HS2

October 2018

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

Working Draft Environmental Statement

Volume 2: Community Area report

LA18: Leeds Station

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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 in Figure 1.

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

The working draft ES comprises the following documents:

Non-technical summary

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

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

Glossary of terms and list of abbreviations

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

Volume 1: Introduction and methodology

This provides:

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

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

Volume 2: Community area reports and map books

These cover the following community areas:

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

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

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

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

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

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

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

Volume 3: Route-wide effects

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

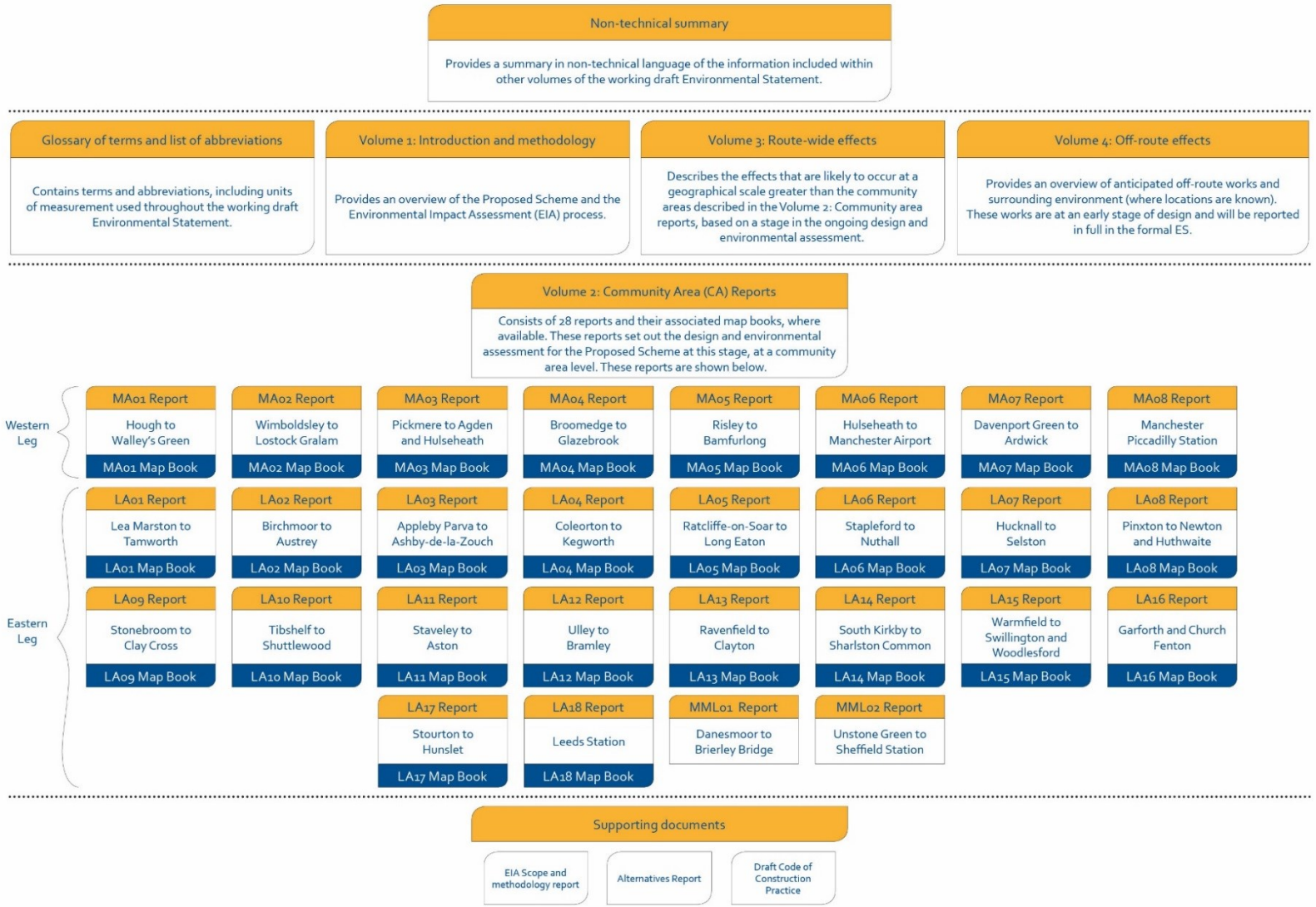
Volume 4: Off-route effects

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

Supporting documents

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

Figure 1: Structure of the working draft Environmental Statement



1 Introduction

1.1 Introduction to HS2

1.1.1 High Speed Two (HS2) is a new high speed railway proposed by the Government to connect major cities in Britain. Stations in London, Birmingham, Leeds, Manchester, East Midlands and South Yorkshire 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.

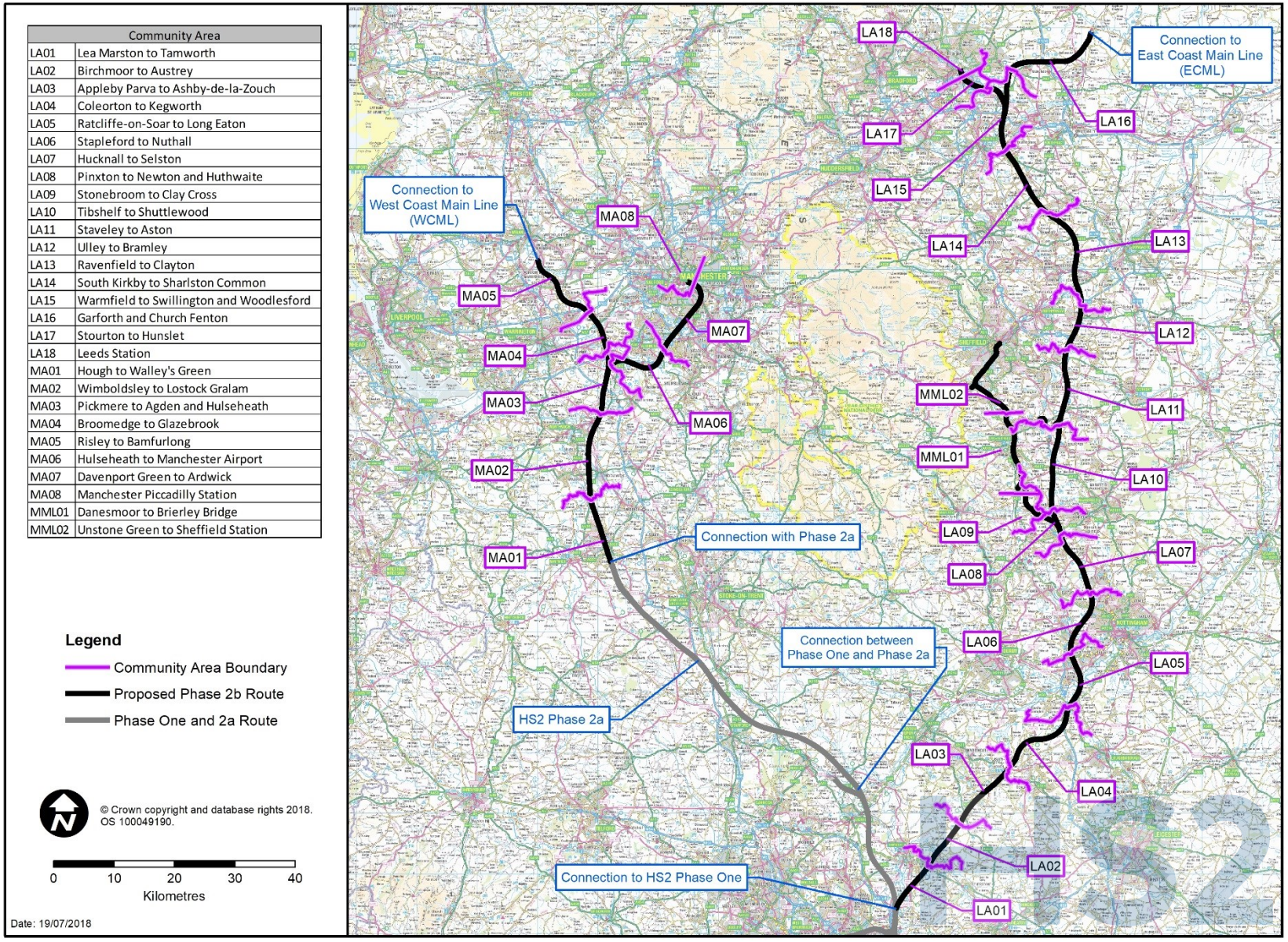
1.1.3 Phase Two of HS2 will extend the route from Phase One in the West Midlands to the north-west to Manchester (approximately 80km (50 miles) with connections to the West Coast Main Line (WCML) at Crewe and Golborne, and to the north-east to Leeds with a connection to the Erewash Valley Line and Midland 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 Leeds Station area (CA number LA18) which is located on the eastern leg of the Proposed Scheme (see Figure 3).

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 Leeds Station area. The report also describes the proposed mitigation measures that have been identified, at this stage, to avoid, reduce or manage the likely significant adverse effects of the Proposed Scheme on the environment within the area, along with proposed monitoring measures.

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

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

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

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

1.3 Structure of this report

1.3.1 This report is divided into the following sections:

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

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

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

1.3.2 Each environmental topic section 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 Leeds Station area are provided in a separate corresponding document entitled Volume 2: LA18 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: LA18 Map Book). There is some

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

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.

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 Leeds Station area (LA18) would be approximately 1.3km in length and would lie within the local authority area of Leeds City Council (LCC). The southern boundary of the Leeds Station area is located approximately 200m north of the M621 junction 4 and the area extends to encompass the existing Leeds Station.

2.1.2 As shown in Figure 3, the Stourton to Hunslet area (LA17) lies to the south of the Leeds Station area.

Settlement, land use and topography

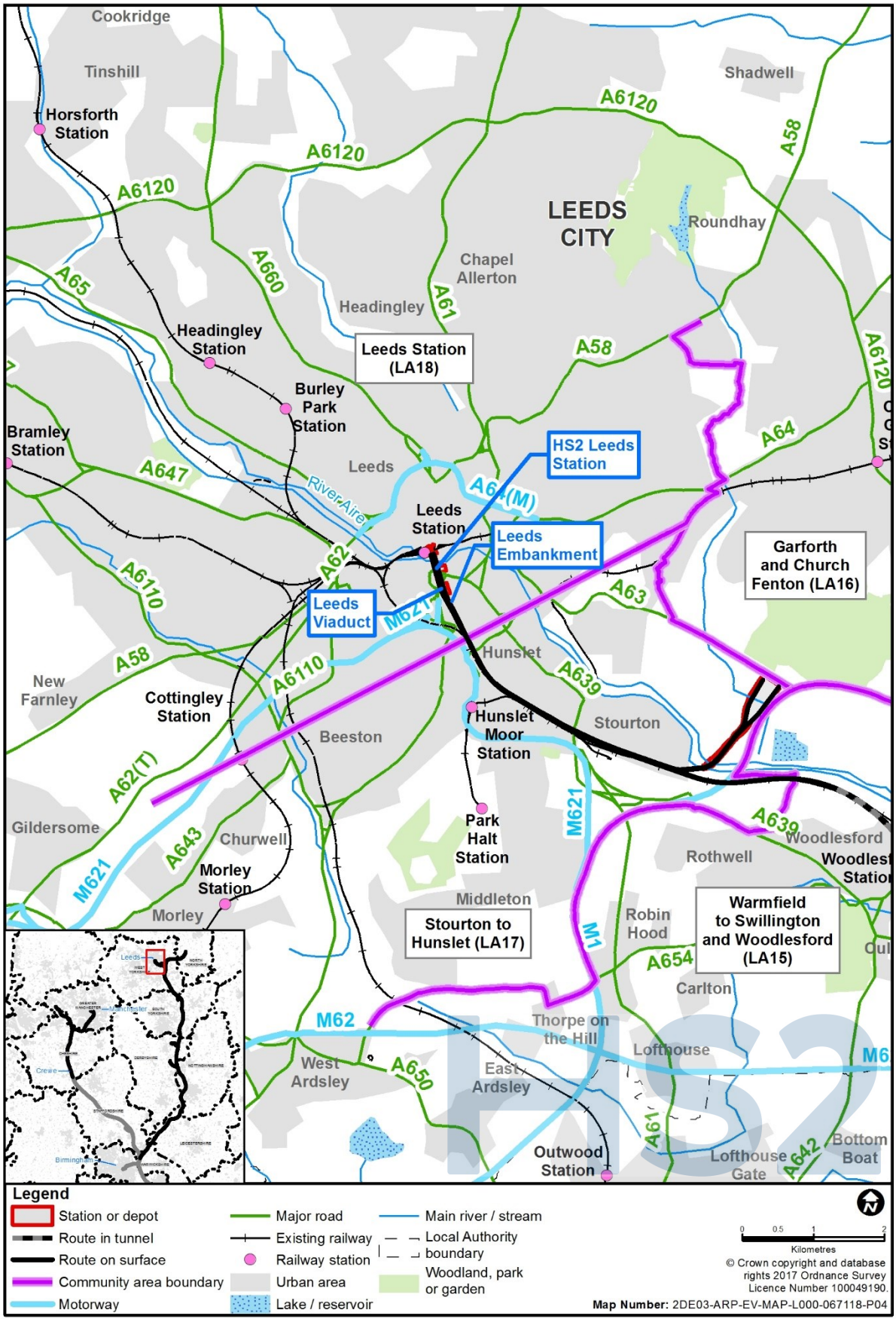
2.1.3 The Leeds Station area is entirely urban in character, with land use comprising mainly industrial, commercial, road and rail infrastructure through Hunslet and towards Leeds city centre. The commercial and industrial properties make use of the low-lying land close to the River Aire.

2.1.4 Key features south of the River Aire include the gas distribution centre and decommissioned gas storage area at Pottery Fields, a number of commercial and retail properties and extensive road infrastructure. Closer to the River Aire there are a number of large office buildings, hotels and residential apartment complexes.

2.1.5 The River Aire passes through the area in an east-west orientation. The Leeds and Liverpool Canal and the Hol Beck merge with the River Aire to the west of Victoria Bridge.

2.1.6 The topography is variable in the Leeds Station area. The land is relatively low-lying, typically between 26m and 28m above Ordnance Datum (AOD) to the south of the River Aire, rising to 35m AOD at the existing Leeds Station north of the river.

Figure 3: Community area context map



Key transport infrastructure

2.1.7 The key transport infrastructure in the Leeds Station area includes the railways, roads, canals and other waterways that lead to and from Leeds city centre. The M621 passes through the southern portion of the area, with junctions 3 and 4 located close to the boundary with the Stourton to Hunslet area.

2.1.8 There are a number of important public highways including the A653, which comprises Victoria Road, part of Meadow Lane and Great Wilson Street, Meadow Road and Dewsbury Road; and the A61 which comprises Hunslet Road and part of Great Wilson Street. There are also a number of local routes in the area, including Neville Street, Holmes Street and Jack Lane.

2.1.9 At the southern boundary of the Leeds Station area the Hallam Line, which is an existing railway, loops around to the west to approach the existing Leeds Station. The existing Leeds Station is a major transport interchange and a terminus for both intercity and local trains. There is a taxi rank and bus station served by 13 bus routes at the north entrance to the station.

2.1.10 From Leeds Station to the southern boundary of the Leeds Station area the River Aire forms part of the mainline of the Aire and Calder Navigation. However, they are mostly separate watercourses outside of the Leeds Station area.

2.1.11 There are public rights of way (PRoW) associated with the Leeds and Liverpool Canal and the River Aire and Aire and Calder Navigation in the Leeds Station area. There are also pedestrian footways adjacent to many of the roads in the Leeds Station area.

Socio-economic profile

2.1.12 Within the LCC area, the professional, scientific and technical sector accounts for the largest proportion of businesses (16%) with the construction (10%), business administration, support services and retail sectors all accounting for approximately 10% each[4].

2.1.13 According to the Annual Population Survey (2016)[5], the employment rate[6] within the LCC area was 74% (376,000 people).

2.1.14 According to the Annual Population Survey, 34% of the LCC residents aged 16-64 were qualified to National Vocational Qualification Level 4 (NVQ4) and above, while 10% of LCC residents had no qualifications.

Notable community facilities

2.1.15 Community facilities in the area are predominantly food and drink establishments, with a small number of health centres, community centres and places of worship. There are also a number of educational establishments.

2.1.16 Leeds city centre contains a variety of retail destinations that are concentrated to the north and north-west of the existing Leeds Station. Crown Point Shopping Park in the

[4] Office for National Statistics, (2017), UK Business Count-Local Units 2017. Available online at https://www.nomisweb.co.uk.
[5] Office for National Statistics, (2016), Annual Population Survey 2016, NOMIS. Available online at https://www.nomisweb.co.uk.
[6] The proportion of working age (16-64 year olds) residents that is in employment.

eastern part of the area is an important local and district resource which attracts large numbers of visitors. The existing Leeds Station also acts as a local commercial centre with restaurants, cafes, shops and a bank branch.

2.1.17 There are a number of religious facilities and/or places of worship in the area, including the LIFE Church Leeds located off the A653 Dewsbury Road, in the central section of the area, and the Leeds Buddhist Centre located off the A653 Meadow Lane towards the east of the area.

2.1.18 There is a Gypsy and Traveller site within the area, located on Kidacre Street to the north of the Leeds School of Motorcycling.

Recreation, leisure and open space

2.1.19 The River Aire/Aire and Calder Navigation provides opportunities for boating, canoeing and other recreational activities.

2.1.20 The route of the Proposed Scheme would cross one PRoW in the Leeds Station area[7], the non-definitive Leeds City Footpath (along the south side of the River Aire) (Footpath Number 62). National Cycle Route 66 and St Bernard's Way promoted routes[8] share the same path as the non-definitive Leeds City Footpath where it would be crossed by the route of the Proposed Scheme. The Airedale Way promoted route passes along Dark Neville Street, Neville Street and New Station Street where it would be crossed by the route of the Proposed Scheme.

2.1.21 Notable areas of open space in the area include Granary Wharf, the River Aire and City Square.

Policy and planning context

Planning framework

2.1.22 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.

2.1.23 The following local policy documents have been considered and referred to where appropriate to the assessment:

- Leeds Core Strategy (2014)[9];
- Natural Resources and Waste Local Plan (2013)[10];
- Policies Map for Leeds (2016)[11];

[7] LCC PRoW Map. Available online at: https://leedscc.maps.arcgis.com/apps/webappviewer/index.html?id=fef90bd138bf48e19e3076a81366d3d3
[8] Some PRoW in the Leeds Station Area form part of routes that are promoted through leaflets and websites.
[9] Leeds City Council. (2014). Leeds Core Strategy. Available online at http://www.leeds.gov.uk/council/Pages/Core-Strategy-Introduction-Page.aspx
[10] 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
[11] Leeds City Council, (2016), Local Development Framework Policies Map Incorporating saved UDP Review Policies & Adopted Natural Resources & Waste Plan. Available online at: http://www.leeds.gov.uk/council/Pages/Policies-map.aspx

- Aire Valley Leeds Area Action Plan (2017)[12];
- Saved Policies of the Leeds Unitary Development Plan (2001) and Unitary Development Plan Review (2006)[13];
- Holbeck, South Bank. Supplementary Planning Document (2016)[14];
- West Yorkshire Transport Strategy 2014 (2017)[15]; and
- Holbeck Neighbourhood Plan (2018)[16].

2.1.24 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[17], which was submitted to the Secretary of State on 5th May 2017 and is therefore considered in this report.

2.1.25 The South Bank Leeds Regeneration Framework Supplementary Planning Document Consultation Draft (2017)[18] and the Leeds Integrated Station Masterplan Consultation Draft (2017)[19], whilst not forming part of the development plan or policies considered in the assessment, are referred to for background context where relevant.

Committed development

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

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

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

2.1.29 Planning applications yet to be determined at the time of the formal ES and sites that are proposed allocations in development plans that have yet to be adopted, on or

[12] 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
[13] 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
[14]Holbeck, South Bank. Supplementary Planning Document (2016). Available online at: https://www.leeds.gov.uk/docs/Holbeck%20%C2%AD%20South%20Bank%20SPD%20June%202016.pdf
[15] West Yorkshire Combined Authority, (2017), Transport Strategy 2040. Available online at: https://www.westyorks-ca.gov.uk/transport/transport-strategy/
[16] Holbeck Neighbourhood Area, (2018), Holbeck Neighbourhood Plan. Available online at: https://www.leeds.gov.uk/docs/01%20Barwick%20Referendum%20Plan%20LR.pdf
[17] Leeds City Council, (2017), Site Allocations Plan. Available online at https://www.leeds.gov.uk/your-council/planning/site-allocations-development-plan-document-(ldf)
[18] South Bank Leeds Regeneration Framework Supplementary Planning Document Consultation Draft (2017) Available online at: https://southbankleeds.co.uk/shapeyourcity
[19] Leeds Integrated Station Masterplan Consultation Draft (2017). Available online at: https://southbankleeds.co.uk/assets/documents/2017.11.03-Leeds-Integrated-Station-Masterplan-LR-v6-DS.pdf

close to the Proposed Scheme, are termed 'proposed developments'. These will not be included in the assessment in the formal ES.

Ongoing design development

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

- refinement of the proposed HS2 Leeds station design and associated public realm;
- refinement of the works associated with the existing Leeds Station;
- review of the proposed lengths and heights of viaducts and other river crossing structures and associated replacement floodplain storage areas;
- temporary and permanent utility diversions;
- refinement of the realignment of roads and PRoW crossing the Proposed Scheme;
- refinement of drainage features required for rail and highways;
- additional environmental features required to mitigate likely significant environmental effects; and
- refinement of construction compound locations and site haul routes.

2.2 Description of the Proposed Scheme

2.2.1 The following section describes the main features of the Proposed Scheme in the Leeds Station area, including any 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 within the Leeds Station area has three main components:

- HS2 Leeds station approach: the route of the Proposed Scheme, continuing from the northern boundary of the Stourton to Hunslet area (LA17) and terminating at the HS2 Leeds station;

- HS2 Leeds station: a five platform terminus station with its northern edge facing onto the existing Leeds Station; and
- modifications to the existing Leeds Station.

2.2.5 Each of these components and their key features are set out in the following sections.

HS2 Leeds station approach

2.2.6 The route of the Proposed Scheme would continue from the Stourton to Hunslet area (LA17) north-west towards the existing Leeds Station. The first part of the route of the Proposed Scheme would be located on Leeds embankment, continuing onto Leeds viaduct.

2.2.7 This section of the route is illustrated on maps CT-06-626b to CT-06-627 in the Volume 2: LA18 Map Book. All dimensions in the sections below are approximate.

2.2.8 Key features of this approximately 890m section would include:

- Leeds embankment, 585m in length and up to 8m in height. There would be retaining walls on both sides of the embankment. There would be landscape mitigation planting on both sides of the southern section of Leeds embankment to help integrate the Proposed Scheme into the surrounding landscape (see Volume 2: Map CT-06-626b, F4 to F5);
- Leeds viaduct, 305m in length, up to 13m in height and up to 55m in width continuing to the HS2 Leeds station. The viaduct would carry the route of the Proposed Scheme over Holmes Street and the A653 Meadow Lane (see Volume 2: Map CT-06-627, H5 to J5 and Map CT-06-627, A6 to C5);
- closure of Jack Lane to the west of the route of the Proposed Scheme, where it would cross the route. A section of the retained road would be realigned 50m to the west of its existing alignment to connect to the A653 Dewsbury Road. To the east of the route, Jack Lane would be diverted 50m to the east of its existing alignment for a length of 95m (parallel to the former railway corridor to the former Leeds Hunslet Lane railway station) to connect with Leathley Road. The diverted Jack Lane would cross over the former railway corridor on embankment (see Volume 2: Map CT-06-626b, F4 to F5). Users would be diverted via Leathley Road, Cross Myrtle Street, Kidacre Street, Holmes Street (under the route of the Proposed Scheme), A653 Meadow Road/A653 Dewsbury Road and Parkfield Street;
- landscape mitigation planting to the east of the Jack Lane diversion to help integrate the Proposed Scheme into the surrounding landscape (see Volume 2: Map CT-06-626b, F5); and
- Holmes Street would pass under the proposed Leeds viaduct on its existing alignment (see Volume 2: Map CT-06-627, B5 to B6). On the western side of the route, a new junction between Holmes Street and A653 Dewsbury Road would be created, where Holmes Street would join the existing A653 Dewsbury Road to enable the east-west flow of traffic under the route of the Proposed Scheme (see Volume 2: Map CT-06-627, B5).

2.2.9 There would also be utilities works within this section, which may include works to overhead and underground lines, gas pipes, sewers and telecommunication cables.

2.2.10 Construction of this section would be managed from the Leeds embankment satellite compound and Leeds viaduct satellite compound, which are described in Section 2.3, and shown on Map CT-05-626b and Map CT-05-627 in the Volume 2: LA18 Map Book.

HS2 Leeds station

2.2.11 The HS2 Leeds station would mark the terminus of the Proposed Scheme in the Leeds Station area. It would span the River Aire and join the southern part of the existing Leeds Station forming a combined T-shaped station, broadly occupying land from Holmes Street in the south to the existing Leeds Station at its northern extent.

2.2.12 The footprint of the HS2 Leeds station would be 480m in length and 64m in width.

2.2.13 The HS2 Leeds station would include:

- a roof and canopy structure, up to 30m in height, that would span the length of the platforms, allowing light into the station;
- two island platforms and one single platform (each approximately 415m in length and up to 13m in height above ground level);
- a central and a northern concourse;
- the HS2 Leeds station pick-up/ drop-off to provide access for taxis, private hire vehicles and private vehicles to the HS2 Leeds station central concourse from the A653 Victoria Road and a short-stay basement car park;
- a cycle parking area;
- the HS2 Leeds station multi-storey car park for short and long-stay parking located adjacent to the eastern side of Leeds viaduct, between Holmes Street and the A653 Meadow Lane;
- a non-ticketed public walkway on the eastern side of the platforms to provide unrestricted north-south movement of pedestrians between the multi-storey car park and the central and northern concourses;
- utility diversions (including water main, electricity and telecommunications cables);
- light wells (open voids) within the platform supporting structure along the length of the platforms to allow daylight to penetrate to ground level and the River Aire; and
- public realm improvements.

2.2.14 The HS2 Leeds station would be accessible from the existing Leeds Station concourse; a central concourse near the middle of the proposed HS2 Leeds station platforms, south of the River Aire; and a northern concourse in the proposed HS2 Leeds station, north of the River Aire. The central concourse would be the main HS2 Leeds station entrance, positioned at ground level and in the centre of the HS2 platforms.

The northern concourse would be located at platform level between the River Aire and existing Leeds Station, with public access provided directly from ground level. The northern concourse would be integrated into the existing Leeds Station via a new pedestrian overbridge to the north. This would create a common concourse by providing direct interchange to the existing Leeds Station platforms.

2.2.15 At the central concourse entrance, there would be taxi, private hire vehicle and private car pick-up/ drop-off facilities and a short-stay basement car park. The HS2 Leeds station multi-storey car park would be at the southern end of the station adjacent to the eastern side of Leeds viaduct between Holmes Street and the A653 Meadow Lane. The HS2 Leeds station multi-storey car park would be for short and long-stay parking and would be accessed from the junction of the A653 Meadow Lane/ Victoria Road via an access road under Leeds viaduct.

2.2.16 A sheltered platform-level public walkway would link the HS2 Leeds station multi-storey car park with both the northern and central concourses.

2.2.17 The following changes to the existing road network would also be required to accommodate the HS2 Leeds station:

- the A653 Meadow Lane would be realigned and modified for 220m to provide bi-directional flow of traffic between the A653 Meadow Lane/A61 Great Wilson Street junction and the A653 Meadow Lane/A653 Meadow Road/A653 Dewsbury Road junction located to the east, west and under the route of the Proposed Scheme (see Volume 2: Map CT-06-626b, J6 to J7 and Map CT-06-627, B6 to C7);
- the A653 Victoria Road would be realigned and modified for 410m to provide bi-directional flow of traffic between the A653 Meadow Lane/A653 Victoria Road Junction and the A653 Great Wilson Street/A653 Victoria Road/Water Lane/Neville Street junction located to the west of the Proposed Scheme (see Volume 2: Map CT-06-627, C4 to C5);
- closure of the A653 Great Wilson Street, from the A653 Meadow Lane/A61 Great Wilson Street junction and the A653 Victoria Road located to the east, west and under the route of the Proposed Scheme. West to east movement of traffic would be via the A653 Victoria Road and the A653 Meadow Lane which would be realigned and modified to allow for bi-directional flow of traffic (see Volume 2: Map CT-06-626b, I4 to J6 and Map CT-06-627, B5 to B6);
- closure of New Lane located to the west and under the route of the Proposed Scheme (see Volume 2: Map CT-06-626b, J4 to J5 and Map CT-06-627, B5);
- closure to road users and pedestrianisation of Neville Street between the junction with Sovereign Street and Bishopgate Street, located underneath the Proposed Scheme and below the existing Leeds Station for 140m, to provide pedestrian connectivity between the HS2 Leeds station entrances and the city centre and surrounds. Road users travelling north from the southern end of Neville Street would be diverted via the realigned and modified Sovereign Street, Swinegate and Bishopgate Street (see Volume 2: Map CT-06-627, D7).

Road users that would have travelled south along Neville Street would be diverted at Swinegate via Sovereign Street; and

- Little Neville Street would be realigned and modified for 110m, located underneath and to the west of the Proposed Scheme. Closure of the access from Little Neville Street to the car parking at Dark Neville Street used by the residents of the Blue apartments, located underneath the Proposed Scheme. Users would be diverted along the realigned and modified Little Neville Street to replacement basement car parking (see Volume 2: Map CT-06-627, C4 to C5).

2.2.18 There would also be minor works, such as junction alignments, to local roads, as well as utilities works within this section, which may include works to overhead and underground lines, gas pipes, sewers and telecommunication cables.

Modifications to the existing Leeds Station

2.2.19 The HS2 Leeds station would be integrated into the existing Leeds Station via a new pedestrian overbridge to the north. This would create a common concourse by providing direct interchange to the existing Leeds Station platforms.

2.2.20 The new pedestrian overbridge, 14m in width, would be installed in the existing Leeds Station above the existing conventional rail tracks located between platforms 16 and 8, parallel to the existing overbridge. There would be escalators, staircases and lifts for access to the overbridge.

2.2.21 The pedestrianised Neville Street would provide an additional north-south pedestrian route connecting the HS2 Leeds station and existing Leeds Station entrances.

2.2.22 Construction of this section would be managed from the HS2 Leeds station main compound and the HS2 Leeds station common concourse satellite compound, which is described in Section 2.3, and shown on Map CT-05-626b and Map CT-05-627 in the Volume 2: LA18 Map Book.

Public realm

2.2.23 The Proposed Scheme would include public realm improvements and reinstatement, including the areas around the access to the northern and central concourses, both sides of the River Aire under and adjacent to the station and a landscaped public park adjacent to the central concourse. The public realm improvements are intended to provide integration with adjacent sites, improved east-west and north-south connectivity and improved public access to the banks of the River Aire.

2.2.24 A new public area to the south of the River Aire and west of the HS2 Leeds station would include areas of hard and soft landscaping, tree planting and seating. This area would extend north and south of the centrally located station pick-up/ drop-off area, and would facilitate access to the central concourse from Victoria Bridge in the north and from footways extending from the A653 Meadow Lane in the south.

2.2.25 The central concourse would incorporate a public area that extends to the east to facilitate access from the east and the east-west movement of pedestrians

underneath the station platform structure. This would include areas of hard and soft landscaping, tree planting and seating.

2.2.26 Areas of hard and soft landscaping, tree planting and seating would be provided along the route of the non-definitive Leeds City Footpath (Footpath Number 62) along the south side of the River Aire.

2.2.27 A number of public realm improvements would also be implemented to the north of the River Aire, around the northern concourse of the proposed HS2 Leeds station. This would include a new area of public realm to the north-west of Victoria Bridge, comprising areas of grass, seating, informal children's play areas and a series of steps to provide an area of seating. A similar area, comprising predominantly hard standing, would extend under the HS2 Leeds station platform supporting structure to facilitate the movement of pedestrians along the waterfront.

2.2.28 Neville Street, between the junction with Sovereign Street and Bishopgate Street, directly below the existing Leeds Station, would be pedestrianised with hard landscaping to promote access between the proposed public open spaces.

2.2.29 Construction of the proposed HS2 Leeds station and these other design features would be managed from HS2 Leeds station main compound (see Volume 2: Map CT-06-627, C5), HS2 Leeds station car park satellite compound (see Volume 2: Map CT-06-627, B6), HS2 Leeds station central concourse satellite compound (see Volume 2: Map CT-06-627, D7) and HS2 Leeds station northern concourse satellite compound (see Volume 2: Map CT-06-627, E5).

Demolitions

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

2.2.31 At this stage of the design development, it is anticipated that demolition of 26 commercial/business properties and four other structures would be required to construct the Proposed Scheme in the Leeds Station 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 Leeds Station area. The construction arrangements described in this section provide the basis for the assessment presented in this ES.

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

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

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

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

Code of Construction Practice

2.3.6 All contractors will be required to comply with a Code of Construction Practice (CoCP). In addition, Local Environmental Management Plans (LEMPs) will be produced for each local authority area. The CoCP and LEMPs will be the means of controlling the construction works associated with the Proposed Scheme, and set out monitoring requirements, with the objective of ensuring that the effects of the works on people and the natural environment are reduced 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[20] 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

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

offering opportunities to influence them, where appropriate.

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

Overview of the construction process

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

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

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

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

Advance works

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

- further detailed site investigations and surveys for proposed construction compounds;
- further detailed environmental surveys;
- advance mitigation works including, where appropriate, contamination remediation, habitat creation and translocation, landscape planting and built

heritage survey and investigation;

- advance site access works;
- site establishment with temporary fence construction; along with soil stripping and vegetation removal; and
- utility diversions and new utility connections for facilities associated with the Proposed Scheme.

Engineering works

Introduction

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

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

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

2.3.15 In the Leeds Station area, part of the construction could take place on or immediately adjacent to the existing operational railway. Where possible, such construction would be planned to normally take place at night, during weekends or bank holidays, so that there is less disruption to peak services.

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

General overview of construction compounds

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

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

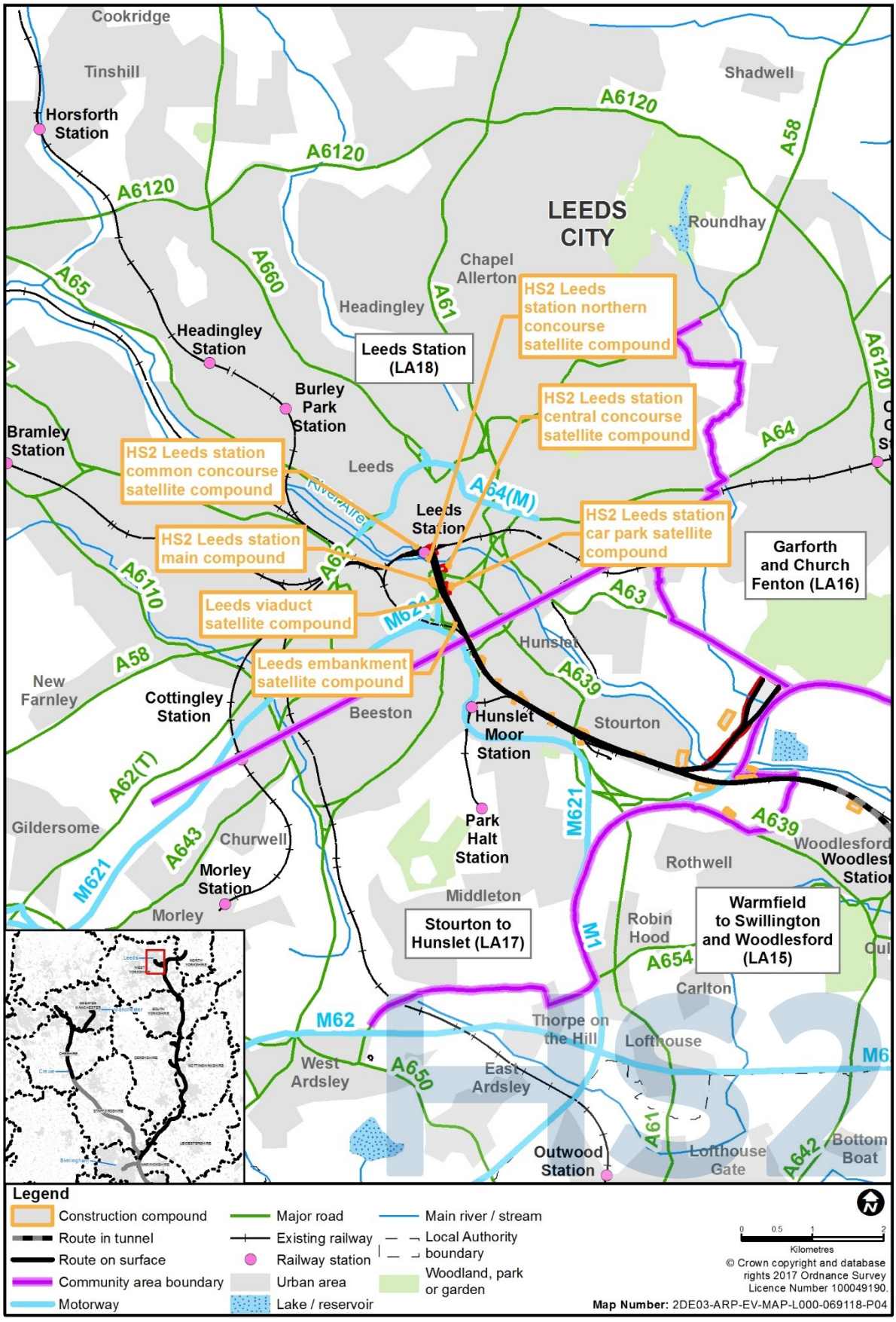
- an area for the fabrication of temporary works equipment and finished goods;
- fuel storage;
- plant and equipment storage including plant maintenance facilities; and
- office space for management staff, limited car parking for staff and site operatives, and welfare facilities.

2.3.18 One main civil engineering compound, the HS2 Leeds station main compound, would be located in the Leeds Station area. This would manage six civil engineering satellite compounds in the Leeds Station area.

2.3.19 Six civil engineering satellite compounds would be located in the Leeds Station area. Following the completion of civil engineering works, three of these compounds (HS2 Leeds station main compound, Leeds Embankment satellite compound and HS2 Leeds station – common concourse satellite compound) 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 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. The location of construction compounds in the Leeds Station area is shown on Figure 4. Map Series CT-05 (in the Volume 2: LA18 Map Book) shows in detail the locations of the construction compounds described below.

Figure 4: Location of construction compounds in the Leeds Station area



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

2.3.22 In the Leeds Station area there would be no worker accommodation required.

2.3.23 Soil stripped as part of the works, prior to it being used when the land is reinstated, would be stored for the duration of construction. The location of topsoil and subsoil storage areas would generally be adjacent to compounds and areas of construction activity. These areas are referred to as material stockpiles and those adjacent to compounds are shown on maps CT-05-626b to CT-05-627, in the Volume 2: LA18 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 site 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 Leeds Station area are described in the subsequent sections of this report.

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

2.3.28 Areas of land are also required for the storage, loading and unloading of bulk earthworks materials that are moved to and from the site on public roads. These areas would allow transfer of material between road vehicles and site vehicles during construction to balance traffic movements on the road network. These areas are referred to as transfer nodes and are shown on Map CT-05-626b and Map CT-05-627 in the Volume 2: L18 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 Leeds Station area, as illustrated in Figure 5, and railway system installation works as illustrated in Figure 6. All dates and durations of activities and number of workers are indicative. All compounds would undertake initial site set-up works and, at the end of their use, finalisation works including site reinstatement, landscaping and planting (as necessary).

Figure 5: Construction compounds for civil engineering works

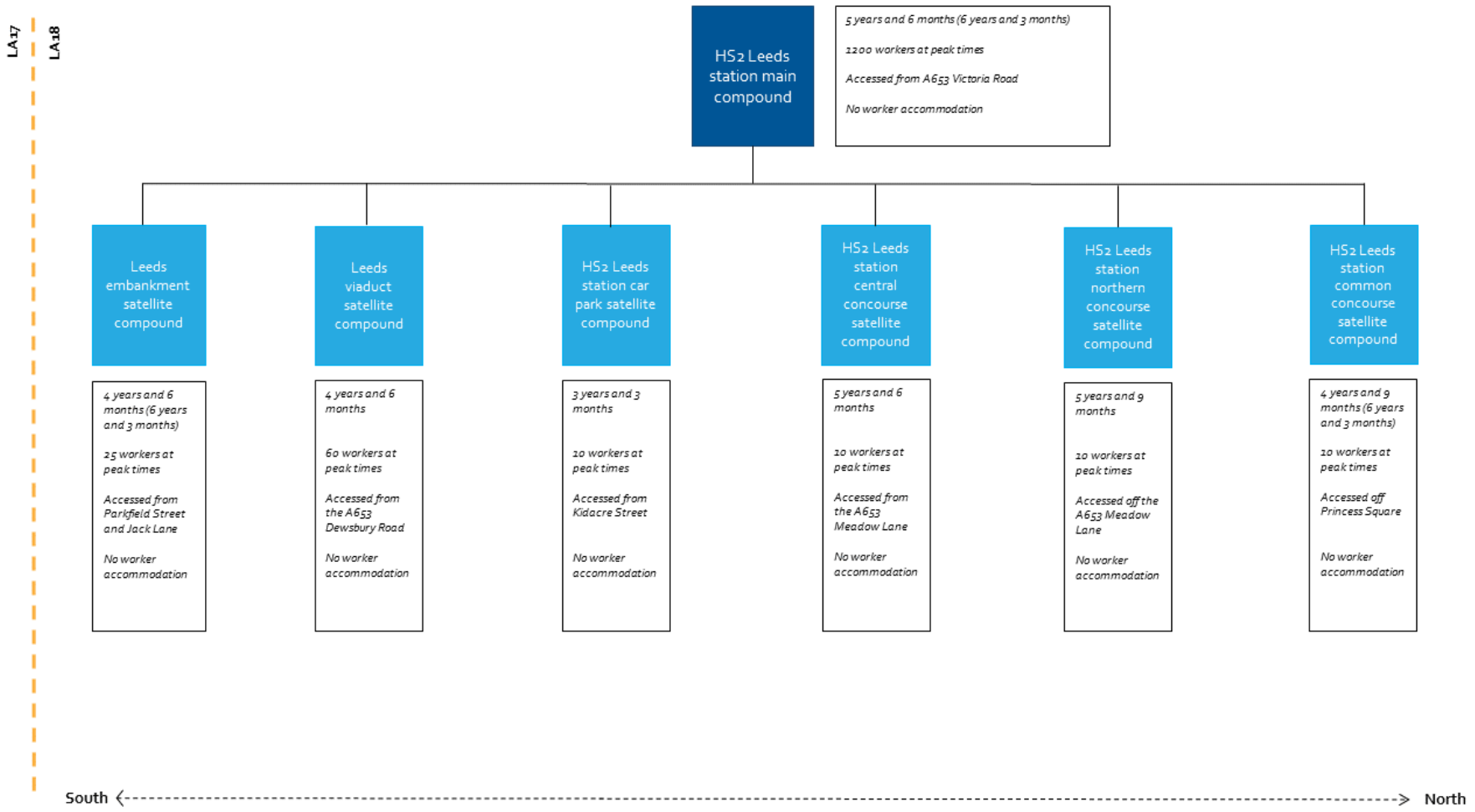
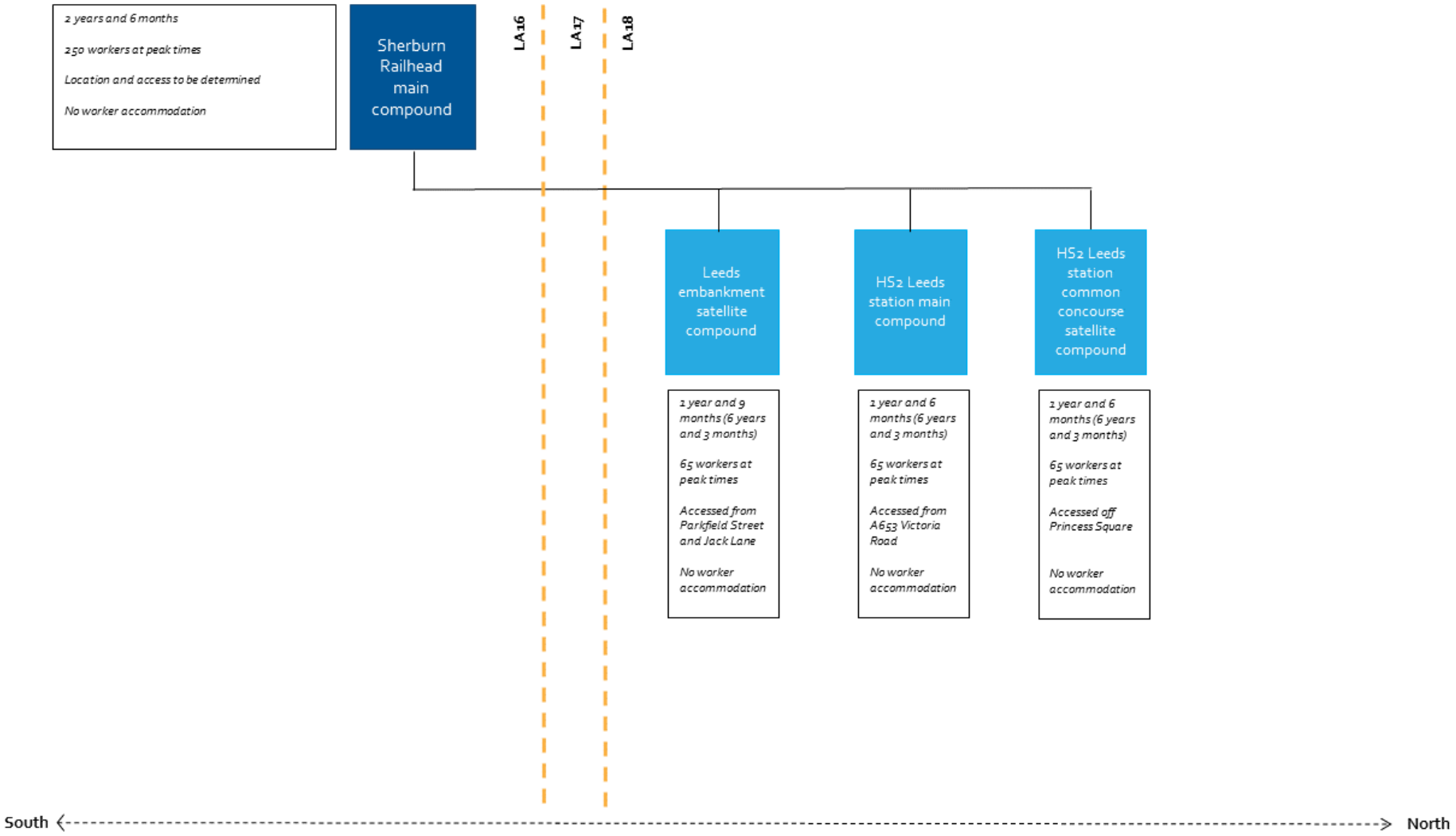


Figure 6: Construction compounds for railway systems installation works



HS2 Leeds station main compound

2.3.30 This compound would be used to manage civil engineering works and would provide main compound support to the six civil engineering satellite compounds in the Leeds Station area as illustrated in Figure 5 (see Volume 2: Map CT-05-627, C4 to C5). The compound would be used for civil engineering works for five years and six months. Concurrently, the compound would be used as a satellite compound for railway systems installation works for a period of one year and six months as illustrated in Figure 6.

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

Table 1: Demolitions required as a result of the works to be managed from the HS2 Leeds station main compound

Description	Location	Feature resulting in the demolition
Commercial		
Engineering works building	Engineering Works, Victoria Road/New Lane, Holbeck, Leeds	HS2 Leeds station
Office building and associated multi-storey car park	Great Wilson Street/Meadow Lane, Holbeck, Leeds	HS2 Leeds station
Office building	The Wharf, Neville Street, Leeds	HS2 Leeds station
Hotel	Hilton Hotel, Neville Street, Leeds	HS2 Leeds station
Office complex	The Embankment 1, Sovereign Street, Leeds	HS2 Leeds station
Office complex	The Embankment 2, Sovereign Street, Leeds	HS2 Leeds station
Office complex	The Embankment 3, Sovereign Street, Leeds	HS2 Leeds station
Office building	Sovereign Street, Leeds	HS2 Leeds station
Other		
Electricity Sub-station	Great Wilson Street, Holbeck, Leeds	HS2 Leeds station
Electricity Sub-station	New Lane, Holbeck, Leeds	HS2 Leeds station
Electricity Sub-station	Leeds City Office Park, Meadow Lane, Holbeck, Leeds	HS2 Leeds station
Electricity Sub-station	Sovereign Street, Leeds	HS2 Leeds station

2.3.32 The construction of HS2 Leeds station would comprise six main phases:

- Phase 1: enabling and site preparation works including mobilisation, site investigation, demolition, utility and road diversions, and protection of existing assets and advance works including provision of car parking;
- Phase 2 and 3: establishment of main compound and satellite compounds, continuing site clearance and demolition;
- Phase 4: sub-structure works, including installation of piled foundations, pile

caps and ground beams, below ground drainage and utilities;

- Phase 5: superstructure works, including construction of the viaduct piers and decks, concourses building envelopes, superstructures and roof canopy supports, internal structures and slabs. Station fit-out and construction of the new pedestrian overbridge in the existing Leeds Station would also commence in this phase; and
- Phase 6: station roof structure works, including installation of the roof canopy and associated glazing, cladding, drainage, lighting and internal finishes; station building fit-out, railway systems and finishing works, and completion of the connection to the existing Leeds Station via a new pedestrian overbridge.

2.3.33 The construction of HS2 Leeds station would take approximately five years to complete. Construction of HS2 Leeds station would require the installation of temporary tower cranes to enable the various components to be lifted in place.

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

- permanent realignment and modification of the A653 Meadow Lane to allow bi-directional flow of traffic, between the A653 Meadow Lane/A61 Great Wilson Street junction and the A653 Meadow Lane/A653 Meadow Road/A653 Dewsbury Road junction under the route of the Proposed Scheme which would take two years to complete. During construction temporary measures would include traffic management and local diversions;
- permanent realignment and modification of the A653 Victoria Road to allow bi-directional flow of traffic, between the A653 Meadow Lane/A653 Victoria Road Junction and the A653 Great Wilson Street/A653 Victoria Road/Water Lane/Neville Street junction, which would take two years to complete. During construction temporary measures would include traffic management and local diversions;
- permanent closure of the A653 Great Wilson Street between the A653 Meadow Lane/A61 Great Wilson Street junction and the A653 Victoria Road, which would take two years to complete. During construction temporary measures would include traffic management and local diversions;
- permanent closure of New Lane between the A653 Meadow Lane and the A653 Victoria Road, which would take three months to complete. During construction temporary measures would include traffic management and local diversions;
- permanent closure to road users and pedestrianisation of Neville Street (from the junction of Sovereign Street to Bishopgate Street) which would take four years and three months to complete. During construction there would be a temporary closure of 120m of Neville Street during construction from Victoria Bridge to the junction with Sovereign Street. During construction temporary measures would include traffic management and local diversions. During construction, road users travelling north would be diverted via Meadow Lane,

Leeds Bridge to Swinegate. During construction, road users travelling south would be diverted via Leeds Bridge and Meadow Lane;

- permanent realignment and modification of Little Neville Street, including the closure of the access from Little Neville Street to the car parking at Dark Neville Street used by the residents of the Blue apartments, which would take five years to complete. During construction temporary measures would include traffic management and local diversions. During construction residents of Blue apartments would be able to continue to travel south along Neville Street to access the car parking at Dark Neville Street. During construction the residents of the Blue apartments travelling by road from the south would be diverted via Meadow Lane, Leeds Bridge, Swinegate, Bishopgate Street, Neville Street to Dark Neville Street to access the car parking at Dark Neville Street; and
- temporary closure of approximately 150m of Sovereign Street during construction for a period of five years. During construction temporary measures would include traffic management and local diversions. During construction, road users travelling north would be diverted via Meadow Lane, Leeds Bridge. During construction, road users travelling south would be diverted via Leeds Bridge and Meadow Lane. During construction, road users requiring access to KPMG's car park would be diverted along a modified Pitt Row for approximately 200m from Swinegate.

2.3.35 The works to be managed from this compound would also include minor works to local roads.

2.3.36 The works to be managed from this compound would require the temporary diversion of the non-definitive Leeds City Footpath (Footpath Number 62)/ NCN Route 66/ St Bernard's Way (along the south side of the River Aire) for a length of 850m, to the south, via the realigned A653 Victoria Road and A653 Meadow Lane/Meadow Lane, for a period of five years. On completion of construction the footpath would be reinstated on its existing alignment. Proposed temporary diversion of the Airedale Way promoted route will be reported in the formal ES.

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

2.3.38 Key railway systems installation works to be managed from this compound would include crossover connections and general station works which would take one year and six months to complete.

Leeds embankment satellite compound

2.3.39 This compound would be used to manage civil engineering works in the Leeds Station area, as illustrated in Figure 5 (see Volume 2: Map CT-05-626b, F4 to G4) for a period of four years and six months. On completion of civil engineering works, this compound would remain as a satellite compound for railway systems installation works for a period of one year and nine months, as illustrated in Figure 5.

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

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

Description	Location	Feature resulting in the demolition
Commercial		
Four automotive maintenance businesses in separate buildings	Jack Lane, close to junction with Leathley Road, Hunslet, Leeds	Leeds embankment
Highways and transportation depot	Pottery Fields Depot, Leathley Road, Hunslet, Leeds	Leeds embankment
Driving school premises	Kidacre Street, Hunslet, Leeds	Leeds embankment
Gas distribution facility	Pottery Fields, Kidacre Street, Leeds	Leeds embankment

2.3.41 The compound would be used to manage the construction of the Leeds embankment, which would take one year to complete.

2.3.42 The works to be managed from this compound would require the permanent closure of Jack Lane on the west side of the route of the Proposed Scheme and diversion of Jack Lane along the east side of the route of the Proposed Scheme, to connect with the Leathley Road/Cross Myrtle Street junction, which would take one year and nine months to complete. Users would be diverted via Cross Myrtle Street, Kidacre Street, the temporarily realigned Holmes Street under the route of the Proposed Scheme, and the A653 Meadow Road/A653 Dewsbury Road and Parkfield Street. Temporary measures would include traffic management and local diversions.

2.3.43 The works to be managed from this compound would also include minor works to local roads.

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

2.3.45 Key railway systems installation works to be managed from this compound would include the installation of crossover connections which would take one year and nine months to complete.

Leeds viaduct satellite compound

2.3.46 This compound would be used to manage civil engineering works in the Leeds Station area, as illustrated in Figure 5 (see Volume 2: Map CT-05-627, B5).

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

Table 3: Demolitions required as a result of the works to be managed from the Leeds viaduct satellite compound

Description	Location	Feature resulting in the demolition
Commercial		
Three office buildings (including Life Church Leeds)	Dewsbury Road, Hunslet, Leeds	Leeds viaduct
Automotive sales and maintenance premises	Holmes Street, Leeds	Leeds viaduct
Three office buildings at Central Park	Central Park, New Lane, Holbeck, Leeds	Leeds viaduct

Description	Location	Feature resulting in the demolition
Two office buildings at City Office Park	City Office Park, Meadow Lane, Holbeck, Leeds	Leeds viaduct
Office building on Victoria Road	Victoria Road, at junction with New Lane, Holbeck, Leeds	Leeds viaduct

2.3.48 The compound would be used to manage the construction of the Leeds viaduct, which would take two years to complete.

2.3.49 The works to be managed from this compound would require the temporary diversion of Holmes Street for 250m approximately 10m south of its existing alignment for a period of one year and nine months. Temporary measures would include traffic management and local diversions. On completion of construction, Holmes Street would be reinstated along its current alignment under the route of the Proposed Scheme. A new Holmes Street/A653 Dewsbury Road junction would be provided to the west of the Proposed Scheme. This work would take one year and nine months to complete.

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

HS2 Leeds station car park satellite compound

2.3.51 This compound would be used to manage civil engineering works in the Leeds Station area, as illustrated in Figure 5 (see Volume 2: Map CT-05-627, B6 to B7 and C6 to C7).

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 HS2 Leeds station multi-storey car park and surrounding public realm areas, which would take three years to complete.

2.3.54 There may also be utilities works managed from this compound.

HS2 Leeds station central concourse satellite compound

2.3.55 The compound would be used to manage civil engineering works in the Leeds Station area, as illustrated in Figure 5 (see Volume 2: Map CT-05-627, D7).

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

2.3.57 The compound would be used to manage the construction of the HS2 Leeds station central concourse, which would take five years and three months to complete.

2.3.58 There may also be utilities works managed from these compounds.

HS2 Leeds station northern concourse satellite compound

2.3.59 The compound would be used to manage civil engineering works in the Leeds Station area, as illustrated in Figure 5 (see Volume 2: Map CT-05-627, E5).

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

2.3.61 The compound would be used to manage the construction of the HS2 Leeds station northern concourse, which would take five years and six months to complete.

2.3.62 There may also be utilities works managed from these compounds.

HS2 Leeds station common concourse satellite compound

2.3.63 This compound would be used to manage civil engineering works and railway systems works in the Leeds Station area, as illustrated in Figure 5 (see Volume 2: Map CT-05-627, F4). The compound would be used for civil engineering works for four years and nine months. On completion of civil engineering works, the compound would remain as a satellite compound for railway systems for a period of one year and six months, as illustrated in Figure 5.

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

Table 4: Demolitions required as a result of the works to be managed from the HS2 Leeds station common concourse satellite compound

Description	Location	Feature resulting in the demolition
Commercial		
Food and beverage outlet	Leeds Station, New Station Street, Leeds	HS2 Leeds station

2.3.65 The compound would be used to manage the construction of the HS2 Leeds station common concourse, which would take four years and nine months to complete.

2.3.66 There may also be utilities works managed from these compounds.

2.3.67 Key railway systems installation works to be managed from this compound would include the installation of crossover connections and general station works which would take one year and six months to complete.

Construction waste and material resources

2.3.68 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.

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

2.3.70 Local excess or shortfall of excavated material within the Leeds Station 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

2.3.71 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

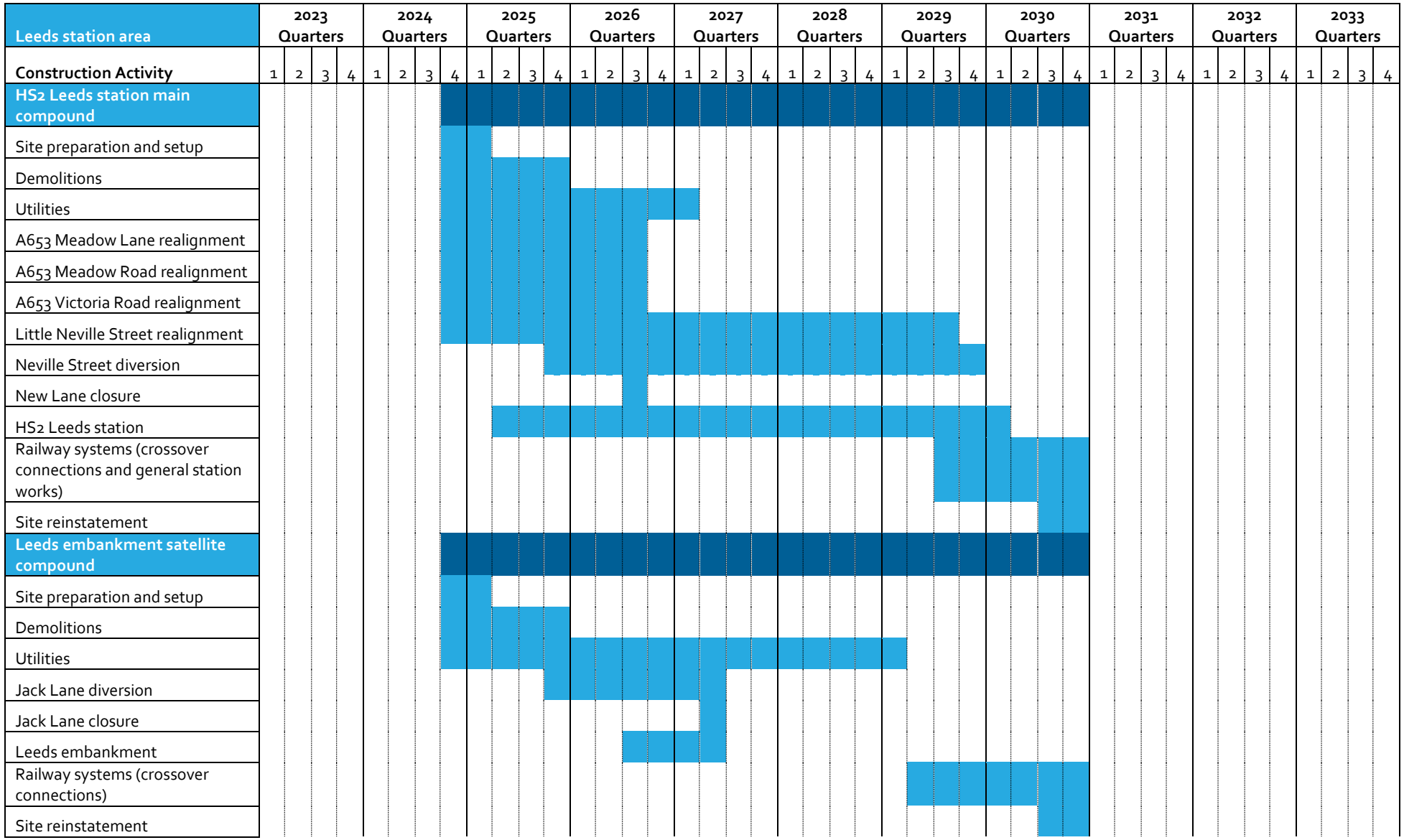
2.3.72 A construction programme illustrating indicative periods for each of the core construction activities described above is provided in Figure 7. Construction durations referred to in the following sections of this report are based on this indicative programme.

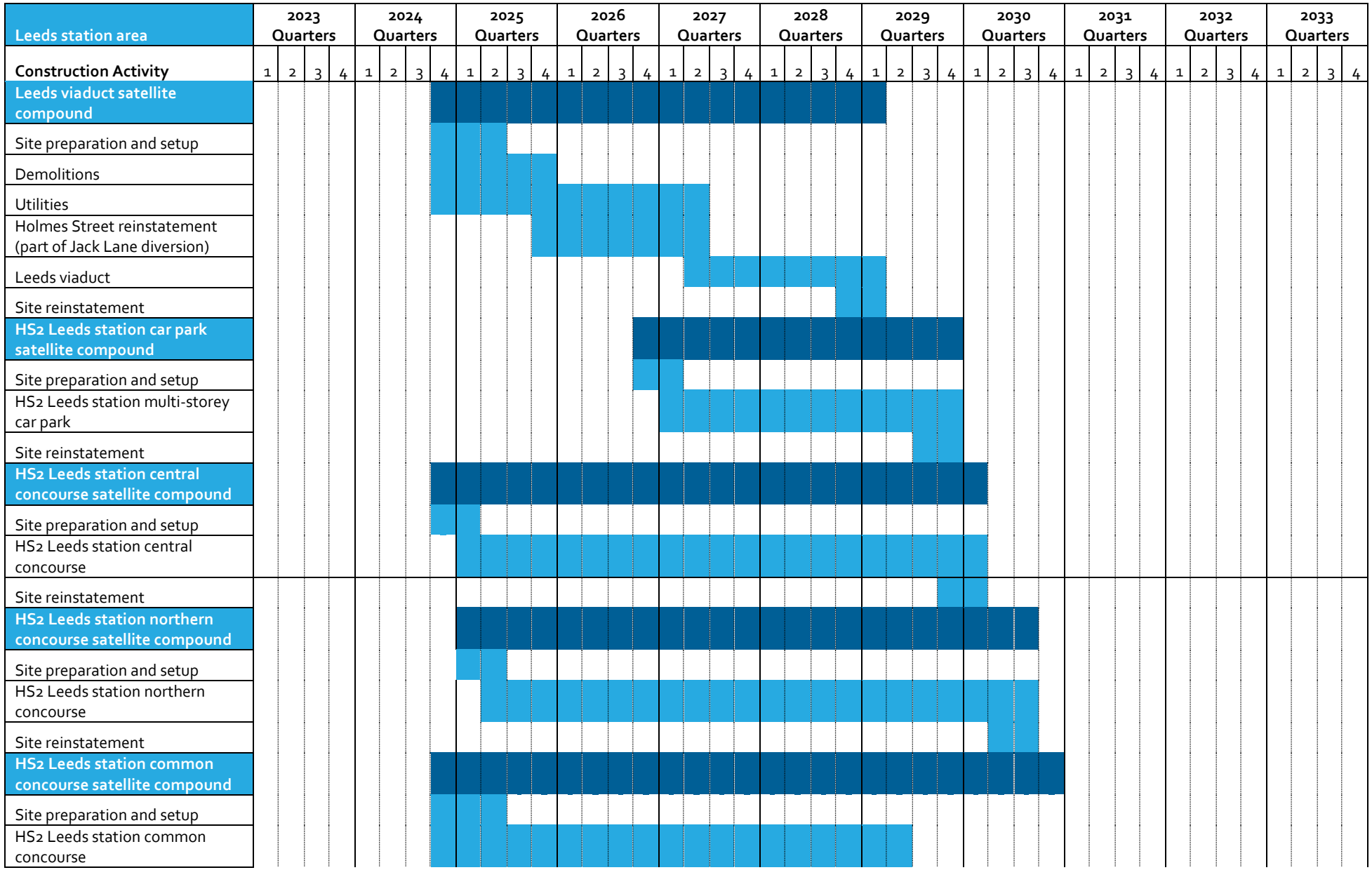
Monitoring during construction

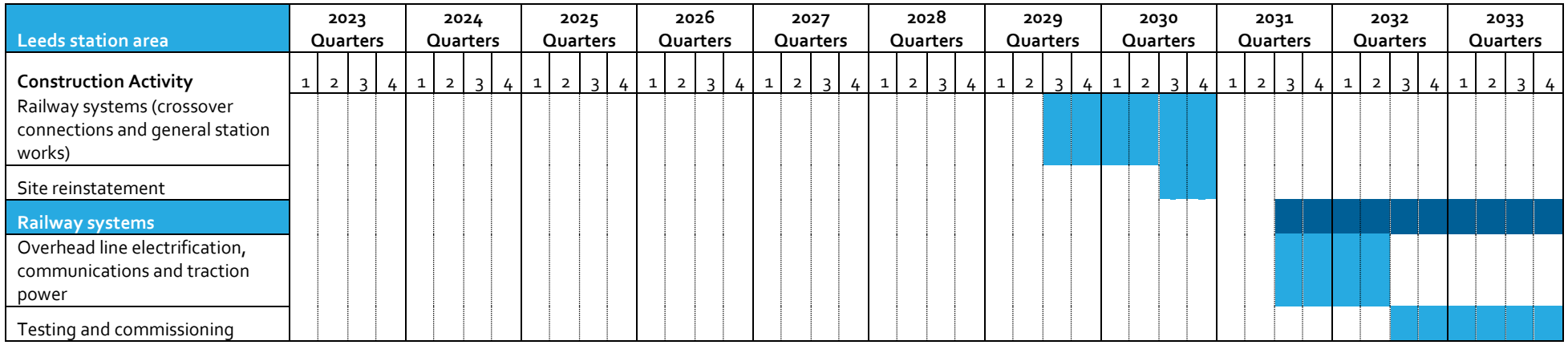
2.3.73 The appointed contractor would be required to undertake the necessary monitoring for each environmental topic to comply with the requirements of the CoCP, the relevant LEMP and any additional consent requirements. Any actions that may be necessary for compliance would be reported to the nominated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

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

Figure 7: Indicative construction programme between 2023 and 2033




Leeds station 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
Leeds viaduct satellite compound
Site preparation and setup
Demolitions
Utilities
Holmes Street reinstatement (part of Jack Lane diversion)
Leeds viaduct
Site reinstatement
HS2 Leeds station car park satellite compound
Site preparation and setup
HS2 Leeds station multi-storey car park
Site reinstatement
HS2 Leeds station central concourse satellite compound
Site preparation and setup
HS2 Leeds station central concourse
Site reinstatement
HS2 Leeds station northern concourse satellite compound
Site preparation and setup
HS2 Leeds station northern concourse
Site reinstatement
HS2 Leeds station common concourse satellite compound
Site preparation and setup
HS2 Leeds station common concourse


Leeds station 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
Railway systems (crossover connections and general station works)
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 Leeds Station 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 Leeds Station 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 during operation prior to construction commencement.

2.5 Route section alternatives

2.5.1 The strategic, route-wide and route corridor alternatives to the Proposed Scheme and local alternatives considered prior to July 2017 are presented in Volume 1, Introduction and methodology and in the Alternatives report as a supporting document to the working draft ES. The local alternatives considered for the Proposed Scheme within the Leeds Station area since the route announcement in July 2017 are described in this section.

2.5.2 In this area, the route of the Proposed Scheme would be carried on viaducts and embankments and terminate at Leeds Station.

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 Leeds Station area, and environmental receptors including: Humber Estuary SAC and SPA; Humber Estuary SSSI; Grade II listed Victoria Bridge; Grade II listed Concourse of London Midland and Scottish Railway; Leeds City Centre Conservation Area; and Canal Wharf Conservation Area.

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 While 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 Environmental Statement (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 5.

Table 5: 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 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 Scope and Methodology Report (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. In total, one hundred and seven responses to the draft SMR were received, as a result of which changes were made to the SMR. These are set out in the SMR Consultation Summary Report published alongside this working draft ES, and will be used to inform the assessment methodologies applied for the formal ES.

Consultation on the working draft ES and ongoing engagement

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

3.2.4 These consultations and wider feedback from ongoing stakeholder engagement will continue to be considered as part of the ongoing design of the Proposed Scheme and the assessment and identification of mitigation opportunities for the Leeds Station 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 the initial preferred route announcement in November 2016.

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

- retaining continuity and connectivity in the network of public rights of way (PRoW) (including cycleways and bridleways) and other walking routes around Leeds;
- temporary and permanent land requirements during construction and operation;
- the potential noise impacts, during both construction and operation;
- the potential visual impacts;
- the mitigation and construction impacts including increased heavy goods vehicles (HGV) movements required for construction;
- potential severance of communities during construction and operation;
- the potential impact of road diversions and realignment on residents, businesses and road users;

- flooding and drainage issues, particularly associated with the River Aire;
- the relocation of accommodation bridges close to existing access points;
- the potential impact on community facilities and heritage assets;
- the potential impact on ecology and biodiversity, and opportunities for environmental mitigation;
- understanding the property schemes available to residents;
- the potential impact on businesses;
- design of the HS2 Leeds station; and
- the interface of the Proposed Scheme with the existing Leeds Station.

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 Leeds Station 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 non-motorised user groups such as Leeds Local Access Forum (LLAF), 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 (CA) and also through the www.gov.uk/hs2 website. Documents have been made available online and in community libraries. Members of local communities and other interested parties have been invited to engage on issues pertinent to the working draft ES and the development of the Proposed Scheme design.

3.4.5 Table 6 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 6: Engagement to date with community stakeholders

Stakeholder	Area of focus
Leeds Local Access Forum (LLAF)	Discussion about line of the route of the Proposed Scheme in relation to local PRoW and access, and schedule of engagement.
Leeds Cycling Campaign	Discussion about the line of the route of the Proposed Scheme in relation to local PRoW and access, and schedule of engagement.
Leeds Ramblers	Discussion about the line of the route of the Proposed Scheme in relation to local footpaths and access, and schedule of engagement.
LLAF Equestrian representative	Discussion about line of the route of the Proposed Scheme in relation to local PRoW and access, and schedule of engagement.
HS2 Growth Partnership	Discussion about development around HS2 Leeds station.

Local authorities and parish councils

3.4.6 Direct engagement has been undertaken with Leeds City Council (LCC) and other local authorities within the Leeds Station 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 others topics.

3.4.8 Key discussion and inputs gained from engagement local authorities and parish councils are summarised in Table 7.

Table 7: Engagement to date with local authorities and parish councils

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.
	Engagement over access to land owned by LCC.

Stakeholder	Area of focus
West Yorkshire Combined Authority (WYCA)	Engagement over Transport Assessment Scoping and Autumn Traffic Surveys
	Meeting of Transport Assessment Modelling Working Group
Leeds Station Joint Working Group	Working Group comprised of LCC, WYCA, Network Rail Infrastructure Limited, Transport for the North, HS2 and Department for Transport. Discussion about design of the HS2 Leeds station, interface with the HS2 route, environmental considerations, commercialisation, and place-based knowledge and requirements.
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)[21].

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;
- The British Geological Survey;
- The Canal & River Trust;
- The Coal Authority;
- The 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;

[21] Supporting document: Draft Code of Construction Practice

- Leeds City Region Enterprise Partnership;
- National Farmers Union;
- National Trust;
- Natural England;
- Network Rail;
- NHS Leeds South and East Clinical Commissioning Group;
- Public Health England;
- The Royal Society for the Protection of Birds;
- Trans Pennine Trail;
- Utilities companies relevant to this area;
- West Yorkshire Archaeological Advisory Services;
- West Yorkshire Health Protection Team;
- The 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.

3.4.12 Organisations with a specialist interest, for example the Environment Agency's interest in canals and waterways, have informed individual technical assessments such as the flooding and drainage assessment.

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

Utilities

3.4.14 Engagement is also ongoing with utility companies and statutory stakeholders, such as BT Openreach, Instalcom, Network Rail, Northern Powergrid, Northern Gas Networks, Sky Telecommunication Services Ltd, Virgin Media and Yorkshire Water, to establish what infrastructure exists in the Leeds Station area and how it may need to be modified as part of the Proposed Scheme.

Directly affected individuals, major asset owners and businesses

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

3.4.16 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 Leeds Station area, an information event was held at The Met Hotel, Leeds, on 4 June 2018. Facilities were available at the event for affected individuals, major asset owners and businesses to have private meetings with HS2 staff.

3.4.17 Engagement has been undertaken with Asda, Direct Line, KPMG and Network Rail.

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

4 Agriculture, forestry and soils

4.1.1 This environmental topic has been scoped out of the assessment for the Leeds Station area as there are no agricultural or forestry activities affected by the Proposed Scheme in this urban 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 Leeds Station area. Oxides of nitrogen (NOx) including nitrogen dioxide (NO_2), fine particulate matter[22] (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 (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: LA18 Map Book.

5.2 Scope, assumptions and limitations

5.2.1 The scope, assumptions and limitations for the air quality assessment are set out in Volume 1, Section 8 and the Scope and Methodology Report (SMR) [23].

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[24]:

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

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

5.2.4 The assessment of construction traffic impacts will use traffic data based on an estimate of the average daily flows in the peak year during the construction period

[22] $PM_{2.5}$ 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.
[23] Supporting document: HS2 Phase 2b Environmental Impact Assessment Scope and Methodology Report
[24] The assessment of construction dust emissions has been undertaken where sensitive receptors are located up to a distance of 350m from dust generating activities. The assessment of traffic emissions will be undertaken where sensitive receptors are located up to a distance of 200m from roads screened in for further assessment.

(2023-2032). The assessment will assume vehicle emission rates and background pollutant concentrations from year 2023. As both pollutant emissions from vehicle exhausts and background pollutant concentrations are anticipated to reduce year by year as a result of vehicle emission controls, the year 2023 represents the worst case for the construction assessment.

5.3 Environmental baseline

Existing baseline

Background air quality

5.3.1 The main sources of air pollution in the Leeds Station area are emissions from road vehicles. The main roads within the Leeds Station area are the M621, the A58(M), the A653 Victoria Road/Meadow Lane/Meadow Road/Dewsbury Road/Great Wilson Street, and the A61 Hunslet Road/Great Wilson Street.

5.3.2 There are three industrial installations (regulated by the Environment Agency) with permits for emissions to air, namely Knostrop Industrial Waste Treatment Works, Knostrop Treatment Works and Knostrop Sewage Treatment Works. The contribution of all industrial processes and other emission sources to local air quality is included within the background concentrations.

5.3.3 Estimates of background air quality have been obtained from the Department for Environment, Food and Rural Affairs (Defra)[25] 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 Leeds Station area.

Local monitoring data

5.3.4 There is currently one local authority continuous monitor located within the Leeds Station area for monitoring NO2 concentrations. This is located at the Corn Exchange near the city centre. Measured concentrations in 2016 were above the annual mean NO2 air quality standard[26].

5.3.5 There are currently four local authority diffusion tube sites located within the Leeds Station area for monitoring NO2 concentrations. Measured concentrations in 2016 were below the NO2 air quality standard at most sites, except at on site at the Corn Exchange.

Air quality management areas

5.3.6 There is one air quality management area (AQMA) within the Leeds Station area, Caspar Apartments. This AQMA covers a block of properties adjacent to the A64 at the eastern end of the Inner Ring Road, surrounded by the slip road access from North Street. The AQMA was designated in July 2001 for exceedances in the annual mean NO2 standard.

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

Receptors

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

5.3.8 Most of the receptors which may be affected by the Proposed Scheme are residential. Other receptors include the Leeds College of Building, The Royal College of Midwives, BPP Law School and the Children's Corner Granary Wharf.

5.3.9 There are no sensitive ecological sites identified within the Leeds Station area.

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)[27]. The draft CoCP includes a range of mitigation measures that are accepted by the Institute of Air Quality Management (IAQM) as being suitable to reduce impacts to as low a level as is reasonably practicable. These measures are generally sufficient to avoid any significant effects from dust during construction.

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

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

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

Assessment of impacts and effects

Temporary effects

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

Construction dust effects

5.4.5 The risks of demolition of existing buildings, earthworks, construction of new structures and trackout[28] have been assessed for their effect on dust soiling, human health[29] and ecological sites. There are receptors located within the Leeds Station area.

5.4.6 The risk of dust and human health effects would range from low to high within this area for all dust generating activities, depending on the location of receptors and the magnitude of the activities.

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

Construction traffic effects

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

5.4.9 The M621, A58, A653 Dewsbury Road/Meadow Road/Meadow Lane/Victoria Road/Great Wilson Street, A61 Great Wilson Street/Hunslet Road, Neville Street, Sovereign Street, Meadow Lane, Swinegate, Jack Lane, Parkfield Street, Cross Myrtle Street; Kidacre Street, Junction Street, Leathley Road, Holmes Street, Wellington Street, Aire Street, Princes Square, Thirsk Row and Northern Street would likely provide the primary access for construction vehicles in this area.

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

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

[28] 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.
[29] Human health effects relate mainly to short-term exposure to particles of size between 2.5µm to 10µm, measured as PM10.

Permanent effects

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

Other mitigation measures

5.4.13 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

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

5.5 Effects arising from operation

Avoidance and mitigation measures

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

Assessment of impacts and effects

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

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

Operational traffic effects

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

Combustion plant emissions

5.5.5 Emissions from any stationary sources, such as the HS2 Leeds station combustion plant, will be included in the air quality assessment. Concentrations of NO_2 will be predicted at receptors and any significant effects will be reported in the formal ES.

Other mitigation measures

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

Summary of likely residual significant effects

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

Monitoring

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

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

6 Community

6.1 Introduction

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

6.1.2 The assessment draws on information gathered from engagement with the users and operators of community facilities including West Yorkshire Combined Authority, Leeds City Council (LCC), Leeds Ramblers Group and Leeds Cycling Group. 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: LA18 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)[30].

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

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

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

[30] 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, heavy goods vehicles (HGV) traffic and visual intrusion. These in-combination effects will be identified in the formal ES. In addition, the study area has regard to the proposed routes of construction traffic and takes account of catchment areas for community facilities that could be affected where intersected by the Proposed Scheme.

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

6.3 Environmental baseline

6.3.1 The Proposed Scheme through the Leeds Station area would be approximately 1.3km in length and would lie within the LCC area. It would extend from junction 3 of the M621 north of Hunslet, passing the Apex Business Park, Crown Point Shopping Park, and the Southbank and Holbeck areas along the River Aire, ending at the existing Leeds Station.

6.3.2 The area is predominantly urban, characterised by commercial and industrial uses as well as major road and rail routes. In general, community facilities in this area are predominantly food and drink establishments, with a small number of health centres, community centres and places of worship. There are also a number of educational establishments.

6.3.3 The study area includes approximately 21,000 residential properties, largely concentrated in apartment blocks in Holbeck to the west, Clarence Dock and Dock Street to the east and Leeds city centre to the north of the existing Leeds Station. Some residential properties would be adjacent to the route of the Proposed Scheme.

6.3.4 The Leeds School of Motorcycling is a motorcycle rider training facility located on Kidacre Street. The facility comprises one building offering classroom facilities as well as outdoor areas, and provides training seven days a week. Training is offered on both

scooters and motorbikes, at a range of levels including for beginners, instructors and companies. The facility also offers taster sessions and team building days.

6.3.5 There is a Gypsy and Traveller site within the study area, located on Kidacre Street to the north of the Leeds School of Motorcycling. The site is owned by LCC, and a temporary planning permission was granted in July 2016 for eight residential pitches with space for 16 vehicles for a temporary period of ten years. Each pitch would have a portable pre-fabricated bathroom/toilet, hot water and kitchen facilities, and mains electricity. Due to the location of the site along the route of the Proposed Scheme, a ten year temporary permission was granted to allow for vacation of the site prior to commencement of construction works associated with the Proposed Scheme.

6.3.6 Life Church Leeds is a multicultural Christian church with a local hub based in Hurley House on the A653 Dewsbury Road. The church offers groups for children, mothers and toddlers, young adults and women. The hub at Hurley House is used for mid-week events including a youth service every Friday, whilst Sunday services are held at the Met Hotel in Leeds city centre.

6.3.7 LivingWell Health Club is a gym located within the Hilton International Hotel on Neville Street. The facility offers a gym, swimming pool, steam room, sauna and exercise classes.

6.3.8 There are three promoted PRoW in the Leeds Station area. Two of the promoted PRoW follow the route of Footpath Number 62 alongside the Leeds and Liverpool Canal adjacent to the existing Leeds Station: National Cycle Route 66 and St Bernard's Way. The Airedale Way promoted PRoW passes along Dark Neville Street, Neville Street and New Station Street where it would be crossed by the route of the Proposed Scheme.

6.4 Effects arising during construction

Avoidance and mitigation measures

6.4.1 The draft Code of Construction Practice (CoCP)[31] includes a range of provisions that will help mitigate community effects associated with construction within this area, including:

- implementation of a community engagement framework to provide appropriate information and resolve community issues (Section 5 of the draft CoCP);
- sensitive layout of construction sites to reduce nuisance as far as possible (Section 5);
- maintenance of 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

[31] Supporting document: Draft Code of Construction Practice

construction (Section 16);

- specific measures in relation to air quality and noise will also serve to reduce impacts for the neighbouring communities including discretionary noise insulation for sensitive community resources and, in special circumstances, temporary rehousing (Sections 7 and 13); and
- where practicable, the avoidance of HGVs operating adjacent to schools during drop off and pick up periods (Section 14).

Assessment of impacts and effects

Temporary effects

Residential properties

6.4.2 As part of the construction of HS2 Leeds station, cranes would be required to pass over (over-sail) land that falls within the boundaries of a residential apartment block on Little Neville Street in Leeds city centre. This area is included within the boundaries of the land required for construction of Proposed Scheme. The over-sailing works would last for approximately two years and six months. The residential apartment block would not need to be demolished, and access would be maintained throughout construction. This would result in a minor adverse effect which would not be significant.

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

Open space and public rights of way

6.4.5 The route of the Proposed Scheme would cross one PRoW in the Leeds Station area, the non-definitive Leeds City Footpath along the south side of the River Aire (Footpath Number 62). National Cycle Route 66 and St Bernard's Way promoted routes share the same path as the non-definitive Leeds City Footpath where it would be crossed by the route of the Proposed Scheme. A temporary diversion would be provided for 850m to the south, via the realigned A653 Victoria Road and Meadow Lane, for a period of five years. After this time the non-definitive Leeds City Footpath (and the two promoted routes which use it) would be reinstated along the south side of the River Aire, including areas of hard and soft landscaping, tree planting and seating. The temporary diversion of the two promoted PRoW would result in a minor adverse effect which would not be significant.

6.4.6 The Airedale Way promoted route passes along Dark Neville Street, Neville Street and New Station Street where it would be crossed by the route of the Proposed Scheme. 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 embankment would require the loss of the Gypsy and Traveller site on Kidacre Street. The site was granted a temporary planning permission for eight residential pitches for ten years in order to allow for vacation prior to construction of the Proposed Scheme. The decision notice states that an alternative site on Tulip Street has been safeguarded in the event that the Kidacre Street site is required for construction works before the end of the plan period (planning application reference 16/01921/FU). Planning permission has not been secured for the alternative site at Tulip Street. The alternative site is identified in LCC's Draft Site Allocations Plan, although this is not an adopted plan, having recently been submitted to the Planning Inspectorate for Examination. Therefore the permanent loss of the Kidacre Site would result in a major adverse effect which would be significant.

Community facilities

6.4.8 The construction of Leeds embankment would require the loss of the Leeds School of Motorcycling on Kidacre Street, including the demolition of a building and loss of outdoor space. The facility provides classroom training as well as outdoor training areas and is open seven days a week. The nearest alternative motorcycle driving schools are Tommy Bee Motorcycle Training approximately six miles away in Lofthouse, and Birstall Urban Motorcycle Project for Youth approximately seven miles away which provides training for people of all ages in riding motorbikes on road and off road. The permanent loss of the Leeds School of Motorcycling would result in a moderate adverse effect which would be significant.

6.4.9 The construction of Leeds viaduct and HS2 Leeds station multi-storey car park would require the demolition of Hurley House on Dewsbury Road, which contains the Leeds hub of Life Church Leeds. Life Church Leeds hosts groups for children, mothers and toddlers, young adults and women. The church also runs a number of larger events including conferences and college courses, which are often facilitated from other conference venues in Leeds. Mid-week services are held at the Hurley House hub whilst the Sunday service is held at a different facility, the Met Hotel in Leeds city centre. The permanent loss of Life Church Leeds would result in a major adverse effect which would be significant.

Recreational facilities

6.4.10 The construction of the HS2 Leeds station northern concourse would require the demolition of Hilton International Hotel on Neville Street, which contains the LivingWell Health Club. The facility is open to the public and hotel users, and offers a gym, swimming pool, steam room, sauna and exercise classes. There are a number of alternative gyms in Leeds city centre, including Trib3 on Wellington Street, Anytime Fitness on Bridgewater Place and PureGym on Cloth Hall Street, all located less than 1km from the LivingWell Health Club. The permanent loss of LivingWell Health Club would result in a moderate adverse effect which would be significant.

Open space and public rights of way

6.4.11 No permanent effects on open space and PRoW have been identified as a result of the land required for construction of the Proposed Scheme.

Other mitigation measures

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

6.4.13 Other mitigation measures, where required, will be described in the formal ES.

Summary of likely residual significant effects

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

- Leeds School of Motorcycling on Kidacre Street;
- Gypsy and Traveller site on Kidacre Street;
- Hurley House on Dewsbury Road, the Leeds hub of Life Church Leeds; and
- LivingWell Health Club within Hilton International Hotel on Neville Street.

Cumulative effects

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

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

6.5 Effects arising from operation

Avoidance and mitigation measures

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

Assessment of impacts and effects

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

Other mitigation measures

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

Summary of likely residual significant effects

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

Cumulative effects

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

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

Monitoring

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

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

7 Ecology and biodiversity

7.1 Introduction

7.1.1 This section of the report provides a summary of the predicted impacts and significant effects on species and habitats in the Leeds Station 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, Yorkshire Wildlife Trust and Leeds City Council (LCC) 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 can be found in the Volume 2: LA18 Map Book.

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

7.2 Scope, assumptions and limitations

7.2.1 The scope, assumptions and limitations for the ecological assessment are set out in Volume 1, Section 8 and the Scope and Methodology Report (SMR)[32].

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

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

7.3 Environmental baseline

Existing baseline

Introduction

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

7.3.2 Land required for the construction of, and adjacent to, the Proposed Scheme in this area, consists of a predominantly built environment, which can broadly be classified as urban infrastructure, industrial and commercial properties, patches of scrub, small areas of grassland and amenity trees. The terrain is predominantly flat with some

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

undulation throughout this section of the route. The route of the Proposed Scheme would cross over the River Aire.

7.3.3 Statutory and non-statutory designated sites are shown on Map Series CT-10, Volume 2: LA18 Map Book.

Designated sites

7.3.4 There is one statutory designated site of international importance that is relevant to the assessment in the Leeds Station area. Humber Estuary Ramsar, Special Area of Conservation (SAC) and Special Protection Area (SPA) is a multi-designated site located 43km east of the Proposed Scheme from the Leeds Station Area.

7.3.5 The Humber Estuary Ramsar, SAC, and SPA cover an area of, respectively, 37,988ha, 36,657ha, 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 Leeds Station 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 Leeds Station area. Humber Estuary SSSI, covering an area of 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 43km east of the land required for construction of the Proposed Scheme within the Leeds Station 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[33].

7.3.7 There are no statutory designated local nature reserves (LNRs) that are within, or close to, the land required for construction of the Proposed Scheme in the Leeds Station area.

7.3.8 There are two non-statutory locally designated sites of potential relevance to the assessment for the Proposed Scheme in the Leeds Station area, both of which are of district/borough value:

- Leeds – Liverpool Canal Site of Ecological or Geological Importance (SEGI), covering an area of 5.5ha, is designated for its communities of aquatic and emergent vegetation. The SEGI is located immediately west of the land required for the Proposed Scheme, to the south of the River Aire; and
- The Aireside Embankment Local Nature Area (LNA), covering an area of 0.4ha, comprises riparian scrub habitat. The LNA is located to the east of Whitehall Road, 420m west of the land required for the Proposed Scheme at its closest point.

[33] 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.

7.3.9 There are no Ancient Woodland Inventory Sites (AWIS) of potential relevance to the assessment within 2km of the land required for the Proposed Scheme in the Leeds Station area.

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

Habitats

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

Woodland

7.3.12 There are no woodlands likely to qualify as habitats of principal importance[34], which would be within or partly within the land that would be required for the Proposed Scheme in the Leeds Station area. Two areas of woodland and scrub exist, adjacent to Jack Lane and west of Kidacre Street. Within the urban context of Leeds, on a precautionary basis, pending the findings of field surveys, these woodlands are considered to be of up to district/borough value.

Watercourses

7.3.13 The River Aire and its tributary, Hol Beck, would be crossed by the Proposed Scheme. The Leeds and Liverpool Canal enters the River Aire immediately adjacent to the land required for the Proposed Scheme. The River Aire and Hol Beck may qualify as habitats of principal importance. On a precautionary basis, pending the findings of field surveys, the River Aire and Hol Beck are considered to be of up to county/metropolitan value.

Water bodies

7.3.14 There are two ponds east of the A653, partly within the land required for the Proposed Scheme. They may qualify as habitats of principal importance (e.g. if they support fauna species of high conservation importance such as great crested newts). On a precautionary basis, pending the findings of field surveys, these ponds have been assumed to be of up to county/metropolitan value.

Ancient and veteran trees

7.3.15 Pending the results of the field surveys, it is possible that ancient and veteran trees will be present on the land required for the Proposed Scheme in the Leeds Station area. On a precautionary basis any such ancient and veteran trees are assumed to be of up to county/metropolitan value.

Protected and notable species

7.3.16 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 8.

[34] Section 41 (41) of the Natural Environment and Rural Communities Act 2006

Table 8: Species potentially relevant to the assessment within the Leeds Station area

Resource/feature	Value	Rationale
Bats	Up to county/metropolitan	Records from West Yorkshire Ecology indicate three common pipistrelle bat roost records in the Leeds Station area, two within the land required for the Proposed Scheme and one within 100m of the land required for the Proposed Scheme. Known bat species include common pipistrelle. There is suitable habitat for both roosting and foraging bats along the route of the Proposed Scheme. The River Aire and associated habitats are likely to be used by a range of bat species for foraging and commuting. Trees and buildings have been identified from desk study with potential to support roosting at numerous locations within 100m of the land required for the Proposed Scheme.
Otter	Up to county/metropolitan.	Yorkshire Wildlife Trust reports otter as being present on the River Aire within Leeds, including immediately adjacent to Leeds Station. Habitat suitable for this species is present along Hol Beck, the River Aire, Leeds and Liverpool Canal, smaller watercourses and drainage ditches.
Water vole	Up to county/metropolitan.	Desk records indicate that water vole are present along the River Aire in the Leeds Station area. Desk study indicates that habitat suitable for this species is present along Hol Beck, the River Aire, Leeds and Liverpool Canal, smaller watercourses and drainage ditches.
Great crested newt	Up to county/metropolitan.	Desk Study indicates habitat suitable for great crested newt is present along the route of the Proposed Scheme, including two ponds east of the A653 Meadow Lane. There are no desk study records for great crested newt within the Leeds Station area.
Birds	Up to county/metropolitan.	Bird populations reflect the largely urban environment and are associated with the watercourses and areas of greenspace present in the Leeds Station area. Species associated with these habitats include house sparrow, grey wagtail and starling. Peregrine is known to breed in Leeds city centre and unconfirmed reports indicate kingfisher are present. Both are Schedule 1 species.
White-clawed crayfish	Up to county/metropolitan.	Records show white clawed crayfish to be present in tributaries of the River Aire. Suitable habitat for white-clawed crayfish is present in Hol Beck and Leeds and Liverpool Canal.
Aquatic invertebrates	Up to district/borough.	Suitable habitat for aquatic invertebrates is likely to be present in watercourses including the River Aire, Hol Beck, Leeds and Liverpool Canal, smaller watercourses and drainage ditches, and in ponds.
Fish	Up to district/borough.	There are records of European bullhead and brown trout in the river catchments crossed by the Proposed Scheme. Suitable habitat for notable fish species is likely to be present within the River Aire, Hol Beck, along with smaller water courses and water bodies.

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: LA18 Map Book, along parts of 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:

- the HS2 Leeds station would cross the River Aire on an elevated platform structure. This would avoid direct effects to the watercourse and allow free passage for wildlife beneath it including along the river and its banks; and
- new woodland planting to help contribute towards replacing woodland and scrub loss at Jack Lane and Kidacre Street, and to enhance connectivity between existing woodlands.

7.4.2 The assessment assumes implementation of the measures set out within the draft Code of Construction Practice (CoCP)[35], 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.

[35] Supporting document: Draft Code of Construction Practice

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 43km 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 will 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 construction area and the receptors, these sites have been scoped out of the Habitats Regulations Assessment process.

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.

Habitats

Watercourses

7.4.7 The HS2 Leeds station would cross the River Aire on an elevated platform structure. This watercourse would not be directly affected, and indirect effects would not be significant, as they would be controlled through the implementation of measures set out in the draft CoCP.

Water bodies

7.4.8 Two ponds, east of the A653 Meadow Lane, would be lost as a result of construction of the Proposed Scheme. The loss of these ponds could result in a potentially permanent adverse effect that would be significant at up to county/metropolitan level, if it is confirmed through field surveys that they support great crested newts or other priority species.

Ancient and veteran trees

7.4.9 On a precautionary basis, in the absence of further survey information, it is assumed that any veteran trees present within the land required for the Proposed Scheme in the Leeds Station 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

7.4.10 The permanent removal of vegetation may have impacts on bats. Habitat loss would reduce the availability of foraging resource, and potentially result in the loss of roosts and fragmentation of commuting routes. Buildings and structures scheduled for

demolition during construction may also result in the loss of bat roosts. This could particularly affect breeding populations of bat species within the Leeds Station area. Bats may also be affected by the lighting associated with construction works, although it is expected 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 county/metropolitan level.

Otter

7.4.11 The HS2 Leeds station would cross the River Aire on an elevated platform structure. This would avoid loss of habitat along the River Aire. Indirect effects from construction activities may result in disturbance to this species, if present in the River Aire or smaller watercourses, during the construction period, and prevent them from moving along the corridors. However, it is expected that these impacts would be controlled through implementation of measures in the draft CoCP, to a level where there would be no significant effects.

Water vole

7.4.12 The HS2 Leeds station would cross the River Aire on an elevated platform structure. This would avoid loss of habitat along the River Aire. Indirect effects from construction activities may result in disturbance to this species, if present, in the River Aire and smaller watercourses, during the construction period and prevent them from moving along the corridors. However, it is expected that these impacts would be controlled through implementation of measures in the draft CoCP to a level where there would be no significant effects.

Great crested newt

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

Birds

7.4.14 The 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 species and waterfowl. These may include kingfisher and peregrine, 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 at up to the district/borough level.

White-clawed crayfish

7.4.15 The HS2 Leeds station would cross the River Aire on an elevated platform structure. This would avoid loss of habitat along the River Aire. Indirect effects from construction activities may result in disturbance to this species, if present, in the River Aire and smaller watercourses, during the construction period and prevent them from moving along the watercourse. However, it is expected that these impacts would be controlled through implementation of measures in the draft CoCP to a level where there would be no significant effects.

Aquatic invertebrates

7.4.16 The land required for the Proposed Scheme would result in loss of habitat suitable for aquatic invertebrates (including species of principal importance[36]). However, it is expected that these impacts would be controlled through implementation of measures in the draft CoCP to a level where there would be no significant effects.

Fish

7.4.17 There are records of fish from river catchments crossed by the Proposed Scheme, including species such as European bullhead (listed on Annex II of the EC Habitats Directive) and brown trout. The route of the Proposed Scheme would cross the River Aire on an elevated platform supporting structure. Indirect effects from construction activities may result in disturbance during the construction period and prevent movement along corridors. However, it is expected that these impacts would be controlled through implementation of measures in the draft CoCP to a level where there would be no significant effects.

7.4.18 Effects on other habitats and species up to local/parish level will be reported in the formal ES.

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

Other mitigation measures

7.4.20 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:

- review of options to strategically replace habitat loss in the Leeds Habitat Network to maintain integrity and connectivity in areas along the route;
- review of options for wetland planting and habitat creation to mitigate impacts on watercourses such as severance effects;

[36] Section 41 (41) of the Natural Environment and Rural Communities Act 2006

- provision of additional measures to facilitate connectivity where significant foraging or commuting routes of fauna species would be affected;
- considering the need for inclusion of structures to reduce severance effects on bats;
- 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 alternate nesting habitat for breeding birds; and
- provision of additional ponds (on a two to one basis where existing ponds supporting great crested newts are lost), outside the area required for the permanent works but within the land required for the Proposed Scheme, and suitable terrestrial habitat around these ponds with habitat links to allow dispersal.

7.4.21 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

7.4.22 Taking into account mitigation proposed in the design of the Proposed Scheme set out above, the expected significant residual ecological effects during construction are described in Table 9.

Table 9: Residual significant effects on ecological resources/features during construction

Resource/feature	Residual effect	Level at which the effect would be significant
Ancient and veteran trees	In the absence of detailed desk study records or field study data, it is assumed that there could be a permanent adverse effect from the loss of individual trees present within the land required for construction along the route of the Proposed Scheme.	Up to county/metropolitan.
Bats	Potential permanent adverse effect on conservation status due to loss of roosts, foraging habitat and fragmentation.	Up to county/metropolitan.
Great crested newts	In the absence of detailed desk study records or field study data, it is assumed that there could be permanent adverse effect from the loss of two ponds and surrounding terrestrial habitat that may support great crested newts.	Up to county/metropolitan.
Birds	In the absence of detailed desk study records or field study data, it is assumed that there could be permanent adverse effects through loss of foraging and nesting opportunities for a range of bird species common to urban and wetland habitats, including schedule 1 species such as peregrine and kingfisher.	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, particularly at frequently used commuting/foraging routes which cross the Proposed Scheme. This represents a potential permanent adverse effect on conservation status of the bat species concerned that would be significant at up to the district/borough level.

Other mitigation measures

7.5.4 Additional mitigation measures currently being considered include the provision of structures to reduce mortality to bats.

Summary of likely residual significant effects

7.5.5 Taking into account mitigation included as part of the Proposed Scheme design, the expected significant residual ecological effects during operation are detailed in Table 10.

Table 10: Residual significant effects on ecological resources/features during operation

Resource/feature	Residual effect	Level at which the effect would be significant
Bats	Potential permanent adverse effect on conservation status due to collision with trains.	Up to district/borough

Monitoring

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

7.5.7 There are no area-specific requirements for monitoring ecology and biodiversity effects or mitigation during the operation of the Proposed Scheme in the Leeds Station area.

8 Health

8.1 Introduction

8.1.1 This section identifies the communities within the Leeds Station area (LA18) 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 (CCG). The purpose of the engagement has been to understand health issues in the Leeds Station 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 Leeds Station area. Health effects across the Proposed Scheme as a whole are assessed in the route-wide health assessment contained in Volume 3: Route-wide effects.

8.1.4 Maps showing the location of the key environmental features (Map Series CT-10) and the key construction (Map Series CT-05) and key operational (Map Series CT-06) features of the Proposed Scheme are provided in the Volume 2: LA18 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)[37].

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.

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

8.2.4 The health determinants of relevance within the Leeds Station area are:

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

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

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

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

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

8.3 Environmental baseline

Existing baseline

Description of communities in the Leeds Station area

8.3.1 The Leeds Station area is heavily urbanised, characterised by land uses which are principally commercial, with some residential areas. As reported in Section 14, Traffic and transport, there is one public right of way (PRoW) (the non-definitive Leeds City Footpath, which is routed along the south side of the River Aire, Footpath Number 62), and several roadside footways near the existing Leeds Station, which provide

walking opportunities within Leeds city centre. Section 6, Community, refers to the National Cycle Route 66 and St Bernard's Way promoted routes[38], which share the same route as the footpath, and the Airedale Way promoted route, which routes via Little Neville Street and Neville Street and New Station Street. These routes provide walking and cycling opportunities near the existing Leeds Station.

8.3.2 The Leeds city centre includes residential properties, largely concentrated in apartment blocks in Holbeck to the west, Clarence Dock and Dock Street to the east, and to the north of the station. Community facilities include a church and the LivingWell Health Club located within Hilton International Hotel, which provides recreational opportunities. A description of community facilities is provided in Section 6, Community.

Demographic and health profile of the Leeds Station area

8.3.3 The local communities in the Leeds Station area have a high population density, commensurate with the urban nature of the area.

8.3.4 Data provided by the Office of National Statistics[39] for the local authority area of Leeds City Council (LCC), shows that this population has a broadly similar health status compared with the national (England) averages.

8.3.5 The population has similar levels of deprivation to the national average, with regard to the combined indices of multiple deprivation[40], and the health domain (a sub-set of the indices of multiple deprivation).

8.3.6 This area as a whole is considered to be of similar resilience to the national average, with regard to changes in the relevant health determinants, and with some vulnerabilities in terms of the health status of the population.

8.3.7 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 Leeds Station 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:

[38] Some PRoW in the Leeds Station Area form part of routes that are promoted through leaflets and websites.
[39] The Office of 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.
[40] 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

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

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

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

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

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

Assessment of impacts and effects

Neighbourhood quality

8.4.7 The term 'neighbourhood quality' is used in this assessment to describe the combination of environmental factors that influence people's experience of, and feelings about, their local environment. When these factors are altered people's levels

[41] Supporting document: Draft Code of Construction Practice

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 Leeds Station 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 Leeds Station area would include:

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

8.4.15 Construction traffic, including HGV, would be present on a number of roads in this area, as reported in Section 14, Traffic and transport.

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

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

Access to services, health and social care

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

8.4.19 The Leeds Station 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 of construction traffic, including HGV, on pedestrians and cyclists;
- any loss of green space or facility used for physical activity; and

- the presence of construction traffic, including HGV, on the local road network, which may deter their use by walkers and cyclists.

8.4.22 There would be direct impacts on access to recreation and physical activity at a number of locations in the Leeds Station area, where community facilities are permanently lost. This includes the following:

- the demolition of Hurley House on Dewsbury Road, which contains the Leeds hub of Life Church Leeds due to construction of Leeds viaduct and HS2 Leeds station multi-storey car park;
- the demolition of the Leeds School of Motorcycling on Kidacre Street, including the demolition of a building and loss of outdoor area due to construction of the Leeds embankment; and
- the demolition and permanent loss of the LivingWell Health Club located within Hilton International Hotel on Neville Street due to construction of the HS2 Leeds station northern concourse.

8.4.23 As reported in Section 14, Traffic and transport, the Proposed Scheme would intersect a number of roadside footways and one PRoW in the Leeds Station 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, including HGV, 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.

Other mitigation measures

8.4.25 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.

8.4.26 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.

8.4.27 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 Leeds Station 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. This has the potential to contribute to adverse impacts on neighbourhood quality. The permanent features of the Proposed Scheme may be visible from nearby neighbourhoods as described 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.

Other mitigation measures

8.5.3 If a need is identified for mitigation to reduce adverse impacts on health determinants during the operation of the Proposed Scheme in this area, the mitigation will be described in the formal ES.

Monitoring

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

8.5.5 No area-specific monitoring of health effects during the operation of the Proposed Scheme have been identified at this stage.

9 Historic environment

9.1 Introduction

9.1.1 This section of the report provides a description of the current baseline for heritage assets and the likely impacts and significant effects resulting from the construction and operation of the Proposed Scheme within the Leeds Station 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 (WYAAS). 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: LA18 Map Book. Only designated heritage assets within the Leeds Station area are shown on maps CT-10-432b. 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)[42], 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.

[42] 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, in the main, been undertaken on that basis. However, exceptions to this are the Grade II listed Victoria Bridge (NHLE 1375218), the Grade II listed Concourse of London Midland and Scottish Railway (NHLE 1255570), the non-designated 'Dark Arches' situated beneath the existing Network Rail station, the non-designated remains of the former Midland Railway corridor and two associated 19th century railway bridges, and the non-designated former sites of Cooper's Mill on Tenter Lane (West Yorkshire HER (WYHER) 11240) and New Mill/Flaycrow Mill on Sovereign Street (WYHER 11241), which although within the land required for the construction of the Proposed Scheme, would not be physically impacted. Also, in relation to Leeds City Centre Conservation Area, although the asset extends into the land required for the construction of the Proposed Scheme and may be affected, any effect is unlikely to be significant. 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 NHLE (Historic England register of designated heritage assets);
- West Yorkshire Historic Environment Record (WYHER); and
- historic maps and aerial photography.

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

Designated assets

9.3.3 The following designated heritage assets are located partially or wholly within the land required for the Proposed Scheme:

- two Grade II listed buildings of moderate value: Victoria Bridge (NHLE 1375218) and Concourse of London Midland and Scottish Railway (NHLE 1255570);
- a conservation area of high value: Leeds City Centre Conservation Area; and
- a conservation area of moderate value: Canal Wharf Conservation Area.

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

- nine Grade I listed buildings of high value: Temple Mill (NHLE 1375162), Church of St Saviour (NHLE 1375400), Parish Church of St Peter (NHLE 1375046), Corn Exchange (NHLE 1255771), Holy Trinity (NHLE 1255870), City Markets (NHLE 1255765), Church of St John (NHLE 1375157), Town Hall (NHLE 1255772) and Leeds General Infirmary (NHLE 1256242);
- 40 Grade II* listed buildings of high value, including the Former Leeds and Liverpool Canal Company Warehouse (NHLE 1255696), Tower Works, Boiler House Chimney (NHLE 1256246), and Tower Works, The Giotto Tower Dust Extraction Chimney (NHLE 1256247);

- 496 Grade II listed buildings of moderate value, including the Victoria Mills East and North East Ranges (NHLE 1256029), and Boiler House Chimney (NHLE 1352697);
- nine conservation areas of moderate and high value: Holbeck Conservation Area; Central, Eastern Riverside Conservation Area, Woodhouse; Hanover Square – Woodhouse Square Conservation Area, Woodhouse; Clarendon Road Conservation Area; Queen Square Conservation Area; Woodhouse: Woodhouse Lane – University Precinct Conservation Area; Woodhouse: Moorlands Conservation Area; Headingley Hill & Hyde Park & Woodhouse Moor Conservation Area; and Buslingthorpe Conservation Area; and
- Beckett Street Cemetery (NHLE 1001678), a Grade II registered park and garden of high value.

Non-designated assets

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

- former industrial buildings at the junction of Leathley Road and Jack Lane;
- buildings associated with the former Union Foundry, located on the northern side of Holmes Street; and
- the network of arches known as the 'Dark Arches', situated beneath the existing Leeds Station.

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

- possible remains of Roman Road 712 (WYHER 3538);
- remains of the former Midland Railway corridor;
- two 19th century railway bridges carrying the courses of Jack Lane and Leathley Road across the former Midland Railway corridor;
- the site of a former Friends Meeting House and its associated burial ground on Meadow Lane (WYHER 15370);
- the site of a possible Anglo-Saxon grave excavated during the early 19th century, on Meadow Lane (WYHER 2322);
- the site of the former Brandling's Coal Staith[43] on Meadow Lane (WYHER 5040 and WYHER 5041);
- the site of the former Camp Hall on Meadow Lane (WYHER 15369); and
- the site of former mills: Cooper's Mill on Tenter Lane (WYHER 11240) and New Mill/Flaycrow Mill on Sovereign Street (WYHER 11241).

[43] Railway lines from which coal wagons could tip coal directly from the trains into boats on the River Aire below.

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

- two assets of low value associated with Roman activity: the site of a possible 'Roman ford' at Dock Street (WYHER 2122), and possible Roman settlement in an area named Camp Field, close to the projected line of the Roman Road (WYHER 6053);
- 10 assets of low value associated with medieval settlement and industrial activity, principally located on the northern side of the River Aire, including: the site of a manorial complex (WYHER 2282 and 11233) and the site of series of medieval mills (WYHER 11238, 11243 and 11239); and
- 23 sites of low value associated with post-medieval activity, the majority of which are former industrial or infrastructure sites, including: the former sites of the Hunslet Engine Company (WYER 5105), Braime Pressed Steel Works (WYHER 10626) and the Darnell Works (WYHER 11281); and a 19th railway bridge carrying the course of Ivory Street across the former Midland Railway corridor.

Historic environment overview

9.3.8 The Leeds Station area lies within a densely urbanised part of Leeds city centre, through which the River Aire runs in a west to east direction. The geological bedrock beneath this part of Leeds principally comprises sand and mudstone of the Pennine Lower Coal Measures Formation, although there are also isolated areas of sandstone bedrock along the southern side of the River Aire. Overlying deposits of clay, sand, silt and gravel are present across the Leeds Station area.

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. To date, no remains of a Palaeolithic date have been discovered in the Leeds Station area.

9.3.10 Evidence of Mesolithic, Neolithic and Bronze Age activity is sparse, and where present is principally characterised by isolated find spots, such as the stone axe found in river gravels below a site north of Great Wilson Street[44]. The limited evidence for settlement and ritual activity that does exist, such as the two Bronze Age barrows[45] on Woodhouse Moor, is largely confined to antiquarian records[46] and areas away from the city centre.

9.3.11 During the Iron Age, the area in which Leeds later developed was associated with a tribe known as the Brigantes but by AD71 it had come under Roman control. The conjectural route of Roman Road 712 from Manchester to Tadcaster extends into the study area (WYHER 3538), with its suggested location bolstered by the discovery in 1819 of what was termed a 'Roman ford' at Dock Street (WYHER 2122). Possible Roman settlement is also suggested to have occurred in an area named Camp Field,

[44] WYAS, 2008, 'Aire Valley development, Leeds Geophysical Survey', report no. 1829, unpublished
[45] Sometimes described as *tumuli* on early maps, barrows are mounds of earth and/or stone (stone examples are often called cairns) of various shapes and sizes that are characteristic monuments of the prehistoric periods (3800- 1400BC)
[46] Wrathmell, S, 2005, *Pevsner Architectural Guides: Leeds*, Yale University Press, New Haven and London, 4

close to the projected line of the road (WYHER 6053), although archaeological work within the Leeds Station area has yet to identify any evidence of Roman activity (WYHER 7684; 7591).

9.3.12 The earliest surviving documentary reference to Leeds dates from the 8th century, when the Venerable Bede mentions an altar surviving from a church erected by Edwin, the Anglo-Saxon King of Northumbria, in the *regione quae vocatur Loidis* ('the region known as Loidis'). By the 9th century Leeds was part of the Danelaw, a term used to describe a broad area of England under Scandinavian influence and control. A human skeleton recorded during the construction of the Wesleyan Chapel (now demolished) on Meadow Lane in the early 19th century is thought, on the basis of the grave goods found in association, to have been of an Anglo-Saxon date (WYHER 2322). Cartographic evidence suggests there was a 'Danish camp' close to Viaduct Road[47], although there is no evidence for such activity within the archaeological record.

9.3.13 It is thought that during the medieval period the settlement of Leeds was focused in the northern part of the Leeds Station area, around the parish church of St Peter (now known as Leeds Minster), Kirkgate and the Calls[48]. An early medieval manorial complex, thought to have been established in the 11th century, is recorded further to the east, with the routes of Swinegate and the Calls suggested as an original route between the manorial complex and the principal areas of settlement (WYHER 2282, 11233).

9.3.14 The medieval period was one of growth and change within the town. Leeds was granted borough charter in 1207 and the market and burgage plots[49] developed along what is now known as Briggate. Key to the development of this area was a new bridge across the River Aire (superseded by the current, 19th century Leeds Bridge). Although of a later period, the street pattern and survival of later medieval housing at Lamberts Arcade is a direct reflection of this 13th century growth (WYHER 11830).

9.3.15 Industrial growth during the medieval period was heavily influenced by the cloth and milling industry, and the area to the north of the River Aire was subject to extensive development and measures to manage water. As part of these works a dam ('Bondman Dam', WYHER 11249) was constructed across the river to divert water along a series of goits[50] towards a complex of fulling and corn mills (WYHER 11237, 11239, 11243 and 11238). In contrast, the southern side of the river, where the soils were less freely draining, was left largely undeveloped.

9.3.16 Leeds continued to grow in the later medieval and post-medieval periods, and the town developed into a key industrial area, with a particular emphasis on cloth. This development had a notable impact on the northern banks of the River Aire, which came to be dominated not only by industrial buildings, but by the large tenter frames used to stretch the cloth. The survival of Tenter Lane is evidence of this former activity. Commerce grew in tandem with the cloth industry, with the former Leeds

[47] 1906 Ordnance Survey Map of Burley
[48] Burt, S and Grady, K, 2002, *The Illustrated History of Leeds*, Breedon Books Publishing Co. Ltd (Derby)
[49] A form of medieval street pattern, comprising a narrow street frontage with long and narrow rear plots, often including rows of outbuildings.
[50] A small artificial channel carrying water. Usually used with respect to channels built to feed mills.

Bridge and Briggate areas being the site of the Leeds Cloth Market during the 17th and 18th centuries. A number of cloth halls[51] were also established during this period (WYHER 11251, 11235, 11236).

9.3.17 Development of the city was further spurred by the opening in 1699 of part of the Aire and Calder Navigation, and in 1816 by the opening of the Leeds and Liverpool Canal. Both remain open, and easily appreciated as evidence of the city's industrial history in this location. To the south of the existing Leeds Station, the built form and layout of Canal Wharf (WYHER 15407, 15408) and various warehouses along the River Aire, including the Grade II* listed Leeds and Liverpool Canal Company Warehouse (NHLE 1255696) and the Grade II listed Victoria Mills East and North East Ranges (NHLE 1256029), all provide legible reminders of the waterways' history and former industrial activity. Light industrial railways, such as the Middleton Colliery Railway which terminated close to Leeds Bridge (WYHER 5040 and 5041), were also developed during the 18th and 19th centuries. Major railways soon followed; the Leeds and Selby Railway opened in 1834 and the Derby to Leeds North Midland Railway in 1840.

9.3.18 By the late 19th century Leeds was a major industrial city[52], and the former industrial structures which survive (both designated and non-designated), such as the flax spinning mills of Temple Mill (a Grade I listed building) and Grade II* listed Marshall Mills, bear witness to these activities. The city's expansion resulted in rapid population growth, a phenomenon partly illustrated by the city's surviving 19th and early 20th century domestic dwellings, places of worship, public houses and cinemas. A sense of the city's industrial past is provided by its street patterns and architectural styles, particularly on the north bank of the river where, despite later development, buildings retain an industrial character and respond to early development plots, for example on the southern side of Sovereign Street.

9.3.19 Extensive clearance and redevelopment to the south of the River Aire has removed many of the area's 19th and early 20th century industrial complexes, although surviving evidence of former complexes is identified at the Hunslet Engine Company (NHLE 1375028; WYHER 5105), the former Boyne Engineering Works (NHLE 1375026, 1375026) and the former Union Foundry. To the north of the river, conversion and redevelopment of former industrial sites for residential and commercial purposes has taken place.

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.

[51] A covered market building dedicated to the selling of textiles.
[52] Leeds was granted city status in 1893.

9.4.2 Section 8 of the draft Code of Construction Practice (CoCP)[53] sets out the measures that will be adopted, insofar as reasonably practicable, to control effects on heritage assets. These include:

- management measures that will be implemented for heritage assets that are to be retained within the land required for the Proposed Scheme;
- route-wide principles, standards and techniques for works affecting heritage assets; and
- a programme of historic environment investigation and recording (including archaeology and historic buildings) to be undertaken prior to or during construction works affecting the heritage assets.

Assessment of impacts and effects

Temporary effects

9.4.3 The construction works, comprising excavations and earthworks and including temporary works such as construction compounds, storage areas, and diversion of existing roads and services, have the potential to affect heritage assets during the construction period. Impacts would occur to assets both within the land required for the Proposed Scheme and to assets in the wider study area as a result of changes to their settings.

9.4.4 The following significant effect is expected to occur as a result of temporary impacts on the character and appearance of Canal Wharf Conservation Area.

9.4.5 Canal Wharf Conservation Area is a designated asset of moderate value located partly within the land required for the Proposed Scheme. It encompasses a section of the Leeds and Liverpool Canal and the remains of an 18th century wharf area located to the south of Leeds Station. The value of Canal Wharf Conservation Area is primarily derived from the character and appearance of the built form and spaces which it contains. Principally, such elements are of evidential and historic value, providing an understanding to the industrial heritage of the city in this location, specifically the former industrial wharf. This is evident by way of the surviving water network, both historic and modern buildings, and the form of the public realm, including the pedestrian access routes. Whilst elements of recent regeneration have occurred within its bounds, the historic industrial character and former use of the area (for example the wharf) remains readily apparent, and is enhanced by the public realm and extent of public access. These characteristics are enhanced by the survival within the conservation area of designated industrial buildings and features such as the Former Leeds and Liverpool Canal Company Warehouse (NHLE 1255696), the Cranes on south and north Side of Leeds and Liverpool Canal (NHLE 1255706, 1255705) and the River Lock and Retaining Walls to River Aire (NHLE 1255707). Such buildings, and the overall composition of the conservation area, are also of aesthetic value, derived primarily from the aesthetic design value of the former industrial complex and the associated buildings.

[53] Supporting document: Draft Code of Construction Practice

9.4.6 More modern elements within the conservation area, in particular The Wharf building (a modern structure of no value), detract from the overall value of the asset. Construction activities associated with demolition of The Wharf, the construction of a new area of public open space, and the presence of the HS2 Leeds station northern concourse satellite compound would temporarily change the physical character and appearance of this part of the conservation area. Whilst the current composition of this part of the conservation area may not be of any notable value, construction activities would result in access patterns and the local sound environment being temporarily changed, and these changes would affect the ability of visitors to fully appreciate the historic context, character and appearance of the eastern end of the conservation area. This would constitute a medium adverse impact and a moderate adverse effect.

9.4.7 The following significant effects are expected to occur as a result of temporary impacts on designated heritage assets due to changes to their settings.

9.4.8 The Former Leeds and Liverpool Canal Company Warehouse (NHLE 1255696) is a Grade II* listed building of high value located approximately 8m to the west of the land required for construction of the Proposed Scheme. The warehouse dates to the 1770s and was constructed for the Leeds and Liverpool Canal Company who operated the surrounding wharf. It is set on the southern side of the surviving wharf area, to the west of Victoria Bridge. Its value is derived principally from the historic and architectural interest of its physical fabric, in particular the historic and evidential value of the physical form of the building as an example of an 18th century warehouse building, with this contributing to the understanding of the industrial heritage of this area. The overall composition of the building and its form, alongside elements of design detail, are of aesthetic value. The relationship between the warehouse and the surrounding canal and wharf, and how it is experienced from these areas, is a key element of the setting of the asset and is considered to make a notable contribution to its overall value. The setting would be temporarily affected by construction activities, including the demolition of The Wharf building (a modern structure of no heritage value), the presence of the HS2 Leeds station northern concourse satellite compound, and the movement of plant and equipment. These activities would adversely affect the appreciation and experience of the value of the asset from within its immediate surrounds. This would constitute a low adverse impact and a moderate adverse effect.

Permanent effects

9.4.9 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.

9.4.10 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.

9.4.11 Construction activities include redevelopment of the eastern part of Canal Wharf Conservation Area, an asset of moderate value. The redevelopment to an area of public open space would include demolition of The Wharf building (a modern

structure of no heritage value) and the reinstatement of a historically open area. In consequence, the Proposed Scheme would allow for greater connectivity within the conservation area, and from adjacent areas, and a better experience and appreciation of the asset and the built form and spaces which it contains. The Proposed Scheme would therefore result in a medium impact and a moderate beneficial effect.

9.4.12 Former industrial buildings at the junction of Leathley Road and Jack Lane, non-designated heritage assets of moderate value, are located within the land required for the Proposed Scheme and would be demolished. This grouping of 19th century industrial buildings are of local interest, with this derived from the evidential and historic value of their physical form as surviving examples of the former industrial history of this area. The demolition of these buildings would constitute a high impact and a moderate adverse effect.

9.4.13 Buildings associated with the former Union Foundry on the northern side of Holmes Street, non-designated heritage assets of moderate value, are located within the land required for the Proposed Scheme and would be demolished. This grouping of 19th century industrial buildings are of local interest, with this derived from the evidential and historic value of their physical form as surviving examples of the former industrial history of this area. The principal building within the complex also demonstrates a number of features of architectural and design intent independent of its former industrial function, and is also considered to be of aesthetic design value. The demolition of these buildings would constitute a high impact and a moderate adverse effect.

9.4.14 The putative[54] route of Roman Road 712 (WYHER 3538), a non-designated heritage asset of low value, extends into the land required for the Proposed Scheme within the vicinity of Meadow Lane. The below-ground remains of the road, should they exist, potentially contain evidence of historic and evidential value from which an understanding of Roman activity within Leeds could be derived. Their removal during construction of the Proposed Scheme would constitute a high magnitude of impact and a moderate adverse effect.

9.4.15 The following sites of former post-medieval industrial activity represent non-designated heritage assets of low value:

- possible remains associated with the former Brandling's Coal Staith on Meadow Lane (WYHER 5040 and 5041); and
- possible remains associated with Camp Hall on Meadow Lane (WYHER 154369).

9.4.16 Although the extent to which such sites were cleared following their demolition is not known, any surviving below-ground remains may contain evidence of historic and evidential value from which an understanding of post-medieval industrial activity within this area could be derived. Their removal would constitute a high magnitude of impact and a moderate adverse effect.

[54] Commonly believed or deemed to be the case.

9.4.17 The site of the former Friends Meeting House and its associated burial ground on Meadow Lane (WYHER 15370) is a non-designated heritage asset of high value. The site was redeveloped in the post-war period and the extent to which below-ground remains may survive is not known. Construction activities would remove the remaining parts of the burial ground and Meeting House, should they still exist, and with them the potential evidential and historic value from which an understanding of post-medieval society, land use, and religious attitudes could be derived. This would constitute a high magnitude of impact and a major adverse effect.

9.4.18 The site of a possible Anglo-Saxon grave excavated during the early 19th century, on Meadow Lane (WYHER 2322) is a non-designated heritage asset of high value. The extent to which further burials of a contemporary date may be present and have survived the construction of the later Friend's Meeting House and burial ground is not known. Construction activities would remove any further contemporary burials, or associated activity, should they still exist, and the potential evidential and historic value from which an understanding of early medieval activity can be derived. This would constitute a high magnitude of impact and a major adverse effect.

9.4.19 The following significant effects are currently expected to occur as a result of permanent impact on the setting of designated heritage assets.

9.4.20 Victoria Bridge (NHLE 1375218), a Grade II listed building of moderate value, is located within the land required for the Proposed Scheme. The bridge was constructed in the 1830s, replacing an earlier wooden footbridge. The value of the bridge is principally derived from the architectural and historic interest of the physical form of the structure, and the evidential and historic values which this embodies as an example of the development of 19th century infrastructure in this location. The structure also contributes to the general streetscape of the area and an understanding of its historic development. The structure incorporates a number of decorative elements, with these, in conjunction with the overall composition of the structure, being of aesthetic design value. The relationship between Victoria Bridge and the River Aire, and how the bridge is experienced from the course of the river in both directions, are key elements of the setting of the bridge which contribute to its value. The presence of the Proposed Scheme would noticeably change the character of the bridge's surroundings, with the HS2 Leeds station platform supporting structure eroding the visual dominance of the asset when seen from the River Aire. This would alter the manner in which the asset is experienced and appreciated within its wider surrounds, constituting a medium magnitude of impact and a moderate adverse effect.

9.4.21 Victoria Mills East and North East Ranges (NHLE 1256029), a Grade II listed building of moderate value, is located immediately to the east of the land required for the Proposed Scheme. The ranges form part of a once much larger industrial complex constructed in 1836 as an oil and dye mill warehouse. The value of is derived principally from the historic and architectural interest of the physical structure, in particular the historic and evidential value of the physical form of the building as an example of an 18th century warehouse building, with this contributing to the understanding of the industrial heritage of this area. The overall composition of the building and its form, alongside elements of design detail, are of aesthetic value. The relationship between the Victoria Mills East and North East Ranges and the River Aire,

and how the building is experienced from the southern bank, are key elements of the setting of the former warehouse building which contribute to its value. The Embankment, a non-designated 20th century extension to Victoria Mills East and North East Ranges, and other late 20th century buildings immediately to the west, whilst not contemporary to the original ranges or of any particular heritage value in their own right, respond to the historic street pattern of the Leeds Station area. They make a neutral contribution to the heritage value of the listed building. The Embankment buildings would be demolished and a new area of open space established on the north bank of the River Aire. These changes would result in the building becoming isolated, a noticeable change to the character of its setting which hitherto was of an area with a dense street pattern. This would alter the manner in which the building is experienced and appreciated, and its historic context understood. This would constitute a medium adverse impact and a moderate adverse effect.

9.4.22 The late 19th and early 20th century industrial chimneys associated with the former Tower Works represent a group of heritage assets of high value. They are located *c.*220m west of the land required for the Proposed Scheme and comprise the Grade II* listed Tower Works, Boiler House Chimney (NHLE 1256246), the Grade II* listed Tower Works, The Giotto Tower Dust Extraction Chimney (NHLE 1256247), and the Grade II listed Boiler House Chimney (NHLE 1352697). The value of the assets is derived principally from the contribution they make to the former industrial skyline of Leeds, the architectural and historic interest of their physical fabric, and the historic, evidential and aesthetic values they embody as ornate examples of industrial architecture of this date. Their ornateness demonstrates the intention of their designer for the structures to be viewed and appreciated from distance. Glimpsed and incidental views of the group, and the ability to experience and appreciate their architectural form and ornate appearance, contributes to their value. In addition, glimpsed views from the River Aire allow the assets to be experienced within the context of, and alongside, other former industrialised areas. The Proposed Scheme would result in the removal of the glimpsed views from the River Aire to the east of Victoria Bridge, and alter the experience and appreciation of the assets from this location. This would constitute a medium adverse impact and a major adverse effect.

Other mitigation measures

9.4.23 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

9.4.24 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.

9.4.25 As no specific mitigation measures have yet been identified in relation to the heritage assets described above, it is currently anticipated that the residual effects would be the same as those reported under permanent effects. Over time, the effect on the setting of some heritage assets could change as planting matures and the Proposed Scheme assimilates into the landscape.

9.5 Effects arising from operation

Avoidance and mitigation measures

9.5.1 The following measures have been incorporated into the design of the Proposed Scheme, which would reduce the impacts and effects on heritage assets as shown on the CT-06 Map Series within the Volume 2: LA18 Map Book:

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

Assessment of impacts and effects

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

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

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

9.5.5 Further effects could occur in relation to heritage assets during the operation of the Proposed Scheme where additional, permanent, changes to the asset's settings have an additional detrimental effect on the way that the asset is understood or appreciated, for example as a result of increased noise or the movement of the trains in combination with the effect of the presence of the Proposed Scheme.

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

- Canal Wharf Conservation Area;
- Victoria Bridge (NHLE 1375218);

- Victoria Mills East and North East Ranges (NHLE 1256029); and
- designated heritage assets at the former Tower Works, comprising the Tower Works, Boiler House Chimney (NHLE 1256246), the Tower Works, The Giotto Tower Dust Extraction Chimney (NHLE 1256247), and the Boiler House Chimney (NHLE 1352697).

Other mitigation measures

9.5.7 The Proposed Scheme includes a number of design measures to address potential impacts and significant effects. At this time, no additional operational mitigation measures beyond those included within the Proposed Scheme design have been identified. Potential opportunities for further mitigation have not been identified, and will be considered as part of the detailed design process.

Summary of likely residual significant effects

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

Monitoring

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

9.5.10 No area-specific heritage monitoring requirements during operation of the Proposed Scheme have been identified at this stage

10 Land quality

10.1 Introduction

10.1.1 This section of the report presents the baseline conditions that exist along the Proposed Scheme in the Leeds Station area (LA18) in relation to land quality, and reports the likely impacts and significant effects identified to date resulting from construction and operation of the Proposed Scheme. Consideration is given to land that potentially contains contamination and land that has special geological significance, either from a scientific, historical, mineral exploitation or mineral resources point of view including geological sites of special scientific interest (SSSI) and local geological sites (LGS), areas of historical mining activity in the context of land quality, and areas of designated mineral resources. Consideration is also given to petroleum (including gas) prospects and licensing.

10.1.2 Engagement has been undertaken with the British Geological Survey (BGS), The Coal Authority, Leeds City Council (LCC), West Yorkshire County Council, the Environment Agency, Fera Science Ltd (FSL)[55] and the Animal and Plant Health Agency (APHA). The purpose of this engagement has been to discuss the Proposed Scheme and potential effects, and obtain relevant baseline information. Engagement will continue as part of the development of the Proposed Scheme and to inform the formal assessment.

10.1.3 Maps showing the location of the key environmental features (Map Series CT-10) and the key construction (Map Series CT-05) and key operational (Map Series CT-06) features of the Proposed Scheme can be found in the Volume 2: LA18 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)[56].

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 abstraction data, 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

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

lack of contact with nearby potentially contaminated sites, and the absence of sensitive receptors within the roadways reduces the risk of an impact occurring to very low levels. The impact of laying these new and diverted utilities has therefore been scoped out of the assessment as they are unlikely to cause any significant land quality effects.

10.2.4 Potentially contaminated areas of land have been identified that could affect, or be affected by, the construction of the Proposed Scheme (e.g. contaminated soils may need to be removed or construction may alter existing contamination pathways). Each of these areas has been studied to evaluate the scale of potential impacts caused by existing contamination (if present) and what needs to be done to avoid significant consequences to people and the wider environment.

10.2.5 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.

10.2.6 The minerals assessment is based upon the mineral resources[57] identified on published mineral plans, and existing planning or licensed areas. Any inference of minerals provided by geological maps/reports is excluded (except where these are covered by the Mineral Plan).

10.2.7 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, FSL 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 Leeds Station area. Recent changes in lithostratigraphic classifications by the BGS have been incorporated where appropriate.

10.3.3 Table 11 provides a summary of the geology (made ground, superficial and bedrock units) underlying the Proposed Scheme and the study area in the Leeds Station area.

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

Table 11: Summary of the superficial and bedrock units underlying the land quality study area

Geology	Distribution	Formation description	Aquifer classification
Made Ground			
Made Ground	The area has been previously developed in some form, and therefore there are 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	Along the River Aire, including approximately the northern half of the study area.	Clay, sand and gravel.	Secondary A
River Terrace Deposits (Undifferentiated)	Approximately the southern half of the study area, to the south of the River Aire channel.	Clay, sand and gravel.	Secondary A
Bedrock			
Pennine Lower Coal Measures Formation	Underlies the full length of this study area.	Interbedded mudstone, sandstone and siltstone 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 All of the land required for the Proposed Scheme has been previously developed in some form, and therefore there are likely to be deposits of made ground across the entire area. These will be variable dependent on the nature of historical developments.

10.3.6 More significant deposits of made ground are likely to be associated with certain historical land uses within the area, including brick pits and potteries where there may have been infilled excavations, and gas works and other heavy industry which required deep excavation for infrastructure and foundations.

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.

Superficial geology

10.3.8 Alluvial deposits comprising variable proportions of clay, sand and gravel underlie the majority of the study area, occurring along the course of the River Aire.

10.3.9 Undifferentiated River Terrace Deposits comprising clay, sand and gravel are present south of the River Aire, beneath the southern part of the study area.

Bedrock geology

10.3.10 The bedrock geology in this area comprises the Pennine Lower Coal Measures Formation, comprising cyclical layers of interbedded mudstone, siltstone and sandstone with coal seams.

10.3.11 One of the named sandstone units within the Pennine Lower Coal Measures Formation, the Thick Stone, subcrops (i.e. close to the surface without actually being exposed at the surface) to the east and south-east of the existing Leeds Station, and to the west of Victoria Road.

10.3.12 Two coal seams, the Black Bed Coal and the Crow Coal, are shown to subcrop running west to east across the centre of the study area.

10.3.13 The study area is punctuated by six north-east to south-west trending normal faults, with downthrow generally to the south-east. The faulting in the study area and resulting offset of strata means that there is repetition of strata in the study area, notably the Black Bed Coal.

Radon

10.3.14 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[58].

10.3.15 The study area lies within a lower probability radon affected area defined as an 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/m^3) for residential properties.

Groundwater

10.3.16 As defined by the Environment Agency, bedrock within the study area is classified as a Secondary A Aquifer. The superficial alluvium and River Terrace Deposits are also classified as Secondary A, as detailed in Table 11.

10.3.17 The site is not within a Drinking Water Safeguard Zone for groundwater. There are no groundwater source protection zones and no abstraction licences for public water supply in the study area. There are two private groundwater abstraction licences registered in the study area.

10.3.18 Information obtained from the local authorities indicates that there are no unlicensed private groundwater abstractions registered within the study area. Unregistered private groundwater supplies may be present.

10.3.19 Further information on the groundwater in the Leeds Station area is provided in Section 15, Water resources and flood risk.

[58] 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.

Surface water

10.3.20 The Proposed Scheme intersects the River Aire (designated a main river) approximately 180m to the south of the existing Leeds Station.

10.3.21 The Leeds and Liverpool Canal (designated inland waterway) and Hol Beck (designated ordinary watercourse) enter the River Aire approximately 100m and 50m to the west of the route of the Proposed Scheme respectively. Some sections of Hol Beck are culverted on the approach to the River Aire.

10.3.22 There are five licensed surface water abstractions in the study area. None of these are located within the land required for the construction and operation of the Proposed Scheme.

10.3.23 The site is not within a Drinking Water Safeguard Zone for surface water.

10.3.24 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. There are no registered private unlicensed surface water abstractions within the study area.

10.3.25 There are four discharge consents recorded within the study area. These relate to sewage storm overflow discharges to surface water.

10.3.26 Further information on surface water within the Leeds Station area is provided in Section 15, Water resources and flood risk.

Current and historical land use

10.3.27 Current potentially contaminative land uses within the study area include various industrial estates, a gas distribution centre, car repair and maintenance centres and garage workshops and the existing Leeds Station.

10.3.28 Historical land use identified within the study area with the potential to have caused contamination include gas holders, foundries, metals works, heavy engineering including railway depots, asphalt works, wharves and associated heavy industry along the River Aire, and numerous textile industry works.

10.3.29 Further details of key current and historical contaminative land uses within the study area are summarised in Table 12 below.

Table 12: Current and historical mining, mineral sites and colliery spoil sites located in the study area

Name and Area Reference	Location	Description
Historical shallow (<30mbgl) mine workings and associated mine shaft	One shaft is shown in the southern part of the study area. Numerous shafts and evidence of mine workings are evident in the wider region. A band of probable workings is shown running approximately west to east/north-east, through	Unconfirmed mine shaft Probable shallow mine workings defined where coal is anticipated at depths <30m. Workings not proven.

Name and Area Reference	Location	Description
	the central section of the Leeds Station area.	

Table 13: Current and historical industrial sites located within the study area

Name and Area Reference	Location	Description
Foundries, tram depot, steam and locomotive works, railways, sidings, heavy engineering, lead works, iron works, brass foundry.	Throughout area	Historical heavy industry. Many sites now redeveloped, no records of development history or any remedial actions identified.
Gas distribution centre.	Central area	Historical industrial use. Operational gas distribution infrastructure and concrete foundations of recently decommissioned gas holders present in the southern part of the site. Northern half of site now redeveloped. No records of development history or any remedial actions identified.
Asphalt works and chemical works.	Southern area	Historical industrial uses. No records of development history or any remedial actions identified.
Petrol filling stations.	Northern and eastern parts of area	Historical and current use.
Brick fields and potteries.	Southern part of the area	The excavated areas have been redeveloped. Information regarding the characteristics of the fill material has not been identified.
Textile factories, mills and dye works.	Northern and western predominantly	Numerous sites were used for industries related to textiles. Potential for contamination will vary considerably dependent on use from simple warehousing to dye and processing works. Further details of site uses and development history have not been identified.
Mixed use wharves, depots and heavy industry adjacent to the River Aire.	South of the existing Leeds Station along River Aire	Historical usage, most sites now redeveloped. No records of infill of former wharves, or development history identified.
Ink works, printing works.	Several sites through area	Historical industrial uses. No records of development history or any remedial actions identified.
Car breakers, garages.	Southern area	Several sites are currently in use for car and garage related industries. These include two sites with waste management licences.
Saw mills and timber industry.	Mostly in the northern area	Historical industrial uses. No records of development history or any remedial actions identified.
Sauce factory and various unnamed factories, depots and works.	Several sites through area	Historical industrial uses. No records of development history or any remedial actions identified.
Burial ground.	Central area	Now developed. No information currently available regarding redevelopment.

10.3.30 Contaminants associated with sites in Table 12 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.

10.3.31 Contaminants commonly associated with industrial sites in Table 13 could include metals, semi-metals, asbestos, organic and inorganic compounds.

Other regulatory data

10.3.32 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).

10.3.33 There are no Control of Major Accident Hazards (COMAH) sites present in the study area.

10.3.34 There were eight substantiated pollution incidents recorded in the study area since 2000: one significant incident to land and seven significant impacts to water, unknown pollutants.

10.3.35 There are three licensed waste management sites in the study area. Two of these are located in the southern part of the study area and relate to vehicle dismantling, and the third is to the north-east of the study area and relates to a mobile soil treatment plant. There is one waste treatment/disposal site in the study area, recorded as a 'very small' scrapyard, located within the land required for the Proposed Scheme on Leathley Road in the southern part of the study area.

10.3.36 There are no nationally significant ecological designations, as defined in the land quality section of the SMR[59], located within the study area.

Mining/mineral resources

10.3.37 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, lime, salt, gypsum 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

10.3.38 LCC is responsible for the overall mineral and waste local plans for the county. The Natural Resources and Waste Development Plan Document (NRWDPD)[60] 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.

[59] Sensitive ecological receptors are defined as national designations such as SSSIs.
[60] A groundwater SPZ is a defined area within which groundwater is extracted for potable water supply. The area is defined by the Environment Agency on the basis of the length of time taken for groundwater to migrate to the potable source.

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

Sand, gravel and clay deposits

10.3.40 The Leeds Station area is within a mineral safeguarding area (MSA) for sand and gravel associated with river terrace and sub-alluvial deposits, associated with the historical course of the River Aire.

Coal mining

10.3.41 The study area is located within a MSA for shallow coal from the Pennine Lower Coal Measures.

10.3.42 The Coal Authority does not identify mining hazards, licenced areas of underground workings or unlicensed open cast workings within the study area.

10.3.43 There are no former open cast workings recorded within the Leeds Station area.

10.3.44 Available records from the Coal Authority show that the central section of the Leeds Station area passes through an area of probable shallow workings, defined where coal is anticipated <30m below ground level.

10.3.45 One mine entry is recorded within the study area, approximately 30m east of the land required for construction of the Proposed Scheme. This mine entry has not been proven by intrusive investigation.

10.3.46 Two named coal seams, the Black Bed and Crow Coal, are shown to subcrop within the study area.

Petroleum Exploration Development Licences /Hydrocarbons

10.3.47 The Leeds Station area is not within a PEDL area or the Bowland Shale Prospective Area[61]. As such, it is considered unlikely that the study area is within an area where hydrocarbon resources could be identified and extracted in the future.

Geo-conservation resources

10.3.48 No geological SSSI or LGS sites have been identified within the study area based on information from the Leeds Geological Trust. Therefore, no assessment of geo-conservation resources has been undertaken.

Receptors

10.3.49 The sensitive receptors that have been identified within the study area are summarised in Table 14 . A definition of receptor sensitivity is given in the SMR.

[61] The Carboniferous Bowland Shale gas study:geology and resource estimation; BGS/DECC 2013

Table 14: Summary of sensitive receptors

Issue	Receptor type	Receptor description	Receptor sensitivity
Land contamination	People	Residents at existing properties Employees and visitors at commercial areas, retail parks and areas, hotels Industrial	High Moderate Low
	Groundwater	Secondary A Aquifers, (superficial alluvium and River Terrace Deposits and Coal Measures bedrock)	Moderate
	Surface waters	River Aire (WFD Status moderate) Tributaries of the River Aire (WFD status moderate/good)	Moderate
	Built environment	Underground structures and buried services	Low
	Natural Environment	Natural environment receptors, ecology	Low
Impacts on mining/mineral and petroleum (gas) sites (severance and sterilisation)	Mining/mineral sites	Mineral safeguarding areas for alluvial sand and gravel deposits associated with the historical course of the River Aire; and shallow coal from the Pennine Lower Coal Measures	Moderate

10.4 Effects arising during construction

Avoidance and mitigation measures

10.4.1 The construction assessment takes into account the mitigation measures described in the draft Code of Construction Practice (CoCP)[62]. 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);

[62] Supporting document: Draft Code of Construction Practice

- methods for the storage and handling of excavated materials (both contaminated and uncontaminated) (Sections 6, 7, 11 and 15);
- management of any unexpected contamination found during construction (Sections 11 and 15);
- a post-remediation permit to work system (Section 11);
- storage requirements for hazardous substances such as oil (Sections 5, 11 and 16);
- traffic management to ensure that there is a network of designated haul routes to reduce compaction/degradation of soils (Sections 5, 6 and 14);
- methods to monitor and manage flood risk and other extreme weather events which may affect land quality during construction (Sections 5 and 16); and
- methods to manage discovery of unknown animal burial pits (Section 6).

10.4.3 The draft CoCP would require that prior to and during construction, a programme of further detailed investigations, which may include both desk based and site based work, takes place in order to confirm the full extent of areas of contamination. It also requires a risk assessment to be undertaken to determine what, if any, site specific remediation measures are required to allow the Proposed Scheme to be constructed safely and to prevent harmful future migration of contaminants. The investigation and assessment of potentially contaminated sites would be undertaken in accordance with Environment Agency CLR11[63] and British Standards BS10175[64].

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[65]. 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.

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

These aspects of the Proposed Scheme, along with other construction features, are shown on the Map Series CT-05 in the Volume 2: LA18 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 industrial sites.

10.4.8 CSMs have been produced for those areas taken to detailed risk assessments. The following factors determine the need for detailed risk assessments:

- whether the site is located on or off the route of the Proposed Scheme or associated off line works;
- the vertical profile of the route;
- the presence of underlying sensitive groundwater aquifers (Principal or Secondary A) or nearby watercourses; and
- the presence of adjacent residential properties or sensitive ecological receptors.

10.4.9 Clusters of potentially contaminated sites of a similar nature have been grouped, and assessed together, where appropriate.

10.4.10 A simple summary of the baseline CSM is provided in Table 15. 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 Leeds Station area 106 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: Mixed heavy industrial sites within land required for the construction of the viaduct or embankment elements of the Proposed Scheme;
- Group B: Engineering and rail related sites within land required for the construction of cutting elements of the Proposed Scheme;
- Group C: Class 2 and 3, mixed heavy industrial uses not within land required for construction of Proposed Scheme (proximity zones 2 and 3); and

- Mining: One shaft has been identified, located in the southern part of the site, outside of the land required for the Proposed Scheme. A swathe of probable shallow mine workings is also shown west-east across the centre of site indicating coal is present within 30m of the surface.

Table 15: Summary of baseline CSM for sites which may pose a contaminative risk for the Proposed Scheme

Area reference[66]	Area name	Human health risk	Groundwater risk	Surface water risk	Ecosystem risk	Buildings risk
On site[67]						
Group A sites: LA18 - 48,LA18 - 117,LA18 - 03,LA18 - 05,LA18 - 06,LA18 - 33,LA18 - 12,LA18 - 29,LA18 - 22,LA18 - 23,LA18 - 84,LA18 - 40,LA18 - 28,LA18 - 75,LA18 - 91,LA18 - 121,LA18 - 32,LA18 - 108,LA18 - 92,LA18 - 20,LA18 - 35,LA18 - 68,LA18 - 94,LA18 - 119,LA18 - 74,LA18 - 63,LA18 - 64,LA18 - 73,LA18 - 72,LA18 - 71, LA18 - 02,LA18 - 118,LA18 - 116,LA18 - 09,LA18 - 26,LA18 - 45,LA18 - 41,LA18 - 112,LA18 - 30,LA18 - 107,LA18 - 39,LA18 - 85,LA18 - 36,LA18 - 01,LA18 - 27,LA18 - 24,LA18 - 140,LA18 - 122,LA18 - 124,LA18 - 125,LA18 - 126,LA18 - 129,LA18 - 130,LA18 - 136,LA18 - 138,	Group A sites comprise mixed heavy industrial sites within land required for construction of Proposed Scheme. In areas proposed as viaduct or embankment.	Low to moderate	Moderate	Moderate	Very low	Moderate/low to moderate
Group B sites: LA18 - 04,LA18 - 21,LA18 - 123,LA18 - 132,	Group B sites comprise engineering and rail related sites within land required for construction of Proposed Scheme. In areas	Low to moderate	Moderate	Moderate/low	Very low	Moderate/low to moderate

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

Area reference[66]	Area name	Human health risk	Groundwater risk	Surface water risk	Ecosystem risk	Buildings risk
	proposed as cutting.					
Off site[68]						
Group C sites: LA18 - 07,LA18 - 10,LA18 - 11,LA18 - 19,LA18 - 25,LA18 - 31,LA18 - 34,LA18 - 37,LA18 - 38,LA18 - 44,LA18 - 46,LA18 - 47,LA18 - 49,LA18 - 54,LA18 - 57,LA18 - 59,LA18 - 60,LA18 - 65,LA18 - 66,LA18 - 67,LA18 - 69,LA18 - 70,LA18 - 77,LA18 - 78,LA18 - 79,LA18 - 80,LA18 - 81,LA18 - 83,LA18 - 87, LA18 - 89,LA18 - 90,LA18 - 93,LA18 - 95,LA18 - 98,LA18 - 99,LA18 - 100,LA18 - 102,LA18 - 106,LA18 - 109,LA18 - 113,LA18 - 114,LA18 - 115,LA18 - 128,LA18 - 137,LA18 - 139,	Group C sites comprise mixed heavy industrial uses not within land required for construction of the Proposed Scheme	Moderate/low	Moderate	Moderate	Very low	Moderate/low to moderate
Mining LA18 – 104, probable mine workings	One mine shaft noted in southern extent of the study area. Swathe of probable mine workings west-east across the centre of the site.	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

[68] 'Off site' is beyond the land required for construction of the Proposed Scheme but within 250m of it.

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

10.4.15 All of the sites set out in Table 16 have been assessed for the change in impact associated with the construction stage of the work. Table 16 presents the summary of the resulting construction effects that have been found to be significant. All other sites referenced in Table 16 were found to have non-significant effects.

Table 16: Summary of construction CSM effects.

Name and area ref[69]	Receptor	Main baseline risk	Main construction risk	Temporary effect
Mining LA18 – 104 Probable mine workings	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 – groundwater and surface water	Moderate/low	High	Moderate adverse effect
	Property (exposure of property to gases and vapours)	Moderate/low	High	Moderate adverse effect

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

10.4.17 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

10.4.18 In order to identify potential permanent effects, a screening assessment has been undertaken comparing the baseline and post-construction CSM to assess the permanent (post-construction) effects.

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

10.4.19 The magnitude of the permanent effects and their significance have been determined by assessing the change in risk between the main baseline risk and the main post-construction risk. Therefore, where there is no change between the main baseline risk and the main post-construction risk, the permanent effect significance is deemed to be negligible even if the risk is assessed to remain as high. This would be the case where the construction of the Proposed Scheme does not alter the risks from an existing potentially contaminated site that is outside the construction boundary. As noted above, a worsening would result in negative effects and an improvement would result in positive effects.

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

10.4.21 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.

10.4.22 Additional site-specific permanent remediation measures, that could focus on source removal, pathway breakage or receptor protection, would be developed during the detailed design stage if required. These measures would ensure that risks to people and property from gas and vapours in the ground, the principal risk in this area, would be controlled to an acceptable level.

Mining/mineral resources

10.4.23 Construction of the Proposed Scheme has the potential to affect existing mineral resources, and proposed areas of mineral exploitation. This could occur by sterilisation of the resource through direct excavation during construction of the Proposed Scheme or through temporary and/or permanent severance[70] or isolation that may occur during the construction phase of the Proposed Scheme, possibly continuing through to its operation.

10.4.24 The area required for construction of the Proposed Scheme intersects an MSA for sand and gravel and a MSA for coal.

Temporary effects

10.4.25 Temporary adverse effects may occur where construction compounds are proposed within a 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.

10.4.26 Given the area is already heavily developed, the Proposed Scheme is not considered likely to have a significant effect on the resource compared to baseline.

Permanent effects

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

[70] 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

10.4.28 The study area lies within a MSA for sand and gravel and a MSA for coal. There are no permitted mineral sites or PEDLs in the study area.

10.4.29 The effects of construction of the Proposed Scheme on the sand and gravel and 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 not considered significant.

10.4.30 Given the area is already urbanised, the Proposed Scheme is not considered likely to have a significant effect on the resource compared to baseline.

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

10.4.32 Table 17 reports the assessment of permanent effects from construction on the mining and mineral resources identified.

Table 17: Summary of effects for mining and mineral resources

Site name	Status	Description	Sensitivity/ value	Magnitude of impact	Effect and significance
Sand and gravel deposits	MSA	MSA for sand and gravel extraction	Medium	Negligible	Negligible
Coal deposits	MSA	MSA for coal	Medium	Negligible	Negligible

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

Geo-conservation sites

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

Other mitigation measures

10.4.35 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.

10.4.36 Mitigation of the effects on mineral resources within the proposed MSA could include extraction of the resource in landscaping areas within the Proposed Scheme adjacent to, rather than beneath the structural footprint of the Proposed Scheme, which would require good founding conditions. A plan would be discussed in advance of the construction works with the landowner, the mineral planning department 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

10.4.37 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 existing Leeds Station and approach.

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

11 Landscape and visual

11.1 Introduction

11.1.1 This section of the report presents the assessment of the likely significant landscape and visual effects identified to date within the Leeds Station 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), West Yorkshire Combined Authorities and Historic England has commenced. The purpose of this engagement has been to discuss the assessment methodology, extent of the landscape and visual study area, and the locations of visual assessment and verifiable photomontage viewpoints. Engagement will continue as part of the development of the Proposed Scheme and to inform the formal assessment.

11.1.4 The Volume 2: LA18 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)[71]

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

11.2.3 At this stage it has not been possible to complete surveys of all publicly accessible land in this area; therefore, for the working draft ES an assumption has been made

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

about the level of sensitivity and magnitude of change on a case by case basis. This will be adjusted, as appropriate, on the basis of survey results to inform the formal ES.

11.2.4 The extent of the study area has been informed by construction and operational phase zones of theoretical visibility (ZTVs). The ZTVs have been produced in line with the methodology described in the SMR[72] and are an indication of the theoretical visibility of the Proposed Scheme. In many locations, intervening buildings 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, which will be reported in the formal ES.

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

11.2.6 Landscape and visual receptors within approximately 500m of the route of the Proposed Scheme have been assessed as part of the study area. Long distance views of up to 1km have been considered at the edge of settlements, on the outskirts of the city fringe, which include Hunslet, Beeston and Holbeck.

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 effects for year 30 will be reported in the formal ES.

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

11.2.9 The assessment has been carried out on the basis that the station and surrounding public realm associated with the Proposed Scheme will be subject to a high quality architectural and landscape design.

11.2.10 The assessment has been carried out on the basis that design of structures would, insofar as reasonably practicable, integrate with existing skyline features and would

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

make use of a simple, clean and coherent palette of materials to help structures fit in the landscape.

11.3 Environmental baseline

Existing baseline

Landscape baseline

11.3.1 The Proposed Scheme through the south of Leeds would be approximately 1.5km in length and would lie within Leeds Metropolitan District, within the City and Hunslet Ward. It would extend from the northern settlement edge of Hunslet in the south to Leeds city centre in the north.

11.3.2 The area south of the River Aire is predominantly industrial, which includes the Pottery Fields Industrial Estate, with some office accommodation within small scale business parks.

11.3.3 In general, the majority of community facilities are located to the south and west in the settlements of Beeston, Middleton and Holbeck which are outside the study area, and also to the north in Leeds itself, including Hyde Park, Richmond Hill and Harehills.

11.3.4 The study area is defined by the flat landform of the broad River Aire valley which ranges in height between 25m above Ordnance Datum (AOD) and 35m AOD. The surrounding gently sloping valley sides to the north, west and south beyond the study area rise to between 125m AOD and 140m AOD where the majority of the residential areas are located.

11.3.5 The northern part of the study area is defined by the route of the River Aire, which emerges from below Leeds Station and converges with the Leeds and Liverpool Canal at the eastern edge of the Canal Wharf Conservation Area. The River Aire then continues east, where it also forms part of the Aire and Calder Navigation. The River Aire, the Aire and Calder Navigation and Leeds and Liverpool Canal are important historically, ecologically, and recreationally and include the Canal Wharf Conservation Area and features such as the Trans Pennine Trail and local footpaths. The non-definitive Leeds City Footpath (Footpath Number 62) (along the south side of the River Aire) crosses the study area in an east west direction and shares the same route as the National Cycle Network Route 66 (NCN).

11.3.6 The historical city centre is concentrated to the north of the River Aire and the Leeds and Liverpool Canal corridor. The Leeds Unitary Development Plan[73] has defined the city centre according to historic influence and use and has identified four 'quarters'. These are:

- the Civic Quarter, predominantly made up of Victorian buildings. Other prominent landmarks include Leeds Town Hall, Millennium Square and Leeds Civic Hall;

[73] Leeds Unitary Development Plan (Review 2006) https://www.leeds.gov.uk/docs/FPI_UDP_001%20Volumen%201%20Written%20Statement.pdf Section 13.7

- the Shopping Quarter which contains Leeds Kirkgate Market, Leeds Trinity, The Corn Exchange, Briggate and the Victorian Quarter;
- the Cultural Quarter which includes BBC Yorkshire, the West Yorkshire Playhouse, the Northern Ballet, Leeds College of Music, the Royal Armouries Museum and Clarence Dock; and
- the Financial Quarter is centred around Park Square (one of the remaining Georgian Squares within the city) and an area with some of the oldest buildings and finest Georgian architecture within the city centre. Leeds Station lies within the fringe of the financial quarter.

11.3.7 LCC has developed the Holbeck, South Bank Supplementary Planning Document (SPD) 2016[74] which sets out a vision for the regeneration of the South Bank, recognising that the development of the Holbeck area is one of the largest city centre regeneration initiatives in Europe and the location of the proposed HS2 Leeds station and associated transport interchanges. The SPD provides a framework against which development proposals will be considered. Its aim is to ensure that forthcoming developments respond appropriately to the special sense of place that characterises this part of the city centre and facilitate comprehensive regeneration of the area whilst not precluding individual approaches and responses.

11.3.8 The various districts of the city are relatively well defined by their use, density, built character, and in many areas, defined through the overlaying of major roads, rail and waterways. These infrastructure features include the A653 Meadow Road/Dewsbury Road, A61 Hunslet Street, the East Coast Main Line, the River Aire and the Leeds and Liverpool Canal. The city centre is further defined by the A58(M) and the A64(M) inner-ring road to the north, as well as the M621 to the south. The Leeds Station is located centrally within the city and towards the northern end of the study area.

11.3.9 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[75], the Leeds Landscape Assessment[76] and the Landscape Character Review[77].

[74] Holbeck, South Bank Supplementary Planning Document 2016. Available online at: https://www.leeds.gov.uk/docs/Holbeck%20%C2%AD%20South%20Bank%20SPD%20June%202016.pdf
[75] 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
[76] Leeds City Council (1994), *Leeds Landscape Assessment*. Available online at: http://www.leeds.gov.uk/docs/CD11-15%20LA%20Composite%20version.pdf
[77] Leeds City Council (2011), *Landscape Character Review*. Available online at: http://www.leeds.gov.uk/docs/CD11-14%20Leeds%20Landscape%20Review%20Maps%202011.pdf

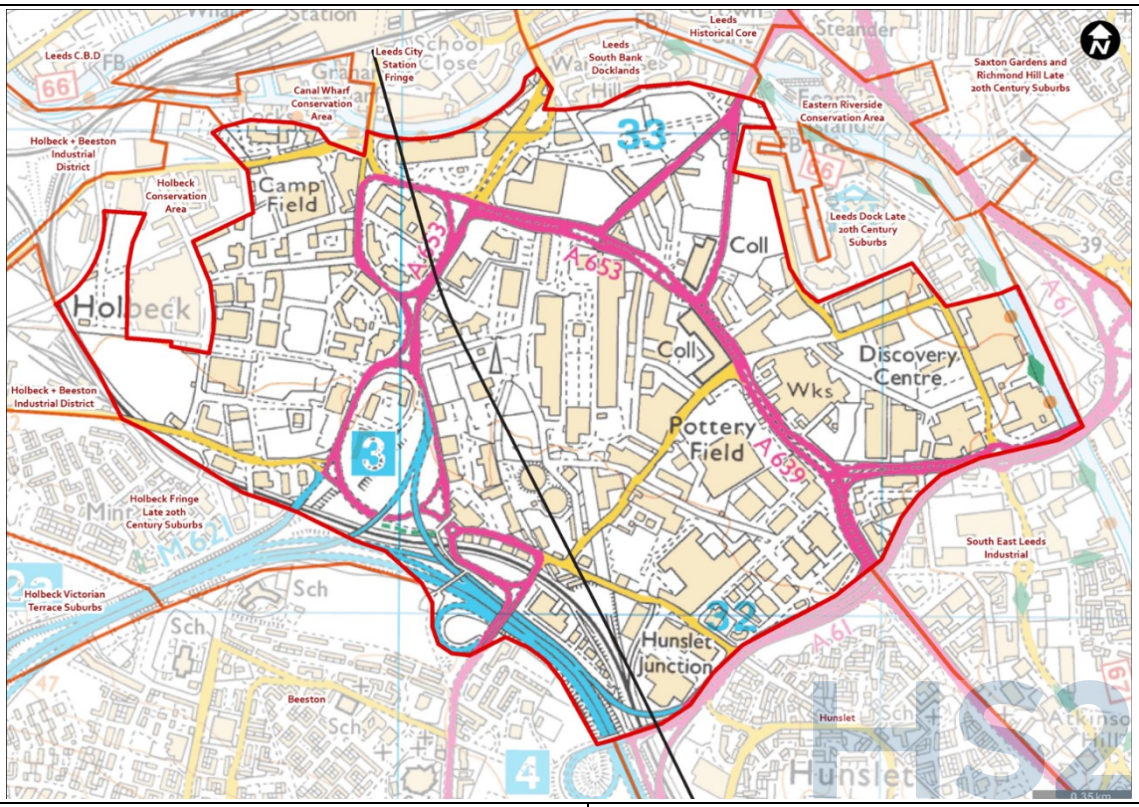
11.3.10 These published LCAs have been adapted for this assessment to provide LCAs of an appropriate and consistent scale. Minor amendments have also been made to some published LCA boundaries to reflect existing conditions.

11.3.11 For the purposes of this assessment, the Leeds Station study area has been subdivided into 29 LCAs. These LCAs are draft and subject to review in consultation with local planning authorities. Full descriptions of all LCAs will be provided in Volume 5 of the formal ES.

11.3.12 Twenty-six of the 29 LCAs would not be significantly affected by the Proposed Scheme as there would be no physical changes to landscape characteristics, the LCAs would be at a distance from the Proposed Scheme and/or intervening buildings would provide screening. A summary of the three LCAs that would be significantly affected within the Leeds Station area is provided in Table 18.

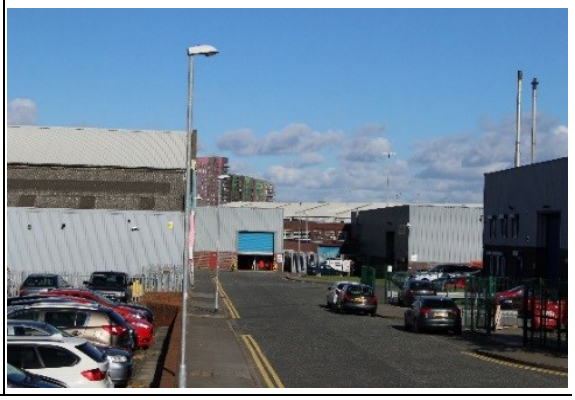
Table 18: Summary of significantly affected LCAs

South Leeds Industrial District



Major arterial road within Hunslet

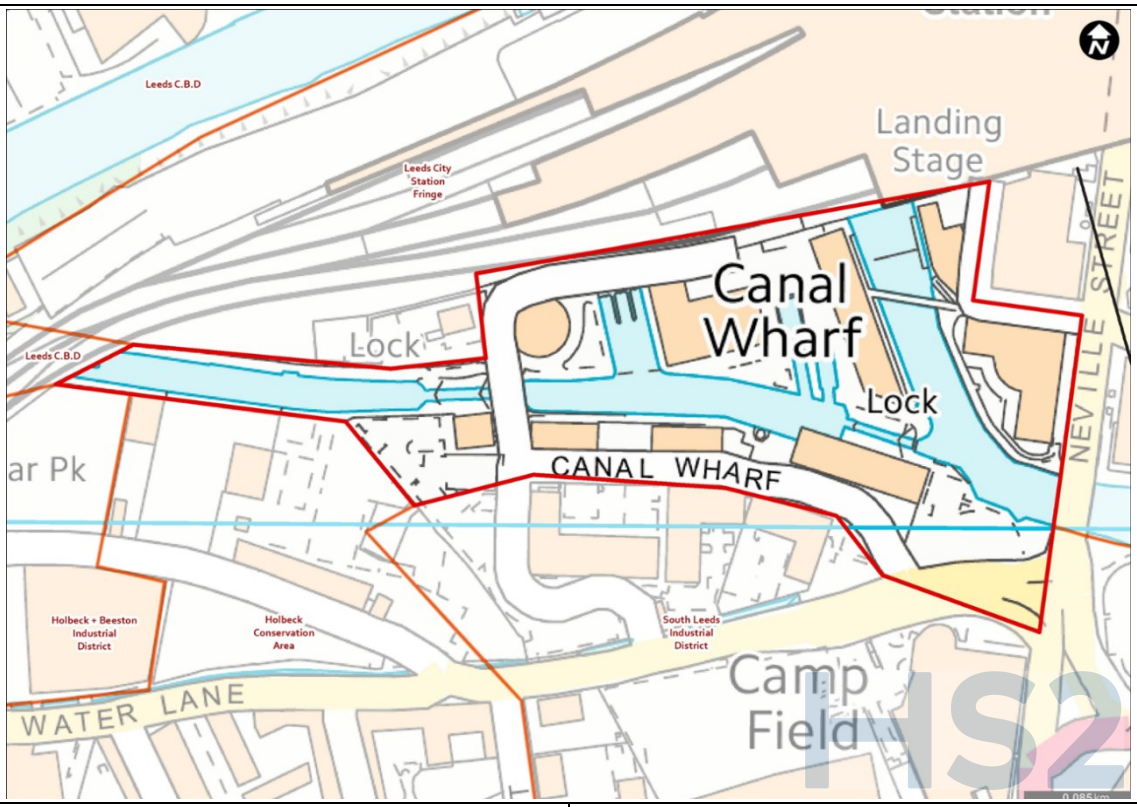
Light industrial units within Pottery Field



The South Leeds Industrial District LCA occupies an area of relatively flat land within the broad Aire valley south of Leeds city centre. The LCA comprises mostly industrial uses with some modern office development, temporary car parks and the large Crown Point Shopping Park. The development pattern is of large scale and coarse grain with an irregular layout. The area was once the industrial heart of Leeds (Pottery Fields) and this has determined the built development pattern and road layout. The LCA generally has few scenic qualities. Built development consists mainly of modern, two to three storey buildings with similar high scale massing and materials, although some distinctive 19th and 20th century red brick buildings scattered within the LCA remain and contribute to the landscape character as recognisable cultural features. These include Boyne Engine Works Offices (Grade II listed), The Hunslet Engine Co. (Grade II listed), Old Red Lion public house (Grade II listed) and Two Water Lane. The LCA is disjointed and divided by major arterial roads including the M621, A653 Great Wilson Street and A61 Hunslet Street. Green space is largely absent and there is a notable absence of street trees; the private semi-mature landscape scheme within Leeds City Office Park is therefore notable.

The overall value of this LCA is low as there is a disjointed, busy character with few scenic qualities and cultural features.

Canal Wharf Conservation Area



Houseboats moored alongside the canal towpath

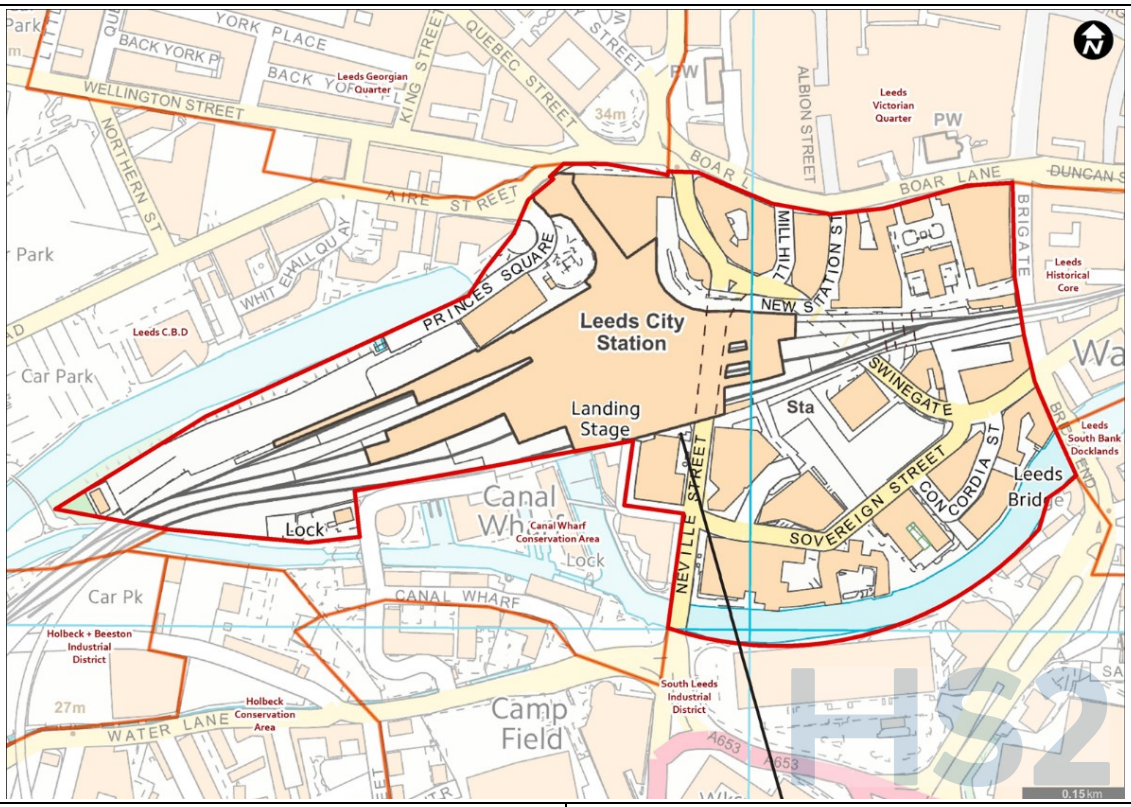
Waterside public realm within Canal Wharf

The Canal Wharf Conservation Area[78] LCA is a historically important conservation area as defined by Leeds City Council. The conservation area is predominantly publically accessible and located south of the Leeds Station. This LCA is located at the confluence of the Leeds and Liverpool Canal and River Aire, where it emerges from beneath the Leeds Station arches. The mix of historical canal side buildings on the south bank, which include the Former Leeds and Liverpool Canal Company Warehouse (Grade II* listed), Victoria Bridge (Grade II listed) and the Candle House and Double Tree Hilton developments provide a high level of containment and character to the wharf and public space which creates a high quality public realm. The canal towpath, which includes the NCN Route 66, and two canal bridges, provide pedestrian permeability and channelled views along the historic Leeds and Liverpool Canal corridor. The recently landscaped area within Granary Wharf surrounds the wharves and canal edge, which creates a series of accessible public spaces surrounded by mixed use arch frontages beneath the railway viaduct. Vehicle access is limited to the car park beneath the arches and the hotel drop off. However, noise from nearby vehicle traffic and trains detracts from an otherwise relatively tranquil area within the busy urban area.

The value of this LCA is high due to the high quality public realm and the abundance of relatively tranquil public spaces and recreational routes.

[78] Canal Wharf Conservation Area, Leeds City Council. https://www.leeds.gov.uk/docs/central%20area%20-%20canal%20wharf%20ca%20no_40.pdf

Leeds City Station Fringe



Sovereign Square, off Sovereign Street

Mixed use buildings along Sovereign Street

The Leeds City Station Fringe LCA is an urban area located on the north bank of the River Aire. The LCA includes part of the Leeds City Centre Conservation Area. Development consists of medium-large scale red brick former Victorian mills and 20th century modern, often red brick, office and residential buildings. Although the architecture is varied the built form has a consistency of height and scale and includes small scale retail, bars and restaurants which create enclosed public realm areas within the dense urban fabric. The large scale of the Leeds Station and railway viaduct to the north interrupts the historical medium grain and irregular street pattern. Notable landmarks include Sovereign Square, Leeds Station, the Victoria Mill East (Grade II listed) and the Queens Hotel (Grade II listed).
The railway viaduct bisects the LCA and access for both pedestrians and vehicles between north and south of the LCA is via Neville Street, Swinegate and Bridge End underbridges. The public footpath along the north side of the River Aire creates locally valued river front areas with seating and a small number of individual trees. Views from Leeds Bridge (Grade II listed) and Victoria Bridge (Grade II listed) afford good quality channelled views along the River Aire. Sovereign Square is a contemporary public space north of the riverfront, which includes grass, seating and tree planting which creates a high quality urban realm area The narrow streets, river and front buildings provide a sense of containment to the public spaces. Noise from nearby busy road and rail network detracts from an otherwise relatively quiet LCA and tranquillity is low.

The value of the LCA is medium due to the consistent building height and scale and series of enclosed public realm areas; however, the rail and road network reduces tranquillity and interrupts the historic street pattern.

Visual baseline

11.3.13 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: LA18 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[79], 4: Transport, 5: Hotels/healthcare/education and 6: Employment.

11.3.14 The residential developments within the study area are generally medium to high buildings, which are located to the south of Leeds city centre and afford short to long distance views. For example, the Candle House apartment building within the Canal Wharf Conservation Area, and the apartments on Waterloo Street, generally have elevated views of extensive industrial and commercial landscape and a busy road infrastructure to the south.

11.3.15 Residents on higher floors of Bridgewater Place, a high-rise apartment building, have longer distance views across south Leeds towards the surrounding settlements on the valley sides. Residential apartments within Leeds city centre generally have short distance views restricted by surrounding nearby buildings. Views for hotel guests would be similar to those within apartment buildings and generally consist of near to middle distance urban views depending on intervening buildings.

11.3.16 Surrounding residential settlements outside the study area but within the Aire valley, such as Hunslet and Holbeck, generally have near to middle distance urban views depending on location and intervening development.

11.3.17 The NCN Route 66 and the Aire Valley towpath are located along the Leeds and Liverpool Canal and River Aire. Users of recreational footpaths and cycleways, generally have near distance views, contained by surrounding buildings, with medium distance views along the waterways.

11.3.18 Road users travelling on urban roads and secondary roads generally have near distance views restricted by the dense development pattern within the city. There are occasional long distance views from elevated sections of motorway infrastructure.

11.3.19 Office buildings are generally located within densely developed areas and views for workers are consequently near distance towards surrounding buildings or of busy main roads or local roads. Some offices, for instance No. 1, 2 and 3 The Embankment on the north side of the River Aire, have medium distance views along the watercourse.

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

[79] 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.

mitigated. Such effects are temporary and would vary over the construction period depending on the intensity and scale of the works at the time. The assessment of landscape and visual effects has been based on the activities occurring during the peak construction phase, which is defined as the period during which the main construction works would take place, including the presence of compounds, main earthworks and structure works.

11.4.2 The effects associated with the peak construction stage in this area are generally considered to be medium-term, based on the indicative construction programme in Section 2.3. It is currently anticipated that the civil engineering stage in this area would be undertaken between 2024 and 2030. Effects during other stages of works are likely to be less intensive due to less construction equipment being required at the time and a reduced intensity of construction activity.

11.4.3 Section 2.2 sets out the key permanent features of the Proposed Scheme and Section 2.3 describes the construction compounds and associated temporary works that have been considered in this assessment.

Avoidance and mitigation measures

11.4.4 Measures that have been incorporated into Sections 12 and 14 of the draft Code of Construction Practice (CoCP)[80] 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[81];
- 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: construction of Leeds embankment; erection of the Leeds viaduct; construction of the HS2 Leeds station and construction of the HS2 Leeds station multi-storey car

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

park. This would require the demolition of buildings and structures, the removal of other landscape elements including trees and other vegetation and the closure and diversion of existing public highways and public rights of way (PRoW).

11.4.7 Other key changes include 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 LCAs set out in Table 19 would be significantly affected during construction of the Proposed Scheme.

Table 19: Summary description and assessment of effect for LCAs

South Leeds Industrial District	**Low-medium susceptibility and sensitivity**
Susceptibility to change: The low scenic quality and distinctiveness of the modern commercial and industrial buildings impart a low-medium susceptibility to change arising from the Proposed Scheme. The demolition and construction works for HS2 Leeds station, HS2 Leeds station multi-storey car park, Leeds viaduct, Leeds embankment and associated retaining walls would alter landscape pattern and grain and reduce pedestrian and vehicular connectivity. The scale and prominence of the works, including demolition of buildings such as Asda House, Hindle House and office buildings within Central Park and Leeds City Office Park, would be noticeable although surrounding built form would limit its influence within the landscape. The works would be prominent elements along the Leeds and Liverpool Canal. Tree removal from Meadow Lane and A61 Great Wilson Street would also be noticeable. Construction works would therefore adversely affect a large part of the LCA. The Proposed Scheme would result in a continuous swathe of construction works that would result in severance of some roads and alter connectivity. Removal of buildings would alter the recognisable skyline. There would therefore be a high magnitude of change and a moderate adverse effect, which is significant.	**Level of effect:** Moderate adverse (significant)
Canal Wharf Conservation Area	**Medium-high susceptibility and sensitivity**
Susceptibility to change: The enclosed character, attractive qualities of the public realm and historic landscape have a medium-high susceptibility to change arising from the Proposed Scheme. The uncharacteristic construction works for HS2 Leeds station, Leeds viaduct and the interface with the Leeds Station would directly affect areas of public realm and reduce pedestrian connectivity. The HS2 Leeds station northern concourse satellite compound, located adjacent to the public spaces would further impact on the character. The scale and prominence of the works, including demolition of the Direct Line House, Leeds City Hilton and No.2 The Embankment on Neville Street would noticeably alter the relatively tranquil, contained character of the public realm areas. The construction works would be prominent elements within the setting of the small scale Canal Wharf Conservation Area, which includes a number of listed buildings and public spaces, and would be notable features on the skyline to the east. Construction works would therefore adversely affect a proportion of the LCA. The Proposed Scheme would result in a change to key characteristics, in particular the demolition of buildings that provide some containment and setting to urban realm areas, an increase in visual disturbance and a reduction in tranquillity. There would therefore be a medium magnitude of change and a moderate adverse effect, which is significant.	**Level of effect**: Moderate adverse (significant)

Leeds City Station Fringe	**Medium susceptibility and sensitivity**
Susceptibility to change: The enclosed character, medium scale and attractive qualities of the landscape have a medium susceptibility to change arising from the Proposed Scheme. The demolition and construction works for the HS2 Leeds station and the interface with the Leeds Station would noticeably alter the pattern and grain and reduce pedestrian and vehicular connectivity. The scale and prominence of the works, including demolition of the Leeds City Hilton on Neville Street, No.2 The Embankment, Asda House and the BT building along Neville Street and Sovereign Street, would open up views to the more industrial areas to the south and would alter the relatively enclosed character of the locally valued public realm associated with the footpath along the north side of the River Aire. Construction works would therefore adversely affect a small section of the LCA. The Proposed Scheme would result in a change to key characteristics, particularly due to the demolition of buildings that form the setting for Sovereign Square and public spaces along the towpath. There would therefore be a medium magnitude of change and a moderate adverse effect, which is significant.	**Level of effect**: Moderate adverse (significant)

Visual assessment

Introduction

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

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

11.4.11 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 potentially significant visual effects based on the current design of the Proposed Scheme are described set out in Table 20 and viewpoint locations are shown in Map Series LV-03 in the Volume 2: LA18 Map Book.

Table 20: Construction phase significant visual effects

View north for recreational users on the footbridge over the A653 Dewsbury Road (VP 465-03-023 (Map Number LV-03-466), VP 466-03-021 and VP 466-04-035 (Map Number LV-03-466))	**Low sensitivity receptors**
Commuters on the footpaths and workers in the office buildings, both east and west of the Proposed Scheme, would have views of the construction works for the HS2 Leeds station, Leeds embankment, Leeds viaduct and HS2 Leeds station multi-storey car park. Travellers on local roads would have sequential views that would include the road realignment works at A61 Great Wilson Street, the A653 Dewsbury Road and Kidacre and Holmes Street. The demolition of buildings within Central Park, Leeds City Office Park and Hindle House, would open up views north, east and south towards construction works. The scale of the construction works for the HS2 Leeds station would substantially change the dense visual character and skyline within near and middle distance views. Construction of the Proposed Scheme would alter the key characteristics of the existing view due to the demolition of buildings and construction activities. There would therefore be a high magnitude of change and a moderate adverse effect, which is significant.	**Level of effect:** Moderate adverse (significant)
View west from the junction of Meadow Lane and Bridge End Street for vehicle travellers and for workers in offices at the corner of Bridge End Street of No.1 Dock Street. (VP 466-03-036 (Map Number LV-03-466))	**Low sensitivity receptors**
Travellers on Bridge End Street and workers in offices east of the Proposed Scheme would have middle distance views of the construction works for the HS2 Leeds station. The demolition of commercial buildings, including Asda House, and removal of trees on the north side of Meadow Lane, would open up views west and south-west towards construction of the HS2 Leeds station. Views would be partially framed by buildings in the near distance. Retained trees on the south side of Meadow Lane would partially screen views of demolition and construction work during the summer months. Large-scale construction works would extend across much of the view. There would therefore be a medium magnitude of change and a moderate adverse effect, which is significant.	**Level of effect:** Moderate adverse (significant)
Views south-west for recreational users and road travellers on Leeds Bridge (VP466-03-033 (Map Number LV-03-466))	**Medium sensitivity receptors**
Recreational users on the footpath and travellers on Leeds Bridge would have channelled views west along the River Aire corridor towards construction works for the HS2 Leeds station. The demolition of Asda House would open up the contained and channelled views along the River Aire corridor. Views would be partially framed by buildings on the north and south banks of the River Aire corridor. However, the scale of the construction works for the HS2 Leeds station would be prominent in middle distance views and substantially change the historic character and skyline along the River Aire corridor. Construction activities associated with the Proposed Scheme would result in a large change in key characteristics in views for users of the Leeds Bridge. There would therefore be a medium magnitude of change and a moderate adverse effect, which is significant.	**Level of effect:** Moderate adverse (significant)
Views south and south-west for recreational users on the canal and towpath, and workers in office buildings (VP466-03-025 and VP466-03-026 (Map Number LV-03-466))	**High sensitivity receptors**
Users of the canal and the canal towpath, including the NCN Route 66 and the non-definitive Leeds City Footpath (Footpath Number 62), would have sequential views west along the River Aire towards Victoria Bridge and views south of the construction works for the HS2 Leeds station, Leeds viaduct and HS2 Leeds station multi-storey car park. Workers within office buildings would have views south towards the construction of the HS2 Leeds station, Leeds viaduct and HS2 Leeds station multi-storey car park. Also in views south, the demolition of Asda House would lead to additional near and middle distance views of demolition and clearance of buildings within Central Park, Leeds City Office Park and Hindle House.	**Level of effect:** Major adverse (significant)

The scale of the construction works for the HS2 Leeds station, Leeds viaduct and HS2 Leeds station multi-storey car park would be prominent in near and middle distance views west and south and would open up the relatively contained views, altering the historic character, skyline and scenic characteristics within the River Aire corridor. Construction activities associated with the Proposed Scheme would form a prominent aspect of the views from the canal and towpath. There would therefore be a high magnitude of change and a major adverse effect, which is significant.	
Views west and south-west for recreational users of the Sovereign Square public space and workers in offices (VP466-03-023 and VP466-03-024 (Map Number LV-03-466))	**Medium sensitivity receptors**
Recreational users within Sovereign Square and workers within office blocks surrounding Sovereign Square, which are orientated in the direction of the Proposed Scheme, would have views towards the construction works for the HS2 Leeds station and the tie-in with Leeds Station. The demolition of No.2 and No.3 The Embankment and the BT building on Pitt Row, off Sovereign Street would also be visible. The demolition would result in additional near and middle distance views of the demolition of Asda House off A61 Great Wilson Street and the Leeds City Hilton and Direct Line House on Neville Street. Views towards the construction of the HS2 Leeds station would be partially obscured by the KPMG building and No.1 The Embankment. However, the scale of the construction works for the HS2 Leeds station would be prominent in near distance views west and would substantially change the scenic characteristics and relatively contained views and skyline of middle distance views. Construction activities associated with the Proposed Scheme would result in a large change in key characteristics in views. There would therefore be a high magnitude of change and a major adverse effect, which is significant.	**Level of effect:** Major adverse (significant)
Canal Wharf Conservation Area: View east from the canal bridge for users of the NCN Route 66 and for occupiers of residential apartments in Candle House and users of the Leeds and Liverpool Canal and canal towpath and guests of the DoubleTree Hilton hotel (VP466-03-011 and VP466-03-016 (Map Number LV-03-466))	**High sensitivity receptors**
Recreational users on the canal bridge, the NCN Route 66, the canal, canal towpath and Granary Wharf would have open views towards the construction works for the HS2 Leeds station. Occupiers of residential apartments within Candle House and guests at the DoubleTree Hilton hotel would have elevated views towards the construction works for the HS2 Leeds station. Also, all viewers would have views of the demolition of Direct Line House which would further open up views towards the demolition of No.2 and No.3 The Embankment and Asda House. Views of construction activity would be partially framed by the DoubleTree Hilton and the canal side commercial buildings, including the Former Leeds and Liverpool Canal Company Warehouse (Grade II* listed). However, the scale of the construction works for the HS2 Leeds station would appear prominent in near distance views and result in a large change to the historic character, skyline and scenic characteristics of the contained views in middle distance views. Construction of the Proposed Scheme would alter the key characteristics of views. There would therefore be a high magnitude of change and a major adverse effect, which is significant.	**Level of effect:** Major adverse (significant)
Canal Wharf Conservation Area: View south-east from the footbridge over the River Aire for occupiers of residential apartments and recreational users of the Leeds and Liverpool Canal and canal towpath (VP466-03-018 (Map Number LV-03-466))	**High sensitivity receptors**
Recreational users on the footbridge and occupiers of residential apartments would have open views towards the construction works for the HS2 Leeds station. The demolition of Direct Line House would further open up views in a south-easterly direction towards the demolition of No.2 and No.3 The Embankment and Asda House, which would alter the scenic characteristics of the relatively enclosed Canal Wharf Conservation Area.	**Level of effect:** Major adverse (significant)

Views would be partially framed by the Former Leeds and Liverpool Canal Company Warehouse (Grade II* listed) and Bridgewater Place. However, the scale of the construction works for the HS2 Leeds station would be prominent in near distance views and result in a noticeable change to the historic character, skyline and scenically attractive characteristics of the views that were previously contained by the Direct Line House. Construction of the Proposed Scheme would alter the key characteristics of views. There would therefore be a high magnitude of change and a major adverse effect, which is significant.	

Other mitigation measures

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

Summary of likely residual significant effects

11.4.14 The temporary residual significant effects during construction remain as described above. These effects would be temporary and reversible in nature lasting only for the duration of the construction works. These residual effects would generally arise from the widespread presence of construction activity and construction plant within the landscape and viewed by surrounding residents, recreational users within the city centre, workers in offices, commuters on footways and transport users along main roads within the study area.

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

- moderate adverse effects in relation to three LCAs that would be directly affected;
- major adverse visual effects on views from seven recreational viewpoint locations;
- moderate adverse visual effects on views from four recreational viewpoint locations;
- moderate adverse visual effects on views from one transport viewpoint location; and
- moderate adverse visual effects on views from one employment viewpoint location.

11.5 Permanent effects arising from operation

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

Avoidance and mitigation measures

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

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 embankment, Leeds viaduct, the HS2 Leeds station, HS2 Leeds station multi-storey car park and alterations to the existing road network. Other aspects include the presence of overhead line equipment.

Landscape assessment

11.5.4 Based on the current design, it is currently anticipated that the LCA described in Table 21 would be significantly affected during operation of the Proposed Scheme.

Table 21: Operational phase significant landscape effects

South Leeds Industrial District	**Low susceptibility and sensitivity**
Susceptibility to change: The industrial nature and urban qualities of the landscape have a low-medium susceptibility to change arising from the Proposed Scheme. **Year 1:** The Proposed Scheme, including the HS2 Leeds station, HS2 Leeds station multi-storey car park, Leeds viaduct, Leeds embankment and associated retaining walls, would permanently alter the landscape pattern and urban grain. These structures, together with the overhead line equipment, would form prominent elements of the LCA. The operational scheme, including the realignment and closure of roads such as A653 Meadow Road/Dewsbury Road, would also reduce vehicular connectivity. The addition of such prominent elements would however result in changes across only a small proportion of the LCA. It is assumed that new areas of public realm would be provided around the station, multi-storey car park and viaduct but these would have limited effect beyond the immediate area. There would therefore be a medium magnitude of change and a moderate adverse effect.	**Level of effect:** Moderate adverse (significant)
Year 15: The Proposed Scheme would continue to be at variance with the pattern and urban grain of the LCA and vehicular connectivity would still be restricted. The proposed HS2 Leeds station, HS2 Leeds station multi-storey car park, Leeds viaduct, Leeds embankment and overhead line equipment would remain as prominent landscape elements. New public realm areas around the proposed HS2 Leeds station, including maturing tree planting, would help integrate the proposed structures into the local landscape but would have limited effects beyond the immediate area. The medium magnitude of change and moderate adverse effect would remain.	**Level of effect:** Moderate adverse (significant)
Canal Wharf Conservation Area	**Medium-high susceptibility and sensitivity**
Susceptibility to change: The enclosed character, attractive qualities of the public realm and historic landscape have a medium-high susceptibility to change arising from the Proposed Scheme. **Year 1:** The Proposed Scheme, including the HS2 Leeds station and Leeds viaduct, would permanently alter the landscape pattern and urban grain and would form prominent elements of the LCA. The Proposed Scheme would introduce a large scale, prominent development into the LCA which is typically medium scale, and alter the relatively enclosed characteristics of the Canal Wharf Conservation Area. The addition of such prominent elements would however result in changes across only a small proportion of the LCA. Public realm development south of Little Neville Street and the River Aire would help integrate the Proposed Scheme and provide connectivity to the surrounding public realm. However, these measures	**Level of effect:** Moderate adverse (significant)

would have a limited effect beyond the immediate area. There would therefore be a medium magnitude of change and a moderate adverse effect.	
Year 15: Whilst the public realm development south of Little Neville Street and the River Aire would help integrate the Proposed Scheme within the urban realm and provide connectivity to the surrounding wharf public realm, the HS2 Leeds station would still be a notable large scale feature, altering the balance of characteristics and medium scale development within the LCA. Soft landscape proposals including tree planting would help integration and provide some screening benefits. However, these measures would have a limited effect beyond the immediate area. The medium magnitude of change and moderate adverse effect would remain.	Moderate adverse (significant)
Leeds City Station Fringe	**Medium susceptibility and sensitivity**
Susceptibility to change: The influence of the Leeds Station, enclosed character and attractive qualities of the River Aire towpath have a medium susceptibility to change arising from the Proposed Scheme. **Year 1:** The Proposed Scheme, including the HS2 Leeds station and Leeds viaduct, would permanently alter the landscape pattern and urban grain and would form prominent elements of the LCA. The large scale of the Proposed Scheme would permanently alter the characteristics locally and would be at variance with the generally medium scale of development within the LCA, although the sensitivity of the area is reduced by the presence of the Leeds Station and railway viaducts. The development of the HS2 Leeds station on an elevated platform structure would connect to the existing Leeds Station, extending the existing ground level areas beneath the existing Leeds Station to beneath the proposed HS2 elevated platform structure along Neville Street and Sovereign Street. In addition, the Leeds viaduct would create a notable influence on urban realm areas. The land parcels left undeveloped following demolitions would be notable features within the characteristic dense built form of the LCA. Public realm development around the northern concourse would help integrate the Proposed Scheme within the urban realm and provide connectivity to the surrounding proposed public realm development south of little Neville Street and the River Aire, and existing public realm at Canal Wharf Conservation Area. There would therefore be a medium magnitude of change and a moderate adverse effect.	**Level of effect:** Moderate adverse (significant)
Year 15: Whilst mitigation planting would provide some integration of structures into the landscape by summer of year 15, the large scale of the Proposed Scheme and the land parcels left undeveloped following demolitions would still be notable and at variance to the existing character. The medium magnitude of change and moderate adverse effect would remain.	Moderate adverse (significant)

Visual assessment

Introduction

11.5.5 The following section describes the likely significant effects on visual receptors during operation at 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 22 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: LA18 Map Book.

Table 22: Operation phase significant visual effects

View north, east and south for workers in office buildings on City Walk, for commuters on the A653 Meadow Road/Dewsbury Road footpath and for workers in office buildings and travellers on Kidacre Street and Junction Street (access to the Crown Point Shopping Park) (VP 466-06-019, VP 466-03-021, and VP 466-04-035 (Map Number LV-04-466))	**Low sensitivity receptors**
Year 1 – winter and summer: Commuters on the footpaths, workers in office buildings and vehicle travellers both east and west of the Proposed Scheme would experience substantial changes to near and middle distance views as a result of the operation of the Proposed Scheme. The HS2 Leeds station, Leeds embankment and Leeds viaduct, together with the overhead line equipment and the movement of trains, would be seen against the skyline from footpath level and would result in a noticeable alteration to medium distance views incorporating small scale commercial development and tree planting. Proposed public realm areas would provide some partial integration although tree planting within the public realm would not contribute to any visual integration at this stage. The land parcels left undeveloped following demolitions would be highly visible across the majority of views. At year 1 winter and summer, there would therefore be a high magnitude of change and a moderate adverse effect, which is significant.	**Level of effect:** Moderate adverse (significant)
Year 15 – summer The Proposed Scheme would remain highly visible in the landscape due to the scale of the features, and would continue to be seen against the skyline from footpath level. The land parcels left undeveloped following demolitions would remain noticeable. Proposed public realm and tree planting would provide partial integration locally although these interventions would be small in scale compared to the Proposed Scheme. The high magnitude of change and moderate adverse effect would therefore remain significant.	**Level of effect:** Moderate adverse (significant)
Views south and south-west for recreational users on the canal and the canal towpath and workers in office buildings (VP466-03-025 and VP466-03-026 (Map Number LV-04-466))	**High sensitivity receptors**
Year 1 – winter and summer: Recreational users on the canal and the canal towpath, including the NCN Route 66 and the non-definitive Leeds City Footpath (Footpath Number 62) (along the south side of the River Aire), and workers in nearby offices, would experience substantial changes to near and middle distance views as a result of the operation of the Proposed Scheme. The HS2 Leeds station and Leeds viaduct would be seen against the skyline from footpath level and would alter the character of the views along the River Aire corridor by introducing a new large scale feature in the near distance that would enclose views west towards Victoria Bridge (Grade II Listed) and Bridgewater Place. The area of public realm surrounding the HS2 Leeds station would provide some visual integration and enhance the setting for recreational users of the waterfront along the River Aire, although tree planting within the public realm would not contribute to any visual integration at this stage. The land parcels left undeveloped following demolitions to the south, west and north would be noticeable, altering the visual character of previously enclosed views. At year 1 winter and summer, there would therefore be a high magnitude of change and a major adverse effect, which is significant.	**Level of effect:** Major adverse (significant)
Year 15 – summer	**Level of effect:** Moderate adverse (significant)

The Proposed Scheme would remain highly visible in the landscape due to the scale of the features and would continue to be seen against the skyline from the canal and towpath. The land parcels left undeveloped following demolitions would remain noticeable. Proposed public realm and tree planting would provide some integration locally and improve the character of views south and west across the River Aire. There would therefore be a medium magnitude of change and moderate adverse effect, which is significant.	
Views west and south-west for recreational users within Sovereign Square and workers in offices surrounding Sovereign Square (VP466-03-023 and VP466-03-024 (Map Number LV-04-466))	**Medium sensitivity receptors**
Year 1 – winter and summer: Recreational users within Sovereign Square and workers in local offices surrounding Sovereign Square would experience noticeable changes to near and middle distance views, partially framed by the KPMG building and No.1 The Embankment, as a result of the operation of the Proposed Scheme. The HS2 Leeds station would be seen against the skyline, resulting in a noticeable alteration to the established urban realm view. The area of public realm surrounding the HS2 Leeds station would provide some visual integration and enhance the setting for recreational users of the waterfront along the River Aire, although tree planting within the public realm would not contribute to any visual integration at this stage. The land parcels left undeveloped following demolitions to the south-west and north-west would be noticeable, altering the visual character of previously enclosed views. At year 1 winter and summer, there would therefore be a high magnitude of change and a moderate adverse effect, which is significant.	**Level of effect:** Moderate adverse (significant)
Year 15 – summer The Proposed Scheme would remain highly visible in the landscape due to the scale of the features and would continue to be seen against the skyline. The land parcels left undeveloped following demolitions would remain noticeable. Proposed public realm and tree planting would provide partial integration locally although these interventions would be small in scale compared to the Proposed Scheme. The high magnitude of change and moderate adverse effect would therefore remain significant.	**Level of effect:** Moderate adverse (significant)
Canal Wharf Conservation Area: View east from the canal bridge for users of the NCN Route 66 and for occupiers of residential apartments in Candle House and users of the Leeds and Liverpool canal and canal towpath and guests of the DoubleTree Hilton hotel (VP466-03-011 and VP466-03-016 (Map Number LV-04-466))	**High sensitivity receptors**
Year 1 – winter and summer: Recreational users on the canal bridge, the NCN Route 66, the canal, canal towpath and Granary Wharf, and occupiers of residential apartments and guests within the hotel would experience a noticeable alteration to near and middle distance views due to the operation of the Proposed Scheme. The HS2 Leeds station would be seen against the skyline in middle distance views east, although it would be framed and partially screened by the DoubleTree Hilton hotel and the canal side commercial buildings. The HS2 Leeds station would foreshorten the scenic, medium distance, framed views along the Leeds and Liverpool Canal towards Victoria Bridge (Grade II Listed), and also the longer distance views along the River Aire corridor. Public realm development south of Little Neville Street and the River Aire would provide some visual integration and enhance the setting for recreational users of the public space along the Leeds and Liverpool Canal, although the large scale of the HS2 Leeds station would contrast with the openness of the new public realm development south of Little Neville Street and the River Aire. Tree planting within the public realm would not contribute to any visual integration at this stage. At year 1 winter and summer, there would therefore be a medium magnitude of change and a moderate adverse effect, which is significant.	**Level of effect:** Moderate adverse (significant)
Year 15 – summer	**Level of effect:**

The Proposed Scheme would remain highly visible in the landscape due to the scale of the Proposed Scheme and would continue to be seen against the skyline. Proposed public realm and tree planting south of Little Neville Street and the River Aire would provide partial integration locally, although these interventions would be small in scale compared to the Proposed Scheme. The medium magnitude of change and moderate adverse effect would therefore remain significant.	Moderate adverse (significant)
View south-east from the footbridge over the River Aire for occupiers of residential properties and recreational users in the Canal Wharf Conservation Area (VP466-03-018 (Map Number LV-04-466))	**High sensitivity receptors**
Year 1 – winter and summer: Recreational users on the footbridge and occupiers of nearby residential apartments would experience a substantial alteration to near distance views due to the operation of the Proposed Scheme. The HS2 Leeds station viaduct structure would be seen from elevated locations by occupiers of the nearby apartment buildings would be seen against the skyline from the canal towpath and would be continuously highly visible across the majority of the view. The new structure would be of great visual mass and would extend across the panorama of the view. The HS2 Leeds station viaduct structure would also alter the character of the views along the River Aire corridor by introducing a new large scale feature that would enclose views east to the River Aire beyond Victoria Bridge (Grade II listed). Public realm development south of Little Neville Street and the River Aire would provide some visual integration and enhance the setting for recreational users of the public space along the Leeds and Liverpool Canal, although the large scale of the HS2 Leeds station would contrast with the openness of the new public realm development south of Little Neville Street and the River Aire. Tree planting within the public realm would not contribute to 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, which is significant.	**Level of effect:** Major adverse (significant)
Year 15 – summer The Proposed Scheme would remain highly visible in the landscape due to the scale of the Proposed Scheme and would continue to be seen against the skyline. The proposed public realm and tree planting south of Little Neville Street and the River Aire would provide partial integration locally although these interventions would be small in scale compared to the Proposed Scheme. The high magnitude of change and major adverse effect would therefore remain significant.	**Level of effect:** Major adverse (significant)

Other mitigation measures

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

Summary of likely residual significant effects

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

- moderate adverse effects in relation to three LCAs that would be directly affected;
- major adverse visual effects on views from one recreational viewpoint location;

- moderate adverse visual effects on views from seven recreational viewpoint locations;
- moderate adverse visual effects on views one transport viewpoint locations; and
- moderate adverse visual effects at one employment viewpoint location.

Monitoring

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

11.5.11 There are no area-specific requirements for monitoring landscape and visual mitigation during the operation of the Proposed Scheme in the Leeds Station area.

12 Socio-economics

12.1 Introduction

12.1.1 This section reports on the environmental baseline, likely economic and employment impacts and significant effects identified to date during construction and operation of the Proposed Scheme within the Leeds Station area (LA18). 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: LA18 Map Book.

12.2 Scope, assumptions and limitations

12.2.1 The scope, assumptions and limitations for the socio-economics assessment are set out in Volume 1, Section 8 and the Scope and Methodology Report (SMR)[82].

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

12.2.3 Businesses may experience significant isolation effects as a result of the Proposed Scheme. Likely significant isolation effects will be reported in the formal ES.

12.3 Environmental baseline

Existing baseline

Study area description

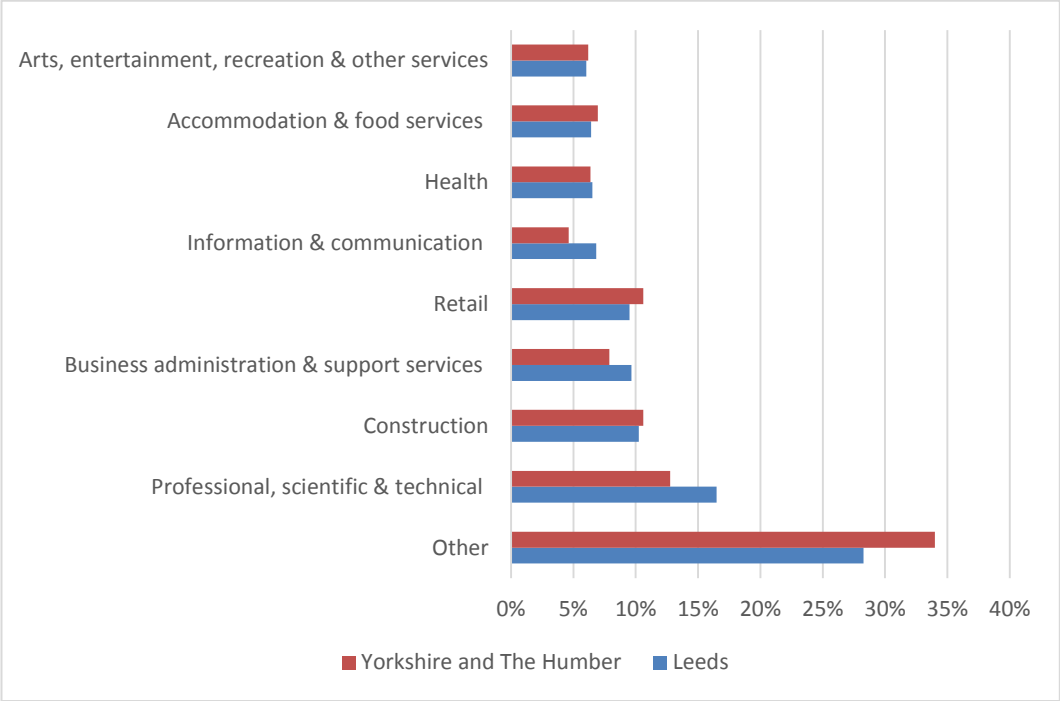
12.3.1 The following provides a brief overview of employment, economic structure, labour market and business premises availability within the Leeds Station area. It lies within the administrative area of LCC. The Leeds Station area falls entirely within the Leeds City Region Local Enterprise Partnership (LEP) area[83] and Yorkshire and the Humber region.

[82] Supporting document: HS2 Phase 2b Environmental Impact Assessment Scope and Methodology Report
[83] Leeds City Region: Strategic Economic Plan (2016) *Strategic Economic Plan 2016-2036*. 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 (16%), with the construction (10%), business administration and support services (10%), and retail (10%) sectors also accounting for relatively large proportions. This is shown below in Figure 8. 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[84].

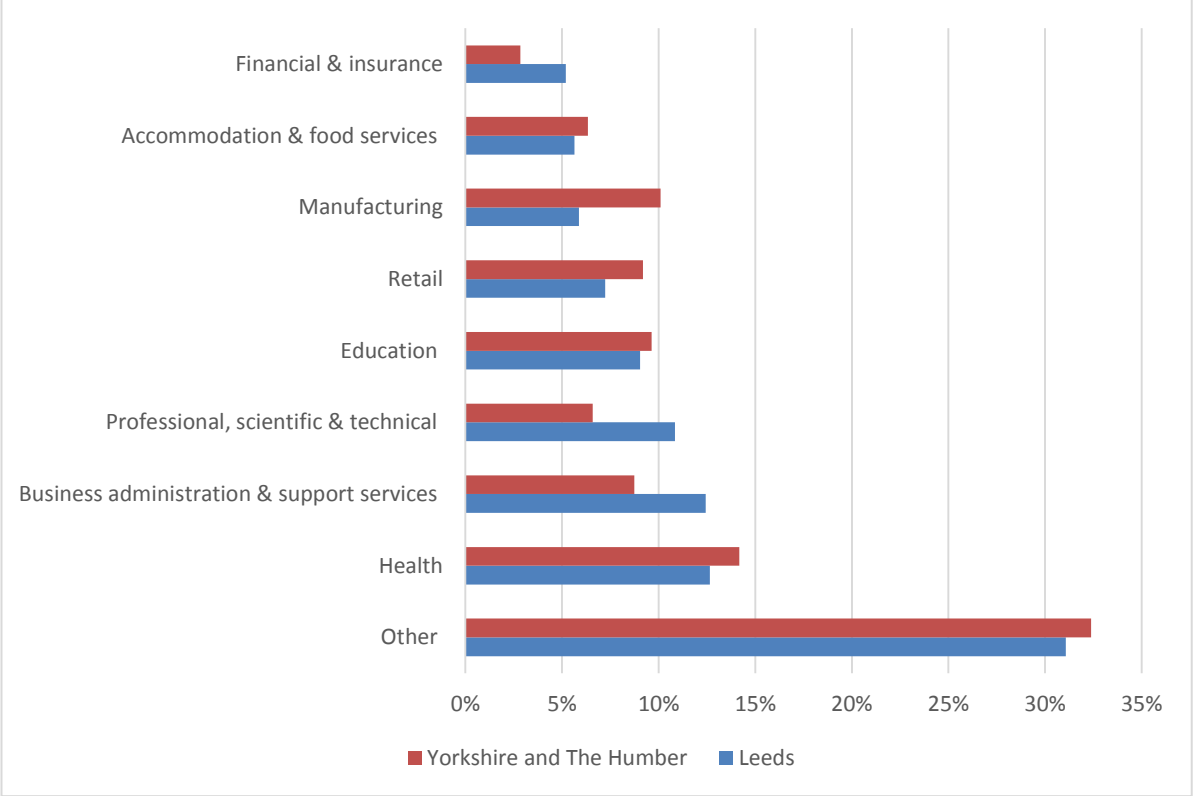
Figure 8: Business sector composition in the LCC area and the Yorkshire and the Humber Region[85]



12.3.3 In 2016, approximately 443,000 people worked in the LCC area[86] 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%) sectors. 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 9[87].

[84] Office for National Statistics – UK Business Counts – Local Units (2017). Office for National Statistics, London. Available at: https://www.nomisweb.co.uk
[85] 'Other' includes Construction; Information and communication; Arts, entertainment, recreation and other services; Transport and storage (inc postal); Wholesale; Public administration and defence; Mining, quarrying and utilities; Motor trades; Property; and Agriculture, forestry and fishing
[86] Office for National Statistics – Business Register and Employment Survey – Employment (2016). Office for National Statistics, London. Available at: https://www.nomisweb.co.uk (this number includes both residents and non-residents of LCC who work within its boundaries)
[87] Office for National Statistics – Business Register and Employment Survey – Employment (2016). Office for National Statistics, London. Available at: https://www.nomisweb.co.uk (this number includes both residents and non-residents of LCC who work within its boundaries)

Figure 9: Employment by Industrial Sector in the LCC area and the Yorkshire and the Humber Region[88]



12.3.4 According to the Annual Population Survey (2016)[89] the employment rate[90] within the LCC area was 74% (376,000 people) representing both residents employed within the area and those working outside it. This compares with the recorded rates for Yorkshire and the Humber region (72%) and England (74%). In 2016, the unemployment rate[91] in the LCC area was 4%, which is less than both Yorkshire and the Humber region (5%) and England (5%).

12.3.5 According to the Annual Population Survey (2016)[92], 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, while 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%).

[88] 'Other' includes Construction; Information and communication; Arts, entertainment, recreation and other services; Transport and storage (inc postal); Wholesale; Public administration and defence; Mining, quarrying and utilities; Motor trades; Property; and Agriculture, forestry and fishing
[89] Annual Population Survey (2016), NOMIS. Available at: http://www.nomisweb.co.uk
[90] The proportion of working age (16-64 year olds) residents that is in employment.
[91] 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.
[92] 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 ha in LCC[93], this is set against a maximum forecast employment land requirement of 526 ha for B2/B8 (Industry/Warehousing) and 706,250m² for B1 (Office)[94]. 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[95].

12.3.7 Based upon the latest available data from the Estates Gazette (October 2017) there is 480,000m² of office space available in the LCC area[96]. Plans for the Leeds Integrated Station Masterplan[97] and the surrounding area include a new 300,000m² district or campus. This will complement plans for South Bank[98] in Leeds, which is expected to create 35,000 new jobs. As can be seen from a comparison with the currently available office space, these proposals would roughly double the amount of potentially available floorspace in the LCC area.

12.4 Effects arising during construction

Avoidance and mitigation measures

12.4.1 The draft Code of Construction Practice (CoCP)[99] includes a range of provisions that would help mitigate socio-economic effects associated with construction within this area, including:

- reducing nuisance through sensitive layout of construction sites (Section 5);
- consulting businesses located close to hoardings on the design, materials used and construction of the hoarding, to reduce impacts on access to and visibility of their premises (Section 12);
- applying best practicable means (BPM) during construction works to reduce noise (including vibration) at sensitive receptors (including local businesses) (Section 13);
- site specific traffic management measures including requirements relating to the movement of traffic from business and commercial operators of road vehicles, including goods vehicles (Section 14);
- maintaining access to businesses for the duration of construction works where reasonably practicable (Section 14); and
- monitor and manage flood risk and other extreme weather events that may affect socio-economic resources during construction (Section 15).

[93] Leeds Local Development Framework Authority Monitoring Report (2016) (page 12) available at: http://www.leeds.gov.uk/docs/2016%20AMR%20Final%20vash.pdf
[94] Leeds City Council (August 2011) Leeds Employment Land Review, 2010 Update: The document shows need as a range from 460ha to 526ha. https://www.leeds.gov.uk/SiteAllocationMaps/Evidence%20Base%20Documents/Employment%20Land%20Review%20%202010%20Update.pdf
[95] 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).
[96] Based on marketed space identified from Estates Gazette data (EGi) (October 2017). Available at: https://www.egi.co.uk/Property/Availability/
[97] Draft South Bank Leeds Regeneration Framework SPD (November 2017): https://southbankleeds.co.uk/shapeyourcity
[98] Draft South Bank Leeds Regeneration Framework SPD (November 2017): https://southbankleeds.co.uk/shapeyourcity
[99] Supporting document: Draft Code of Construction Practice

Assessment of impacts and effects

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

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

Temporary effects

In-combination effects

12.4.3 Businesses within the Leeds Station 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 Leeds Station area. Isolation effects will be reported in the formal ES.

Construction employment

12.4.5 It is currently expected that there would be one main construction compound at the HS2 Leeds station and six satellite construction compounds in the Leeds Station area. These sites could result in the creation of up to 5,170 person years of construction employment opportunities[100], broadly equivalent to 520 full-time jobs[101], 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 of construction workers. The impact of the indirect construction employment creation has been considered as part of the route-wide assessment (see Volume 3: Route-wide effects).

[100] 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
[101] Based on the convention that 10 employment years is equivalent to one full time equivalent job

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

Permanent effects

Businesses

12.4.8 Businesses directly affected, comprising those that lie within land required for the Proposed Scheme, are reported in groups/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.

12.4.9 Overall, 59 business accommodation units or sites in the study area would experience direct impacts as a result of the Proposed Scheme. These 59 units or sites, together, form 15 defined resources comprising:

- Hilton Leeds City Hotel, Neville Street, Leeds (five business units consisting of: four accommodation and food service activities units; one arts, entertainment and recreation unit);
- Asda Head Office, Great Wilson Street/Meadow Lane, Holbeck, Leeds (eight business units consisting of: one financial and insurance activities unit; seven professional, scientific and technical activities units);
- Jack Lane, close to junction with Leatherly Road, Hunslet, Leeds (seven light industrial business units);
- Dewsbury Road, Hunslet, Leeds (eight business units consisting of: two light industrial units, one retail warehouse unit and five financial/professional services units);
- Central Park and Victoria Road, New Lane, Holbeck, Leeds (six business units consisting of: four financial/professional services units, one recruitment and training unit and one travel agency unit);
- City Office Park, Meadow Lane, Holbeck, Leeds (three financial/professional services business units);
- The Wharf, Neville Street, Leeds (four financial/professional services business units);
- 1 – 3 The Embankment, Leeds (11 financial/professional services business units);
- Pottery Fields Depot, Leatherley Road, Hunslet, Leeds (maintenance and storage depot);
- Kidacre Street, Hunslet, Leeds (driving school training centre);
- Pottery Fields, Kidacre Street, Leeds (gas utility provider);
- Sovereign Street, Leeds (telecommunications utility provider);

- Victoria Road/New Lane, Holbeck, Leeds (security services);
- New Station Street (café); and
- Holmes Street/Apex Way, Leeds (automotive dealer).

12.4.10 Of the defined resources, only two of the resources which experience direct impacts are subject to potentially significant effects on business activities and employment. Table 23 sets out the resources which would potentially experience significant effects.

Table 23: Resources which would potentially experience significant direct effects

Resource	Description of business activity
Hilton Leeds City Hotel	Accommodation and food service activities (four); arts, entertainment and recreation (one)
Asda Head Office	Financial and insurance activities (one); professional, scientific and technical activities (seven)

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 24.

Table 24: Significance of effects on resources

Resource	Impact magnitude	Sensitivity	Significance of effect
Hilton Leeds City Hotel	High	Moderate	Major adverse - significant
Asda Head Office	High	Moderate	Major adverse - significant

12.4.14 The construction of the Proposed Scheme would require the demolition of the Hilton Leeds City Hotel, and of Asda Head Office.

12.4.15 The Hilton Leeds City Hotel is treated as a cluster of business units, which includes the primary hotel, and a series of associated functions including a gym, café, restaurant, and conference facility. Hotels can be bespoke buildings that exist in unique locations

within a city; and there is a more limited supply than, for example, office space. It is considered that these operators would have difficulty in finding suitable alternative premises. The effect on the Hilton Leeds City Hotel, and its employees, would be major adverse and therefore significant.

12.4.16 Asda Head Office operates as the headquarters for a multi-national retailer. The location accommodates eight business units consisting of one financial and insurance activities unit and seven professional, scientific and technical activities units jointly dealing with finance, commerce, training, communications, and customer services. It is considered that the operator(s) would have difficulty in finding suitable quality alternative premises of equivalent scale. The effect on Asda Head Office, and its employees, is assessed to be major adverse and therefore significant.

12.4.17 An estimated 4,870 jobs would either be displaced or possibly lost in the wider Leeds Station area. There is a reasonable probability that businesses would be able to relocate to places that would still be accessible to residents within the travel to work areas due to the general availability of vacant premises. However, there may be cases where alternative locations are problematic and the businesses may be unable to relocate on a like-for-like basis within the area. The impact on the local economy from the relocation or loss of jobs is considered to be relatively modest in the context of the total number of people employed in the LCC area (approximately 443,000 jobs), and the scale of economic activity and opportunity in the area.

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

Other mitigation measures

12.4.19 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.

12.4.20 The construction of the Proposed Scheme offers considerable opportunities to businesses and residents along the route of the Proposed Scheme in terms of supplying goods and services and obtaining employment. HS2 Ltd at this stage assumes that it would, therefore, adopt a policy to work with its suppliers to build a skilled workforce that promotes further economic growth across the UK as it has done on Phases One and 2a.

Summary of likely residual significant effects

12.4.21 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 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 will be created at locations along the route including stations, train crew facilities and infrastructure/maintenance depots. Within the Leeds Station area, there will be a new station at Leeds, and initial estimates suggest that gross direct employment for the new station, train operations and retail may be approximately 130 jobs.

12.5.5 The Proposed Scheme will contribute significantly to the creation of wider development opportunities in the Leeds area. More specifically, the South Bank Leeds Regeneration Framework Supplementary Planning Document (SPD) (November 2017) sets out proposals to deliver the Leeds Integrated Station Masterplan[102]. The plans for the station and the surrounding area include a new 300,000m² district or campus.

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 Leeds Station area.

[102] Draft South Bank Leeds Regeneration Framework SPD (November 2017). Available online at: https://southbankleeds.co.uk/shapeyourcity

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 Leeds Station 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[103]; and
- 'non-residential receptors'[104] such as:
  - community facilities including schools, hospitals, places of worship and 'quiet areas'[105]; 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[106], planning policy, planning practice guidance on noise (PPGN)[107] and EIA Regulations as described in the Scope and Methodology Report[108] (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 existing Leeds Station 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: LA18 Map Book. Map Series SV-01 also presents key 'non-residential receptors'. These receptors will be reviewed and developed further to

[103] '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.
[104] Non-residential receptors with multiple uses would be assessed either based on the most noise sensitive use or would be subject to multiple assessments as appropriate.
[2] 'quiet areas' are defined as either Quiet Areas as identified under the Environmental Noise Regulations 2007 (as amended) or are resources which are prized for providing tranquillity as noted in the NPPF and are therefore designated as such under the relevant local plan or are designated under local plans or neighbourhood development plans as local green spaces.
[106] Noise Policy Statement for England, (2015) Department for Environment, Food & Rural Affairs (Defra)
[107] Department for Communities and Local Government (DCLG) (2014), Planning Practice Guidance – Noise. Available online at: https://www.gov.uk/guidance/noise--2
[108] 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 heritage and ecological receptors and the assessment of tranquillity is ongoing and will be reported in the formal Environmental Statement (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 urban, with industrial, commercial and residential premises throughout. The sound environment is generally dominated by local and distant road traffic, rail traffic, overflying aircraft arriving into and departing from Leeds Bradford Airport and local neighbourhood sources.

13.3.3 Several main roads contribute to the sound environment of the Leeds Station area, including the M621; the A58; the A62; the A643; the A653 and the A61. Several rail lines serving the existing Leeds Station contribute to the sound environment within the area.

13.3.4 Sound levels close to these main transportation routes are high during the daytime and are generally lower at night. Sound levels decrease with increasing distance from the main transportation routes.

13.3.5 The effects of vibration at all receptors are being initially assessed using specific thresholds, below which receptors will not generally be adversely affected by vibration. Further information is provided in Volume 1, Section 8.

13.3.6 The baseline assessment presented in the formal ES will consider current sound levels and how these may change in the future. This will include any changes firstly due to national trends such as road traffic growth and the progressive electrification of road vehicles and secondly due to area specific changes caused either by local committed development and/or noise reduction provided in Important Areas identified in Defra's Noise Action Plans for Agglomerations[109], Roads[110] or Railways[111]. HS2 Ltd will engage with the Competent Authorities responsible for the relevant Important Areas. Map Series SV-01 (Volume 2: LA18 Map Book) shows any noise Important Areas in the Leeds Station area.

13.4 Effects arising during construction

Assumptions and limitations

13.4.1 The construction arrangements that form the basis of the assessment are presented in Section 2.3 of this report, in Volume 1, Section 8 and in the draft Code of Construction Practice (CoCP)[112]. 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 (Section 13), which are:

- best practicable means (BPM) as defined by the Control of Pollution Act 1974 (CoPA) and Environmental Protection Act 1990 (EPA), which will be applied during construction activities to minimise noise (including vibration) at neighbouring residential properties and other sensitive receptors[113];
- as part of BPM, mitigation measures are applied in the following order:

[109] Noise Action Plan: Agglomerations (large urban areas) (2014) Department for Environment, Food & Rural Affairs
[110] Noise Action Plan: Roads (including major roads) (2014) Department for Environment, Food & Rural Affairs
[111] Noise Action Plan: Railways (including major railways) (2014) Department for Environment, Food & Rural Affairs
[112] Supporting document: Draft Code of Construction Practice
[113] Including local businesses and quiet areas designated by the local authority.

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

13.4.4 Noise insulation or, where appropriate, temporary re-housing would avoid residents of qualifying properties being significantly affected by levels of construction noise inside their dwellings. Work is being undertaken to provide a reasonable worst case estimate of the buildings that are likely to qualify for such measures and the estimate will be reported in the formal ES.

13.4.5 Qualification for noise insulation and temporary re-housing would be confirmed as part of seeking prior consent from the local authority under Section 61 of the CoPA. Qualifying properties would be identified, as required in the draft CoCP so that noise insulation could be installed, or any temporary re-housing provided, before the start of the works predicted to exceed noise insulation or temporary re-housing criteria.

Assessment of impacts and effects

13.4.6 Potential construction airborne noise significant effects could occur at the communities, or those parts of the communities, that are nearest to the Proposed Scheme in the following locations, as a result of the construction works illustrated on Map Series CT-05 (Volume 2: LA18 Map Book):

- Holbeck area in Leeds Southbank, arising from construction activities such as demolition, viaduct construction, HS2 Leeds station construction, and road realignment;

- Granary Wharf area in Leeds Southbank, arising from construction activities such as demolition, and HS2 Leeds station construction; and
- Brewery Wharf area in Leeds Southbank, arising from construction activities such as demolition, Leeds viaduct construction, HS2 Leeds station construction, and road realignments.

13.4.7 Map Series SV01 (Volume 2: LA18 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):

- Eiger Music Studios and Vox Exhibition Centre in the Pottery Field area in south Leeds;
- Clayton Hotel Leeds in the Holbeck area in Leeds Southbank;
- DoubleTree by Hilton hotel in the Granary Wharf area in Leeds Southbank; and
- Roomzzz Leeds City hotel in the Brewery Wharf area in Leeds Southbank.

13.4.8 There are a number of planned developments in the Leeds City Centre area that may introduce new noise sensitive receptors. These will be reviewed and where appropriate, assessed in the formal ES.

13.4.9 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.

13.4.10 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:

- Sweet Street and St Barnabas Road between A653 Meadow Road and A653 Victoria Road;
- Back Row and Water Lane, between Bridgewater Place and A653 Victoria Road;
- Meadow Lane, Hunslet Road, Swinegate and Sovereign Street between A61 Great Wilson Street and Crown Point Road and the existing Leeds Station; and
- Princes Square, Aire Street, Whitehall Road, Thirsk Row, Northern Street, New Station Street and Wellington Street between the existing Leeds Station and A58 Wellington Bridge Street.

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

Other mitigation measures

13.4.12 Further work is being undertaken to confirm the likely significant effects and identify any site-specific mitigation, or amendment to construction routes considered necessary in addition to the general measures set out in the draft CoCP. Any site-specific mitigation will be presented in the formal ES and would include an estimate of

the number of properties that may qualify for noise insulation or temporary re-housing under provisions set out in the draft CoCP.

Summary of likely residual significant effects

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

13.4.14 Non-residential receptors identified at this stage as potentially subject to construction noise or vibration effects will be further considered, where necessary, on a receptor-by-receptor basis. Any likely significant effects will be reported in the formal ES.

13.5 Effects arising from operation

Assumptions and limitations

Local assumptions

13.5.1 The assessment of the effects of noise and vibration from the operation of the Proposed Scheme is based on the envisaged design as described in Section 2.2 of this report and in Volume 1, Sections 4 and 8 and the highest likely train flows, assuming the service pattern including Phase One and Phase Two services. The expected passenger service frequency for Phase 2b is described in Volume 1, Section 4 and as outlined below for the existing Leeds Station area.

13.5.2 Passenger services will start at or after 05:00 from the terminal stations. In this area, with Phase One and Phase Two in operation, after 05:00 services will progressively increase to five trains per hour in each direction on the main lines with an operating speed below 120kph. This number of services is assumed to operate every hour from 07:00 to 21:00. The number of services will progressively decrease after 21:00 and the last service will arrive at terminal stations by midnight. Further information is presented in Volume 1, Section 4.

Avoidance and mitigation measures

13.5.3 The development of the Proposed Scheme alignment has sought to reduce noise impact insofar as reasonably practicable.

13.5.4 Envisaged avoidance and mitigation measures that apply route-wide are described in Volume 1, Section 9.

Airborne noise

13.5.5 Through the procurement process for the trains and the track, the use of proven international technology will enable the railway to be quieter than implied by current minimum European standards. Details of operational train noise will be provided in the formal ES. Overall it is assumed that proven international technology would reduce noise emissions by approximately 3dB at 360kph (225mph) compared to the current minimum European standards[114].

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

13.5.6 Noise effects would be reduced in locations along the route by engineering structures (including station design).

Ground-borne noise and vibration

13.5.7 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

13.5.8 Map Series SV-01 (Volume 2: LA18 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.

13.5.9 The potential for noise effects that are considered significant on a community basis in areas between the 50dB and 65dB daytime noise contours, or 40dB and 55dB night-time contours, is dependent on the baseline in that area and the change in level brought about by the Proposed Scheme. Baseline information will be confirmed in the formal ES.

13.5.10 A summary of the likely significant effects identified on a precautionary basis is presented at the end of this section.

13.5.11 Likely significant airborne noise effects arising from permanent changes to existing roads, will be reported in the formal ES.

Other mitigation measures

13.5.12 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

13.5.13 Mitigation described in Volume 1, Section 9, section 2.2 and presented in Map Series SV-01 (Volume 2: LA18 Map Book) and Map Series CT-06 (Volume 2: LA18 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.

13.5.14 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.

13.5.15 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 any individual residential properties close to the Proposed Scheme.

13.5.16 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.

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

13.5.18 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

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

13.5.20 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 route of the Proposed Scheme.

13.5.21 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 consequential potential significant effects on transport users arising from the construction and operation of the Proposed Scheme through the Leeds Station area.

14.1.2 Engagement with Highways England, Leeds City Council (LCC), West Yorkshire Combined Authority (WYCA) and Network Rail 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: LA18 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)[115].

14.2.2 The study area for traffic and transport includes the Hunslet and Holbeck areas and surrounding area of Leeds city centre together with the existing Leeds Station.

14.2.3 The study area also includes all roads potentially affected by the Proposed Scheme including the M621, which is the only strategic route in the Leeds Station area. It also includes the following local roads: the A58(M)/A58; the A61 Hunslet Road/Great Wilson Street; the A653 Victoria Road/Great Wilson Street/Meadow Lane/Meadow Road/Dewsbury Road; Jack Lane; Parkfield Street; Leathley Road; Cross Myrtle Street; Ivory Street; Kidacre Street; Holmes Street; City Walk; Manor Road; Back Row; New Lane; Water Lane; Sovereign Street; Neville Street; Dark Neville Street; Meadow Lane; Sovereign Place; Pitt Row; Little Neville Street; Swinegate; New Station Street; Princes Square; Wellington Street; Aire Street; Thirsk Row and Northern Street.

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.

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

14.3 Environmental baseline

Existing baseline

14.3.1 Existing conditions in the study area have been determined through site visits, traffic and transport surveys, liaison with Highways England, LCC, WYCA and Network Rail (including provision of information on public transport, public rights of way (PRoW) and accident data) and desktop analysis.

Surveys

14.3.2 Traffic surveys, comprising junction turning counts and queue surveys and automatic traffic counts, were undertaken in June, July, October and November 2017. These data have been supplemented by existing traffic data from other sources, including from Highway England, LCC, WYCA and Network Rail. Assessment of the data indicates that the peak hours in the area are 08:00-09:00 and 16:30-17:30. However, there are only small differences (1% to 5%) between the observed peak hours and the periods 08:00-09:00 and 17:00-18:00, which are the periods when HS2 construction traffic movements and workforce arrivals and departures would have the maximum impact. Consequently, the 08:00-09:00 and 17:00-18:00 periods have been used as the assessment hours representing a reasonable worst case.

14.3.3 PRoW surveys were undertaken in August and 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 M621 is the only strategic route which passes through the area. The strategic road network in the Leeds Station area is busy at peak times and delays can be experienced.

14.3.5 The local roads that could be affected by the Proposed Scheme include: the A58(M)/A58; the A61 Hunslet Road/Great Wilson Street; the A653 Victoria Road/Great Wilson Street/Meadow Lane/Meadow Road/Dewsbury Road; Sovereign Street; Swinegate; Neville Street; Jack Lane; Parkfield Street; Leathley Road; Cross Myrtle Street; Ivory Street; Kidacre Street; Holmes Street; City Walk; Manor Road; Back Row; New Lane; Water Lane; Sovereign Street; Neville Street; Dark Neville Street; Meadow Lane; Sovereign Place; Pitt Row; Little Neville Street; Swinegate; New Station Street; Princes Square; Wellington Street; Aire Street; Thirsk Row and Northern Street. The local road network in this area is busy at peak times and delays can be experienced.

14.3.6 Relevant accident data for the road network subject to assessment have been obtained from the Department for Transport[116]. Data for the three-year period (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 Five accident clusters were identified within the Leeds Station area:

- M621 Junction 2 (17 accidents, including one with a serious casualty);
- the junction of the A61 Duke Street with York Street (18 accidents, including one with a fatality and one with serious casualties);
- the junction of the A61 Marsh Lane with Mill Street (nine accidents, including one with a serious casualty);
- the junction of the A65 Kirkstall Road with Wellington Street/West Street, the A58(M) and the A58 (14 accidents, including one accident with three serious casualties); and
- Armley Gyratory (34 accidents, including one with a serious casualty).

14.3.8 The route of the Proposed Scheme would cross 22 roads with footways within the Leeds Station area. These are: the A653 Dewsbury Road/Meadow Road/Meadow Lane/Victoria Road/Great Wilson Street; Jack Lane; Parkfield Street; Leathley Road; Cross Myrtle Street; Kidacre Street; Holmes Street; City Walk; Manor Road; New Lane; the A61 Great Wilson Street; Meadow Lane; Water Lane; Neville Street; Sovereign Street; Little Neville Street; Pitt Row; and Dark Neville Street.

Parking and loading

14.3.9 There is on-street parking on some roads within the Leeds Station area that would be impacted by the Proposed Scheme. This includes pay and display parking on New Lane and Holmes Street and informal parking on Cross Myrtle Street, Leathley Road and Kidacre Street. There are also off-street parking and loading areas that may be impacted.

14.3.10 Car parking is provided at the existing Leeds Station for long-stay and short-stay users with a total of 749 long-stay parking spaces and 37 short-stay parking spaces provided. The car parks are accessed from Princes Square via Aire Street to the north-east of the main station building.

14.3.11 A dedicated taxi rank and pick-up facility is provided on New Station Street that is accessed from Boar Lane. Drop-off facilities for taxis, private hire vehicles and private vehicles is provided on Princes Square. This area is also used by private hire vehicles and private vehicles arriving to pick passengers up. Informal drop-off/pick-up associated with the station by taxis, private hire vehicles and private vehicles also occurs at the Queen's Hotel (on City Square) and within the bus stop lay-by on Bishopsgate.

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

Public transport network

14.3.12 Bus services 1, 70, 117, 217, 220, 221, 222, 223, 481, PR1, PR2, MAX 202, MAX 203, X25, X29 and X41 all operate along, and are served by bus stops on Neville Street, and therefore operate near the existing Leeds Station. The station is also served by a number of bus routes on New Station Street, with five bus stops provided at or close to the New Station Street entrance to the station.

14.3.13 Twenty-three bus routes operate on nine roads that are crossed by the route of the Proposed Scheme in the Leeds Station area. There are also bus stops along these routes which serve residential and employment land uses, as well as the existing Leeds Station. The bus routes that could be affected by the Proposed Scheme include:

- the A653 Dewsbury Road/Meadow Road and Parkfield Street: Bus services 1, 2, 3/3A, 117, 217, 220, 221, 222, 223, 481, MAX 202, and MAX 203;
- A653 Meadow Road (at City Walk): bus services 2, 3/ 3A; 51, 52, 481; PR1; and X25;
- the A653 Victoria Road/Great Wilson Street and Neville Street: Bus services 1, 2, 3/3A, 51, 52, 117, 70, 217, 220, 221, 222, 223, 481, MAX 202, MAX 203, X25, X29, X41, PR1, and PR2; and
- Meadow Lane (north of A61 Great Wilson Street) and A61 Great Wilson Street (east of Crown Point Road): Bus services 2, 3/3A, 12, 13/13A, 47, 48, 51; and 52.

14.3.14 National and local rail services are accessible via the existing Leeds Station. Leeds Station provides access to national services to London, Birmingham and the south-west, the north-west, the north-east and Scotland. Leeds Station also provides access to local services to areas of North, West and South Yorkshire.

14.3.15 Coach services also operate along a number of roads in the Leeds Station area. Outbound services from Leeds Coach Station to Manchester, Birmingham and London travel westbound along the A61 to access the M621 at junction 4. Inbound services to Leeds Coach Station from London, Birmingham and Manchester travel eastbound along the A61 from junction 4 of the M621.

Non-motorised users

14.3.16 There are pedestrian footways adjacent to many of the roads in the Leeds Station area. Footways vary in width and condition within these areas.

14.3.17 The route of the Proposed Scheme would cross the route of one PRoW within the Leeds Station 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. This is the non-definitive Leeds City Footpath (along the south side of the River Aire) (Footpath Number 62). The surveys undertaken to inform the assessment show that this PRoW and 11 roadside footways crossed by the Proposed Scheme are used by more than 100 users per day. The routes with the greatest usage during the survey day were: Jack Lane used by 153 pedestrians and 11 cyclists; Parkfield Street used by 166 pedestrians and 13 cyclists; Cross Myrtle Street used 320 pedestrians and 56 cyclists;

the A653 Dewsbury Road (south of Holmes Street) used by 448 pedestrians and 31 cyclists; Holmes Street used by 146 pedestrians and 33 cyclists; the A653 Victoria Road used by 184 pedestrians and 16 cyclists; Kidacre Street used by 313 pedestrians; the A653 Great Wilson Street used by 338 pedestrians; Sovereign Street used by 3,225 pedestrians and 56 cyclists Neville Street used by 3,506 pedestrian and 300 cyclists; Little Neville Street used by 3,361 pedestrians and 86 cyclists; and non-definitive Leeds City Footpath (along the south side of the River Aire) used by 15 cyclists and 284 pedestrians.

14.3.18 The surveys undertaken indicate that weekday use of these routes is generally higher than at the weekend. The routes with greater usage during the survey day at the weekend than on a weekday were: the A653 Dewsbury Road (south of Parkfield Street); Parkfield Street, Leathley Road; Holmes Street; and non-definitive Leeds City Footpath (along the south side of the River Aire).

14.3.19 In the Leeds Station area, National Route 66 (part of the National Cycle Network) crosses the route of the Proposed Scheme along the southern side of the River Aire (which is part of the non-definitive Leeds City Footpath). This was observed to be used by 15 cyclists on a weekday and 77 cyclists on a weekend day.

Waterways and canals

14.3.20 There are two navigable waterways in the Leeds Station area:

- the River Aire (Navigable Waterway and Towpath and part of the Aire and Calder Navigation Main Line) is located to the south of the city centre and runs beneath the existing Leeds Station; and
- the Leeds and Liverpool Canal also runs through the area connecting to the River Aire directly south of the existing Leeds Station.

Air transport

14.3.21 Leeds Bradford Airport is located approximately 12km north-west of the proposed HS2 Leeds station. However, it is not expected that there will be any effects on air transport and this topic is not considered further in this assessment.

14.4 Effects arising during construction

Avoidance and mitigation measures

14.4.1 The following measures are currently proposed to avoid or reduce effects on transport users:

- new highways (roads and PRoW) would be constructed and operational prior to the permanent closure of any existing highways, insofar as reasonably practicable;
- the majority of roads crossing the route of the Proposed Scheme would be maintained or locally diverted during construction to limit the need for diversion of traffic onto alternative routes;
- traffic management measures would be implemented to limit any disruption;

- road closures would be restricted to overnight and weekends, insofar as reasonably practicable;
- temporary alternative routes for PRoW would be provided during construction, insofar as reasonably practicable, where either the existing or final proposed route is not available;
- where reasonably practicable, site haul routes would be created adjacent to the route of the Proposed Scheme to transport construction materials and equipment to reduce heavy goods vehicles (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)[117] 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 HGV 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.

[117] Supporting document: Draft Code of Construction Practice

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[118] to be produced that would include a range of potential measures to mitigate the impacts of traffic and transport movements associated with construction of the Proposed Scheme.

14.4.7 Where works potentially affect Network Rail assets, disruption to travelling passengers and freight movements would be reduced insofar as reasonably practicable. This includes measures such as:

- programming the construction works to coincide with the possessions that are required and planned by Network Rail for the general maintenance of their railway;
- planning the required construction works so that they can be undertaken in short overnight stages so that passenger services are not disrupted; and
- programming longer closures at the weekend and on bank holidays to reduce insofar as reasonably practicable the number of passengers affected.

Assessment of impacts and effects

Temporary effects

14.4.8 The traffic and transport impacts during the construction period within the Leeds Station area are likely to include:

- construction vehicle movements to and from the various construction compounds;
- road closures and associated realignments and diversions;
- alternative routes for PRoW;
- possessions and blockades on the conventional rail network; and
- impacts on the existing Leeds Station due to construction work which could affect users of the station and users of the adjacent highway network.

14.4.9 The construction assessment has also considered any impacts in the Leeds Station area that arise from construction of the Proposed Scheme in the adjoining community areas (CA).

[118] 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.

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: LA18 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, HGV 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 M621 junctions 2 and 3;
- the A58(M)/A58 between the M621 and the junction with Wellington Street;
- the A61 Great Wilson Road/Hunslet Road;
- the A653 Dewsbury Road/Meadow Road/Meadow Lane/Victoria Road/Great Wilson Street; Neville Street;
- Sovereign Street;
- Meadow Lane north of A61 Great Wilson Street;
- Swinegate between Leeds Bridge and Sovereign Street;
- Jack Lane;
- Parkfield Street;
- Cross Myrtle Street;
- Kidacre Street;
- Junction Street;
- Leathley Road;
- Holmes Street;
- Wellington Street between the A58(M) and Thirsk Row;
- Aire Street;
- Princes Square;
- Thirsk Row; and
- Northern Street.

14.4.13 In addition to increases in traffic flows due to construction traffic, construction of the Proposed Scheme is expected to result in temporary highway closures and diversions or realignments as set out in Section 2.3. The works to construct both temporary and permanent highway diversions/realignments could also result in disruption to highway users. These are expected to include:

- local diversions of the A653 Victoria Road between the A653 Meadow Lane and Water Lane;
- local diversions of the A653 Meadow Lane between the A653 Victoria Road and the A61 Great Wilson Street;
- closure of Neville Street between Victoria Bridge and Bishopgate Street;
- closure of Sovereign Street between Pitt Row and Neville Street; and
- closure of Little Neville Street at its junction with Neville Street.

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 temporary impacts on parking and loading. This would include parking bays or other parking amenities, which could 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 temporary bus route diversions, including bus routes that use Neville Street, the A653 Victoria Road and the A653 Meadow Lane. 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 East Coast Main Line, TransPennine Line and the Hallam Line, which operate through the existing Leeds Station. Rail possessions would be required to undertake localised works, including the construction of the new overbridge across the existing east to west through railway lines, connecting the north side of the

existing station with the new common concourse. This could potentially result in disruption to services, although many of the interventions would be combined to reduce the frequency of potential disruption. The effects of railway possessions will be assessed and reported in the formal ES.

14.4.21 Some users of the existing Leeds Station would be impacted during construction of the Proposed Scheme. As well as restrictions during works to the station itself, this would include the diversion of bus routes and the relocation of bus stops, particularly on Neville Street, as well as reduced pedestrian access to the station via Neville Street and Little Neville Street. The taxi rank for the existing Leeds Station is located on New Station Street and would not be directly affected by the Proposed Scheme. However, access to the existing Leeds Station for taxis and other vehicles may be impacted during construction of the Proposed Scheme. The effects on users of the existing Leeds Station will be reported in the formal ES.

Non-motorised users

14.4.22 The construction works associated with the Proposed Scheme would require the temporary closure or diversion/realignment of PRoW and other pedestrian or cyclist routes. There would be temporary alternative routes for a number of routes in the vicinity of the Proposed Scheme. Where necessary, pedestrian and cyclist routes would be re-routed around construction compounds. Alongside the changes to highways, it is currently expected that one PRoW, non-definitive Leeds City Footpath (along the south side of the River Aire), would be temporarily diverted.

14.4.23 The changes to pedestrian and cyclist routes are likely to result in some increases in travel distance with the potential for adverse significant effects. The assessment of these will be reported in the formal ES.

Waterways and canals

14.4.24 It is not currently expected that the construction of the Proposed Scheme would have a significant effect upon navigable waterways or canals in the Leeds Station area.

Permanent effects

14.4.25 Any permanent effects of construction will be considered in the assessment of operation for traffic and transport. This is because the impacts and effects of ongoing increases in travel demand and the wider impacts and effects of the operations phase need to be considered together.

Other mitigation measures

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

14.4.27 Any further traffic and transport mitigation measures required during the construction of the Proposed Scheme will be considered based on the outcomes of the assessment. These will be reported in the formal ES.

Summary of likely residual significant effects

14.4.28 Construction of the Proposed Scheme has the potential to lead to additional congestion and delays for road users on a number of routes including: the M621 junctions 2 and 3; the A58(M)/A58; the A61 Great Wilson Road/Hunslet Road; Neville Street; the A653 Dewsbury Road/Meadow Road/Meadow Lane/Victoria Road/Great Wilson Street; Sovereign Street; Meadow Lane (north of A61 Great Wilson Street); Swinegate; Jack Lane; Parkfield Street; Cross Myrtle Street; Kidacre Street; Junction Street; Leathley Road; Holmes Street; Wellington Street; Aire Street; Princes Square; Thirsk Row; and Northern Street. 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.

14.4.29 Construction of the Proposed Scheme is also likely to result the temporary closures and diversions or realignments of the following: the A653 Victoria Road; the A653 Meadow Lane; Neville Street; Sovereign Street and Little Neville Street. These would affect all road users including pedestrians and cyclists.

14.4.30 It is currently expected that the construction of the Proposed Scheme could have temporary impacts on parking and loading. This would include parking bays or other parking amenities, which could be affected or temporarily suspended due to construction works.

14.4.31 The works would require the temporary diversion of 13 bus routes that operate along Neville Street, the A653 Victoria Road/Meadow Lane and the relocation of bus stops associated with these routes.

14.4.32 Rail possessions would be required to undertake localised works within Leeds Station. This could potentially result in disruption to services.

14.4.33 Access to the existing Leeds Station would be impacted during construction of the Proposed Scheme, affecting pedestrian, bus and taxi users. Users of the station could also be affected by works to construct the new high speed station.

14.4.34 Construction of the Proposed Scheme would require the temporary closure or diversion/realignment of one PRoW; the non-definitive Leeds City Footpath and diversion of other roadside routes.

14.4.35 The assessment of significant effects in relation to traffic and transport during construction of the Proposed Scheme will be reported in the formal ES.

14.5 Effects arising from operation

Avoidance and mitigation measures

14.5.1 The following measures have been included as part of the design of the Proposed Scheme and would avoid or reduce impacts on transport users:

- HS2 Leeds station would include provision for access by sustainable modes, including walking and cycling to promote non-car access;
- changes to the highway and pedestrian routes and public transport network to accommodate users of the HS2 services;

- provision of dedicated taxi, private hire vehicle and private vehicle drop-off and pick-up facilities; and
- reinstatement of roads on or close to their existing alignments, where reasonably practicable.

14.5.2 A station travel plan for HS2 Leeds station would include measures that aim to reduce the impacts and effects of traffic and transport movements.

Assessment of impacts and effects

14.5.3 The following section considers the impacts on traffic and transport and the likely consequential effects resulting from the operational phase of the Proposed Scheme. Operational effects arising from the Proposed Scheme in year 2033 and year 2046 will be reported in the formal ES.

Key operation transport issues

14.5.4 HS2 Leeds station would be a new station for the Proposed Scheme, providing direct and fast access from Leeds to the Midland and the south of England. It would link to the existing Leeds Station. These benefits would include improved journey times between Leeds the Midlands and the south of England, increases to rail capacity in the West Yorkshire area, and reduced pressure and lower crowding on the conventional rail network.

14.5.5 The operation of the Proposed Scheme could result in impacts on the highway and public transport networks within this area due to increased rail users and traffic associated with the HS2 Leeds station. However, the maintenance of the Proposed Scheme would generate limited vehicular trips and the effect would not be significant.

14.5.6 The operational impacts are therefore primarily related to the major benefits arising from improved public transport provision together with traffic associated with HS2 Leeds station and the permanent diversion, realignment and closure of roads.

Public transport network

14.5.7 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 Leeds Station and from the introduction of HS2 services at the HS2 Leeds station;
- significantly improved journey times between Leeds, the Midlands and south of the UK, as detailed in Volume 1; 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.

14.5.8 The permanent realignment of roads could increase travel distances for bus passengers. This would include bus routes 1, 2, 3/3A, 51, 52, 70, 117, 217, 220, 221, 222, 223, 481, MAX 202, MAX 203, PR1, PR2, X25, X29 and X41 that use the A639 Great Wilson Street. This could result in increased journey times and would require the relocation of bus stops. However, the provision of new bus facilities included in the

Proposed Scheme would improve bus access to the Leeds Station area. Any consequent effects will be reported in the formal ES.

Highway network

Strategic and local highway network

14.5.9 The Proposed Scheme would result in a number of permanent highway changes that would affect all users, including pedestrians and cyclists. These include:

- Jack Lane, which would be closed on both sides of the Proposed Scheme. An alternative route would be available via Leathley Road, Cross Myrtle Street and Kidacre Street and users would be able to cross the route of the Proposed Scheme at Holmes Street;
- A653 Dewsbury Road, which would be realigned at its junction with Jack Lane;
- Parkfield Street, which would be realigned at its junction with Jack Lane and the A653 Dewsbury Road;
- Cross Myrtle Street, which would be realigned at its southern end;
- Leathley Road, which would be realigned at its junction with Cross Myrtle Street;
- Holmes Street, which would be realigned at its junction with Kidacre Street;
- Kidacre Street, which would be realigned at its junction with Holmes Street;
- the A653 Great Wilson Street, which would be closed between the A653 Victoria Road and the A653 Meadow Lane. An alternative route would be available via the A653 Victoria Road and the A653 Meadow Lane;
- the A653 Victoria Road, which would be realigned and modified to provide bi-directional flows as result of the closure of the A653 Great Wilson Street and to provide access to the Leeds Station taxi, private hire vehicle and private vehicle pick-up and drop-off facilities;
- the A653 Meadow Lane, which would be realigned and modified to provide bi-directional flows as a result of the closure of the A653 Great Wilson Street;
- the A61 Great Wilson Street which would be realigned between Junction Street and the A653 Meadow Lane;
- City Walk, which would be realigned at its junction with the realigned A653 Victoria Road;
- Manor Road, which would be realigned at its junction with the realigned A653 Victoria Road;
- New Lane, which would be closed to accommodate the Proposed Scheme;
- Water Lane, which would be reconfigured at its junction with the A653 Victoria Road;

- Meadow Lane, which would be realigned at the junction of the A61 Great Wilson Street and the A653 Meadow Lane;
- Neville Street, which would be closed to vehicular traffic but would allow for future use by public transport (northbound only) and emergency vehicles;
- Little Neville Street, which would be realigned from its junction with Neville Street to its western extent;
- Sovereign Street, which would be realigned at its junction with Neville Street; and
- Pitt Row, which would be realigned at its junction with Sovereign Street.

14.5.10 Operation of the Proposed Scheme would result in changes in traffic flows due to passengers and staff accessing HS2 Leeds station. This could result in changes to traffic movements in the Leeds Station area and affect, in particular, the M621; the A61 Hunslet Road/Great Wilson Street; the A653 Victoria Road/Meadow Lane/Meadow Road/Dewsbury Road; Sovereign Street; Swinegate; Neville Street; Leathley Road; Cross Myrtle Street; Kidacre Street and Holmes Street.

14.5.11 The Proposed Scheme would also introduce changes to taxi facilities, bus pick up and drop off, car parking, servicing and loading. The key changes are:

- the provision of a new long- and short-stay multi-storey car park. This would be accessed from the junction of the A653 Meadow Lane/Victoria Road;
- the provision of dedicated taxi, private hire vehicle and private vehicle pick-up and drop-off facilities which would be accessed from the A653 Victoria Road;
- the provision of bus stops on-street on Meadow Lane, the A653 Victoria Road and Sovereign Street close to HS2 Leeds station entrances; and
- off-street loading and servicing facilities which would be accessed from the A653 Meadow Lane.

14.5.12 The effects of these changes will be reported in the formal ES.

Accidents and safety

14.5.13 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

14.5.14 Long-stay and short-stay car parking would be provided for the HS2 Leeds station. In addition, HS2 Ltd would provide parking spaces in the existing Leeds Station area to help offset those displaced.

14.5.15 It is currently expected that there would be a permanent loss of car parking at locations along the route of the Proposed Scheme in this area. This would include New Lane and Holmes Street. Where car parking is lost that would have served facilities that are displaced by the Proposed Scheme this is not considered a material effect.

14.5.16 HS2 Ltd will work with the businesses affected to identify opportunities where reasonably practicable to mitigate effects on parking.

14.5.17 The effects of these changes will be reported in the formal ES.

Non-motorised users

14.5.18 The layout of the HS2 Leeds station would improve permeability and connectivity through the station in the east-west and north-south directions. This would enhance connectivity across the Leeds South Bank area to destinations including the former Tetley Brewery site (which is proposed for development) and would provide pedestrian connectivity between HS2 Leeds station entrances and the city centre and surrounds. It is also proposed to enhance the east-west connectivity on both sides of the River Aire, including along National Cycle Route 66 (part of non-definitive Leeds City Footpath) on the south side of the river. A cycle parking area would also be provided.

14.5.19 The Proposed Scheme would result in a number of permanent highway changes that would affect pedestrians and cyclists.

14.5.20 It is expected that the HS2 Leeds station would generate additional pedestrian movements particularly in the morning and evening peak hour. These pedestrian movements would then be dispersed to access onward travel modes and nearby destinations, increasing use of footways and crossings in the local area.

14.5.21 The effect of these changes will be reported in the formal ES.

Waterways and canals

14.5.22 It is not currently expected that the operation of the Proposed Scheme would have a significant effect upon navigable waterways or canals in the Leeds Station area.

Other mitigation measures

14.5.23 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.

14.5.24 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

14.5.25 The Proposed Scheme would generate significant major beneficial effects for rail passengers as a result of the introduction of HS2 services at HS2 Leeds station, including significantly improved journey times between Leeds, the Midlands and the south of the England and released capacity on the network easing pressure on other passenger rail services. The permanent realignment of roads could increase travel distances for bus passengers on bus routes that use the A653 Great Wilson Street.

14.5.26 Operation of the Proposed Scheme would require permanent highway changes affecting all users including pedestrians and cyclists. These include the permanent closure of: Jack Lane; the A653 Great Wilson Street (between the A653 Victoria Road

and the A653 Meadow Lane); and New Lane. Neville Street would be closed to vehicular traffic except for public transport (northbound only), servicing and emergency vehicles. Operation of the Proposed Scheme would also require the permanent diversion of: Myrtle Street; Leathley Road; Holmes Street; Kidacre Street; the A653 Victoria Road; the A653 Meadow Lane; City Walk; Manor Road; Water Lane; Little Neville Street; Sovereign Street and Pitt Row. 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.

14.5.27 It is currently expected that there would be a permanent loss of car parking at locations along the route of the Proposed Scheme in this area. This would include New Lane and Holmes Street.

14.5.28 The layout of the HS2 Leeds station would improve permeability and connectivity through the station. It is expected that the HS2 Leeds station would generate additional pedestrian movements particularly in the morning and evening peak hour which would increase usage of footways and crossings in the local area.

14.5.29 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

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

14.5.31 A station travel plan will detail monitoring of travel associated with operation of HS2 Leeds station.

14.5.32 There are no other area-specific monitoring requirements currently proposed for traffic and transport in the Leeds Station 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 Leeds Station area. The likely impacts and significant effects of the Proposed Scheme's construction and operation on surface water and groundwater bodies and their associated water resources are assessed. The likely impacts and significant effects of the Proposed Scheme on flood risk and land drainage are also considered.

15.1.2 Engagement has been undertaken with the Environment Agency, Canal & River Trust (CRT), Leeds City Council (LCC) which is the Lead Local Flood Authority (LLFA) and Yorkshire Water Limited (the local water and sewerage undertaker). The purpose of this engagement has been to obtain relevant baseline information and to discuss the Proposed Scheme and potential effects. Engagement with these stakeholders will continue as part of the development of the Proposed Scheme.

15.1.3 Maps showing the location of the key environmental features (Map Series CT-10), and the key construction (Map Series CT-05) and key operational (Map Series CT-06) features of the Proposed Scheme can be found in the Volume 2: LA18 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)[119].

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)[120].

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.

[119] National Planning Policy Framework, DCLG, 2015.
[120] Supporting document: HS2 Phase 2b Environmental Impact Assessment Scope and Methodology Report

15.2.3 This assessment is based on desk study information, including information provided to date by consultees and stakeholders, as well as surveys of accessible water features.

15.2.4 Where surveys have not been undertaken due to land access constraints, a precautionary approach has been adopted in the assessments of receptor value and impact magnitude.

15.2.5 Hydraulic analysis is currently being undertaken of watercourses and key structures within flood risk areas. This includes modelling of the River Aire and Hol Beck.

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[121] identifies the chemical[122] and ecological[123] status of surface water bodies, and the quantitative[124] and chemical[125] 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.

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

[121] Environment Agency (2015), Water for life and livelihoods Part 1: Humber river basin district: River basin management plan.
[122] The chemical status of surface waters reflects concentrations of priority and hazardous substances present.
[123] 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.

[124] 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.
[125] 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.

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 25. The receptor value attributed to each individual water body is based on the methodologies set out in the SMR.

Table 25: Surface water body receptors

Water body name and location[126]	Designation	Q95 value (m3/s)[127]	Receptor value	Parent WFD water body name and identification number[128]	Current WFD status/Objective[129]
River Aire WR-01-371-b G6 – J4	Main river	2	High	Aire from Gill Beck (Baildon) to River Calder GB104027063032	Moderate/Good by 2027
Hol Beck WR-01-371-b H1 – H4	Ordinary watercourse	0.06	High	Low/Wortley/Pudsey Bks GB104027062830	Moderate/Good by 2027
Lady Beck WR-01-371-b J8 – H6	Ordinary watercourse	0.04	High	Meanwood Beck from Source to River Aire GB104027062900	Moderate/Good by 2027
Leeds and Liverpool Canal WR-01-371-b J3 – H5	Canal	n/a	High	Leeds and Liverpool Canal, summit to Leeds GB70410231	Good/Good by 2015
Aire and Calder Navigation WR-01-371-b H5 – G6	Canal	n/a	High	Aire from Gill Beck (Baildon) to River Calder GB104027063032	Moderate/Good by 2027

Abstractions and permitted discharges (surface water)

15.3.6 There are five licensed surface water abstractions in the study area, all of which are for non-potable, spray irrigation. None of these are located within the land required for the construction and operation of the Proposed Scheme. Three of these are considered as high value receptors due to the daily licence quantity being above 100m^3. The remaining two abstractions are of moderate value due to the daily licence quantity being less than 100m^3.

[126] The feature locations are indicated by the grid coordinates on the relevant Volume 2: LA18 Map Book figure (in this case WR-01).
[127] This is the flow within the watercourse that is exceeded for 95% of the time
[128] The Environment Agency has attributed each surface water and groundwater body a unique water body identification (ID) number.
[129] Status and objectives are based on those set out in the 2015 River basin management plan

15.3.7 Records of private unlicensed surface water abstractions, which comprise those for quantities less than 20m^3 per day, have been obtained from the local authorities. These data indicate that there are no registered private unlicensed surface water abstractions within the study area. As there is no obligation to register private water supplies, unregistered private groundwater supplies may be present. Private water supplies would be assessed as high value receptors unless details obtained from the owner indicate otherwise.

15.3.8 There are seven[130] consented discharges to surface waters within the study area, none 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 26. Unless stated otherwise, the geological groups listed would all be crossed by the Proposed Scheme. Table 26 also identifies the receptor values attributed to each groundwater receptor based on the methodologies set out in the SMR.

Table 26: Summary of geology and hydrogeology in the study area

Geology	Distribution	Formation description	Aquifer classification	WFD body (ID) and current overall status[131]	WFD status objective[132]	Receptor value
Superficial deposits						
Alluvium	Along the River Aire and tributaries	Clay, silt, sand and gravel	Secondary A	Not assessed by the Environment Agency	Not assessed by the Environment Agency	Moderate
River Terrace Deposits	Along the River Aire and tributaries	Clay, sand and gravel	Secondary A	Not assessed by the Environment Agency	Not assessed by the Environment Agency	Moderate
Bedrock						
Pennine Coal Measures Group – Pennine Lower Coal Measures Formation	The entire study area	Mudstone, siltstone and sandstone, with some areas of mapped sandstone.	Secondary A	Aire and Calder Carboniferous Limestone/Millstone Grit/Coal Measures (GB40402G700400) Poor	Poor by 2015	Moderate

[130] The number of consents listed here is different to the number listed in Section 10, Land quality. This is because the Water resources and flood risk default study area comprises all land within 1km of the centreline of the Proposed Scheme; the Land quality default study area extends 250m from the land required for the construction of the Proposed Scheme. These default study areas are extended where the potential for wider pathways exists.
[131] As stated in the 2015 River basin management plan
[132] As stated in the 2015 River basin management plan

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 26, is outlined briefly as alluvium and River Terrace Deposits, which may be capable of supporting water supplies at a local rather than regional scale and may also form an important source of baseflow to rivers. They have therefore been classified as moderate value receptors.

Bedrock aquifers

15.3.11 The basis of the receptor values attributed to the bedrock aquifers present within the study area, as shown in Table 26, is outlined briefly as the Pennine Coal Measures Group (locally comprising sandstone, and sandstone with interbedded siltstones and mudstones of the Pennine Lower Coal Measures Formation), which has been classified as a Secondary A aquifer by the Environment Agency. As with the superficial deposits this aquifer may be capable of supporting water supplies at a local rather than regional scale and may also form an important source of baseflow to rivers. It has therefore been classified as a moderate value receptor.

WFD status of groundwater bodies

15.3.12 A summary of locations, current overall WFD status, and future overall status objectives associated with the designated bedrock groundwater bodies within the study area is provided in Table 26. The value attributed to each of these receptors is also indicated.

15.3.13 The superficial deposits in the study area are not formally designated as WFD groundwater bodies but may be hydraulically connected to the WFD bedrock aquifers.

Abstractions and permitted discharges (groundwater)

15.3.14 There are no groundwater abstractions licenced for public water supply in the study area. There are no source protection zones (SPZs) associated with licensed public water supplies within the study area.

15.3.15 There are a total of two private groundwater abstraction licences registered in the study area, as shown on Map WR-02-201. Both of these have been assessed as high value receptors because although they are associated with water abstraction for non-potable use, the licence quantities are above 100m3 per day.

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 three[133] consented discharges to groundwater within the study area. These discharges have been assessed as low value receptors.

Groundwater – surface water interactions

15.3.18 Desk-based assessment using Ordnance Survey maps and detailed river network data provided by the Environment Agency did not identify any features within the study area that had potential to be springs.

15.3.19 There are two 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

15.3.20 No groundwater dependent designated nature conservation sites have been identified within the study area that have the potential to be affected by the Proposed Scheme.

15.3.21 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.

Existing baseline - flood risk and land drainage

15.3.22 The Environment Agency's Flood map for planning (rivers and sea)[134] has been used to scope the baseline flood risk for flooding from main rivers and ordinary watercourses. These plans define Flood Zone 2 (land assessed as having between a 1 in 100 (1%) and 1 in 1,000 (0.1%) annual probability of river flooding) and Flood Zone 3 (land assessed as having a 1 in 100 (1%) or greater annual probability of river flooding).

15.3.23 The updated Flood map for surface water[135] 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[136]. The British Geological Survey's (BGS) Groundwater flooding susceptibility dataset[137], has been used to assess the future risk of groundwater flooding.

15.3.24 The following reports were used to help determine the baseline flood risk within the study area:

- Leeds Preliminary Flood Risk Assessment (PFRA) (2011)[138];

[133] The number of consents listed here is different to the number listed in Section 10, Land quality. This is because the Water resources and flood risk default study area comprises all land within 1km of the centreline of the Proposed Scheme; the Land quality default study area extends 250m from the land required for the construction of the Proposed Scheme. These default study areas are extended where the potential for wider pathways exists.
[134] Environment Agency, Flood map for planning. Available online at: https://flood-map-for-planning.service.gov.uk/
[135] 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
[136] 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
[137] British Geological Survey, BGS groundwater flooding. Available online at: http://www.bgs.ac.uk/products/hydrogeology/groundwaterFlooding.html
[138] Leeds Preliminary Flood Risk Assessment (2011) Leeds City Council

- Leeds Strategic Flood Risk Assessment (SFRA) (2007)[139]; and
- Leeds Local Flood Risk Management Strategy (LFRMS) (2014)[140].

River flooding

15.3.25 The study area includes substantial areas of floodplain (Flood Zone 2 and 3) associated with the River Aire. Other watercourses that join the River Aire in the vicinity of the Proposed Scheme include Hol Beck, which flows into the River Aire approximately 50m upstream of the proposed HS2 Leeds station, and Lady Beck, which enters the River Aire approximately 900m downstream. Table 27 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 27: River flood risk sources and receptors

Source	Location description and figure/coordinate[141]	Receptor potentially affected	Receptor value/sensitivity to flooding
River Aire	WR-01-371-b G5	Residential and commercial properties on Brookfield Street; Butterley Street; Cudbear Street; Grape Street; Hunslet Lane; Hunslet Road; Junction Street; Kitson Road; Leathley Road; Pearson Street; Pym Street; Sayner Road; Scala Court and South Accommodation Road	High
	WR-01-371-b G6	Residential and commercial properties on Armouries Drive; Black Bull Street; Carlisle Road; Chadwick Street; Clarence Road; East Street; Neptune Street; Royal Armouries Square; Sayner Lane; South Accommodation Road; The Boulevard and The Walk	High
	WR-01-371-b H5	Residential and commercial properties on Aire Street; Back Row; Blayds Yard; Bridge End; Canal Wharf; City Walk; Concordia Street; Crown Point Road; Dark Neville Street; Dewsbury Road; Dock Street; Great Wilson Street; Holmes Street; Hunslet Lane; Hunslet Road; Junction Street; Kidacre Street; Little Neville Street; Meadow Lane; Meadow Road; Neville Street; New Lane; New Station Street; Princes Square; Sheaf Street; Sovereign Place; Sovereign Street; Swinegate; Victoria Place; Victoria Road; Water Lane; Waterloo Street and Wharf Approach	High
	WR-01-371-b H6	Residential and commercial properties on Armouries Way; Back York Street; Bernard Street; Black Bull Street; Bowman Lane; Brewery Place; Bridge End; Bridge Street; Brussels Street; Call Lane; Chantrell Court; Church Row; Clarence Road; Cross Union Street; Cross York Street;	High

[139] Leeds Strategic Flood Risk Assessment (2007) Leeds City Council
[140] Leeds Local Flood Risk Management Strategy (2014) Leeds City Council
[141] This is the location at which the source intersects the Proposed Scheme, as indicated by the grid coordinates on the relevant Volume 2: LA18 Map Book figure (in this case WR-01).

Source	Location description and figure/coordinate[141]	Receptor potentially affected	Receptor value/sensitivity to flooding
		Crown Point Road; Dock Street; Duke Street; Dyer Street; East Street; Eastgate; George Street; Harewood Street; Harper Court; Harper Street; High Court; High Court Lane; Kendell Street; Kirkgate; Lady Lane; Lydia Street; Marsh Lane; Maude Street; Millgarth Street; Navigation Walk; New York Street; Quarry Hill; Riverside Court; St Peters Place; St Peters Square; St Peters Street; Templar Lane; The Calls; The Chandlers; Turlow Court; Waterloo Street; Wharf Street and York Street	
	WR-01-371-b I4	Residential and commercial properties on Globe Road; Gotts Road; Graingers Way; Riverside Way; Wellington Bridge Street; Wellington Place; Wellington Road to Whitehall Road Towpath; Wellington Street; Whitehall and Whitehall Road	High
	WR-01-371-b I5	Residential and commercial properties on Aire Street; Britannia Street; Duncombe Street; Grove Street; Lisbon Street; Northern Street; Queen Street; Skinner Street; Wellington Place; Wellington Street; West Way; Westgate; Whitehall Quay and Whitehall Road	High
Hol Beck	WR-01-371-b H3	Commercial properties on Triumph Close	Moderate
	WR-01-371-b H4	Residential and commercial properties on Bath Road; Bridge Road; Butcher Street; City Walk; David Street; Foundry Square; Foundry Street; Globe Road; Ingram Street; Keys Court; Leodis Court; Long Passage; Manor Road; Marshall Street; Saw Mill Street; Saw Mill Yard; Siddall Street; Silver Street; St Barnabas Road; Sweet Street; Sweet Street West; Union Place; Victoria Place and Water Lane	High
Lady Beck	WR-01-371-b H7	Residential and commercial properties on Bridge Street; Eastgate; Ladybeck Close; St Peters Place; Templar Street and York Street	High

Surface water flooding

15.3.26 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 28. The value of these receptors, based on Table 57 of the SMR, is also indicated.

Table 28: Surface water flood risk sources and receptors

Source	Location description and figure/coordinate[142]	Receptor potentially affected	Receptor value
Surface water flow paths	WR-01-371-b G3	Residential and commercial properties on Beeston Road; Bismarck Street; Brett Gardens; Colville Terrace; Disraeli Terrace; Folly Lane; Lady Pit Lane; Malvern Road; Moorville Close; Moorville Court; Moorville Grove; Northcote Drive; Northcote Green; St Lukes Green and St Lukes Road	High
	WR-01-371-b G4	Residential and commercial properties on Apex Way; Bismarck Drive; Dewsbury Road; Disraeli Terrace; Moor Crescent Chase; New Craven Gate; Northcote Crescent and Northcote Drive	High
	WR-01-371-b G5	Residential and commercial properties on Brookfield Street; Butterley Street; Cudbear Street; Grape Street; Hunslet Lane; Hunslet Road; Jack Lane; Junction Street; Kitson Road; Leathley Road; Sayner Road and Scala Court	High
	WR-01-371-b G6	Residential and commercial properties on Armouries Drive; Carlisle Road; Chadwick Street; Clarence Road; East Street; Neptune Street; Royal Armouries Square; Sayner Lane; South Accommodation Road and The Boulevard	High
	WR-01-371-b H3	Residential and commercial properties on Beeston Road; Cambrian Street; Cambrian Terrace; Gaitskell Walk; Holbeck Lane; Holbeck Moor Road; Jenkinson Lawn; Lane End Place; Meynell Approach; Meynell Heights Access Road; Meynell Square; Moor View; Moorville Court; Nineveh Parade; Sandlewood Close; Sandlewood Green; St Lukes Road; Temple Garth and Triumph Close	High
	WR-01-371-b H4	Residential and commercial properties on Apex View; Beeston Road; Bridge Road; Butcher Street; City Walk; Elland Terrace; Globe Road; Ingram Street; Jack Lane; Leodis Court; Long Passage; Manor Road; Marshall Street; Meadow Road; New Princess Street; Nineveh Gardens; Nineveh Road; Sandlewood Close; Saw Mill Yard; Siddall Street; Silver Street; St Barnabas Road; Sweet Street; Sweet Street West and Water Lane	High
	WR-01-371-b H5	Residential and commercial properties on Albion Street; Back Row; Bishopgate Street; Blayds Yard; Boar Lane; Bond Street; Bridge End; Briggate; Canal Wharf; City Walk; Concordia Street; Dark Neville Street; Dewsbury Road; Dock Street; Great Wilson Street; Heatons Court; Hunslet Lane; Hunslet Road; Junction Street; Little Neville Street; Meadow Lane; Meadow Road; Neville Street; New Station Street; Sheaf Street; Sovereign Place;	High

[142] This is the location at which the source intersects the Proposed Scheme, as indicated by the grid coordinates on the relevant Volume 2: LA18 Map Book figure (in this case WR-01).

Source	Location description and figure/coordinate[142]	Receptor potentially affected	Receptor value
		Sovereign Street; Swinegate; The Bourse; Victoria Place; Water Lane and Wharf Approach	
	WR-01-371-b H6	Residential and commercial properties on Albion Place; Albion Street; Armouries Way; Back York Street; Bank Street North; Bernard Street; Boar Lane; Bond Street; Bowman Lane; Brewery Place; Bridge End; Bridge Street; Briggate; Burtons Arcade; Call Lane; Central Road; Chantrell Court; Church Row; Commercial Street; County Arcade; Cross Union Street; Cross York Street; Dock Street; Duke Street; Dyer Street; East Street; Eastgate; George Street; Grand Arcade; Harewood Street; Harper Street; Harrison Street; High Court; High Court Lane; King Charles Street; Kirkgate; Lady Lane; Lands Lane; Ludgate Hill; Lydia Street; Marsh Lane; Maude Street; Merrion Street; Millgarth Street; Navigation Walk; New Briggate; New Market Street; New York Street; Quarry Hill; Queen Victoria Street; Queens Arcade; Rockley Hall Yard; St Peters Square; St Peters Street; Templar Lane; The Calls; The Chandlers; The Headrow; Trevelyan Square; Trinity Street; Trinity Street Arcade; Turks Head Yard; Turlow Court; Vicar Lane and York Street	High
	WR-01-371-b H7	Residential and commercial properties on Bridge Street; Eastgate; Ladybeck Close and New York Road	High
	WR-01-371-b I3	Commercial properties on Springwell Road	High
	WR-01-371-b I4	Residential and commercial properties on Gotts Road; Graingers Way; Springwell Road; Wellington Place; Wellington Street; Whitehall and Whitehall Road	High
	WR-01-371-b I5	Residential and commercial properties on Aire Street; Back York Place; Britannia Street; Calverley Street; City Square; Clarendon Road; Clarendon Way; Duncombe Street; East Parade; Grace Street; Great George Street; Greek Street; Grove Street; Hanover Walk; Hanover Way; Infirmary Street; King Street; Leighton Street; Lisbon Street; Northern Street; Oxford Place; Oxford Row; Park Cross Street; Park Lane; Park Place; Park Square East; Park Square North; Park Square West; Park Street; Quebec Street; Queen Street; Russell Street; Somers Street; South Parade; St Georges Road; St Pauls Street; The Headrow; Thoresby Place; Toronto Street; Wellington Place; Wellington Street; West Way; Westgate; Whitehall Quay; Whitehall Road and York Place	High
	WR-01-371-b I6	Residential and commercial properties on Albion Street; Belgrave Street; Bond Street; Calverley Street; Cookridge Street; Great George Street; Merrion Street; Merrion Way; New Briggate; Oxford	High

Source	Location description and figure/coordinate[142]	Receptor potentially affected	Receptor value
		Row; Portland Crescent; Portland Street; Portland Way; South Parade; The Headrow and Wade Lane	

Artificial water bodies

15.3.27 Flooding from artificial water bodies may occur due to failure of an impounding structure, such as a dam or canal embankment. There are no artificial water bodies with potential implications for flood risk within the study area. The Aire and 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.

15.3.28 There are a number of reservoirs located outside the study area, on the Pennine Moors, with potential to affect flood risk of relevance to the Proposed Scheme. The closest of these is Yeadon Tarn, located 11km to the north-west of Leeds. However, as these are large raised reservoirs, subject to the requirements of reservoir safety legislation[143], the inundation risk posed by these reservoirs is considered negligible.

Groundwater flooding

15.3.29 Information related to historical incidents of groundwater flooding in the Leeds Station area is provided within the LCC Strategic Flood Risk Assessment (SFRA). The SFRA states that there is a history of groundwater flooding within the Leeds City centre, however no specific details are provided.

15.3.30 The BGS Groundwater flooding susceptibility dataset indicates that there is potential for groundwater flooding to occur at surface across the study area, particularly in areas where there is coverage with alluvium and River Terrace Deposits.

15.4 Effects arising during construction

Avoidance and mitigation measures

15.4.1 The principal strategy adopted to limit the temporary and permanent effects of the Proposed Scheme is through avoidance of sensitive receptors wherever reasonably practicable. Where receptors could not be avoided, mitigation measures have been incorporated where appropriate and reasonably practicable, to limit the potential effects. Section 16 of the draft Code of Construction Practice (CoCP)[144] includes a range of mitigation measures that aim to reduce construction impacts as far as is reasonably practicable. The avoidance and mitigation measures that are of particular relevance to water resources and flood risk during construction are described in the following sections of this report.

[143] 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
[144] Supporting document: Draft Code of Construction Practice

Water resources and WFD

15.4.2 The avoidance of sensitive receptors has reduced the risks associated with the Proposed Scheme not complying with the requirements of the WFD. Examples of this strategy include:

- avoidance of channels and floodplain areas, where reasonably practicable – the route of the Proposed Scheme would pass over larger watercourses, such as the River Aire on the HS2 Leeds station platform supporting structure 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: LA18 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 The design of infrastructure required within or in proximity to an existing channel (including bridge abutments, intermediate piers and outfalls) will aim to reduce impacts on the natural hydromorphology of watercourse channels, as far as is reasonably practicable.

15.4.6 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.

15.4.7 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.

15.4.8 No permanent culverts are proposed within the Leeds Station area.

15.4.9 Existing groundwater abstraction boreholes or monitoring points would be protected from physical damage, insofar as reasonably practicable, including appropriate decommissioning of abandoned boreholes in order to prevent pollution pathways. If boreholes are to be decommissioned and replaced with alternatives, the contractors would follow the latest good practices. This principle 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.

15.4.10 Measures would be introduced, as required, to mitigate the temporary and permanent effects on groundwater flows and water quality during excavation and construction of foundations and cuttings as far as is reasonably practicable. The types of measure likely to be adopted could include:

- installation of cut-off[145] structures around excavations;
- ensuring cut-off structures are driven to sufficient depths to meet an underlying strata or zone of lower permeability;
- promoting groundwater recharge, such as discharging pumped water to recharge trenches around excavations to maintain baseline groundwater and surface water conditions; and
- incorporating passive bypasses within the design, which could comprise a 'blanket' of permeable material, such as gravel, placed around temporary structures allowing groundwater to bypass the below-ground works, without a rise in groundwater levels on the upstream side.

15.4.11 The exact requirements would be refined and method of mitigation would be designed following ground investigation at foundations or cuttings locations.

[145] Impermeable barrier preventing water flow

Flood risk and land drainage

15.4.12 The design of the Proposed Scheme will aim to mitigate permanent impacts on flood risk and land drainage as follows:

- the temporary works shown in the Volume 2: LA18 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[146];
- 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; and
- measures would be introduced to reduce any potentially significant effects on groundwater flood risk as far as is reasonably practicable, including the incorporation of passive hydraulic bypasses at cuttings and other below ground structures. These could for example comprise a 'blanket' of permeable material such as gravel.

15.4.13 The nominated undertaker will, insofar as reasonably practicable, ensure that flood risk is managed throughout the construction period and will consider flooding issues when planning sites and storing materials. If necessary, temporary provision would be made to reduce to the potential for impacts on existing land drainage systems during construction. Some of the specific measures referred to in the draft CoCP, include:

- preparation of flood risk assessments and method statements for temporary works, including main construction and satellite compound drainage, watercourse crossings and realignments and temporary realignments in consultation with the Environment Agency, and where applicable, the LLFA and other relevant regulators;

[146] Environment Agency (2016) Adapting to Climate Change. Advice for Flood and Coastal Erosion Risk Management Authorities

- 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.

15.4.14 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

15.4.15 This section describes the significant effects following the implementation of the avoidance and mitigation measures. The majority of the potential temporary impacts on the water environment during construction would be avoided or mitigated by the working methods outlined in the draft CoCP. The mitigation embedded into the design has focused on reducing permanent impacts resulting from the presence of the Proposed Scheme to as low a level as is reasonably practicable.

Temporary effects – Water resources and WFD

Surface water

15.4.16 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

15.4.17 The route of the Proposed Scheme in the study area would cross the alluvium, River Terrace Deposits and Pennine Lower Coal Measures Secondary A aquifers on a viaduct. The construction footprint of the HS2 Leeds station would also cross these 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 impacts on the overall status of these aquifers would not be significant.

15.4.18 Where foundations could affect local receptors, such as groundwater abstractions, this is reported in the sections below.

Abstractions

15.4.19 No potential for temporary significant effects has been identified in connection with the licensed groundwater abstractions.

Groundwater – surface water interactions

15.4.20 No temporary significant effects have been identified in connection with groundwater – surface water interactions.

Water dependent habitats

15.4.21 No water dependent designated nature conservation sites have been identified within the study area that have the potential to be temporarily affected by the Proposed Scheme.

Temporary effects - Flood risk and land drainage

15.4.22 Construction of Leeds viaduct and the HS2 Leeds station, would require temporary working within flood zones. Construction sequencing and temporary works design will be carefully considered and assessed in terms of potential impacts on flood risk. Method statements detailing how these works will be undertaken will be produced by the nominated undertaker in consultation with the Environment Agency and the LLFA. It is not anticipated that these temporary activities would result in significant effects related to flood risk and land drainage.

Permanent effects – Water resources and WFD

15.4.23 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

15.4.24 The assessment has not identified any localised impacts on surface water receptors that would give rise to permanent significant effects on surface water quality and channel hydromorphology in the Leeds Station area.

Groundwater

Aquifers

15.4.25 It is currently anticipated that implementation of the avoidance and mitigation measures would ensure that there are no permanent significant effects related to the impact on water levels and quality in the aquifers intercepted by the Proposed Scheme. Where the impacts of the foundations on the aquifers could affect additional local receptors that rely on the groundwater resource, such as abstractions, the impacts on these have been assessed below.

Abstractions

15.4.26 No potential for permanent significant effects has been identified in connection with the licensed groundwater abstractions.

Groundwater - surface water interactions

15.4.27 No potential for permanent significant effects has been identified in connection with groundwater-surface water interactions.

Water dependent habitats

15.4.28 No water dependent designated nature conservation sites have been identified within the study area that have the potential to be permanently affected by the Proposed Scheme.

Permanent effects - Flood risk and land drainage

15.4.29 The HS2 Leeds station central concourse and the entrances to the northern concourse would be located within an area of flood zone 2 and 3 based on the Environment Agency's Flood map for planning (rivers and sea). The HS2 Leeds station entrances, concourse and any associated retail and commercial functions would be raised above surrounding ground levels to provide an appropriate standard of flood protection. Consequently, there would be a small reduction in flood storage capacity following completion of the Proposed Scheme, unless this is compensated for.

15.4.30 In the absence of detailed hydraulic analysis, the current design has been assessed as having potential to have a minor impact on multiple very high value receptors (residential properties within Leeds City Centre) giving rise to a moderate adverse effect, which would be significant.

15.4.31 The Proposed Scheme includes several shallow basement structures, which would be built within the superficial deposits near to the River Aire. These have 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.

Other mitigation measures

15.4.32 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

15.4.33 Detailed fluvial hydraulic analysis will be undertaken to more accurately determine the extent of the floodplain and quantify the change in flood level, if any, caused by the construction of the HS2 Leeds station within the defended floodplain of the River Aire. The results of this analysis will be used to design an appropriate replacement flood storage strategy to ensure that any significant localised flood risk effects are reduced insofar as reasonably practicable. The existing Flood Alleviation Scheme will be taken into account in this analysis.

Summary of likely residual significant effects

15.4.34 In the absence of the other mitigation measures set out above, the Proposed Scheme would potentially result in a moderate adverse effect on flood risk to neighbouring

properties in Leeds City centre relating to the flood protection measures at HS2 Leeds station, which is significant.

15.4.35 It is currently anticipated that it should be possible to develop the means of mitigating these impacts, to ensure that there are no residual significant effects arising from construction of the Proposed Scheme.

15.5 Effects arising from operation

Avoidance and mitigation measures

15.5.1 The principal issue of concern during operation of the Proposed Scheme is the potential for accidental spillages to occur that could result in the release of contaminants into the water environment. This issue has been assessed on a route-wide basis in Volume 3: Route-wide effects, where the mitigation measures associated with this risk are described. A draft operation and maintenance plan for water resources and flood risk will be provided in the formal ES.

15.5.2 The design takes into account the policies in the NPPF and will aim to ensure that the Proposed Scheme is safe from flooding without increasing flood risk elsewhere. Evidence of application of the Sequential Test and Exception Tests in the NPPF is provided on a route-wide basis in Volume 3: Route-wide effects.

15.5.3 Sustainable drainage systems will be used where reasonably practicable. These will help to remove any suspended material within runoff from the Proposed Scheme through filtration, vegetative adsorption or settlement. The drainage systems proposed will aim to ensure that the quantity and quality of water draining from the Proposed Scheme during its operational phase would have a negligible impact on the water environment.

15.5.4 A summary of the route-wide WFD compliance assessment process is provided in Volume 3: Route-wide effects. This describes the ongoing assessment process and how measures will be embedded into the design that are specifically designed to ensure that the Proposed Scheme complies with the requirements of the WFD, where reasonably practicable. It is currently anticipated that the Proposed Scheme will be compliant with WFD legislation.

Assessment of impacts and effects

15.5.5 There are considered to be no significant adverse effects related to water resources and flood risk arising from operation of the Proposed Scheme.

Other mitigation measures

15.5.6 There are considered to be no further measures required to mitigate adverse effects on surface water resources, groundwater resources or flood risk.

Summary of likely residual significant effects

15.5.7 The assessment shows that there will be no residual significant effects on surface water, groundwater or flood risk during operation of the Proposed Scheme.

Monitoring

15.5.8 Volume 1, Section 9 sets out the general approach to monitoring of water resources and flood risk during operation of the Proposed Scheme.

15.5.9 There are no area-specific requirements for monitoring water resources and flood risk during operation of the Proposed Scheme.

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