveys were undertaken on a weekday.

Strategic and local highway network

14.3.4 The strategic routes that pass through the area are: the M1 and the M621. The strategic road network in and around the Stourton to Hunslet area is busy at peak times and delays can be experienced, particularly on the M621 in the north-westbound direction during the morning peak period and in both directions during the evening peak hour. Congestion and delays are also experienced at the M621 junctions 4 and 7 and the M1 junctions 44 and 45 at peak times.

14.3.5 The local roads that could be affected by the Proposed Scheme include: the A61 Hunslet Distributor Road, which is part of the Leeds Inner Ring Road; the A63 Pontefract Lane; the A639 Leeds Road/Wakefield Road; the B6481 Pontefract Road; Haigh Park Road; Westbury Place North, Queen Street; Pepper Road/Sussex Avenue; Middleton Road; Winrose Grove; Balm Road/Belle Isle Road; Moor Road; Midland Road; Beza Street; Church Street; and Hillidge Road. The local road network in this area generally operates well outside of the peak times. However, at peak times, the level of traffic experienced can result in congested conditions, in particular on the B6481 Pontefract Road at its junction with the M1 (Junction 44), at the junction of the A639 Wakefield Road with Pontefract Road and at the junction of the A639 Thwaite Gate and Sussex Avenue.

14.3.6 Relevant accident data for the road network subject to assessment have been obtained from the Department for Transport[131]. Data for the three year period

[131] Department for Transport; Crashmap.co.uk. Available online at: www.crashmap.co.uk. CrashMap provides accident data for the UK.

mid-2014 to mid-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 Stourton to Hunslet area: at Junction 7 of the M621 (31 accidents, including 30 with slight injuries and one with serious injuries).

14.3.8 The route of the Proposed Scheme would cross 13 roads with footways within the Stourton to Hunslet area. These are: the M621 southbound off-slip road (at Junction 4) at its junction with the A61 Hunslet Distributor Road; the A61/M621 northbound off-slip road (at Junction 4); the A61 Hunslet Distributor Road/South Accommodation Road; the A639 Wakefield Road; the B6481 Pontefract Road; Queen Street; Westbury Place North; Pepper Road; Balm Road; Midland Road; Beza Street; Church Street; and Hillidge Road.

Parking and loading

14.3.9 There is on-street parking on some roads within the Stourton to Hunslet area, which could be impacted by the Proposed Scheme. There are also off-street parking and loading areas which could be impacted.

Public transport network

14.3.10 Seventeen bus routes operate on five roads that would be crossed by the route of the Proposed Scheme in the Stourton to Hunslet 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 B6481 Pontefract Road: Bus service 167 (Leeds – Woodlesford – Castleford); bus service 168 (Leeds – Woodlesford – Castleford); bus service 189 (Leeds – Rothwell – Oulton – Wakefield); and bus service 410 (Leeds – Oulton – Eastbourne);
- the A639 Wakefield Road: Bus service 444 (Leeds – Rothwell – Wakefield); bus service 446 (Leeds – Woodlesford – Wakefield); bus service 110 (Leeds – Wakefield – Kettlethorpe); and bus service N10 (Leeds – Robin Hood – Wakefield);
- Pepper Road: Bus service 74/74A (Leeds – Hunslet – Middleton); and bus service 86 (Middleton – Hunslet – Bramley);
- Balm Road: Bus service 12 (White Rose Centre – Leeds – Roundhay); bus service 13/13A (Middleton – Leeds – Gledhow); bus service 47 (White Rose Centre – Middleton – Leeds); bus service 48 (Wigton Moor – Leeds - Hunslet – Morley); and bus service 48A (White Rose Centre – Hunslet – Leeds); and
- Beza Street: Bus service 61 (St. James' Hospital – Hunslet – Beeston); bus service 86 (Middleton – Hunslet – Bramley); and bus service 86A (St. James' Hospital – Hunslet – Bramley).

14.3.11 A park and ride facility is also provided close to the M1 Junction 45 at Temple Green (the Temple Green Park & Ride) which is accessed from the A63 Pontefract Lane.

14.3.12 National and local rail services are accessible via Leeds Station, which is located within the adjacent Leeds Station area, and local rail services are accessible via Woodlesford Station, which is located within the adjacent Warmfield to Swillington and Woodlesford area. Leeds Station provides access to national services to London, Birmingham and the south-west, the north-west, the north-east and Scotland as well as local services to areas of North, West and South Yorkshire. Woodlesford Station provides access to local services to Leeds, Sheffield and Knottingley. The existing Hallam Line in this area also provides access for freight services, including access to the Freightliner Ltd Leeds Terminal.

Non-motorised users

14.3.13 There are pedestrian footways adjacent to many of the roads in the built-up areas of Stourton, Belle Isle and Hunslet. Footways vary in width and condition within these areas. Where there is no formal footway provision adjacent to a road, non-motorised user numbers are generally low.

14.3.14 The route of the Proposed Scheme would cross 11 PRoW within the Stourton to Hunslet 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 a day recorded on four of the PRoW on a weekend and fewer than 10 people a day recorded on five of the PRoW on a weekday. The routes with the greatest usage during the survey day on a weekday were: the B6481 Pontefract Road as used by 48 pedestrians and 131 cyclists; Pepper Road used by 102 pedestrians and 15 cyclists; Balm Road used by 130 pedestrians and eight cyclists; Beza Street used by 521 pedestrians, 86 cyclists and two equestrians; Church Street used by 226 pedestrians and 30 cyclists; Hillidge Road used by 238 pedestrians and 28 cyclists; the Non-definitive Leeds City Footpath 3 used by 314 pedestrians and 34 cyclists; and the Non-definitive Leeds City Footpath 42 used by 94 pedestrians and 38 cyclists.

14.3.15 The surveys undertaken indicate that weekday use of these routes is generally higher than at the weekend. The routes with greater usage on a weekend were: Rothwell Bridleway 9 (Trans Pennine Trail); and Balm Road.

14.3.16 In the Stourton to Hunslet area, National Route 67 (part of the National Cycle Network) passes through the area on a north-west to south-east alignment, along the route of the River Aire and the towpath of the Aire & Calder Navigation. National Route 67, which partly runs along Bridleway Rothwell 9 and is also part of the Trans Pennine Trail, was used by 128 cyclists during the weekend survey day.

Waterways and canals

14.3.17 There are two navigable waterways in the Stourton to Hunslet area. The River Aire is located north-east of the route of the Proposed Scheme through much of the area and is crossed by the Proposed Scheme where the Leeds East rolling stock depot (RSD) connects with the HS2 Leeds spur. The Aire & Calder Navigation runs alongside the River Aire and is crossed by the route of the Proposed Scheme at the same location as the River Aire.

Air transport

14.3.18 There is no relevant air transport in the Stourton to Hunslet 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 PRoW is not available;
- where reasonably practicable, site haul routes would be created adjacent to the route of the Proposed Scheme to transport construction materials and equipment to reduce heavy goods vehicle (HGV) movements on public roads with access taken via the main road network;
- HGV would be routed, insofar as reasonably practicable, along the strategic and/or primary road network;
- the use of the local road network would, insofar as reasonably practicable, be limited to use for site set-up, access for surveys and on-going servicing (including refuse collection and general deliveries to compounds) during construction;
- the reuse of excavated material along the route of the Proposed Scheme, insofar as reasonably practicable;
- highway measures including junction improvements, passing places and carriageway widening would be provided, as required, to manage the safe passing of construction vehicles on construction HGV routes; and
- on-site welfare facilities would be provided which would reduce daily travel by site workers.

14.4.2 Section 14 of the draft Code of Construction Practice (CoCP)[132] includes measures that aim to reduce the adverse impacts and effects on local communities and maintain public access. This includes the impacts of deliveries of construction materials and equipment.

14.4.3 The measures in the draft CoCP include controls on vehicle types, hours of site operation and routes for HGVs to reduce the impact of road-based construction traffic. In order to achieve this, general and site-specific traffic management measures would be implemented during the construction of the Proposed Scheme on or adjacent to public roads and PRoW affected by the Proposed Scheme.

14.4.4 The draft CoCP includes the requirement to develop local traffic management plans in consultation with the highway and traffic authorities and the emergency services. These would consider the local traffic management strategy including consideration of sensitive receptors, such that adverse impacts would be reduced insofar as reasonably practicable and any effect on safety and accidents would not be significant.

14.4.5 Specific measures would include core site operating hours of 08:00 to 18:00 on weekdays and 08:00 to 13:00 on Saturdays with site staff and workers generally arriving before the morning peak hour and departing after the evening peak hour.

14.4.6 The number of private car trips to and from the construction compounds (both workforce and visitors) would be reduced by encouraging alternative sustainable modes of transport or vehicle sharing. This would be supported by an overarching framework travel plan that would require construction workforce travel plans[133] to be produced that would include a range of potential measures to mitigate the impacts of traffic and transport movements associated with construction of the Proposed Scheme.

14.4.7 Where works potentially affect Network Rail assets, disruption to travelling passengers and freight movements would be reduced insofar as reasonably practicable. This includes measures such as:

- programming the construction works to coincide with the possessions that are required and planned by Network Rail for the general maintenance of their railway;
- planning the required construction works so that they can be undertaken in short overnight stages so that passenger services are not disrupted; and
- programming longer closures at the weekend and on bank holidays to reduce insofar as reasonably practicable the number of passengers affected.

[132] Supporting document: Draft Code of Construction Practice

[133] 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.

Assessment of impacts and effects

Temporary effects

14.4.8 The traffic and transport impacts during the construction period within the Stourton to Hunslet 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 and blockades on the conventional rail network.

14.4.9 The construction assessment has also considered any impacts in the Stourton to Hunslet 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: LA17 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 44 and 45;
- the M621 Junctions 4, 5 and 7;
- the A61 Hunslet Distributor Road/South Accommodation Road between the A63 Pontefract Land and junction 4 of the M621;
- the A63 Pontefract Lane between junction 45 of the M1 and the A61 Hunslet South Accommodation Road;
- the A639 Leeds Road/Wakefield Road south of the M1 and between junction 7 of the M621 and the B6481 Pontefract Road; the B6481 Pontefract Road;
- Haigh Park Road;
- Queen Street;
- Balm Road;

- Sussex Avenue;
- Pepper Road;
- Winrose Grove;
- Middleton Road between Pepper Road and Winrose Grove;
- Belle Isle Road between Belle Isle Circus and Balm Road;
- Moor Road;
- Beza Street;
- Church Street between Balm Road and Hillidge Road; and
- Hillidge Road.

14.4.13 Of these construction routes, Haigh Park Road would have limited use[134]. 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 diversions, reduced lane widths and overnight and weekend closures of the main carriageway of the M1 and northbound on-slip road and southbound off-slip road at Junction 44;
- closure of the M621 southbound off-slip road at junction 4, with traffic diverted onto the local road network;
- closure of the A61 Hunslet Distributor Road (south), with traffic diverted onto the local road network;
- closure of the A61 Hunslet Distributor Road, with traffic diverted onto the local road network;
- closure of the B6481 Pontefract Road where it crosses the existing Hallam Line, with traffic diverted onto the local road network;
- closure of Balm Road where it crosses the existing Hallam Line, with traffic diverted onto the local road network;
- closure of Pepper Road where it crosses the existing Hallam Line, with traffic diverted onto the local road network; and
- closure of Beza Street where it crosses the existing Hallam Line, with traffic diverted onto the local road network; and closure of Hillidge Road where it crosses the existing Hallam Line, with traffic diverted onto the local road network.

[134] 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

14.4.14 Permanent changes to highways are reported under operation.

14.4.15 Changes in traffic have the potential, at some locations, to result in increased travel distance, congestion and delays and increased traffic severance for non-motorised users. The assessment of these changes will be reported in the formal ES.

14.4.16 Assessment of the traffic and transport impacts from utilities works, either separately or in combination with other works, will be reported in the formal ES.

Accidents and safety

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

Parking and loading

14.4.18 It is currently expected that the Proposed Scheme could have impacts on parking and loading. This would include where parking bays or other parking amenities would be 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. An assessment of parking and loading effects will be reported in the formal ES.

Public transport network

14.4.19 It is expected that construction of the Proposed Scheme would require bus route diversions, including bus routes 12, 13/13A, 47, 48, 48A, 61, 74/74A, 86, 86A, 167, 168, 189 and 410. This could result in increased journey times and the need to relocate bus stops. Any consequent effects will be reported in the formal ES.

14.4.20 There are interfaces with the existing rail network in this area, in particular on the operation of the existing Hallam Line including its rail freight services, with closures and possessions required due to the works associated with the modification and construction of bridges in this area in addition to the works associated with the construction of the Woodlesford tunnel in the adjacent Warmfield to Swillington and Woodlesford area. Design development is focussed on minimising these possessions and closures. This would result in disruption to services, although many of the interventions would be combined to reduce the potential disruption. The effects of the closure of the railway will be assessed and reported in the formal ES.

Non-motorised users

14.4.21 The construction works associated with the Proposed Scheme would require the temporary closure or diversion/realignment of PRoW and roads. There would be temporary alternative routes for a number of PRoW in the vicinity of the Proposed Scheme. Where necessary, PRoW would be re-routed around construction compounds.

14.4.22 There would be temporary alternative routes for a number of PRoW in the vicinity of the Proposed Scheme. It is currently expected that the following PRoW would be temporarily diverted or realigned:

- Aire & Calder Navigation (Navigable Waterway and Towpath) (north-west of Woodlesford);

- Footpath 1 (Rothwell Bridleway 9) – Trans Pennine Trail (running along the bank the Aire & Calder Navigation from Leeds to west of the M1);
- Non-definitive Footpath Leeds City 9 (between Pepper Road and the A639 Wakefield Road on the south side of the existing Hallam Line);
- Non-definitive Footpath Leeds City 10 (running along Flax Mill Road connecting Balm Road to Telford Terrace on the south side of the existing Hallam Line);
- Non-definitive Footpath Leeds City 4 (connecting Balm Road to Tulip Street on the south side of the existing Hallam Line);
- Non-definitive Footpath Leeds City 1 (between Beza Street and Tulip Street adjacent to the south side of the existing Hallam Line);
- Non-definitive Footpath Leeds City 2 (between Hillidge Road and Beza Street adjacent to the east side of the existing Hallam Line);
- Non-definitive Footpath Leeds City 3 (connecting Hillidge Road across the M621 via a footbridge); and
- Non-definitive Footpath Leeds City 42 (running from Moor Lane, Holbeck to the north of the M621 at junction 4).

14.4.23 Permanently diverted PRoW are reported under operation although these PRoW could also be subject to temporary closure or diversion/realignment.

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

Waterways and canals

14.4.25 It is currently expected that the construction of the Proposed Scheme could have an effect upon the Aire & Calder Navigation in the Stourton to Hunslet area where the route of the Proposed Scheme could require short-term closures during the works due to the construction of the Leeds East viaduct and Aire & Calder Navigation retaining wall No.3. Short-term closures could also be required due to works to the existing crossing of the canal to the south of the M1 to accommodate construction vehicles. The assessment of these will be reported in the formal ES.

Permanent effects

14.4.26 Any permanent effects of construction will be considered in the assessment of operation for traffic and transport. This is because the impacts and effects of ongoing increases in travel demand and the wider impacts and effects of the operations phase need to be considered together.

Other mitigation measures

14.4.27 The implementation of the 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.

14.4.28 Any further traffic and transport mitigation measures required during the construction of the Proposed Scheme will be considered based on the outcomes of the assessment. These will be reported in the formal ES.

Summary of likely residual significant effects

14.4.29 Construction of the Proposed Scheme has the potential to lead to congestion and delays for road users on a number of routes including: the M1 Junctions 44 and45; the M621 Junctions 4, 5 and 7; the A61 Hunslet Distributor Road/Hunslet Distributor Road (south)/South Accommodation Road; the A63 Pontefract Lane; the A639 Leeds Road/Wakefield Road; the B6481 Pontefract Road; Queen Street; Pepper Road, Sussex Avenue; Middleton Road; Winrose Grove; Belle Isle Road; Balm Road; Moor Road; Beza Street; Church Street; and Hillidge 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.

14.4.30 Construction of the Proposed Scheme is also likely to result in the temporary closures and diversions or realignments of the following: the M1 at Junction 44; the M621 Junction 4 southbound off-slip at Junction 4; the A61 Hunslet Distributor Road (south); the A61 Hunslet Distributor Road; the B6481 Pontefract Road; Balm Road; Pepper Road; Beza Street; and Hillidge Road.

14.4.31 It is currently expected that the construction of the Proposed Scheme could have impacts on parking and loading. Some roads that could be used as construction routes and have on-street parking could be affected.

14.4.32 Construction of the Proposed Scheme would require the temporary diversion of 13 bus routes, including bus routes: 12, 13/13A, 47, 48, 48A, 61, 74/74A, 86, 86A, 167, 168, 189 and 410.

14.4.33 Construction of the Proposed Scheme would result in disruption to rail services and passenger and freight services on the existing Hallam Line as a result of the closure and possessions on the line.

14.4.34 Construction of the Proposed Scheme would require the temporary closure or diversion/realignment of PRoW, including: Aire & Calder Navigation (Navigable Waterway and Towpath); Footpath 1 (Rothwell Bridleway 9) – Trans Pennine Trail; Non-definitive Footpath Leeds City 9; Non-definitive Footpath Leeds City 10; Non-definitive Footpath Leeds City 4; Balm Road; Non-definitive Footpath Leeds City 1; Non-definitive Footpath Leeds City 2; Non-definitive Footpath Leeds City 3; and Non-definitive Footpath Leeds City 42.

14.4.35 It is currently expected that the construction of the Proposed Scheme could have an effect upon the Aire & Calder Navigation in the Stourton to Hunslet area where the route of the Proposed Scheme could require short-term closures during the works.

14.4.36 The assessment of significant effects in relation to traffic and transport during construction of the Proposed Scheme will be reported in the formal ES.

14.5 Effects arising from operation

Avoidance and mitigation measures

14.5.1 The following measures have been included as part of the design of the Proposed Scheme and would avoid or reduce impacts on transport users:

- 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 Leeds East RSD would include measures that aim to reduce the impacts 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 beneficial impacts within this area due to the introduction of HS2 services and improvements to existing rail services at HS2 Leeds Station in the adjacent Leeds Station area, as well as improvements in access to the station, including by public transport and for drop-off/pick-up.

14.5.5 The operation of the Proposed Scheme would result in road traffic impacts within this area due to increased traffic associated with the Leeds East RSD and Hs2 Leeds Station in the adjacent Leeds Station area. However, the maintenance of the Proposed Scheme would generate limited vehicular trips and the effect would not be significant.

Highway network

Strategic and local highway network

14.5.6 The Proposed Scheme would result in a number of permanent highway changes. These include:

- Knowsthorpe Lane, which would be permanently closed where it crosses the Leeds East RSD to the north of the M1 close to the M1 Junction 45;
- Haigh Park Road, which would be permanently closed where it is crossed by the route of the Proposed Scheme to the north of the existing Hallam Line;
- the A639 Wakefield Road, which would be realigned to the east of its existing alignment to cross the Proposed Scheme via the new A639 Wakefield Road overbridge;
- Westbury Place North, which would be realigned at its junction with the A639 Wakefield Road to maintain its connection to the A639 Wakefield Road;

- Queen Street, which would be realigned at its junction with the A639 Wakefield Road to maintain its connection to the A639 Wakefield Road;
- Pepper Road, which would be realigned via an overbridge to accommodate the Proposed Scheme;
- Balm Road, which would be realigned via an overbridge to accommodate the Proposed Scheme;
- Midland Road, which would be realigned at its junction with Balm Road, to maintain its connection to Balm Road;
- Beza Street, which would be realigned via an overbridge to accommodate the Proposed Scheme;
- Church Street, which would be realigned as part of the work to construct Hillidge Road Overbridge; and
- Hillidge Road, which would be realigned via an overbridge to accommodate the Proposed Scheme.

14.5.7 The permanent highway changes are not expected to result in significant changes in travel distances. The effects of these changes including on non-motorised users will be reported in the formal ES.

14.5.8 Operation of the Proposed Scheme would result in changes in traffic flows due to passengers and staff accessing HS2 Leeds Station in the Leeds Station area. This could result in changes to traffic movements in the Stourton to Hunslet area and affect, in particular, the M621 and the A61 Hunslet Distributor Road/South Accommodation Road. The effects of these changes will be reported in the formal ES.

14.5.9 The proposed Leeds East RSD 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 would also 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

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 currently expected that there would be a permanent loss of car parking and loading at locations along the route of the Proposed Scheme in this area. Where car parking or loading is lost that would have served facilities that are displaced by the Proposed Scheme this is not considered a material effect. Any effects will be reported in the formal ES.

14.5.12 HS2 Ltd would work with the businesses affected to identify opportunities to mitigate effects on parking where reasonably practicable.

Public transport network

14.5.13 It is expected that the Proposed Scheme would generate significant major beneficial effects for rail passengers, as a result of:

- the increase in rail capacity at HS2 Leeds Station in the adjacent Leeds Station area and from the introduction of HS2 services;
- significantly improved journey times between Leeds, 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 local commuters and potentially freeing up space for freight.

14.5.14 The operation of the Proposed Scheme is not expected to have a significant effect on bus services in the Stourton to Hunslet area.

Non-motorised users

14.5.15 One PRoW that crosses the route of the Proposed Scheme, Rothwell Footpath 1, would be closed with an alternative route provided via Queen Street and the B6481 Pontefract Road. The diversion would not require additional travel distance in excess of 500m. The assessment of this change 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 Stourton to Hunslet 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, realignment or closure of: the A639 Wakefield Road; Knowsthorpe Lane; Haigh Park Road; Westbury Place North; Queen Street; Pepper Road; Balm Road; Midland Road; Beza Street; Church Street; and Hillidge Road. Pepper Road, Balm Road and Beza Street would be realigned over new overbridges, whilst Midland Road, Westbury Place North and Queen Street are realigned at their junctions due to the proximity to new overbridges. 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 The operation of the Proposed Scheme could result in impacts within this area due to increased traffic associated with Leeds station in the Leeds Station area (LA18).

14.5.21 It is currently expected that there would be a permanent loss of car parking and loading at locations along the route of the Proposed Scheme in the Stourton to Hunslet area.

14.5.22 The operation of the Proposed Scheme would result in beneficial impacts within the Stourton to Hunslet area due to increased access to rail services at Leeds Station in the adjacent Leeds Station area, as well as improvements in access to the station, including by public transport and for drop-off/pick-up.

14.5.23 The operation of the Proposed Scheme would require the permanent diversion of one PRoW, Rothwell Footpath 1.

14.5.24 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

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

14.5.26 A workforce travel plan would detail monitoring of travel associated with operation of the Leeds East RSD.

14.5.27 There are no other area-specific monitoring requirements currently proposed for traffic and transport in the Stourton to Hunslet 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 Stourton to Hunslet area. The likely impacts and significant effects identified to date arising from the construction and operation of the Proposed Scheme on surface water and groundwater bodies and their associated water resources are reported. The likely impacts and significant effects of the Proposed Scheme on flood risk and land drainage are also reported.

15.1.2 Engagement has been undertaken with the Environment Agency, the Canal & River Trust (CRT), Leeds City Council (LCC), which is the Lead Local Flood Authority (LLFA), and Yorkshire Water Services Limited (the local water and sewerage undertaker). The purpose of this engagement has been to obtain relevant baseline information and to discuss the Proposed Scheme and potential effects. Engagement with these stakeholders will continue as part of the development of the Proposed Scheme.

15.1.3 Maps showing the location of the key environmental features (Map Series CT-10), and the key construction (Map Series CT-05) and key operational (Map Series CT-06) features of the Proposed Scheme can be found in the Volume 2: LA17 Map Book. This map book also includes Map Series WR-01 and WR-02 showing surface water and groundwater baseline information respectively.

15.1.4 Volume 3: Route-wide effects, Water resources and flood risk (Section 16) covers the following at a route-wide level:

- the risk to water resources associated with accidents or spillages from trains during operation of the Proposed Scheme;
- a summary of how the Proposed Scheme aims to demonstrate compliance with the statutory requirements of the Water Framework Directive (WFD); and
- route-wide flood risk issues related to alignment of the Proposed Scheme with the Sequential Test and Exception Test policies in the National Planning Policy Framework (NPPF)[135].

15.2 Scope, assumptions and limitations

15.2.1 The scope, assumptions and limitations for the water resources and flood risk assessment are set out in Volume 1, Section 8 and the Scope and Methodology Report (SMR)[136].

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 centre line of the route of the Proposed Scheme, as described in Section 2.2 of this report.

[135] National Planning Policy Framework, DCLG, 2015.
[136] Supporting document: HS2 Phase 2b Environmental Impact Assessment Scope and Methodology Report

15.2.3 This assessment is based on desk study information, including information provided to date by consultees and stakeholders, as well as surveys of accessible water features.

15.2.4 Where surveys have not been undertaken due to land access constraints, a precautionary approach has been adopted in the assessments of receptor value and impact magnitude.

15.2.5 Hydraulic analysis is currently being undertaken of watercourses and key structures within flood risk areas. This includes fluvial modelling of the River Aire and Wyke Beck, and hydraulic modelling of Yorkshire Water Services Limited's combined sewer network.

15.2.6 Groundwater levels have been inferred from the available Environment Agency groundwater level monitoring boreholes, historic borehole logs and topographic data, as well as from spring and watercourse locations.

15.2.7 Impacts on biological receptors such as aquatic fauna and flora are assessed in Section 7, Ecology and biodiversity.

15.2.8 The assessments in this working draft ES are based on professional judgement using the information that it currently available. A precautionary approach has been adopted with regard to assessing the potential for adverse impacts to occur. The surveys, analysis and modelling work currently in progress, and the results of the consultation process, will be used to refine the assessments reported in the formal ES.

15.3 Environmental baseline

Existing baseline - Water resources and WFD

Surface water

15.3.1 All surface water bodies in the study area fall within the Aire and Calder management catchment of the Humber river basin district (RBD).

15.3.2 The river basin management plan[137] identifies the chemical[138] and ecological[139] status of surface water bodies, and the quantitative[140] and chemical[141] status of groundwater bodies within this RBD.

15.3.3 To be compliant with WFD legislation, the Proposed Scheme should not cause deterioration of a water body from its current status; nor prevent future attainment of good status where this has not already been achieved. The Proposed Scheme should also avoid adverse impacts on protected or priority species and habitats.

[137] Environment Agency (2015), Water for life and livelihoods Part 1: Humber river basin district: River basin management plan.
[138] The chemical status of surface waters reflects concentrations of priority and hazardous substances present.
[139] 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.

[140] 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.
[141] 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.

15.3.4 Specialist field surveys are being undertaken, where access is available. Receptor values will be adjusted to reflect the outputs from these surveys, in close consultation with the Environment Agency. In the absence of field surveys, surface water bodies, other than minor ponds and ditches, have been identified within this assessment as being of either high or very high value on a precautionary basis.

15.3.5 Summary information relating to the surface water bodies potentially affected by the Proposed Scheme within the study area is provided in Table 30. The receptor value attributed to each individual water body is based on the methodologies set out in the SMR.

Table 30: Surface water body receptors

Water body name and location[142]	Designation	Q95 value (m^3/s)[143]	Receptor value	Parent WFD water body name and identification number[144]	Current WFD status / Objective[145]
Aire & Calder Navigation WR-01-371a C6	Canal	n/a	Very High	Aire from Gill Beck (Baildon) to River Calder GB10427063032	Good / Good by 2015
River Aire WR-01-371a C6	Main river	2	High		Moderate / Moderate by 2015
Tributary of Main Effluent Channel WR-01-371a D7	Ordinary watercourse	<0.002	Low	Wyke Beck from Source to River Aire GB104027062880	Moderate / Good by 2027
Main Effluent Channel WR-01-371a D8	Ordinary watercourse	<0.002	Low		Moderate / Good by 2027
Wyke Beck WR-01-371a D8	Main River	0.02	High		Moderate / Good by 2027

Abstractions and permitted discharges (surface water)

15.3.6 There is one licensed surface water abstraction in the study area, which is not located within the land required for the construction and operation of the Proposed Scheme. This is considered to be a high value receptor.

15.3.7 Records of private unlicensed surface water abstractions, which comprise those for quantities less than $20m^3$ per day, have been obtained from the local authorities. These data indicate that there are no registered private unlicensed surface water

[142] The feature locations are indicated by the grid coordinates on the relevant Volume 2: LA17 Map Book figure (in this case WR-01).
[143] This is the flow within the watercourse that is exceeded for 95% of the time.
[144] The Environment Agency has attributed each surface water and groundwater body a unique water body identification (ID) number.
[145] Status and objectives are based on those set out in the 2015 River basin management plan.

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 23 consented discharges to surface waters within the study area, four of which are within the land required for the Proposed Scheme. These have been assessed as being receptors of low value.

Groundwater

15.3.9 The geology of the study area is described in Section 10, Land quality, and the superficial and bedrock hydrogeology is summarised in Table 31. Unless stated otherwise, the geological groups listed would all be crossed by the Proposed Scheme. Table 31 also identifies the receptor values attributed to each groundwater receptor based on the methodologies set out in the SMR.

Table 31: Summary of geology and hydrogeology in the study area

Geology	Distribution	Formation description	Aquifer classification	WFD body (ID) and current overall status[146]	WFD status objective[147]	Receptor value
Superficial deposits						
Alluvium	Areas in the east and north of the study area in the vicinity of the River Aire and its tributaries	Clay, sand and gravel	Secondary A	Not assessed by the Environment Agency	Not assessed by the Environment Agency	Moderate
River Terrace Deposits	Western, central and northern parts of the study area along the River Aire and its tributaries	Clay, sand and gravel	Secondary A	Not assessed by the Environment Agency	Not assessed by the Environment Agency	Moderate
Glaciofluvial deposits	Small area in the south-east of the study area	Sand and gravel	Secondary A	Not assessed by the Environment Agency	Not assessed by the Environment Agency	Moderate
Head	Small linear area in the south of the study area	Gravelly clay	Secondary (undifferentiated)	Not assessed by the Environment Agency	Not assessed by the Environment Agency	Moderate
Bedrock						
Pennine Middle Coal Measures Formation	The south eastern extent of the study and a subcrop near	Interbedded mudstone, siltstone and	Secondary A	Aire and Calder Carb Limestone -	Poor by 2015	Moderate

[146] As stated in the 2015 River basin management plan.
[147] As stated in the 2015 River basin management plan.

Geology	Distribution	Formation description	Aquifer classification	WFD body (ID) and current overall status[146]	WFD status objective[147]	Receptor value
	Woodhouse Hill	sandstone with coal seams		Millstone Grit - Coal Measures (GB40402G700400) Poor		
Pennine Lower Coal Measures Formation	Majority of the study area	Interbedded mudstone, siltstone and sandstone with coal seams	Secondary A		Poor by 2015	Moderate

Superficial deposit aquifers

15.3.10 The basis of the receptor values attributed to the superficial deposit aquifers present within the study area, as shown in Table 31, is outlined briefly as follows:

- alluvium, river terrace deposits and glaciofluvial deposits have been classified by the Environment Agency as Secondary A aquifers. These may be capable of supporting water supplies at a local rather than regional scale and may also form an important source of baseflow to rivers. These have therefore been classified as moderate value receptors; and
- head deposits have been classified by the Environment Agency as a Secondary (undifferentiated) aquifer. These may supply baseflow to watercourses or store and yield limited amounts of groundwater. Therefore, they have 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 31 is outlined briefly as the Pennine Middle Coal Measures Formation and the Pennine Lower Coal Measures Formation, which have been classified as Secondary A aquifers by the Environmental Agency. These aquifers 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. Therefore, these aquifers have been classified as moderate value receptors.

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 31. The value attributed to each of these receptors is also indicated.

15.3.13 The superficial deposits in the study area are not formally designated as WFD groundwater bodies but may be hydraulically connected to the WFD bedrock aquifers.

Abstraction and permitted discharges (groundwater)

15.3.14 There are no groundwater abstractions licenced for public water supply within the study area. There are no source protection zones (SPZ) associated with licensed public water supplies within the study area.

15.3.15 There is one private groundwater abstraction licence registered in the study area, as shown on Map WR-02-201. This is assessed as a high value receptor due to its non-potable use and the daily licence quantity being above 100m^3.

15.3.16 Records of private unlicensed groundwater abstractions, which comprise those for quantities less than 20m^3 per day, have been obtained from the local authorities. These data indicate that there are no registered private unlicensed groundwater abstractions within the study area. As there is no obligation to register private water supplies, unregistered private groundwater supplies may also be present. Private water supplies have been assessed as high value receptors unless details obtained from the owner indicate otherwise.

15.3.17 There are no consented discharges to groundwater in the study area.

Groundwater – surface water interactions

15.3.18 Desk-based assessment using Ordnance Survey maps and detailed river network data provided by the Environment Agency identified two features within the study area that had potential to be springs. Access was not possible to inspect either of these features at this stage.

15.3.19 The two potential spring features that have yet to be inspected are assumed to be high value receptors on a precautionary basis.

15.3.20 There are three 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 site within the study area is potentially groundwater dependent; Rothwell Colliery LNA (Rothwell Country Park), covering an area of 46.8ha. The designation citation was not available at the time of writing, but from publicly available sources the site appears to contain ponds which have the potential to be groundwater fed but is yet to be surveyed. The LNA is located south of the existing Hallam Line, partially within the land required for the Proposed Scheme and at the boundary with the Warmfield to Swillington and Woodlesford area (LA15).

15.3.22 No designated nature conservation sites within the study area which are dependent on surface water flows have the potential to be affected by the Proposed Scheme.

15.3.23 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.

Existing baseline - flood risk and land drainage

15.3.24 The Environment Agency's Flood map for planning (rivers and sea)[148] 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

[148] Environment Agency, Flood map for planning. Available online at: https://flood-map-for-planning.service.gov.uk

1 in 1,000 (0.1%) annual probability of river flooding) and Flood Zone 3 (land assessed as having a 1 in 100 (1%) or greater annual probability of river flooding).

15.3.25 The updated Flood map for surface water[149] has been used to scope surface water flood risks. Infrastructure failure flood risks have been scoped using the Environment Agency risks of flooding from reservoirs national dataset[150]. The British Geological Survey's (BGS) Groundwater flooding susceptibility data set[151] has been used to assess the future risk of groundwater flooding.

15.3.26 The following reports were used to help determine the baseline flood risk within the study area:

- Leeds Preliminary Flood Risk Assessment (PFRA) (2011)[152];
- Leeds Strategic Flood Risk Assessment (SFRA) (2007)[153]; and
- Leeds Local Flood Risk Management Strategy (LFRMS) (2014)[154].

River flooding

15.3.27 The study area includes substantial areas of floodplain (Flood Zones 2 and 3) associated with the River Aire at Stourton and Hunslet. The study area also includes the floodplain associated with Wyke Beck, which would be the location for the proposed Leeds East rolling stock depot. Table 32 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 32: River flood risk sources and receptors

Source	Location description and figure/coordinate[155]	Receptor potentially affected	Receptor value / sensitivity to flooding
River Aire	WR-01-371a D6	Commercial properties on: Haigh Park Road; Intermezzo Drive; Pontefract Road; and Skelton Grange Road	Moderate
	WR-01-371a D7	Commercial properties on Haigh Park Road and South Road	Moderate
	WR-01-371a E5	Residential and commercial properties on Sussex Avenue and Sussex Gardens	High
	WR-01-371a E6	Residential and commercial properties on: George Mann Road; George Mann Way; Lockside Road; Skelton Grange Road; South Road; Thwaite Gate; Thwaite Lane; and Waterside Road	High

[149] Environment Agency, (2018), Learn more about this area's flood risk. Available online at: https://flood-warning-information.service.gov.uk/long-term-flood-risk/map?easting=402498&northing=282043&address=100070518535
[150] Environment Agency, (2018), Learn more about this area's flood risk. Available online at: https://flood-warning-information.service.gov.uk/long-term-flood-risk/map?easting=402498&northing=282043&address=100070518535
[151] British Geological Survey (BGS) (2018) BGS groundwater flooding. Available online at: http://www.bgs.ac.uk/products/hydrogeology/groundwaterFlooding.html
[152] Leeds Preliminary Flood Risk Assessment (2011) Leeds City Council
[153] Leeds Strategic Flood Risk Assessment (2007) Leeds City Council
[154] Leeds Local Flood Risk Management Strategy (2014) Leeds City Council
[155] This is the location at which the source intersects the Proposed Scheme, as indicated by the grid coordinates on the relevant Volume 2: LA17 Map Book figure (in this case WR-01).

Source	Location description and figure/coordinate[155]	Receptor potentially affected	Receptor value / sensitivity to flooding
	WR-01-371a F3	Residential and commercial properties on Lake Terrace and Moor Road	High
	WR-01-371a F4	Residential and commercial properties on: Arthington Avenue; Arthington Grove; Arthington Place; Arthington Street; Arthington Terrace; Arthington View; Balm Road; Beza Road; Norwich Avenue; Playfair Road; Prospect Crescent; Royal Court; Royal Drive; Royal Grove; Royal Place; and Tulip Street	High
	WR-01-371a F5	Residential and commercial properties on: Balmoral Chase; Belinda Street; Bowcliffe Road; Cable Place; Gibraltar Island Road; Grove Road; Hemingway Garth; Larchfield Road; Low Road; Lupton Street; Midland Road; National Road; New Pepper Road; Old Mill Lane; Pepper Lane; Rocheford Close; Rocheford Gardens; Severn Road; Stafford Street; Sussex Gardens; and Yarn Street	High
	WR-01-371a F6	Residential and commercial properties on: Bowcliffe Road; Cable Place; George Mann Way; Gibraltar Island Road; Goodman Street; Jacquard Square; Linen Walk; National Road; Old Mill Lane; Severn Road; Severn Way; and Yarn Street	High
	WR-01-371a G5	Residential and commercial properties on: Donisthorpe Street; Forster Street; Goodman Street; Grape Street; Hunslet Road; Larchfield Road; Pym Street; and Whitehouse Street	High
	WR-01-371a G6	Residential and commercial properties on: Atkinson Street; Clarence Road; Fox Way; Goodman Street; National Road; Pym Street; and South Accommodation Road	High

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 33. The value of these receptors, based on Table 57 of the SMR, is also indicated.

Table 33: Surface water flood risk sources and receptors

Source	Location description and figure/coordinate [156]	Receptor potentially affected	Receptor value
Surface water flow paths	WR-01-371a C6	Commercial properties on Pontefract Road	Moderate
	WR-01-371a D4	Residential and commercial properties on: Middlecroft Close; Middlecroft Road; and Savannah Way	High
	WR-01-371a D5	Commercial properties on: Leodis Way; Pontefract Road; Savannah Way; Valley Farm Road; Valley Farm Way; and Wakefield Road	Moderate
	WR-01-371a D6	Commercial properties on: Haigh Park Road; Intermezzo Drive; Pontefract Road; and Skelton Grange Road	Moderate

[156] This is the location at which the source intersects the Proposed Scheme, as indicated by the grid coordinates on the relevant Volume 2: LA17 Map Book figure (in this case WR-01).

Source	Location description and figure/coordinate [156]	Receptor potentially affected	Receptor value
	WR-01-371a E3	Residential properties on Belle Isle Road; West Grange Gardens; Winrose Avenue; and Winrose Hill	High
	WR-01-371a E4	Residential and commercial properties on: Belle Isle Road; East Grange Rise; East Grange Road; Middleton Road; Nursery Mount Road; and Woodville Square	High
	WR-01-371a E5	Residential and commercial properties on: Clayton Court; Clayton Road; Indigo Court; Pepper Road; Queen Street; and Wakefield Road	High
	WR-01-371a E6	Residential and commercial properties on: George Mann Road; Lockside Road; Pontefract Road; and Skelton Grange Road	High
	WR-01-371a F3	Residential and commercial properties on: Blakeney Grove; Carr Moor Side; Dartmouth Way; Garnet Road; Garnet Terrace; Glover Way; Lenton Drive; Lockwood Park; Moor Road; Old Run Road; Parkside Lane; and West Grange Gardens	High
	WR-01-371a F4	Residential and commercial properties on: Arthington Place; Balm Road; Belle Isle Road; Beza Road; Beza Street; Royal Court; Royal Drive; Royal Grove; and Royal Place	High
	WR-01-371a F5	Residential and commercial properties on: Belinda Street; Church Street; Gibraltar Island Road; Hemingway Garth; Midland Close; Midland Garth; Midland Road; Pepper Road; Rocheford Close; Rocheford Gardens; Severn Road; and Sussex Gardens	High
	WR-01-371a F6	Residential and commercial properties on: Cable Place; George Mann Way; Severn Road; and Severn Way	High
	WR-01-371a G3	Residential and commercial properties on: Bismarck Drive; Bismarck Street; Burton Terrace; Dewsbury Road; Fairford Avenue; Lady Pit Lane; Malvern Road; Middleton Crescent; and Tunstall Road	High
	WR-01-371a G4	Residential and commercial properties on: Bismarck Drive; Burton Row; Dewsbury Road; Dobson Grove; Dobson Place; Gabriel Court; Hillidge Road; Hunslet Hall Road; Longroyd Avenue; Longroyd Grove; Longroyd Place; Longroyd View; Moor Road; and Primrose Lane	High
	WR-01-371a G5	Residential and commercial properties on: Gabriel Court; Goodman Street; Grape Street; Jack Lane; Larchfield Road; Prosper Street; Pym Street; and Whitehouse Street	High
	WR-01-371a G6	Commercial properties on South Accommodation Road	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. The Aire & Calder Navigation is not impounded above ground level in this area. Any instance of the canal flooding, would be a result of fluvial flooding into the canal and not failure of the canal embankment.

15.3.30 There are no artificial water bodies with potential implications for flood risk within the study area. The Environment Agency's flood risk from reservoirs national dataset[157] indicates that there are a number of other reservoirs, located on the Pennine Moors upstream of the Proposed Scheme, with potential implications for flood risk within the study area. The closest of these is Yeadon Tarn, located 13km to the north-west of Leeds. However, as these are large raised reservoirs, subject to the requirements of reservoir safety legislation[158], the inundation risk posed by these reservoirs is considered negligible.

Groundwater flooding

15.3.31 Information related to historical incidents of groundwater flooding in the Stourton to Hunslet area is contained within the Leeds SFRA. The Leeds SFRA states that the risk of groundwater flooding is highly variable within the district. It is heavily dependent upon local ground conditions at any particular time and the structures that have been constructed on them.

15.3.32 The BGS Groundwater flooding susceptibility data set indicates that there is some potential for groundwater flooding to occur within the study area in the River Aire floodplain and in areas where the Proposed Scheme is underlain by river terrace deposits and glaciofluvial deposits. The flooding data set further indicates that there is limited potential for groundwater flooding in areas underlain by the Pennine Lower Coal Measures Secondary A aquifers and in areas underlain by Secondary (undifferentiated) aquifers.

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 CoCP[159] 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 will avoid passing along river or stream

[157] Environment Agency, (2018), Learn more about this area's flood risk. Available online at: https://flood-warning-information.service.gov.uk/long-term-flood-risk/map?easting=436042&northing=428966&address=72383505
[158] Department for Communities and Local Government (DCLG), (2014), Reservoirs: Owners and Operator Requirements (Updated 2016). Available online at: https://www.gov.uk/guidance/reservoirs-owner-and-operator-requirements
[159] Supporting document: Draft Code of Construction Practice

valleys, such as that of the River Aire and its associated floodplain. 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 would be discussed with any landowners potentially affected by the Proposed Scheme.

15.4.4 The temporary works shown on Map Series CT-05 in the Volume 2: LA17 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 No watercourse realignments are proposed within the Stourton to Hunslet area.

15.4.6 Watercourse diversions, which would result in changes in flow regime within discrete sections of channel, have been avoided wherever possible. There are no diversions proposed within this study area.

15.4.7 The design of infrastructure required within or in proximity to an existing channel (including bridge abutments, intermediate piers and outfalls) will aim to reduce impacts on the natural hydromorphology of watercourse channels, insofar as is reasonably practicable.

15.4.8 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: Knowsthorpe Lane culvert on tributary of Main Effluent Channel; Main Effluent Channel culvert on Main Effluent Channel; and Wyke Beck culvert on Wyke Beck. The detailed design of these culverts will be developed in general accordance with Construction Industry Research and Information Association (CIRIA) and Environment Agency guidance and in consultation with Environment Agency specialists. The design has sought to mitigate the impact on the hydromorphology of the affected watercourses, as follows:

- drop inlet culverts and inverted siphons have been avoided;
- culvert lengths have been reduced insofar as is reasonably practicable; and
- invert levels would 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 will be protected from physical damage, insofar as reasonably practicable, including appropriate decommissioning of abandoned boreholes in order to prevent pollution pathways. If boreholes are to be decommissioned and replaced with alternatives, the contractors will follow the latest good practices. This principle will also be applicable to springs potentially affected by the Proposed Scheme, although additional measures may be required to mitigate temporary construction impacts. Wherever reasonably practicable, the design will aim to recreate affected spring features nearby.

15.4.13 Measures will be introduced, as required, to mitigate the temporary and permanent effects on groundwater flows and water quality during excavation and construction of foundations and cuttings insofar as is reasonably practicable. The types of measure likely to be adopted could include:

- installation of cut-off[160] structures around excavations;
- ensuring cut-off structures are driven to sufficient depths to meet an underlying strata or zone of lower permeability;

[160] Impermeable barrier preventing water flow

- promoting groundwater recharge, such as discharging pumped water to recharge trenches around excavations to maintain baseline groundwater and surface water conditions; and
- incorporating passive bypasses within the design, which could comprise a 'blanket' of permeable material, such as gravel, placed around temporary structures allowing groundwater to bypass the below-ground works, without a rise in groundwater levels on the upstream side.

15.4.14 The exact requirements will be refined and method of mitigation will be designed following ground investigation at foundations or cutting locations.

Flood risk and land drainage

15.4.15 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 Leeds East viaduct across the River Aire and the Aire & Calder Navigation between the HS2 Leeds spur and the Leeds East rolling stock depot (RSD). The Proposed Scheme includes replacement floodplain storage areas to replace losses associated with the piers and highway realignment;
- the temporary works shown in the Volume 2: LA17 Map Book have been informed by a detailed consideration of the flood risk constraints and have sought to avoid flood zones wherever reasonably practicable;
- provision has been made to pass surface water runoff and land drainage flows beneath sections of raised embankment that would cross surface water flow paths where reasonably practicable. This would be achieved using perimeter drainage and culverts, with their inverts set below the likely level of any upstream field subsurface drainage systems;
- in locations where the route of the Proposed Scheme would cross watercourses, the design aim is for structures to accommodate flood flows up to and including the 1 in 100 (1%) annual probability flood with an allowance for climate change based on latest guidance issued by the Environment Agency[161];
- runoff from the footprint of the infrastructure could occur more rapidly post-construction due to steeper slope angles and the permeability of the newly-created surfaces. The design of drainage systems aims to ensure that there would be no significant increases in flood risk downstream, during storms up to and including the 1 in 100 (1%) annual probability design event, with an allowance for climate change based on the latest guidance issued by the Environment Agency;

[161] Environment Agency (2016) Adapting to Climate Change. Advice for Flood and Coastal Erosion Risk Management Authorities

- balancing ponds for new sections of highway and railway drainage have been sized on a precautionary basis, pending more detailed information about the permeability and runoff characteristics of existing and proposed ground surfaces;
- where the Proposed Scheme would pass in a retained cutting within an urban area, the height of the retaining walls would be designed to take into account the risk of surface water flooding from the adjacent built-up area. Measures would be introduced to reduce any potentially significant effects on surface water flood risk to neighbouring land and property insofar as is reasonably practicable, including the incorporation of SUDs features such as swales and conveyance channels, infiltration devices and retention/ detention features;
- 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 would, insofar as reasonably practicable, ensure that flood risk is managed throughout the construction period and would consider flooding issues when planning sites and storing materials. If necessary, temporary provision would be made to reduce to the potential for impacts on existing land drainage systems during construction. Some of the specific measures referred to in the draft CoCP, include:

- preparation of flood risk assessments and method statements for temporary works, including main construction and satellite compound drainage, watercourse crossings and realignments and temporary realignments in consultation with the Environment Agency, and where applicable, the LLFA and other relevant regulators;
- location of storage, machinery, equipment and temporary buildings outside flood risk areas where reasonably practicable;
- construction of outfalls during periods of low flow to reduce the risk of scour and erosion;
- design of temporary watercourse realignments with equivalent hydraulic capacity to the existing channels, ensuring that field subsurface drainage systems can be adapted to discharge into the new channel; and
- having regard to the requirement for construction activities to avoid any increases in flood risk to vulnerable receptors.

15.4.17 In accordance with Section 16 of the draft CoCP, monitoring would also be undertaken in consultation with the Environment Agency and, where applicable, the LLFA, to ensure that temporary structures are installed, maintained and removed in accordance with the relevant environmental approvals and that impact on existing land drainage systems are managed appropriately.

Assessment of impacts and effects

15.4.18 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 will be avoided or mitigated by the working methods outlined in the draft CoCP. The mitigation embedded into the design has focused on reducing permanent impacts resulting from the presence of the Proposed Scheme to as low a level as is reasonably practicable.

Temporary effects – Water resources and WFD

Surface water

15.4.19 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 Lower Pennine Coal Measures Formation, Middle Pennine Coal Measures Formation, the river terrace deposits and the alluvium 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 mean that any effects on the overall status of these aquifers would not be significant.

15.4.21 Where 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.

Water dependent habitats

15.4.24 Temporary dewatering and drainage at Rothwell Country Park cutting have potential to lower the groundwater table and flow resulting in a moderate hydrological impact on Rothwell Colliery LNA. 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

15.4.25 Construction of the Leeds East viaduct over the River Aire, and the culverts required for Wyke Beck and its tributaries (Knowsthorpe Lane culvert, Main Effluent Channel culvert and Wyke Beck culvert) would require temporary working within flood zones. Construction sequencing and temporary works design would be carefully considered and assessed in terms of potential impacts on flood risk. Method statements detailing how these works would be undertaken would be produced by the nominated undertaker in consultation with the Environment Agency 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

15.4.26 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

15.4.27 Construction of the Wyke Beck culvert underneath the Leeds East RSD has the potential to result in a moderate impact on the channel hydromorphology of this high value receptor. This would potentially result in a moderate adverse effect, which is significant.

Groundwater

Aquifers

15.4.28 Implementation of the avoidance and mitigation measures outlined in the draft CoCP, would ensure that there are no permanent significant effects related to the impact of the proposed cuttings on water levels and quality in the aquifers crossed by the route of the Proposed Scheme.

15.4.29 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 effects on these have been assessed below.

Abstractions

15.4.30 The assessment has not identified any permanent significant effects on groundwater abstractions.

Groundwater - surface water interactions

15.4.31 The assessment has not identified any permanent significant effects on groundwater - surface water interactions

Water dependent habitats

15.4.32 The permanent dewatering and drainage at Rothwell Country Park cutting have potential to lower the groundwater table and flow resulting in a moderate hydrological impact on Rothwell Colliery LNA. 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

15.4.33 The perimeter retaining wall of the Leeds cutting has been designed to protect HS2 infrastructure against surface water flooding from adjacent built-up areas, south of the route of the Proposed Scheme, during a 1 in 1000 (0.1%) annual probability storm event. As a barrier to surface water flow, it therefore has the potential to increase the risk of flooding to residential and commercial properties within the area of Leeds bounded by Balm Road and Moor Road (see Map WR-01-371a F2-F4 in the Volume 2: LA17 Map Book). A hydraulic model of Yorkshire Water Limited's combined sewer network is currently being developed to establish the baseline flood extent for a combination of localised rainfall and fluvial flood conditions in the River Aire. Until such time as the results of this model are available, a precautionary approach has been adopted with regard to the potential for adverse impacts to occur. The current design has therefore been assessed as having the potential to cause a minor impact on high value receptors (residential properties), giving rise to a moderate adverse effect on flood risk, which is significant.

15.4.34 The retaining wall of the Leeds cutting would be built within the superficial deposits, which have the potential to impede shallow groundwater flow and change local groundwater levels. With the implementation of the measures outlined in the draft CoCP and embedded mitigation measures, any increase in groundwater flood risk would be negligible and unlikely to result in a significant effect.

15.4.35 Based upon the Environment Agency's Flood map for planning (rivers and sea), the Leeds East viaduct approach embankment and piers would be located within an area of flood zone 2. In the absence of detailed fluvial hydraulic analysis to accurately quantify the change in flood level and determine an appropriate level for level compensation strategy, the current design has been assessed as having a moderate impact on the high value receptors (residential and commercial properties) identified in Table 32, giving rise to a moderate adverse significant effect on flood risk.

Other mitigation measures

15.4.36 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.

Flood risk and land drainage

15.4.37 The embedded mitigation proposed in the design of the crossings for the tributaries of the River Aire and Wyke Beck will be developed further in consultation with the Environment Agency and LCC.

15.4.38 Hydraulic model studies of the River Aire and Yorkshire Water Services Limited's combined sewer network are being undertaken. The output from these models will make it possible to more accurately determine the surface water flood extent and flooding mechanisms, associated with surcharging of the combined sewer network within the area south of the route of the Proposed Scheme, bounded by Balm Road and Moor Road (see map WR-01-371a F2-F4 in the Volume 2: LA17 Map Book). The model will be used to assess the change in flood level, if any, caused by the proposed flood wall alongside the Leeds cutting. It will also provide information to facilitate the

development of a range of mitigation options, in consultation with Yorkshire Water Limited and the LLFA, to reduce any localised adverse flood risk effects, insofar as is reasonably practicable.

15.4.39 Detailed hydraulic analysis will be undertaken to quantify the change in flood level caused by the encroachment of the Leeds East viaduct approach embankment and piers into the floodplain of the River Aire. The results of this analysis will be used to design an appropriate mitigation strategy, so that any significant localised flood risk effects are reduced insofar as reasonably practicable.

Summary of likely residual significant effects

15.4.40 In the absence of the other mitigation measures set out above, the Proposed Scheme would potentially result in residual significant effects as follows:

- a permanent moderate adverse effect on flood risk related to the potential obstruction of surface water flow paths at Leeds cutting, which is significant;
- a permanent moderate adverse effect on the hydromorphology of the Wyke Beck due to the construction of the Wyke Beck culvert, which is significant; and
- a permanent moderate adverse effect on flood risk related to the encroachment of the Leeds East viaduct approach embankment and piers into the floodplain of the River Aire, which is significant.

15.4.41 It is currently anticipated that it should be possible to develop the means of mitigating these impacts, to ensure that there are no residual significant effects arising from construction of the Proposed Scheme.

15.5 Effects arising from operation

Avoidance and mitigation measures

15.5.1 The principal issue of concern during operation of the Proposed Scheme is the potential for accidental spillages to occur that could result in the release of contaminants into the water environment. This issue has been assessed on a route-wide basis in Volume 3: Route-wide effects (Section 16), where the mitigation measures associated with this risk are described. A draft operation and maintenance plan for water resources and flood risk will be provided in the formal ES.

15.5.2 The design takes into account the policies in the NPPF and will aim to ensure that the Proposed Scheme is safe from flooding without increasing flood risk elsewhere. Evidence of application of the Sequential Test and Exception Tests in the NPPF is provided on a route-wide basis in Volume 3: Route-wide effects.

15.5.3 Sustainable drainage systems will be used where reasonably practicable. These will help to remove any suspended material within runoff from the Proposed Scheme through filtration, vegetative adsorption or settlement. The drainage systems proposed will aim to ensure that the quantity and quality of water draining from the Proposed Scheme during its operational phase will have a negligible impact on the water environment.

15.5.4 A summary of the route-wide WFD compliance assessment process is provided in Volume 3: Route-wide effects. This describes the ongoing assessment process and how measures will be embedded into the design that are specifically designed to ensure that the Proposed Scheme complies with the requirements of the WFD, where reasonably practicable. It is currently anticipated that the Proposed Scheme will be compliant with WFD legislation.

Assessment of impacts and effects

15.5.5 There are considered to be no significant adverse effects related to water resources and flood risk arising from operation of the Proposed Scheme.

Other mitigation measures

15.5.6 There are considered to be no further measures required to mitigate adverse effects on surface water resources, groundwater resources or flood risk.

Summary of likely residual significant effects

15.5.7 The assessment indicates that there would be no residual significant effects on surface water, groundwater or flood risk during operation of the Proposed Scheme.

Monitoring

15.5.8 Volume 1, Section 9 sets out the general approach to monitoring of water resources and flood risk during operation of the Proposed Scheme.

15.5.9 There are no area-specific requirements for monitoring water resources and flood risk during operation of the Proposed Scheme.

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