HS2

October 2018

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

Working Draft Environmental Statement

Volume 2: Community Area report

MA01: Hough to Walley's Green

HS2

October 2018

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

Working Draft Environmental Statement

Volume 2: Community Area report

MA01: Hough to Walley's Green

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.

High Speed Two (HS2) Limited,
Two Snowhill
Snow Hill Queensway
Birmingham B4 6GA

Telephone: 08081 434 434

General email enquiries: HS2enquiries@hs2.org.uk

Website: www.hs2.org.uk

A report prepared for High Speed Two (HS2) Limited:

AECOM CAPITA lineco forward together

ARUP + ERM | FOSTER + PARTNERS | JACOBS RAMBOLL | TYPSA | COSTAIN

MWJV

High Speed Two (HS2) Limited has actively considered the needs of blind and partially sighted people in accessing this document. The text will be made available in full on the HS2 website. The text may be freely downloaded and translated by individuals or organisations for conversion into other accessible formats. If you have other needs in this regard please contact High Speed Two (HS2) Limited.

recycle

Printed in Great Britain on paper containing at least 75% recycled fibre.

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.

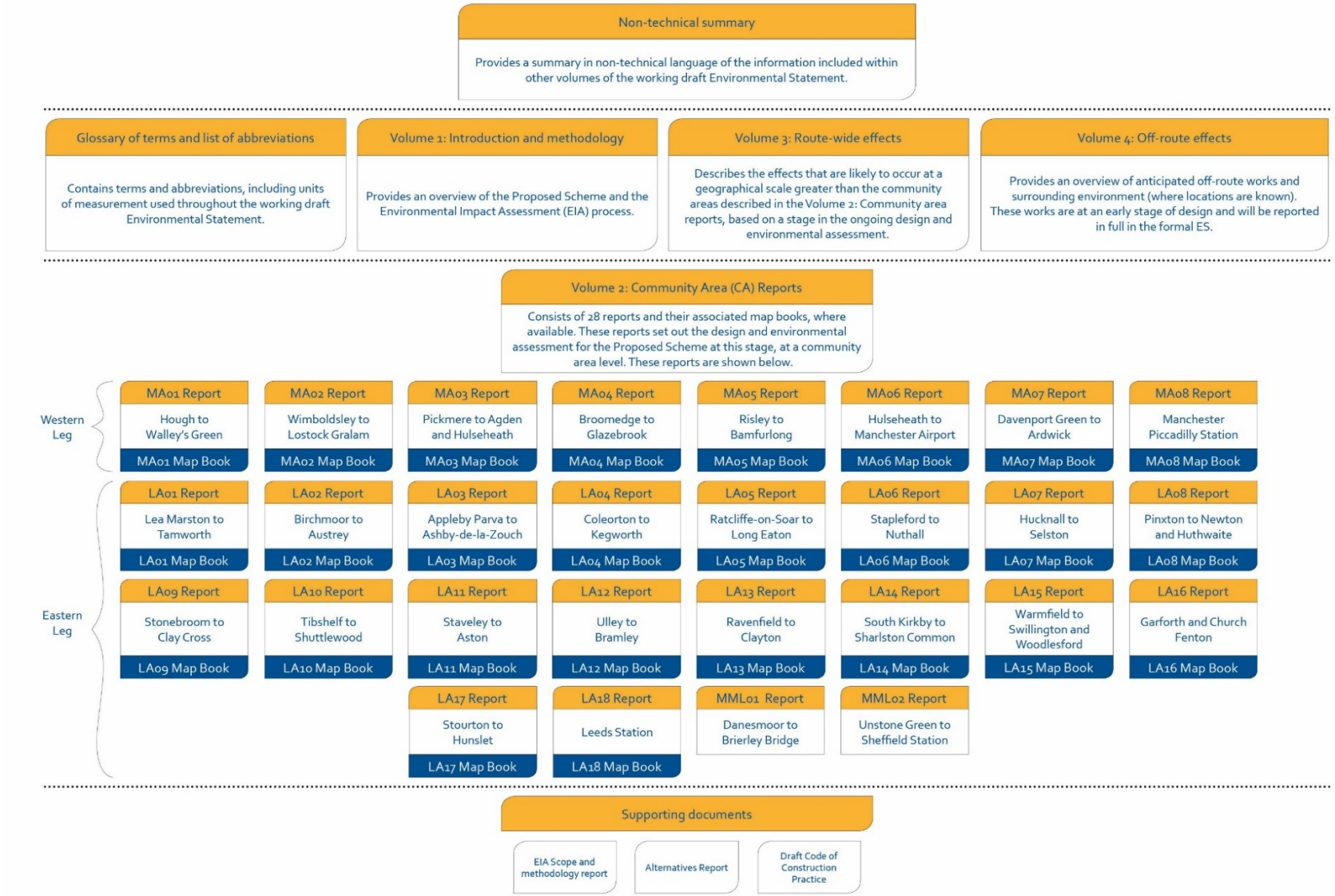
Volume 4: Off-route effects

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 will be served by high speed trains running at speeds of up to 360 kilometres per hour (kph) (225 miles per hour (mph)).

1.1.2 HS2 will be built in phases. Phase One comprises the first section of the HS2 network of approximately 230km (143 miles) between London and the West Midlands that will commence operations in 2026. It was the subject of an Environmental Statement (ES) deposited with the High Speed Rail (London - West Midlands) Bill in November 2013. Subsequent ESs were deposited with Additional Provisions to that Bill in 2014 and 2015. The High Speed Rail (London - West Midlands) Bill received Royal Assent in February 2017 and pre-construction work on Phase One commenced in 2017.

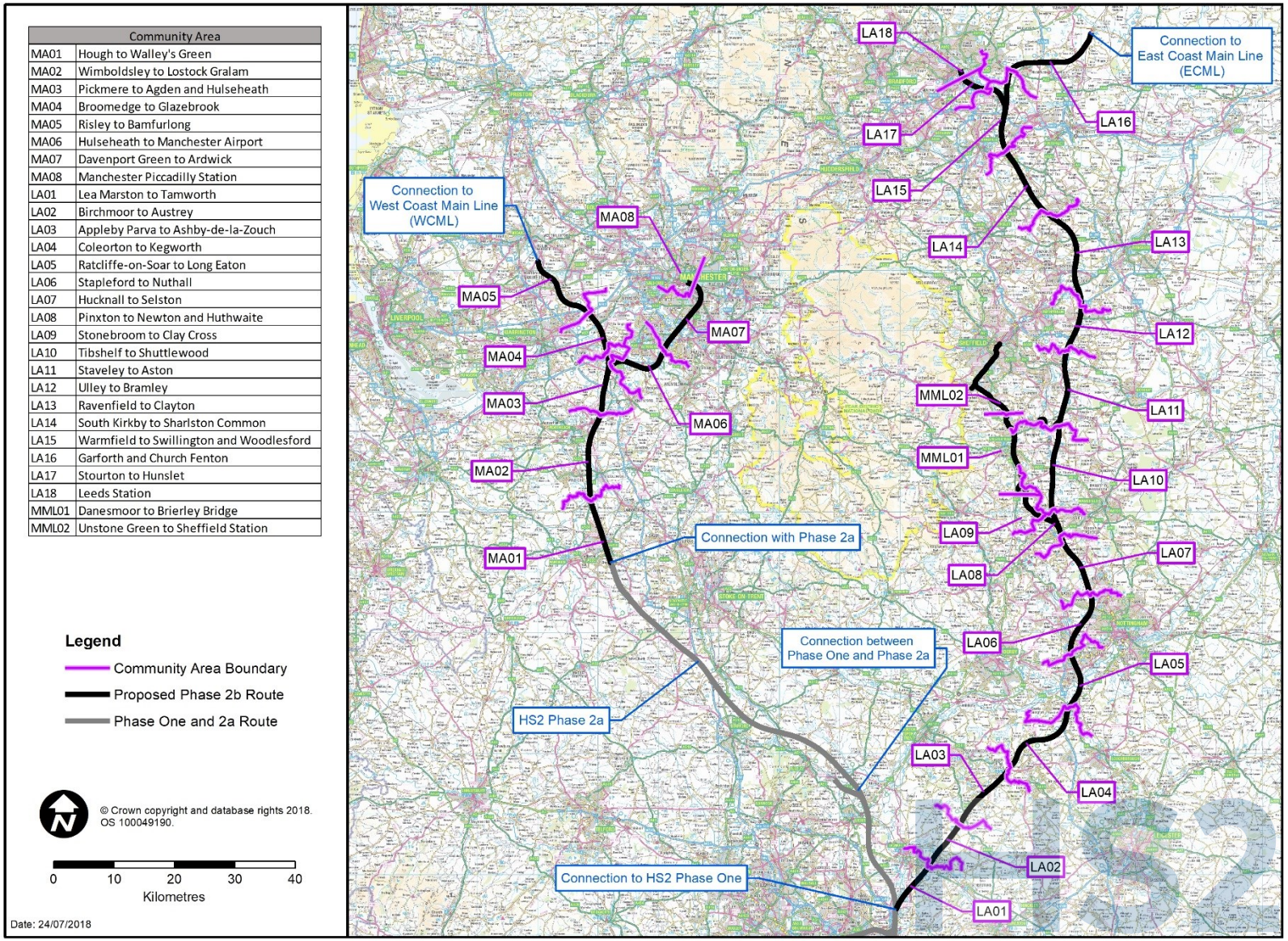
1.1.3 Phase Two of HS2 will extend the route from Phase One in the West Midlands to the north-west to Manchester (approximately 80km (50 miles) with connections to the West Coast Main Line (WCML) at Crewe and Golborne, and to the north-east to Leeds with a connection to the Erewash Valley Line and Midland Main Line (MML) south-east of Chesterfield and the East Coast Main Line (ECML) approaching York (approximately 198 km (123 miles)), completing what is known as the 'Y network'.

1.1.4 Phase Two of HS2 is being taken forward in two stages, referred to as Phase 2a and Phase 2b. Phase 2a of HS2 includes the section of the route between the West Midlands and Crewe. The High Speed Rail (West Midlands - Crewe) Bill, together with an ES, was prepared for the Phase 2a proposals and deposited in Parliament in July 2017. A subsequent ES was deposited with Additional Provisions to that Bill in March 2018.

1.1.5 Phase 2b (the Proposed Scheme), the subject of this working draft ES, comprises the route from Crewe to Manchester (and connections into the WCML) (referred to as the 'western leg'), and from the West Midlands to Leeds (and connections into the Midland Main Line (MML and the ECML)) via the East Midlands and South Yorkshire (referred to as 'the eastern leg'). The connection to and electrification of an approximately 30km (19 miles) section of the existing MML would enable high speed trains to connect to Chesterfield and Sheffield. Construction of the Proposed Scheme would commence in 2023, with operation planned to start in 2033.

1.1.6 For environmental assessment and community engagement purposes, the Proposed Scheme has been divided into 28 community areas (CA). These are shown in Figure 2. This CA report relates to the Hough to Walley's Green area (CA number MA01) which is located on the western leg of the Proposed Scheme.

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



1.2 Purpose of this report

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

[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.

description of the local alternatives considered;

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

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

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

1.3.3 Environmental effects have been assessed in accordance with the methodology set out in Volume 1 and the EIA Scope and Methodology Report (SMR)[3].

1.3.4 The maps relevant to the Hough to Walley's Green area are provided in a separate corresponding document entitled Volume 2: MA01 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: MA01 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 Hough to Walley's Green area covers an approximately 11km section of the Proposed Scheme passing through the parishes of Basford, Crewe, Warmingham and Minshull Vernon within the local authority area of Cheshire East Council (CEC).

2.1.2 The boundary between the Proposed Scheme and HS2 Phase 2a forms the southern boundary of this section. The boundary between Minshull Vernon parish and Stanthorne and Wimboldsley parish forms the northern boundary of this section.

2.1.3 As shown in Figure 2, the connection with HS2 Phase 2a lies to the south and the Wimboldsley to Lostock Gralam area (MA02) lies to the north.

Settlement, land use and topography

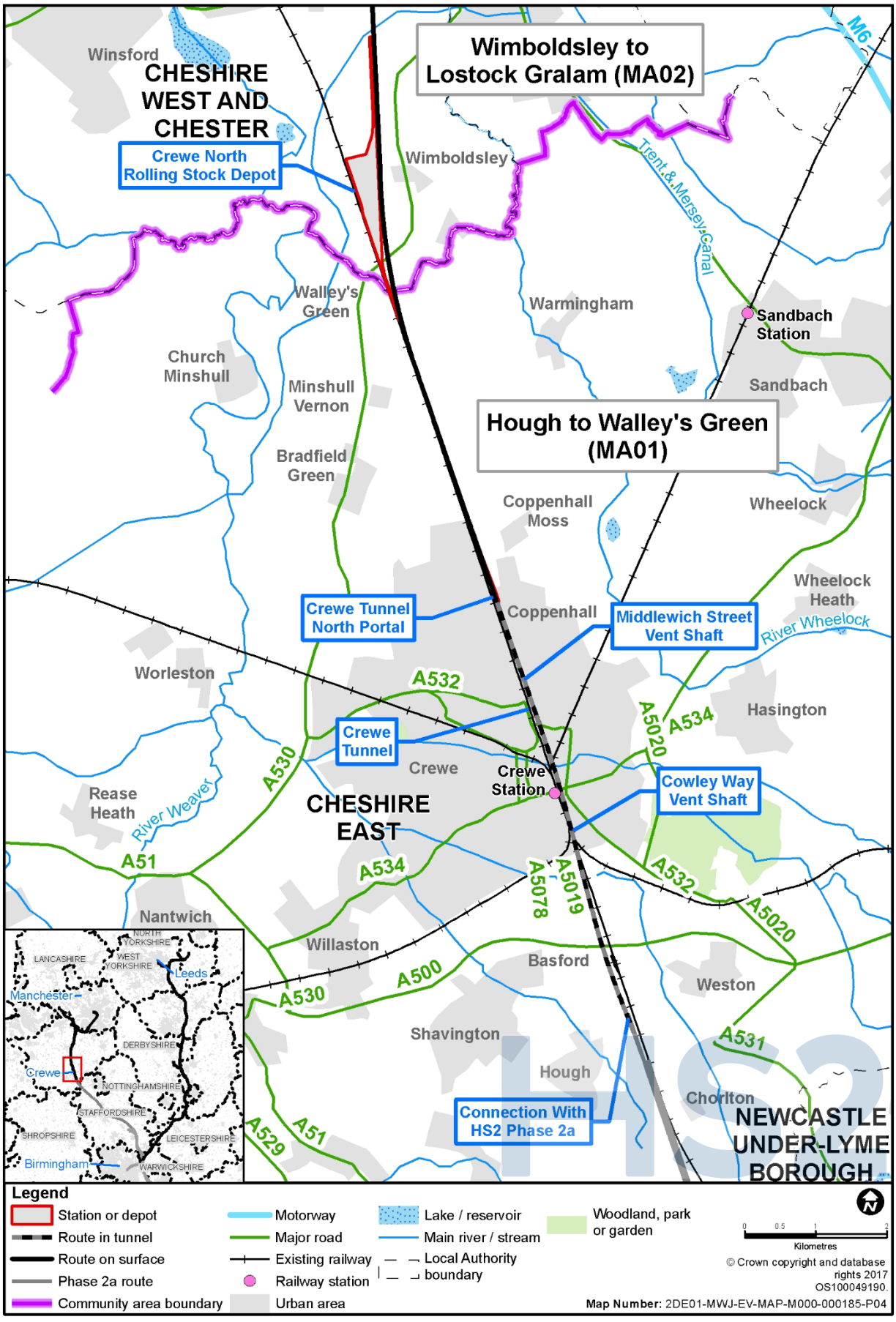
2.1.4 The southern part of the area is predominantly urban, with land use comprising light industrial and commercial uses, railway infrastructure and residential areas of Crewe. The route of the Proposed Scheme would pass in a tunnel under this southern area. The principal residential areas are Wistaston and Wistaston Green (to the south) and Coppenhall, Maw Green and Barrows Green (to the north). Crewe Gates Farm Industrial Estate dominates the south-east sector of the town. Crewe Railway Station (to the south), is surrounded by commercial uses and facilities including the Grand Junction Retail Park. The station forms a key interchange on the West Coast Main Line (WCML) which connects with the additional railway infrastructure of Basford Hall Sorting Sidings (to the south).

2.1.5 The low-lying area occupied by the town is approximately 50m above Ordnance Datum (AOD) and is crossed by the Gresty and Valley Brooks which provide the only notable topographic features across this generally flat land.

2.1.6 To the north of Crewe, the area is predominantly rural, characterised by open space, woodland and farmland. The route of the Proposed Scheme would follow the line of the WCML northwards towards the hamlet of Walley's Green passing Minshull Vernon moat scheduled monument and a number of listed buildings, including Park House Farm. The land use north of Crewe is principally agriculture, supporting several isolated farms, with Spring Farm and Parkfield in the west, and Moss Farm, Moss Fields Farm and Park Hall Farm in the east.

2.1.7 The land remains low-lying at approximately 50m AOD and slopes very gently towards the River Weaver valley to the west and the River Wheelock valley to the east.

Figure 3: Community area context map



Key transport infrastructure

2.1.8 The A500 Shavington Bypass passes through the Hough to Walley's Green area in an east-west alignment, connecting the M6 in the east with Nantwich in the west. The A534 Nantwich Road connects Crewe to Sandbach to the north-east. The A530 Middlewich Road connects Nantwich to the west with Middlewich to the north. Within Crewe itself, key roads include the A532 Weston Road, the A534 Nantwich Road, the A5019 Mill Street and the A5078 Dunwoody Way.

2.1.9 Crewe has a large train station, serving as a key interchange. The WCML runs through the area running in a south to north direction. The route of the Proposed Scheme would follow the alignment of the WCML for much of this area.

2.1.10 The Middlewich Branch of the Shropshire Union Canal is also present in the north of this area.

2.1.11 In the north of the Hough to Walley's Green area, the route would cross several public rights of way (PRoW), which provide important links across the existing WCML. The Shropshire Union Canal towpath and the Crewe and Nantwich Circular Walk pass through the area.

Socio-economic profile

2.1.12 Within the CEC area there is a wide spread of business types reflecting a diverse range of commercial activities. The professional, scientific and technical sector accounts for the largest proportion of businesses (20%), with business administration and support services as the second largest (10%), followed by construction and retail (8% each)[4].

2.1.13 According to the Annual Population Survey (2016)[5], the employment rate[6] within the CEC area was 76% (170,900 people), and unemployment in the CEC area was 4.5%.

2.1.14 According to the Annual Population Survey (2016), 39% of CEC area residents aged 16-64 were qualified to National Vocational Qualification Level 4 (NVQ4) and above, while 6% of residents had no qualifications.

Notable community facilities

2.1.15 The main concentration of community facilities is in the large urban settlement of Crewe and its suburbs. The villages and hamlets of Chorlton, Hough, Shavington, Weston, Basford, Coppenhall Moss, Bradfield Green and Warmingham provide a smaller number of local services. There are also hamlets and scattered dwellings in the northern part of the area which has limited community resources.

2.1.16 Crewe is a large town with a large train station, serving as a key interchange. Community resources within Crewe include nurseries and over 30 primary and secondary schools, an engineering college and the Cheshire Campus for Manchester Metropolitan University. A specialist health care facility, the Sherborne Court Neurological Centre for young adults with mental health conditions and physical

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

disability is also in the vicinity. There are also several places of worship, community centres, libraries, medical facilities, care homes (including Bentley Manor Care Home) and public houses.

2.1.17 Other notable community facilities within the urban centre of Crewe include: several retail and shopping centres (the Market Centre, the Victoria Centre and the Grand Junction Retail Park) and Crewe Cemetery and Crematorium. Within the northern Crewe suburb of Barrows Green is Bright Stars Children's Day Nursery, Mablins Lane Primary School and Mablins Lane Children's Centre.

2.1.18 The notable community facilities located in the smaller settlements in the Hough to Walley's Green area include Chorlton Methodist Church, north-west of Chorlton and Chorlton Golf Course; Church of All Saints, Weston Cemetery and Weston Village Primary School in Weston and Oakfield Lodge School, in Coppenhall Moss.

Recreation, leisure and open space

2.1.19 Within Crewe there are a range of recreation, leisure and open space facilities consisting of playing fields, sports clubs and centres, recreational grounds and allotments. Notable facilities include Crewe Alexandra Football Club football ground; Crewe Golf Club to the east of the town; Queens Park and Queens Park Golf Club, in the west; and the Cumberland Arena and adjacent playing fields. The Valley Brook runs east to west through Crewe, with small amounts of open space surrounding it.

2.1.20 Outside Crewe, the Hough to Walley's Green area is predominantly rural, characterised by open space, woodland and farmland. Notable recreation, leisure and open space facilities include several PRoW, including the Crewe and Nantwich Circular Walk and the Cheshire Ring Canal Walk as well as other unnamed PRoW. Notable waterways in the Hough to Walley's Green area include the River Weaver, the River Wheelock and a short section of the Shropshire Union Canal, all of which are navigable and can be used for recreation. The Winton Equestrian Centre is located in the rural area to the north of Crewe. Additional facilities immediately to the south of the Hough to Walley's Green area, include the Chorlton Golf Course and the South Cheshire Way.

Policy and planning context

Planning framework

2.1.21 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.

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

- Adopted Cheshire East Local Plan Strategy 2010-2030 (2017)[7];

[7] Cheshire East Local Plan Strategy 2010-2030 (Adopted 2017). Available online at: http://www.cheshireeast.gov.uk/planning/spatial_planning/cheshire_east_local_plan/local-plan-strategy/local_plan_strategy.aspx

- Adopted Borough of Crewe and Nantwich Replacement Local Plan 2005-2011 (saved policies) (2005)[8];
- Adopted Congleton Borough Local Plan 2005 -2011 (saved policies) (2008)[9];
- Adopted Weston and Basford Neighbourhood Plan (2017)[10];
- Adopted Wistaston Neighbourhood Plan (2017)[11];
- Adopted Cheshire Replacement Waste Local Plan 2007 (saved policies) (2007)[12];
- Adopted Cheshire Replacement Minerals Local Plan 1999 (saved policies) (1999)[13]; and
- Adopted Cheshire East Local Transport Plan Strategy 2011-2026 (2011)[14].

2.1.23 Emerging policies are not generally included within this report unless a document has been submitted to the Secretary of State for Examination.

Committed development

2.1.24 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. These will be listed in the formal ES.

2.1.25 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.

2.1.26 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.

2.1.27 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

[8] Borough of Crewe and Nantwich Replacement Local Plan (Adopted 2005). Available online at: http://www.cheshireeast.gov.uk/planning/spatial_planning/saved_and_other_policies/crewe_and_nantwich_local_plan/crewe_and_nantwich_local_plan.aspx
[9] Congleton Borough Local Plan (Adopted 2005) Available online at: http://www.cheshireeast.gov.uk/planning/spatial_planning/saved_and_other_policies/congleton_local_plan/congleton_local_plan.aspx
[10] Weston and Basford Neighbourhood Plan (Adopted 2017). Available online at: http://www.cheshireeast.gov.uk/planning/neighbourhood-plans/neighbourhood-plans-n-z/weston-and-basford-neighbourhood-plan.aspx
[11] Wistaston Neighbourhood Plan (Adopted 2017). Available online at: http://www.cheshireeast.gov.uk/planning/neighbourhood-plans/neighbourhood-plans-n-z/wistaston-neighbourhood-plan.aspx
[12] Cheshire Replacement Waste Local Plan 2007 (Adopted 2007). Available online at: http://www.cheshireeast.gov.uk/planning/spatial_planning/saved_and_other_policies/cheshire_waste_local_plan/cheshire_waste_local_plan.aspx
[13] Cheshire Replacement Minerals Local Plan 1999 (Adopted 1999). Available online at: http://www.cheshireeast.gov.uk/planning/spatial_planning/saved_and_other_policies/cheshire_minerals_local_plan/cheshire_minerals_local_plan.aspx
[14] Cheshire East Local Transport Plan Strategy 2011-2026 (Adopted 2011). Available online at: http://www.cheshireeast.gov.uk/public_transport/local_transport_plan/local_transport_plan.aspx

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

Interface with HS2 Phase 2a

2.1.28 The route of the Proposed Scheme would connect to HS2 Phase 2a within a tunnel portal at Hough. The High Speed Rail (West Midlands - Crewe) Bill is proceeding through Parliament with the aim of receiving Royal Assent in 2019.

2.1.29 The HS2 Phase 2a scheme described within the South Cheshire area (Community Area 5) in the HS2 Phase 2a Environmental Statement[15] overlaps with the Hough to Walley's Green area north of Newcastle Road.

2.1.30 The likely significant environmental effects of the HS2 Phase 2a scheme were reported in the Environmental Statement deposited with the HS2 Phase 2a Bill in July 2017 and in the Supplementary Environmental Statement and Additional Provision Environmental Statement for HS2 Phase 2a published in March 2018. Although Royal Assent has not yet been received, the HS2 Phase 2a scheme will be considered as a committed development in the context of this assessment. Where there is the potential for cumulative impacts to arise from the construction and operation of HS2 Phase 2a in combination with the construction and operation of the Proposed Scheme, these will be reported in Sections 4 to 15 of the formal ES for HS2 Phase 2b.

2.1.31 In addition, changes to the HS2 Phase 2a design may be required at the interface with Phase 2b. Any new or different significant environmental effects arising from these changes will be described in the relevant topic sections of the formal ES.

Ongoing design development

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

- 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;
- refinement of maintenance access routes and access to balancing ponds;
- additional environmental features required to mitigate likely significant environmental effects;
- accommodation works and crossings of the route for private means of access;

[15] High Speed 2 (HS2) Ltd (July 2017). High Speed Rail (West Midlands - Crewe) Environmental Statement Volume 2: Community Area report CA5: South Cheshire.

- refinement of construction compound locations and site haul routes;
- refinement of the construction interface between Phase 2a and Phase 2b;
- refinement of auto-transformer station and auto-transformer feeder station locations;
- location of tunnel vent shafts;
- location of the northern extent of the tunnel and tunnel portal; and
- additional auto transformer feeder station and overhead line equipment south of Crewe.

2.2 Description of the Proposed Scheme

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

2.2.2 Land required for operation of the Proposed Scheme is described in this section and is shown on Volume 2: MA01 Map Book Map Series CT-06. Land also required for construction is described in Section 2.3 and shown on Volume 2: MA01 Map Book Map Series CT-05.

Overview

2.2.3 The route of the Proposed Scheme through the Hough to Walley's Green area would be approximately 11km in length and would lie within the CEC area. The route would extend from Hough, where it would connect to HS2 Phase 2a, and continue north-west beneath Crewe and on towards Walley's Green.

2.2.4 This section of route is illustrated on maps CT-06-302 to CT-06-308a in the Volume 2: MA01 Map Book.

2.2.5 All dimensions in the sections below are approximate.

2.2.6 In the Hough to Walley's Green area, the route of the Proposed Scheme would be carried on the following features:

- tunnels (including porous portal) for a total length of 6.5km (Crewe tunnel and Crewe tunnel north portal);
- cuttings for a total length of 700m (Crewe North cutting and Coppenhall cutting); and
- embankments for a total length of 3.8km (Coppenhall embankment, Minshull Vernon embankment and Walley's Green embankment).

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

2.2.8 In general, features are described along the route of the Proposed Scheme from south to north and to the eastern and western sides of the route as they cross the Proposed Scheme, as shown on Map Series CT-06 in the Volume 2: MA01 Map Book.

Crewe tunnel to Crewe tunnel north portal

2.2.9 The Proposed Scheme would connect to HS2 Phase 2a, north of Hough and continue north-west towards Coppenhall. This section of the route of the Proposed Scheme would pass within the Crewe tunnel before emerging from Crewe tunnel north portal north of the B5076 Bradfield Road.

2.2.10 This section of route is illustrated on maps CT-06-302 to CT-06-305 in the Volume 2: MA01 Map Book.

2.2.11 Key features of this 6.5km section would include:

- Crewe tunnel, a twin bore tunnel, 6.3km in length and up to 40m in depth, passing under Crewe. The top of the bored tunnel would be up to 42m below existing ground level and track level would be up to 53m below ground level. Both excavated bores would be 10m in diameter with a lined internal diameter of 9m. Cross passages would connect the tunnel bores at intervals of up to 350m for rescue and maintenance purposes. (see Volume 2: Map CT-06-302, B6 to CT-06-305, F6);
- Cowley Way vent shaft and headhouse at Cowley Way. The vent shaft would be 22m by 36m, with a depth of 36m below ground level to rail level. The headhouse would be 6m in height (see Volume 2: Map CT-06-303, G6);
- Cowley Way vent shaft auto-transformer station, 46m by 24m, 300m south-east of Crewe Alexandra Football Club football ground. Access would be provided via an access road from Cowley Way (see Volume 2: Map CT-06-303, G6);
- Middlewich Street vent shaft and headhouse at Middlewich Street. The vent shaft would have an external diameter of 26m, with a depth of 40m below ground level to the rail level. The headhouse would be 6m in height (see Volume 2: Map CT-06-304, J6);
- a tunnel portal building and rescue area at the northern end of the Crewe tunnel, on the route of the Proposed Scheme. Access would be provided from Broughton Road (see Volume 2: Map CT-06-305, F6); and
- Crewe tunnel north portal extending 150m to the north of Crewe tunnel, with a tunnel headwall, 22m in width and 20m in height with landscape mitigation planting to the east to provide visual screening for the residents of Broughton Road (see Volume 2: Map CT-06-305, G6).

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

2.2.13 Construction of this section would be managed from the Crewe tunnel south satellite compound, Crewe tunnel south portal satellite compound, Cowley Way vent shaft satellite compound, Middlewich Street vent shaft satellite compound and Crewe tunnel north main compound which are described in Section 2.3, and shown on map CT-05-301, map CT-05-302, map CT-05-303, map CT-05-304 and map CT-05-305 in the Volume 2: MA01 Map Book.

Crewe tunnel north portal to Coppenhall cutting

2.2.14 The Proposed Scheme would continue from the Crewe tunnel north portal north-west towards Parkers Road. The route would pass into Crewe North cutting before continuing into Coppenhall cutting.

2.2.15 This section of route is illustrated on maps CT-06-305 to CT-06-306 in the Volume 2: MA01 Map Book.

2.2.16 Key features of this 704m section would include:

- Crewe North cutting, 514m in length, up to 19m in depth and 18m width, with landscape mitigation planting on the east of the route of the Proposed Scheme to provide screening for residents on Broughton Road and Coppenhall. On the western side of the route there would be a noise fence barrier, 3m in height, extending from Parkers Road to provide acoustic screening for properties in Barrows Green (see Volume 2: Map CT-06-305, G6 to J6);
- Crewe tunnel north portal auto-transformer station, 46m by 24m, 200m west of Ironstile Farm. Access would be provided via an access road off Broughton Road (see Volume 2: Map CT-06-305, G6);
- diversion of an unnamed watercourse south of Parkers Road via Spring Farm culvert and new ditch (see Volume 2: Map CT-06-305, I5);
- Parkers Road overbridge, 55m in length and up to 5m above existing ground, on its existing alignment, to carry Parkers Road over the route of the Proposed Scheme (see Volume 2: Map CT-06-305, J6);
- Coppenhall cutting, 190m in length, up to 9m in depth and 48m width with associated landscape earthworks and landscape mitigation planting to help integrate the Proposed Scheme into the surrounding landscape. On the western side of the route there would be a noise fence barrier, 3m in height, extending from Parkers Road to provide acoustic screening for properties in Barrows Green (see Volume 2: Map CT-06-306, A6 to B6); and
- two ecological mitigation ponds within an area of grassland habitat creation 30m to the east of the route of the Proposed Scheme to provide replacement habitat (see Volume 2: Map CT-06-306, A7 to C7).

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

2.2.18 Construction of this section would be managed from the Crewe tunnel north main compound, which is described in Section 2.3, and shown on map CT-05-305 in the Volume 2: MA01 Map Book.

Coppenhall cutting to Spring Farm accommodation overbridge

2.2.19 This section of the route of the Proposed Scheme would continue to the north-west towards Warmingham Moss, on the Coppenhall embankment towards the Spring Farm accommodation overbridge.

2.2.20 This section of route is illustrated on maps CT-06-306 to CT-06-307 in the Volume 2: MA01 Map Book.

2.2.21 Key features of this 1.6km section would include:

- a section of Coppenhall embankment, 1.6km in length and up to 4m in height, with landscape earthworks and landscape mitigation planting on both sides of the route to help integrate the Proposed Scheme into the surrounding landscape (see Volume 2: Map CT-06-306, F6 to J6 and Map CT-06-307, A6);
- diversion of an unnamed watercourse north of Parkers Road, via Spring Farm culvert and new ditch (see Volume 2: Map CT-06-306, C6);
- Spring Farm culvert, 600m south-east of Spring Farm to provision the diversion of two unnamed watercourses and convey a tributary of Fowle Brook under the route of the Proposed Scheme (see Volume 2: Map CT-06-306, D7);
- Crewe Footpath 29 accommodation overbridge, 46m in length and up to 13m above existing ground level, to carry Crewe Footpath 29 on its existing alignment over the route of the Proposed Scheme (see Volume 2: Map CT-06-306, C7);
- an area of landscape mitigation planting 50m to the west of the route of the Proposed Scheme, to help integrate the Proposed Scheme into the surrounding landscape (see Volume 2: Map CT-06-306, D6 to G6);
- four ecological mitigation ponds within an area of grassland habitat creation 75m to the west of the route of the Proposed Scheme and areas of woodland habitat creation, to provide replacement habitat (see Volume 2: Map CT-06-306, D4 to D6);
- an area of woodland habitat creation 60m to the west of the route of the Proposed Scheme, to provide replacement habitat and provide connectivity between existing habitats (see Volume 2: Map CT-06-306, E5);
- a balancing pond for railway drainage to the east of the Proposed Scheme, 300m to the south-west of Moss Farm. Access would be provided from Warmingham Road and a new access track (see Volume 2: Map CT-06-306, E7);

- realignment of Warmingham Footpath 16, 15m north of its current alignment, crossing the route of the Proposed Scheme on the Warmingham Footpath 16 accommodation overbridge. The overbridge would be 47m in length and up to 14m above existing ground level (see Volume 2: Map CT-06-306, F6);
- realignment of a private access to Spring Farm, 100m south of its existing alignment onto the Spring Farm accommodation overbridge. There would be landscape mitigation planting on the north and south of the alignment of the overbridge to help integrate the Proposed Scheme into the surrounding landscape (see Volume 2: Map CT-06-306, H5 to J7); and
- Spring Farm accommodation overbridge, 78m in length, and up to 13m above ground level (see Volume 2: Map CT-06-306, H5 to J7).

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

2.2.23 Construction of this section would be managed from the Crewe tunnel north main compound, which is described in Section 2.3, and shown on map CT-05-306 in the Volume 2: MA01 Map Book.

Spring Farm accommodation overbridge to Walley's Green embankment

2.2.24 The Proposed Scheme would continue from Coppenhall embankment north-west towards Winsford. The route would pass onto Minshull Vernon embankment before continuing onto Walley's Green embankment to the end of the Hough to Walley's Green area.

2.2.25 This section of route is illustrated on maps CT-06-306 to CT-06-308a in the Volume 2: MA01 Map Book.

2.2.26 Key features of this 2.4km section would include:

- continuation of Coppenhall embankment for 280m, up to 4m in height, with landscape earthworks and landscape mitigation planting to help integrate the Proposed Scheme into the surrounding landscape (see Volume 2: Map CT-06-306, J6 and Map CT-06-307, A5);
- three ecological mitigation ponds within an area of grassland habitat creation 155m west of the route of the Proposed Scheme to provide replacement habitat (see Volume 2: Map CT-06-307, B3);
- Minshull Vernon embankment, 1.5km in length and up to 3m in height. There would be a retained section on the west side of the route, adjacent to the WCML. There would also be landscape mitigation planting on the east of the Proposed Scheme to help integrate the Proposed Scheme into the surrounding landscape (see Volume 2: Map CT-06-307, B5 to I5);

- an area of woodland habitat creation to the west of the route of the Proposed Scheme linking Larch Wood and Burnt Covert, to provide replacement habitat (see Volume 2: Map CT-06-307, C5 to D5);
- realignment of a private access to Hole House on the eastern side of the route of the Proposed Scheme with users diverted via alternative routes to the east of the existing alignment (see Volume 2: Map CT-06-307, D6);
- diversion of the Minshull Vernon Footpath 8, 135m north of its existing alignment crossing the route of the Proposed Scheme on the Minshull Vernon Footpath 8 accommodation overbridge, which would be 50m in length, and up to 14m above ground level. (see Volume 2: Map CT-06-307, G4 to G7);
- diversion of Minshull Vernon Footpath 13, 526m north of its existing alignment, to join Minshull Vernon Footpath 8 and cross the route of the Proposed Scheme on the Minshull Vernon Footpath 8 accommodation overbridge (see Volume 2: Map CT-06-307, G4 to G7 and H5);
- realignment of a private access to Parkfield, 138m north of its existing alignment, crossing the route of the Proposed Scheme on the Minshull Vernon Footpath 8 accommodation overbridge (see Volume 2: Map CT-06-307, H5);
- Minshull Vernon Footpath 8 accommodation overbridge, 50m in length, and up to 14m above ground level. There would be landscape planting on the north and south of the alignment of the overbridge to help integrate the Proposed Scheme into the surrounding landscape (see Volume 2: Map CT-06-307, H5);
- three ecological mitigation ponds within an area of wetland habitat creation 95m to the east of the route of the Proposed Scheme and an adjacent area of grassland habitat creation to provide replacement habitat (see Volume 2: Map CT-06-307, I6 to I7);
- Walley's Green embankment, 600m in length and up to 4m in height, with landscape mitigation planting on both sides of the route of the Proposed Scheme and landscape earthworks on the east side of the embankment to help integrate the route of the Proposed Scheme into the surrounding landscape. The earthworks and landscape planting would also provide visual and acoustic screening of the route of the Proposed Scheme for residents to the east. (see Volume 2: Map CT-06-307, I6 to J6 and Map CT-06-308a, A7 to C7);
- an area of landscape mitigation planting to the west of the WCML to help integrate the Proposed Scheme into the surrounding landscape (see Volume 2: Map CT-06-307, I6 to J6 and Map CT-06-308a, A7 to C7); and
- an area of landscape mitigation planting to the west of Walley's Green embankment, located in the area between the Proposed Scheme and the WCML to help integrate the Proposed Scheme into the surrounding

landscape (see Volume 2: Map CT-06-307, I5 to J5 and Map CT-06-308a, A6 to C6).

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

2.2.28 Construction of this section would be managed from the Crewe tunnel north main compound, which is described in Section 2.3, and shown on map CT-05-308a in the Volume 2: MA01 Map Book.

Demolitions

2.2.29 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.

2.2.30 At this stage of the design development, it is anticipated that demolition of two existing residential properties and three commercial/ business properties (including farm outbuildings) would be required to construct the Proposed Scheme in the Hough to Walley's Green 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 Hough to Walley's Green area. The construction arrangements described in this section provide the basis for the assessment presented in this working draft ES.

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

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

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

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

Code of Construction Practice

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

2.3.7 In addition, HS2 Ltd has produced a Community Engagement Framework[16] which sets out how HS2 Ltd and its contractors, as well as their sub-contractors, would undertake community engagement during the construction of the HS2 project. The framework is being implemented on Phase One of HS2 and is applicable to all phases of HS2.

2.3.8 The objectives of the framework include:

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

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

Overview of the construction process

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

- advance works including: site investigations further to those already

[16] 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

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; tunnelling; site restoration; removal of construction compounds where the compound is not required for railway installation works; and associated utility diversions;
- railway installation works including: establishment of construction compounds; infrastructure installation; connections to utilities; changes to the existing rail network; and removal of construction compounds;
- site finalisation works; and
- systems testing and commissioning.

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

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

Advance works

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

- further detailed site investigations and surveys for proposed construction compounds;
- further detailed environmental surveys;
- advance mitigation works including, where appropriate, contamination remediation, habitat creation and translocation, landscape planting and built heritage survey and investigation;
- advance site access works;
- site establishment with temporary fence construction; along with soil stripping and vegetation removal; and
- utility diversions and new utility connections for facilities associated with the Proposed Scheme.

Engineering works

Introduction

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

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

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

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

General overview of construction compounds

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

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

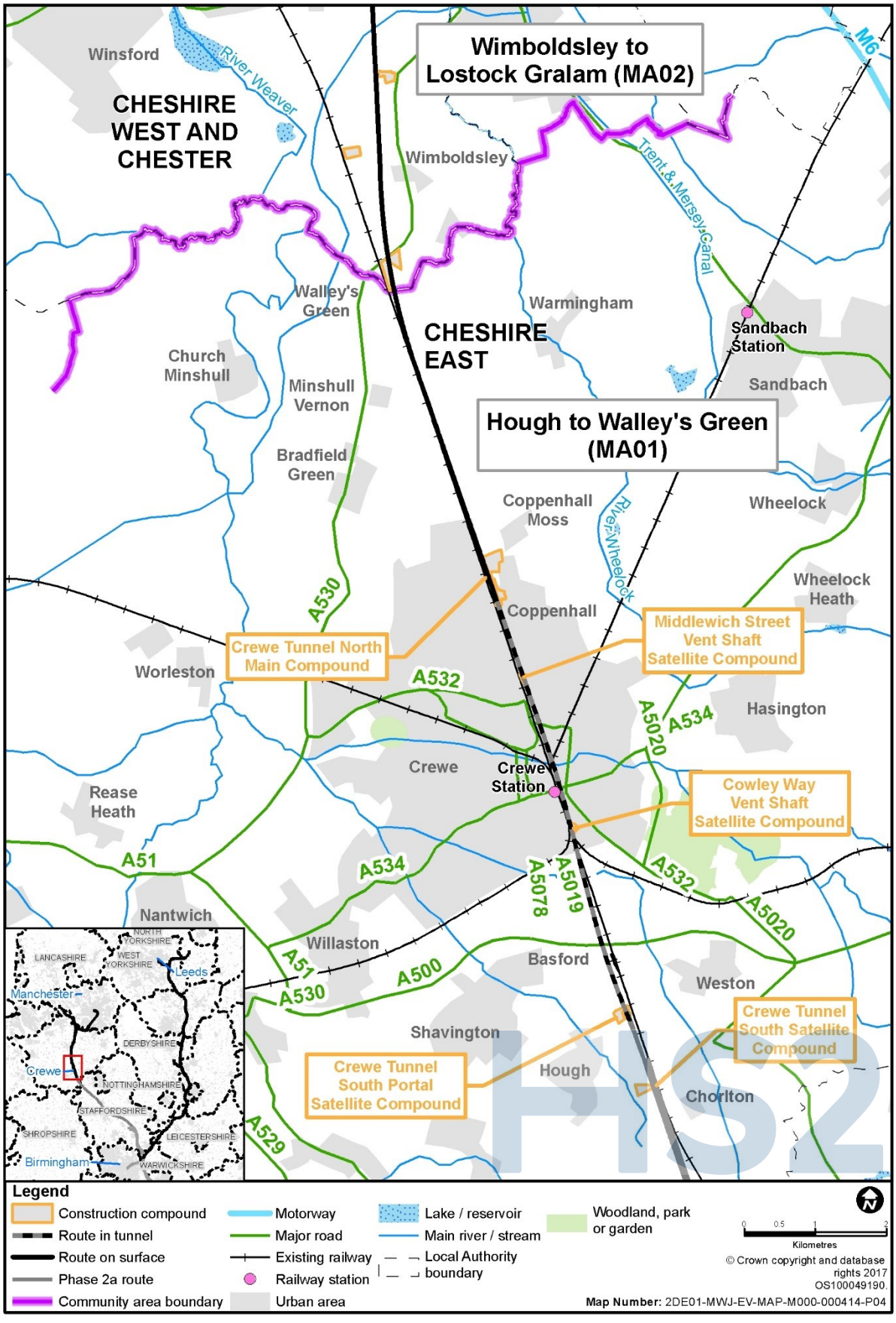
2.3.17 Satellite compounds would be used as the base to manage specific works along a section of the route. Depending on the nature and extent of the works to be managed, these satellite compounds could include office accommodation for staff, local storage for plant and materials, car parking for staff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

2.3.18 One main civil engineering compound, the Crewe tunnel north main compound, would be located in the Hough to Walley's Green area. This would manage four civil engineering satellite compounds in the Hough to Walley's Green area.

2.3.19 Four civil engineering satellite compounds would be located in the Hough to Walley's Green area. On completion of civil engineering work four of the civil engineering compounds will continue to be used as railway systems compounds.

2.3.20 The location of construction compounds in the Hough to Walley's Green area is shown on Figure 4. Map Series CT-05 (in the Volume 2: MA01 Map Book) show in detail the locations of the construction compounds described below.

Figure 4: Location of construction compounds in the Hough to Walley's Green 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 Hough to Walley's Green area there would be worker accommodation at Crewe tunnel north main compound for the construction workforce. Details of the location and duration of worker accommodation are provided in the description of the compound.

2.3.23 Soil stripped as part of the works, prior to it being used when the land is reinstated, would be stored for the duration of construction. The location of top soil 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-05-305 to CT-05-308a, in the Volume 2: MA01 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 Hough to Walley's Green 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-05-308b and Map CT-05-309 in the Volume 2: MA01 Map Book.

Construction compounds

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

Figure 5: Construction compounds for civil engineering works

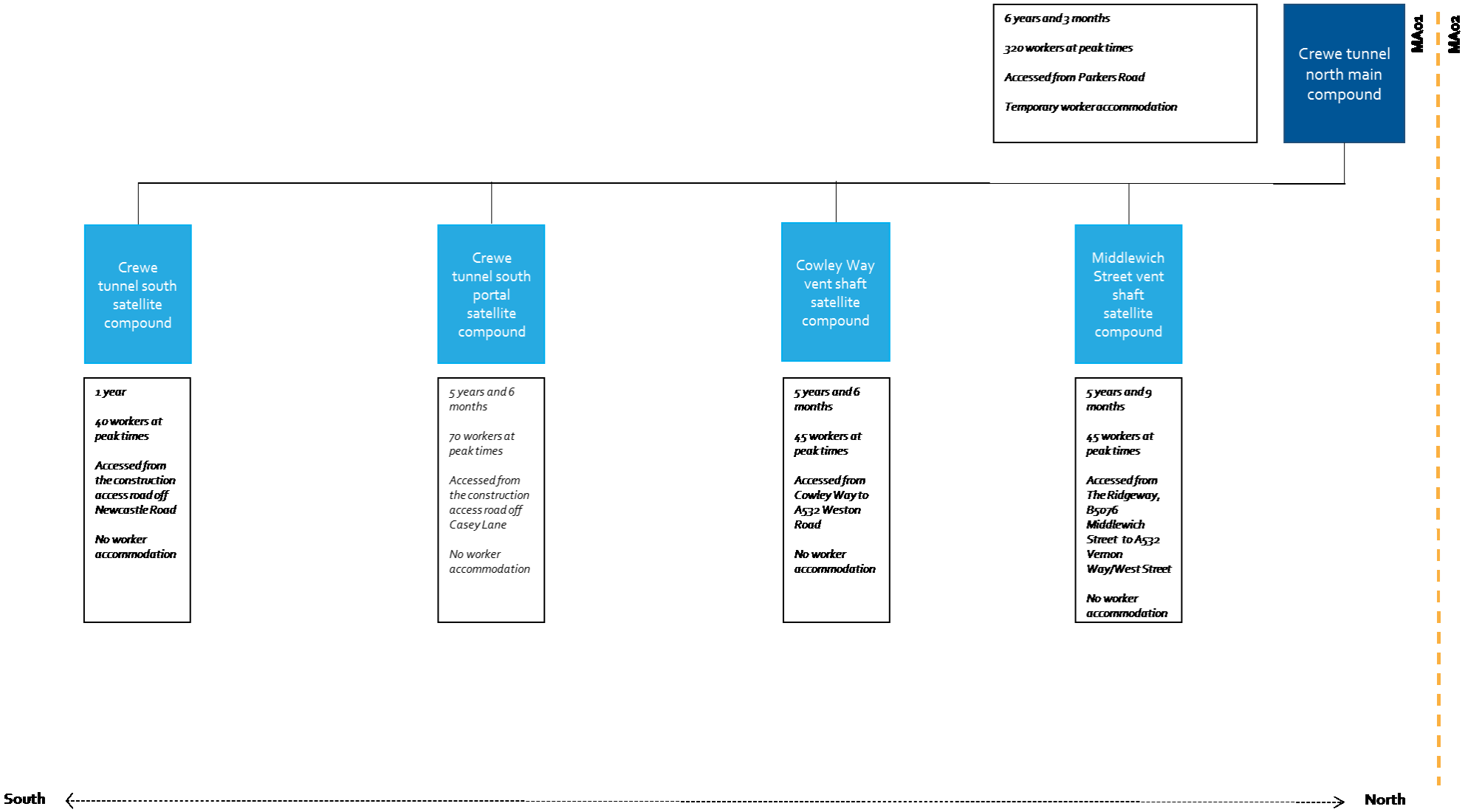
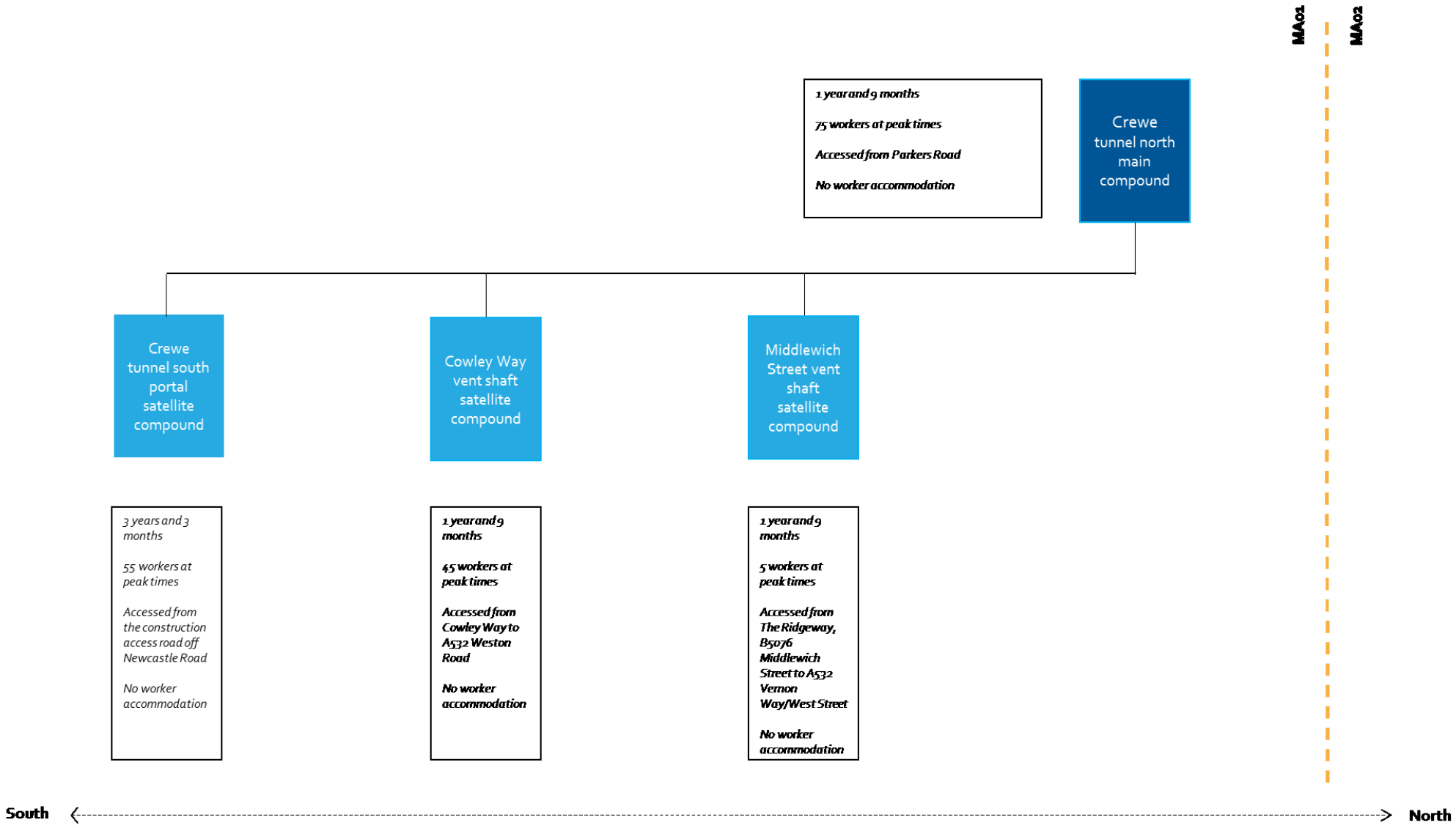


Figure 6: Construction compounds for railway systems works



Crewe tunnel north main compound

2.3.30 This compound (see Volume 2: Map CT-05-305, F1 to J8) would be used to manage both civil engineering and railway system works and provides main compound support to four satellite compounds in the Hough to Walley's Green area, as illustrated in Figure 5 for the civil engineering works.

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

Table 1: Demolitions required as a result of the works to be managed from the Crewe tunnel north main compound

Description	Location	Feature resulting in the demolition
Residential		
Residential property with outbuildings	Bridge Farm, Parkers Road, Crewe	Crewe North cutting
Residential property	Moss Bridge Farm, Parkers Road, Crewe	Coppenhall cutting
Commercial		
Kennels	Bridge Farm, Parkers Road, Crewe	Crewe North cutting
Equestrian Centre	Moss Bridge Farm, Parkers Road, Crewe	Coppenhall cutting

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

- Parkers Road overbridge, which would take two years and three months to complete;
- Crewe Footpath 29 accommodation overbridge, which would take two years and three months to complete;
- Warmingham Footpath 16 accommodation overbridge, which would take one year and six months to complete;
- Spring Farm accommodation overbridge, which would take two years and three months to complete; and
- Minshull Vernon Footpath 8 accommodation overbridge, which would take two years and three months to complete.

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

- Crewe North cutting, which would take two years and three months to complete;
- Coppenhall cutting, which would take one year and six months to complete;
- Coppenhall embankment, which would take one year and six months to complete;
- Minshull Vernon embankment, which would take two years and three

months to complete; and

- Walley's Green embankment, which would take one year and nine months to complete.

2.3.34 The compound would be used to manage the construction of the following tunnel and associated infrastructure:

- Crewe tunnel north portal, which would take five years and nine months to complete;
- tunnel boring machine (TBM) assembly and launch and tunnel drive for the western section of the twin bore tunnel, which would take two years and three months to complete. A conveyor is progressively installed as the tunnel advances; with excavated material transported via conveyor from the tunnel face to the storage location to the north;
- TBM assembly and launch and tunnel drive for the eastern section of the twin bore tunnel, which would take two years and three months to complete; and
- Crewe tunnel north portal building and rescue area and porous portal, which would take one year to complete.

2.3.35 The public roads works to be managed from this compound would require the temporary closure of Parkers Road for the construction of Parkers Road overbridge on its existing alignment, which would take two years and three months to complete. During construction of the overbridge, users would be diverted along alternative routes.

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

- permanent realignment of the Crewe Footpath 29 through the provision of the Crewe Footpath 29 accommodation overbridge over the route of the Proposed Scheme, which would take two years and three months. During construction of the realignment and overbridge, users would be diverted along alternative routes for a period of two years and three months;
- permanent realignment of Warmingham Footpath 16 through the provision of the Warmingham Footpath 16 accommodation overbridge over the route of the Proposed Scheme, which would take one year and six months. During construction of the realignment and overbridge, users would be diverted along alternative routes;
- permanent diversion of Minshull Vernon Footpath 13 through the provision of the Minshull Vernon Footpath 8 overbridge over the route of the Proposed Scheme, which would take two years and three months. During construction of the realignment and overbridge, users would be diverted along alternative routes; and
- permanent diversion of Minshull Vernon Footpath 8 providing access to Parkfield through the provision of the Minshull Vernon Footpath 8 overbridge over the route of the Proposed Scheme, which would take two years and

three months. During construction of the realignment and overbridge, users would be diverted along alternative routes.

2.3.37 Works to a number of PRoW would be managed from this compound, and are subject to ongoing design development and identification of alternative routes. It is currently expected that alternative temporary routes would be required on the following PRoW:

- Crewe Footpath 12;
- Minshull Vernon Footpath 17;
- Leighton Footpath 7; and
- Minshull Vernon Footpath 2.

2.3.38 Works to a number of accommodation accesses would be managed from this compound, and are subject to ongoing design development and identification of alternative routes. It is currently expected that alternative temporary routes would be required on the following accommodation accesses:

- Spring Farm accommodation access;
- Hole House accommodation access; and
- Parkfield accommodation access.

2.3.39 The works to be managed from this compound would require the construction of Spring Farm culvert to divert two unnamed watercourses and convey a tributary of Fowle Brook under the route of the Proposed Scheme.

2.3.40 Key railway systems works to be managed from this compound would include fitout of the Crewe tunnel and construction and installation of the Crewe tunnel north portal auto-transformer station, located 200m west of Ironstile Farm. The construction of the Crewe tunnel north portal auto-transformer station foundation and buildings would take one year and three months to complete. The installation of the Crewe tunnel north portal auto-transformer station would take six months to complete. Construction works for the auto-transformer station would be accessed from Parkers Road.

2.3.41 There would also be minor utilities works managed from this compound.

Crewe tunnel south satellite compound

2.3.42 This compound (see Volume 2: Map CT-05-301, F5) would be used to manage civil engineering works in the Hough to Walley's Green area as illustrated in Figure 4.

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

2.3.44 The compound would be used to manage the removal of TBM for both western and eastern sections of the Crewe tunnel, tunnel cleanout and removal of temporary works and placement of tunnel first stage concrete. All of these works would take one year to complete.

2.3.45 There would also be minor utilities works managed from this compound.

Crewe tunnel south portal satellite compound

2.3.46 This compound (see Volume 2: Map CT-05-302, B5) would be used to manage civil engineering works in the Hough to Walley's Green area as illustrated in Figure 4, for a period of five years and nine months. On completion of the civil engineering works, the compound would remain and be used to manage railway systems installation works in the Hough to Walley's Green area for a period of three years and three months.

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

2.3.48 The compound would be used to manage the construction of civil engineering infrastructure associated with the Crewe tunnel south portal, which would take five years and six months.

2.3.49 Works to a number of PRoW would be managed from this compound, and are subject to ongoing design development and identification of alternative routes. It is currently expected that alternative temporary routes would be required on the following PRoW:

- Chorlton Footpath 7; and
- Basford Footpath 10.

2.3.50 Key railway systems that would be managed from this compound would include tunnel fit-out of the Crewe tunnel within the Hough to Walley's Green area and railway system installation which would take three years and three months to complete.

2.3.51 There would also be minor utilities works managed from this compound.

2.3.52 This compound would be in the same location as a compound used to manage works for HS2 Phase 2a[17].

Cowley Way vent shaft satellite compound

2.3.53 This compound (see Volume 2: Map CT-05-303, G6) would be used to manage civil engineering works in the Hough to Walley's Green area, as illustrated in Figure 4, for a period of five years and six months. On completion of the civil engineering works, the compound would remain and manage railway systems installation works for a period of six months.

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

[17] HS2 (July 2017). High Speed Rail (West Midlands – Crewe). Environmental Statement Volume 2: Map CT-05-240, G4 to F4

Table 2: Demolitions required as a result of the works to be managed from the Cowley Way vent shaft satellite compound

Description	Location	Feature resulting in the demolition
Commercial		
Diner	The Portakabin, Cowley Way, Crewe	Cowley Way vent shaft

2.3.55 The compound would be used to manage the construction of the Cowley Way vent shaft and its headhouse, which would take five years and three months to complete.

2.3.56 Key railway systems works to be managed from this compound would include fit-out of the Cowley Way vent shaft, which would take one year and nine months to complete. Additional works would include the construction and installation of the Cowley Way vent shaft auto-transformer station, located 300m south-east of Crewe Alexandra Football Club football ground. The construction of the Cowley Way vent shaft auto-transformer station foundation and buildings would take one year and three months to complete. The installation of the Cowley Way vent shaft auto-transformer station would take six months to complete. Construction works for the auto-transformer station would be accessed from Cowley Way off A532 Weston Road.

2.3.57 There would also be minor utilities works managed from this compound.

Middlewich Street vent shaft satellite compound

2.3.58 This compound (see Volume 2: Map CT-05-304, J5) would be used to manage civil engineering works in the Hough to Walley's Green area, as illustrated in Figure 4, for a period of five years and nine months. During the civil engineering works the compound would also be used to manage railway systems installation works for a period of one year and nine months.

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

2.3.60 The compound would be used to manage the construction of the Middlewich Street vent shaft and headhouse, which would take five years and nine months to complete.

2.3.61 Key railway systems works to be managed from this compound would include fit-out of the Middlewich Street vent shaft, which would take one year and nine months to complete. There would also be minor utilities works managed from this compound.

Construction waste and material resources

2.3.62 Excavated material generated across the Proposed Scheme would be reused as engineering fill material or in the environmental mitigation earthworks of the Proposed Scheme, where suitable and reasonably practicable, either with or without treatment.

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

2.3.64 Local excess or shortfall of excavated material within the Hough to Walley's Green area would be managed through the mitigation earthworks design approach adopted

for the Proposed Scheme, with the aim of contributing to an overall balance of excavated material on a route-wide basis. The overall balance of excavated material will be presented in Volume 3 of the formal ES.

2.3.65 Forecasts of the amount of waste generated at temporary worker accommodation sites will be reported in the formal ES.

Commissioning of the railway

2.3.66 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

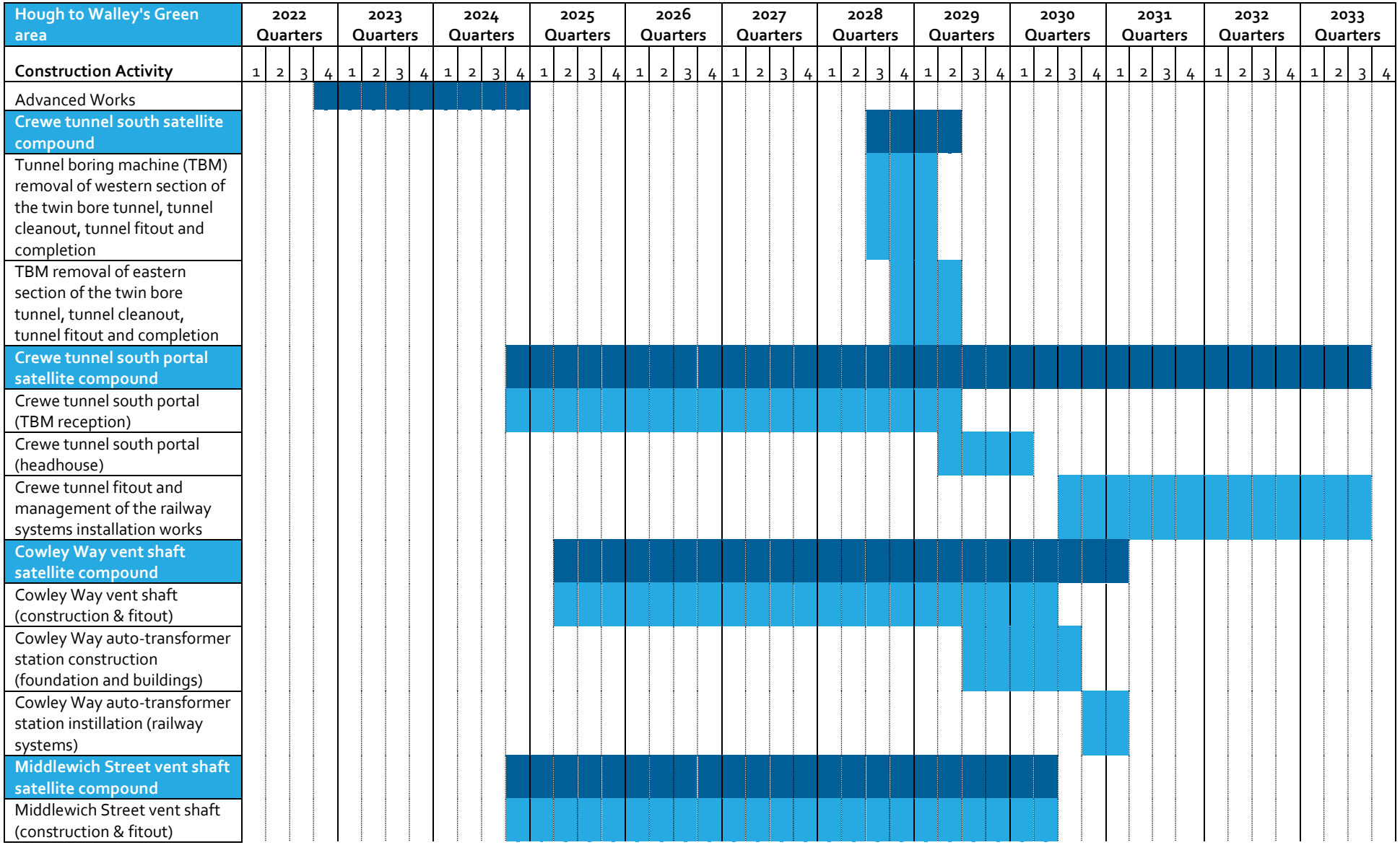
2.3.67 A construction programme illustrating indicative periods for each of the core construction activities described above is provided in Figure 7. Construction durations referred to in the following sections of this report are based on this indicative programme.

Monitoring during construction

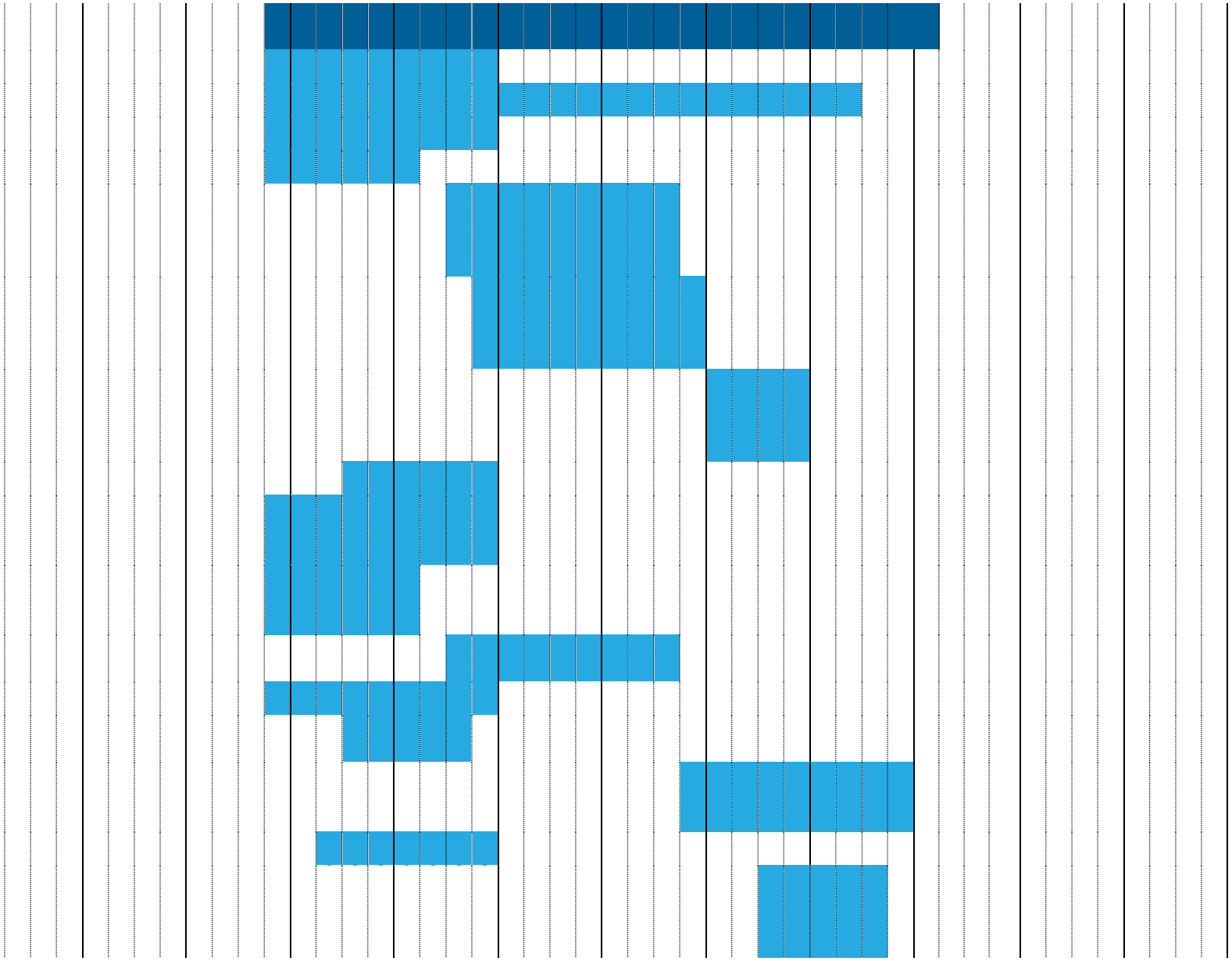
2.3.68 The appointed contractor would be required to undertake the necessary monitoring for each environmental topic to comply with the requirements of the CoCP, the relevant LEMP and any additional consent requirements. Any actions that may be necessary for compliance would be reported to the nominated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

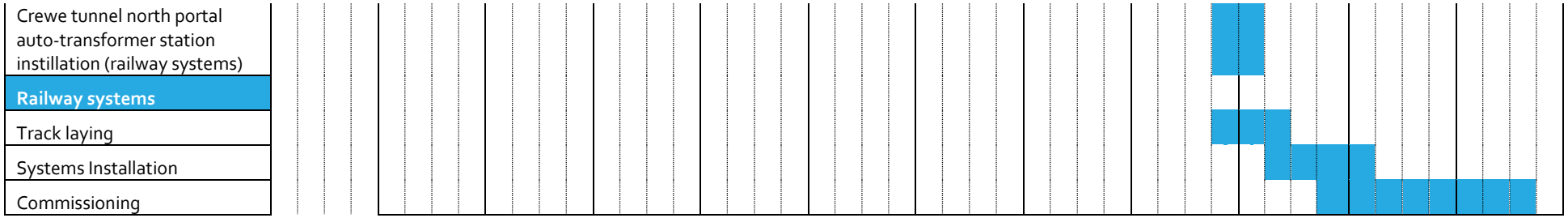
2.3.69 The CoCP and the relevant LEMP would set out inspection and monitoring procedures to assess the effectiveness of measures to prevent or reduce environmental effects during construction. Relevant local authorities and consenting authorities, such as the Environment Agency, would be consulted on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

Figure 7: Indicative construction programme between 2023 and 2033



Crewe tunnel north main compound
Parkers Road overbridge
Crewe tunnel north portal
Crewe North cutting
Coppenhall cutting
TBM assembly, launch and tunnel drive for the western section of the twin bore tunnel
TBM assembly, launch and tunnel drive for the eastern section of the twin bore tunnel
Crewe tunnel north portal building and rescue area (headhouse and porous portal)
Coppenhall embankment
Crewe Footpath 29 accommodation overbridge and realignment
Warmingham Footpath 16 accommodation overbridge and realignment
Spring Farm accommodation overbridge and realignment
Minshull Vernon embankment
Hole House accommodation access
Minshull Vernon Footpath 8 accommodation overbridge and diversion
Walley's Green embankment
Crewe tunnel north portal auto-transformer station construction (foundation and buildings)




Crewe tunnel north portal auto-transformer station instillation (railway systems)
Railway systems
Track laying
Systems Installation
Commissioning

2.4 Operation of the Proposed Scheme

Introduction

2.4.1 This section describes the operational characteristics of the Proposed Scheme in the Hough to Walley's Green area. Volume 1, Section 4 describes the envisaged operational characteristics of the Proposed Scheme as a whole, including Phase One, Phase 2a and Phase 2b.

HS2 services

2.4.2 It is anticipated that there would be up to nine trains per hour each way passing through the Hough to Walley's Green 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 western leg of the route of the Proposed Scheme would be made at the Crewe North RSD in the Wimboldsley to Lostock Gralam area (MA02). Further information on the Crewe North RSD can be found in Volume 2: Community area MA02 Wimboldsley to Lostock Gralam.

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

Crewe tunnel vent shaft location options

2.5.1 As part of the design development process since July 2017, consideration has been given to the location of vent shafts required for Crewe tunnel.

2.5.2 The Proposed Scheme would include vent shafts at two locations on the surface along the alignment of the Crewe tunnel. Each vent shaft would include a headhouse, which would contain ventilation equipment and access lifts and stairs.

2.5.3 As part of the development of the design, further work is being undertaken to consider the location of the vent shafts to optimise the operation of the Proposed Scheme and to seek to reduce potential environmental impacts. A potential location to the south of Crewe Station has been identified for a vent shaft for the southern section of the Crewe tunnel. A potential location at a site to the east of Middlewich Street in Crewe has been identified for a vent shaft for the northern section of the Crewe tunnel.

2.5.4 Further studies will be carried out to consider the vent shaft locations to be included in the Proposed Scheme and the outcome of these studies will be reported in the formal ES.

3 Stakeholder engagement and consultation

3.1 Introduction

3.1.1 HS2 Ltd's approach to stakeholder engagement and consultation on the Proposed Scheme is set out in Volume 1, Section 3.

3.1.2 Since the initial preferred route announcement in November 2016, HS2 Ltd has carried out a programme of informal stakeholder engagement and formal consultation with a broad range of stakeholders.

3.1.3 A variety of mechanisms have been used to enable an open and inclusive approach to engagement and consultation, reflecting the differing requirements and expectations of stakeholders.

3.1.4 Whilst stakeholders have informed the design and assessment of the Proposed Scheme to-date, it is important to note that this is an ongoing process. Feedback from the consultation on the working draft ES and emerging scheme design and ongoing engagement will continue to be considered as part of the ongoing design and assessment of the Proposed Scheme ultimately presented in the formal ES. There will be further consultation undertaken on the formal ES by Parliament following deposit of the hybrid Bill.

3.2 Key stages of Phase 2b engagement and consultation

3.2.1 The process of engagement remains ongoing. A summary of engagement undertaken or underway since the initial preferred route announcement in November 2016 is provided in Table 3.

Table 3: Mechanisms and timeline of stakeholder engagement since route announcement

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

Draft EIA SMR consultation

3.2.2 The draft EIA SMR was formally consulted on between July and September 2017 and was issued to statutory bodies, non-government organisations and local authorities. It was also available on the Government's website, allowing comment by local interest groups and the public. One hundred and seven responses to the draft SMR were received, as a result of which changes were made to the SMR. These are set out in the SMR Consultation 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 Hough to Walley's Green area. A consultation summary report will be published with the formal ES explaining how the responses have been taken into consideration.

3.3 Informing the Proposed Scheme

3.3.1 The main purpose of stakeholder engagement and consultation at this early stage is to inform the Proposed Scheme. Volume 1 details the engagement and consultation undertaken prior to initial preferred route announcement in November 2016.

3.3.2 The main themes to emerge from stakeholder engagement in the Hough to Walley's Green area since the initial preferred route announcement in November 2016, and which are informing the Proposed Scheme are:

- Management of construction works at the interface with Phase 2a;
- Crewe Hub Masterplan, in particular how it may affect or be affected by vent shaft location; and
- Location of Crewe tunnel north portal and proximity to neighbouring residents.

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 Hough to Walley's Green area include a range of local interest groups, local facility and service providers, places of worship, schools and educational establishments, cultural, leisure and sports stakeholders.

3.4.2 The purpose of this engagement has been to give affected communities the opportunity to raise issues in relation to the Proposed Scheme. Community stakeholders have been provided with information on the development of the Proposed Scheme, as a basis from which to identify potential impacts and opportunities for mitigation within the local area, reflecting local conditions and issues.

3.4.3 Engagement has been, and will continue to be, undertaken with schools and educational establishments, in particular, with those within proximity to the Proposed Scheme and those with specialist interests or catering to the needs of vulnerable people within the community. This has informed the assessment of community and health in the working draft ES, whilst also informing the separate EQIA being undertaken in parallel to the EIA.

3.4.4 As part of the consultation process for this working draft ES, public events are being held in communities across the route of the Proposed Scheme. Communities have been notified of these events through a range of publicity in the community area and also through the www.gov.uk/hs2 website. Documents have been made available online and in community libraries. Members of local communities and other interested parties have been invited to engage on issues pertinent to the working draft ES and the development of the Proposed Scheme design.

3.4.5 Table 4 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 4: Engagement to date with community stakeholders

Stakeholder	Area of focus
Crewe Active Travel	Meeting to discuss how Crewe can benefit from public and active transport improvements and air quality improvements.
St Pauls Centre	Engagement over potential impacts on users of this church-based community outreach and support for vulnerable people.
Laura Smith MP, Crewe and Nantwich	Meeting with MP for Crewe and Nantwich to discuss Crewe Hub, the interface and cumulative effects of Phase 2a with the Phase 2b Proposed Scheme.
Cheshire East Voluntary Action	Engagement to identify and discuss the approach to working with local community groups.
Sherborne Court Neurological Care Centre	Introductory meeting to discuss potential impacts of the Proposed Development.

Local authorities and parish councils

3.4.6 Direct engagement has been offered to and undertaken with county, borough, district and parish councils within the Hough to Walley's Green area. The purpose of this engagement is to collate local baseline information and knowledge to inform the design and assessment, identify and understand local issues and concerns, provide access to wider stakeholders and communities and provide a mechanism for ongoing dialogue and discussion on the assessment and design development.

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

3.4.8 Key issues identified during engagement with local authorities and parish councils include those summarised in Table 5.

Table 5: Engagement to date with local authorities and parish councils

Stakeholder	Area of focus
Cheshire East Council	General introductory and project update meetings, including discussion over preferred vent shaft locations for Crewe Tunnel (including how options could affect Crewe Masterplan, EQIA community groups and voluntary organisations).
	Meetings with technical leads to collate data and discuss key assessment topics including: air quality; geotechnics; highways; land quality; sound, noise and vibration; traffic and transport, and waste.
Crewe Town Council	General introductory and project update meetings, including: interface with Network Rail Crewe Hub project, Rural Support Zone principles, tunnelling, community engagement, vent shaft locations, construction compound locations, and ongoing design development.
Cheshire Association of Local Councils[18]	General introductory and project update meetings, including ongoing design development, construction logistics and mitigation (e.g. landscaping, noise barriers, PRoW); and matters relating to A530 Church Minshull and Middlewich bypass (separate scheme)
Doddington and District Parish Council	General introductory and project update meetings, including interface between Phases 2a and 2b

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)[19].

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;
- British Geological Survey;
- Campaign to Protect Rural England;
- Canal & River Trust;
- Coal Authority;
- Department of Environment, Food and Rural Affairs;
- Environment Agency;
- Fera Science Ltd;

[18] Minshull Vernon Parish Council, Church Minshull Parish Council, Byley Parish Council, Stanthorne and Wimboldsley Parish Council
[19] Supporting document: Draft Code of Construction Practice

- Forestry Commission;
- Highways England;
- Historic England;
- Inland Waterways Association;
- National Farmers Union;
- National Trust;
- Natural England;
- Network Rail;
- Public Health England;
- Ramblers Association;
- Royal Agricultural Society;
- Royal Society for the Protection of Birds;
- Royal Society of Wildlife Trusts/The Wildlife Trusts; and
- Woodland Trust.

3.4.11 A key purpose of this engagement has been to obtain detailed specialist baseline information to inform the working draft ES and the design development of the Proposed Scheme.

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

Utilities

3.4.13 Engagement is also ongoing with utility companies and statutory stakeholders to establish what infrastructure exists in the Hough to Walley's Green area and how it may need to be modified as part of the Proposed Scheme.

3.4.14 Stakeholders include: National Grid Transmission (Gas), United Utilities, Cadent Gas, SP Energy Networks, EDF Energy (Gas Storage Operations), BT Openreach, Vodafone Ltd (Below Ground Assets), Vodafone and O2 Mobile Masts, EE and 3 Mobile Masts, Airwave Mobile Masts, Instalcom, ESP Utility Group, and GTC-UK.

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 Hough to Walley's Green area.

3.4.16 Engagement is ongoing with farmers and growers whose land or property would be directly affected by the Proposed Scheme whether permanently or temporarily. The purpose of this engagement has been to obtain baseline information and provide them with the opportunity to raise issues and discuss mitigation in relation to the

Proposed Scheme. For example, the location of environmental mitigation will seek to reduce the loss of agricultural land and the location of accommodation overbridges across the route will be considered to better reflect the needs of farmers.

3.4.17 Information gathered from 12 farm visits have informed the assessment presented in this working draft ES. Farm visits are ongoing and engagement will continue as the design and assessment develops.

3.4.18 Engagement is also continuing with key representatives for the farmers and growers industry, in particular with the National Farmers Union and Country Land and Business Association.

3.4.19 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 Hough to Walley's Green area, an information event was held at Crewe Alexandra FC on 10 July 2018. Facilities were available at the event for affected individuals, major asset owners and businesses to have private meetings with HS2 staff.

3.4.20 Engagement has been undertaken with EDF Energy Ltd and TATA Chemicals Europe Ltd to discuss impacts on their operations and potential mitigation.

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

4 Agriculture, forestry and soils

4.1 Introduction

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

4.1.2 Engagement with farmers and landowners has commenced and is ongoing. The purpose of the engagement has been to obtain baseline information on the scale and nature of the farm and forestry operations and related farm-based uses, and to provide farmers and landowners with the opportunity to raise issues and discuss mitigation in relation to the Proposed Scheme. Engagement undertaken with farmers and landowners will be documented in a farm pack for each farm holding within a Phase 2b Farmers and Growers Guide[20].

4.1.3 Maps showing the location of the key environmental features (Map Series CT-10) and the key construction (Map Series CT-05) and key operational (Map Series CT-06) features of the Proposed Scheme are provided in the Volume 2: MA01 Map Book.

4.2 Scope, assumptions and limitations

4.2.1 The assessment scope, key assumptions and limitations for the agriculture, forestry and soils assessment are set out in Volume 1, Section 8 and the Scope and Methodology Report (SMR)[21].

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

4.2.3 The quality of agricultural land in England and Wales is assessed according to the Agricultural Land Classification (ALC)[22] system, which classifies agricultural land into five grades from excellent quality Grade 1 land to very poor quality Grade 5 land. Grade 3 is subdivided into Subgrades 3a and 3b. The main issue in the assessment of

[20] To be prepared for Phase 2b in due course, as per previous Phases found here: https://www.gov.uk/government/publications/hs2-guide-for-farmers-and-growers
[21] Supporting document: HS2 Phase 2b Environmental Impact Assessment Scope and Methodology Report
[22] Ministry of Agriculture, Fisheries and Food (1988), Agricultural Land Classification of England and Wales – Revised guidelines and criteria for grading the quality of agricultural land.

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

4.2.4 Forestry is considered as a commercial land use feature providing resources such as timber or fuel. The impacts on this feature have been calculated quantitatively in terms of the physical extent of commercial forestry land required. The qualitative effects on forestry land and woodland are addressed principally in Section 7, Ecology and biodiversity and Section 11, Landscape and visual.

4.2.5 The primary functions provided by soils other than for food and biomass production, such as flood water attenuation, carbon storage or the support of ecological habitats, are identified in this section and the ability of the soils to fulfil their primary functions after construction of the Proposed Scheme is assessed. Soil attributes, other than for food and biomass production, are identified in this section, but the resulting function or service provided is assessed in other sections, notably Section 7, Ecology and biodiversity; Section 9, Historic environment; Section 11, Landscape and visual; and Section 15, Water resources and flood risk.

4.2.6 The main issue for farm holdings is disruption by the Proposed Scheme of the physical structure of agricultural holdings and the operations taking place upon them, during both construction and operational phases. Where any part of a farm or rural holding is required for the construction and operation of the Proposed Scheme, the whole land holding is part of the study area for impacts on this receptor.

4.2.7 Common assumptions that have been used in assessing the effects of the Proposed Scheme are set out in Volume 1, Section 8. These assumptions include the restoration of agricultural land that is required temporarily for construction to agricultural use, and the handing back of land used temporarily to the original landowner. It is also assumed that buildings and other farm infrastructure on the land holding will not be replaced as this would ultimately be at the discretion of the landowner. For this reason, financial compensation is not a consideration in the assessment of effects on farm holdings, as set out under Impacts on holdings below. In the majority of cases, the details of land use have been obtained from face-to-face interviews. Where this has not been possible, holding data has been obtained from publicly available sources.

4.3 Environmental baseline

Existing baseline

4.3.1 This section sets out the main baseline features that influence the agricultural and forestry use of land within the Hough to Walley's Green area. These include the underlying soil resources that are used for food and biomass production, as well as providing other services and functions for society, and the associated pattern of agricultural and other rural land uses.

Soil and land resources

Geology and soil parent materials

4.3.2 A full description of the geological characteristics of the Hough to Walley's Green area is provided in Section 10, Land quality and Section 15, Water resources and flood risk.

The majority of the Hough to Walley's Green area is covered by superficial deposits of glacial till[2] (Devensian). These deposits predominantly comprise poorly sorted sandy, silty clay but can contain gravel rich or laminated sand layers. Where glacial till is not mapped, the following superficial deposits are identified.

4.3.3 Glaciofluvial sheet deposits comprising sand and gravel, locally with lenses of silt, clay or organic material, are present in the area surrounding Weston and Hough, to the south of the A500 Shavington Bypass in the southern extent of the study area. Some of the sands within the area have historically been worked.

4.3.4 Alluvial deposits (which variably comprise silty clay, silt, sand and gravel and are often organic in nature) are mapped along the following watercourses within the study area: Swill Brook, Gresty Brook, Valley Brook and Leighton Brook. River terrace deposits comprising sand and gravel are also present in a limited strip in the valley of Gresty Brook.

4.3.5 There are two types of bedrock geology mapped by the British Geological Survey (BGS)[23] underlying the study area. These are the Wilkesley Halite Member and Sidmouth Mudstone Formation, both of the Mercia Mudstone Group. The Wilkesley Halite Member is a deposit comprising halite (salt) with mudstone partings. It is present to the south of the Casey Bridge in the far south of the study area. Elsewhere, the Sidmouth Mudstone Formation is present beneath the study area.

Topography and drainage

4.3.6 The study area is located on the Cheshire Plain, characterised by broadly flat countryside, incised by river courses and streams. The land from Hough to Crewe slopes northwards over a gentle to moderate gradient (less than 7 degrees) from 65m above Ordnance Datum (AOD) to 55m AOD. To the north of Crewe, the open countryside has a gentle gradient of between approximately zero and 3 degrees, and ranges in elevation from 51m AOD to 53m AOD. The quality of agricultural land in the study area is not limited by gradient.

4.3.7 Land at risk of flooding by rivers occurs in this study area. There are substantial areas of floodplain in Flood Zone 2, in which there is between a 1 in 100 and 1 in 1,000 annual probability of river flooding, and Flood Zone 3, in which there is a 1 in 100 or greater annual probability of river flooding. The flood zones are associated with Gresty Brook, Valley Brook and Hoggins Brook. Further details are provided in Section 15, Water resources and flood risk.

Description and distribution of soil types

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

[23] British Geological Survey (2017). Geology of Britain viewer. Available online at: http://mapapps.bgs.ac.uk/geologyofbritain/home.html
[24] Soil Survey of England and Wales (1984), *Soils and their use in Midland and Western England*, Soil Survey of England and Wales, Bulletin No. 12, Harpenden.
[25] Cranfield University (2001), *The National Soil Map of England and Wales 1: 250,000 scale.* Cranfield University: National Soil Resources Institute.

4.3.9 There are three known groups of soil associations in this study area. The presence of each group has been confirmed in parts of the study area by published soil survey data. Clayey and fine loamy soils in the Crewe association are most prevalent. These soils, which are developed in reddish, stoneless, glacial deposits, i.e. till and glaciofluvial sand and gravel deposits, overlying the Sidmouth Mudstone, are seasonally waterlogged for long periods during the winter and are Wetness Class[26] (WC IV).

4.3.10 Deep sandy loam and loamy sand soils of the Newport 1 association occur in glacial river sand and gravel deposits in the south of the study area between Hough and Crewe. The soils are generally well drained (WC I).

4.3.11 At the far southern end of the study area, there are deep, permeable sandy and sandy loam soils that belong to the Blackwood association. These soils are developed in glacial river deposits, which are variable in stone content and frequently overlie clay deposited in glacial lakes, or glacial till, at depth. Where undrained, the Blackwood soils are waterlogged for long periods during the winter (WC III and IV). These soils experience fluctuating levels of groundwater, but where the water-table has been lowered, the soils are well drained (WC I) or only slightly seasonally waterlogged (WC II).

Soil and land use interactions

Agricultural land quality

4.3.12 The principal soil/land use interaction is the quality of the agricultural land resource. The ALC is based on the identification of physical limitations to the agricultural capability of land resulting from the interactions of soil, climate, topography and drainage.

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

4.3.14 Climate within this area does not in itself place any limitation on agricultural land quality. However, the interactions of climate with soil characteristics are important in determining the wetness and droughtiness[27] limitations of the land.

4.3.15 The local agro-climatic data have been interpolated from the Meteorological Office's standard 5km grid point dataset[28] for three points within the study area. The data show climate in this area to be cool and moist. The number of Field Capacity Days[29] (FCDs), when the moisture deficit[30] is zero, ranges from 172 to 173 days per annum.

[26] The Wetness Class of a soil is classified according to the depth and duration of waterlogging in the soil profile and has six categories from WC I which is well drained to WC VI which is very poorly drained.
[27] A measure of the likely moisture stress in a crop arising from the crop's requirement for water exceeding the available water capacity in the soil
[28] Meteorological Office (1989), *Gridpoint Meteorological data for Agricultural Land Classification of England and Wales and other Climatological Investigations*.
[29] Field Capacity Days (FCD) is a meteorological parameter which estimates the duration of the period when the soil moisture deficit is zero. Soils usually return to field capacity (zero deficit) during the autumn or early winter and the field capacity period, measured in days, ends in the spring when evapotranspiration exceeds rainfall and a moisture deficit begins to accumulate.
[30] The moisture deficit is a crop-related meteorological variable which represents the balance between rainfall and potential evapotranspiration calculated over a critical portion of the growing season.

This is higher than average for lowland England (150 days) and generally constrains agricultural cultivations and soil handling for relatively long periods over winter. Moisture deficits, which give an indication of the liability of soils to droughtiness in summer, are moderate to moderately small.

4.3.16 The quality of agricultural land within the study area is not limited by gradient or microrelief[31]. Flood risk limits the quality of agricultural land to Subgrade 3b or Grade 4 alongside the Gresty Brook, Valley Brook and Hoggins. Further details are provided in Section 15, Water resources and flood risk.

4.3.17 The main physical limitations that result from interactions between soil, climate and site factors are soil wetness, soil droughtiness and a localised susceptibility to erosion on agricultural land with sandy soils in the south of the study area. For soil wetness, each soil can be allocated a Wetness Class based on soil structure, evidence of waterlogging and the number of FCDs. The topsoil texture then determines its ALC grade. Soil droughtiness is determined by the moisture retention of different soil textures and thicknesses of each soil horizon, soil structures, stone content and moisture deficits.

4.3.18 The clayey and fine loamy soils in the Crewe association, which are widespread in this study area, limit the quality of agricultural land to mainly Subgrade 3b due to soil wetness where the topsoil is medium clay loam or heavy clay loam, and where the profile is waterlogged for long periods over the winter (WC IV). Where the topsoil is medium clay loam and the profile is seasonally waterlogged (WC III), agricultural land quality is limited by soil wetness to Subgrade 3a.

4.3.19 The quality of agricultural land with well drained (WC I) sandy and sandy loam soils in the Newport 1 association is limited mainly by soil droughtiness. The severity of the limitation is determined by the factors set out above. As moisture deficits are moderate to moderately small, the profiles are only slightly limited by soil droughtiness to Grade 2, or Subgrade 3a in stony soils. Grade 2 and Subgrade 3a agricultural land mainly occurs to the south of Crewe, over glacial sands and gravels.

4.3.20 Where sandy soil profiles in the Blackwood association in the south of the study area are affected by a high water-table (WC III-IV), the quality of agricultural land is limited by soil wetness to Grade 2 where the profile is seasonally waterlogged (WC III), or Subgrade 3a where the profile is waterlogged for long periods during the winter (WC IV).

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

[31] Microrelief is the complex change of slope angle and direction over short distances, or the presence of boulders or rock outcrops, which can severely limit the use of agricultural machinery.
[32] Defra (2005), *Likelihood of Best and Most Versatile Agricultural Land*.

4.3.22 The preceding assessment of agricultural land quality attributed to the soil associations is based on interpretation of publicly available data and will be confirmed by detailed soil survey, as will be the detailed distribution of soil types and land in the various grades of the ALC. The results will be reported in the formal ES.

Other soil interactions

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

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

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

4.3.25 Within the study area, the floodplains of the Gresty Brook, Valley Brook and Hoggins Brook occupy land where water has to flow or be stored in times of flood. This is set out in Section 15, Water resources and flood risk. The soils and floodplains in this study area function as water stores for flood attenuation, as well as providing ecological habitat.

Land use

Land use description

4.3.26 Agricultural land use in this study area is predominantly pasture, and used mostly to support dairy herds, with a number of beef cattle and sheep enterprises also present. The grassland is divided into small, irregularly shaped fields separated by hedgerows, oak trees and many small woods, often planted as game cover. Arable land more commonly associated with pockets of permeable and well drained sandy soils are present in the south of the study area.

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

4.3.27 Woodland is sparse in this study area and is limited to Larch Wood and Burnt Covert in the north near Minshull Vernon. Neither is understood to be commercially managed.

4.3.28 A number of environmental designations influence land use within the study area. The whole area is a nitrate vulnerable zone, where statutory land management measures apply limiting the average amount of nitrogen from manufactured fertiliser and organic manures that can be applied to agricultural land in order to reduce nitrogen losses from agricultural sources to the natural water environment.

4.3.29 Some agricultural land within the study area is also subject to agri-environment management prescriptions that seek to retain and enhance the landscape and biodiversity qualities and features of farmland. These are associated with the Environmental Stewardship Scheme (Entry Level Scheme (ELS) or Higher Level Scheme (HLS)), or the Countryside Stewardship Scheme (CSS) which has been the main agri-environment scheme in England since 2015. The CSS incorporates elements of Environmental Stewardship, the England Woodland Grant scheme and Catchment Sensitive Farming grants.

4.3.30 Most Environmental Stewardship agreements, which were extensive and covered approximately 70% of agricultural land in England, have now ended although existing agreements will run their course. The higher tier and mid-tier options in the CSS are more focused than Environmental Stewardship, with applications for funding being competitive and the area covered by the scheme being less than that covered under Environmental Stewardship. However, four new simpler non-competitive offers have been introduced in 2018 to complement the higher tier and mid-tier options and open up the scheme to more farmers and land managers. Holdings that have land entered into an agri-environment scheme are identified in Table 6.

Number, type and size of holdings

4.3.31 Table 6 sets out the current understanding of main farm holdings within this study area. The details of holdings have been obtained from face-to-face interviews with farm owners and occupiers. Publicly available sources have been used to obtain information about farm holdings where it has not yet been possible to arrange interviews and this information will be validated as survey work continues. Other farm holdings may be identified as survey work continues and the design develops. Effects on these farm holdings will be reported in the formal ES.

4.3.32 Table 6 also sets out the sensitivity of individual holdings to change. This is determined by the extent to which they have the capacity to absorb or adapt to impacts, which in turn is determined primarily by their nature and scale. In general terms, larger holdings have a greater capacity to change enterprise mix and scale, can better absorb impacts and are less sensitive. Units that rely on the use of buildings (such as intensive livestock and dairy farms, and horticultural units) are less able to accommodate change and have a higher sensitivity. Non-commercial land uses and units, such as pony paddocks associated with residential properties, have a low sensitivity.

Table 6: Summary of characteristics of holdings

Holding name	Holding type	Holding size (ha)	Diversification	Agri-environment scheme	Sensitivity to change
Ellesmere Dairy Farm†	Dairy and beef cattle	304	Paintball	ELS	High
Heath Farm†	Arable	100	DIY livery, contracting	None	Medium
The Moss†	Arable	92	Not known	None	Medium
Oakhanger Hall†	Dairy and arable	304	Shoot	ELS	High
Land south of Parkers Road*	Grassland	7	Not known	None	Medium
Winton Equestrian Centre (WEC)	Equestrian	8	Phone mast	None	Medium
Land north of WEC*	Grassland	7	Not known	None	Low
Land north of Crewe	Grassland	9	None	None	Medium
Land east of WEC*	Grassland	5	Not known	None	Medium
Moss Lane grazing	Beef cattle	16	None	Mid-tier CSS	Medium
Moss Farm	Grazing and fodder	26	None	None	Medium
Land south and west of Spring Plantation	Grassland	10	None	None	Low
Land south and east of Spring Plantation*	Grassland	1	Not known	None	Low
Spring Plantation*	Grassland and scrub	2	Not known	None	Low
Spring Farm	Arable and grassland	71	Business Park	None	Medium
Land east of WCML* (gas)	Grassland	82	Gas storage	None	Medium
Land east of Minshull Hall Court*	Grassland	34	Not known	None	Medium
Land north of Minshull Hall Court*	Grassland	26	Not known	ELS	Medium

Holding name	Holding type	Holding size (ha)	Diversification	Agri-environment scheme	Sensitivity to change
Land at Parkfield Farm*	Dairy	22	Not known	ELS	High
Park House Farm	Sheep and beef cattle	22	Property lets	Mid-tier CSS	Medium
Newfield Hall Farm	Cattle breeding	36	None	None	Medium

† Also affected by High Speed Rail Phase 2a (West Midlands - Crewe) see Environmental Statement, Volume 2: Community Area report CA5, South Cheshire
* It has not yet been possible to arrange farm impact assessment interviews with these holdings. Publicly-available sources have been used to obtain the information presented.

4.4 Effects arising during construction

Avoidance and mitigation measures

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

4.4.2 Compliance with the Code of Construction Practice (CoCP) will avoid or reduce environmental impacts during construction. Those measures that are particularly relevant to agriculture, forestry and soils are set out in the draft CoCP[35] and relate to:

- the reinstatement of agricultural land that is used temporarily during construction to agriculture, where this is the agreed end use (Section 6);
- the provision of a method statement within the farm pack for stripping, handling, storing and replacing agricultural and woodland soils to reduce risks associated with soil degradation on areas of land to be returned to agriculture and woodland following construction, based on detailed soil survey work to be undertaken prior to construction. This would include any remediation measures necessary following the completion of works (Section 6). Where they occur, there will be special provisions for handling peat and peaty soils (Section 6);
- a requirement for contractors to monitor and manage flood risk and other extreme weather events, insofar as reasonably practicable, that may affect agriculture, forestry and soil resources during construction (Sections 5 and 16);

[35] Supporting document: Draft Code of Construction Practice

- arrangements for the maintenance of farm and field accesses affected by construction (Section 6);
- the protection and maintenance of existing land drainage and livestock water supply systems, where reasonably practicable (Sections 6 and 16);
- the protection of agricultural land adjacent to the construction site, including the provision and maintenance of appropriate stock-proof fencing (Sections 5, 6, 9 and 12);
- the adoption of measures to control the deposition of dust on adjacent agricultural crops (Section 7);
- the control of invasive and non-native species; and the prevention of the spread of weeds generally from the construction site to adjacent agricultural land (Section 9);
- the adoption of measures to prevent, insofar as reasonably practicable, the spread of soil-borne, tree, crop and animal diseases from the construction area (Sections 6 and 9); and
- liaison and advisory arrangements with affected landowners, occupiers and agents, as appropriate (Sections 5 and 6).

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

- agricultural crossing incorporated into the Spring Farm accommodation overbridge to mitigate severance for Spring Farm (CT-06-306);
- agricultural crossing incorporated into the Minshull Vernon Footpath 8 accommodation overbridge to mitigate severance for Parkfield Farm (CT-06-307); and
- a revised agricultural access that presently serves both Park Hall Farm and Park House Farm (CT-06-308a).

4.4.4 As part of the ongoing development of the design, further measures may be incorporated to avoid or mitigate adverse impacts on agriculture, forestry and soils. As the design develops it will be necessary to continue to assess the requirement for access to severed parcels of agricultural land.

4.4.5 Upon completion of construction, it is currently anticipated that soils replaced for agricultural, forestry or landscape uses would be monitored to identify any unsatisfactory growing conditions during the five-year aftercare period. Where agricultural uses are to be resumed on land disturbed during the construction of the Proposed Scheme, the design objective is to avoid any reduction in long-term capability, which would downgrade the quality of the disturbed land, through the adoption of good practice techniques in handling, storing and reinstating soils on that land. Some poorly, or very poorly drained land, or land with heavier textured soils (such as the Crewe association soils) may also require particularly careful

management, such as the timing of cultivation and livestock grazing, during the aftercare period to optimise this outcome.

Assessment of impacts and effects

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

4.4.7 Land used to construct the Proposed Scheme would fall into the following main categories when work is complete:

- part of the operational railway or associated infrastructure and kept under the control of the operator;
- returned to agricultural use (with aftercare management to ensure stabilisation of the soil structure);
- used for drainage or replacement floodplain storage areas, which may also retain some agricultural use; or
- used for ecological and/or landscape mitigation.

Temporary effects during construction

Impacts on agricultural land

4.4.8 Interpretation of publicly available data from Defra shows that the Proposed Scheme is likely to require approximately 76ha of agricultural land within the Hough to Walley's Green area during the construction phase, of which approximately 11ha (14%) are likely to be classified as BMV land (Grades 2 and 3a). This is a low magnitude of impact on BMV land.

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

4.4.10 Following completion of construction, temporary facilities would be removed and the topsoil and subsoil reinstated in accordance with the agreed end use for the land. Some permanently displaced soils may be used to restore land to agriculture or other uses with slightly deeper topsoil and subsoil layers, where appropriate.

Nature of the soil to be disturbed

4.4.11 The sensitivity of the soils disturbed by construction activity reflects their textural characteristics, in the light of local FCDs, as set out in the SMR. In areas with the

highest number of FCDs, and during the wettest times of the year, soils with high clay and silt fractions are most susceptible to the effects of handling during construction and the re-instatement of land; whereas soils with a high sand fraction in areas with the fewest number of FCDs and during the driest times of the year are the least susceptible.

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

4.4.13 Clayey and seasonally waterlogged soils (including Crewe association) are least able to remain structurally stable if moved in wet conditions or by inappropriate equipment. They are susceptible to compaction and smearing, which could affect successful reinstatement.

4.4.14 Implementation of the measures set out in the draft CoCP would reduce the magnitude of impact on soil. The detailed soil survey data will define the sensitivity of soil, and the assessment of the effects on soils to be disturbed will be reported in the formal ES.

Impacts on holdings

4.4.15 Land may be required for the Proposed Scheme from holdings temporarily, during the construction period, or permanently. In most cases, the temporary and permanent land requirement would occur simultaneously at the start of the construction period and it is the combined effect of both that would have the most impact on the holding. During the construction period, some agricultural land would be restored and the impact on individual holdings would reduce.

4.4.16 The effects of the Proposed Scheme on individual agricultural and related interests during the construction period will be reported in the formal ES. The formal ES will present the total area of land required on a particular holding during the construction period in absolute terms and as a percentage of the total area farmed. It will also show the area of land that would be returned to the holding following the construction period. The disruptive effects, principally of construction noise and dust, will be reported in the formal ES and assessed according to their effects on land uses and enterprises.

4.4.17 The potential temporary effects from the construction of the Proposed Scheme on individual agricultural and related interests are summarised in Table 7 for those holdings currently identified. The scale of the impact of land required to construct the Proposed Scheme is based on the likely proportion of land required from the holding during construction. The effects of severance will be judged on the ease and availability of access to severed land. With the implementation of the measures set

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

out in the draft CoCP, these would generally be the same during and post construction.

4.4.18 The potential scale of effect is determined by combining the highest impact on the farm holding with the sensitivity of that holding, as set out in the SMR.

Table 7: Summary of temporary effects on holdings from construction

Holding name/ sensitivity to change	**Land potentially required**	**Potential severance impact**	**Potential scale of effect**
Ellesmere Dairy Farm High sensitivity	Negligible	Negligible	Minor
Heath Farm Medium sensitivity	Negligible	Negligible	Negligible
The Moss Medium sensitivity	Negligible	Negligible	Negligible
Oakhanger Hall High sensitivity	Negligible	Negligible	Minor
Land south of Parkers Road Medium sensitivity	High	Negligible	Major/moderate adverse
Winton Equestrian Centre Medium sensitivity	High	Negligible	Major/moderate adverse
Land north of WEC Low sensitivity	High	Negligible	Moderate adverse
Land north of Crewe Medium sensitivity	High	Negligible	Major/moderate adverse
Land east of WEC Medium sensitivity	High	Low	Major/moderate adverse
Moss Lane grazing Medium sensitivity	Negligible	Low	Minor adverse
Moss Farm Medium sensitivity	Medium	Low	Moderate adverse
Land south and west of Spring Plantation Low sensitivity	High	Low	Moderate adverse
Land south and east of Spring Plantation Low sensitivity	High	Negligible	Moderate adverse
Spring Plantation Low sensitivity	High	Negligible	Moderate adverse
Spring Farm Medium sensitivity	Low	Low	Minor adverse
Land east of WCML (gas) Medium sensitivity	Medium	Low	Moderate adverse

Holding name/ sensitivity to change	Land potentially required	Potential severance impact	Potential scale of effect
Land east of Minshull Hall Court Medium sensitivity	High	Negligible	Major/moderate adverse
Land north of Minshull Hall Court Medium sensitivity	Low	Negligible	Minor adverse
Land at Parkfield Farm High sensitivity	Low	Low	Moderate adverse
Park House Farm Medium sensitivity	High	High	Major/moderate adverse
Newfield Hall Farm Medium sensitivity	Low	Negligible	Minor adverse

4.4.19 Overall, the construction of the Proposed Scheme could potentially affect 21 holdings in the Hough to Walley's Green area temporarily. On the basis of information currently available, 13 holdings could experience moderate or major/moderate adverse temporary effects from the construction of the Proposed Scheme, which would be significant for each holding.

4.4.20 In four cases (south of Crewe) where holdings are already likely to be affected by the construction of Phase 2a there would be further impacts arising from the construction of Phase 2b. As these impacts are all negligible there would be no significant cumulative effect on any of the holdings.

4.4.21 Although financial compensation would be available under existing statutory arrangements to offset these impacts, it is not a consideration in the assessment of effects on farm holdings.

Permanent effects of construction

Impacts on agricultural land

4.4.22 Interpretation of publicly available data shows that the Proposed Scheme is likely to require approximately 55ha of agricultural land permanently within the Hough to Walley's Green area, of which approximately 8ha (15%) is likely to be classified as BMV land (Grades 2 and 3a). This is a low magnitude of impact on BMV land.

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

Impacts on forestry land

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

Impacts on holdings

4.4.25 The potential permanent effects from the construction of the Proposed Scheme on individual agricultural and related interests are summarised in Table 8 for those holdings currently identified. The scale of the impact of land required to operate the Proposed Scheme is based on the likely proportion of land required from the holding. The potential effects of severance are judged on the ease and availability of access to severed land once construction is completed. The impact on farm infrastructure refers mainly to the potential loss of or damage to farm capital, such as property, buildings and structures, and the consequential effects on land uses and enterprises.

4.4.26 The potential scale of effect is determined by combining the highest impact on the farm holding with the sensitivity of that holding, as set out in the SMR.

Table 8: Summary of permanent effects on holdings from construction

Holding name/ Sensitivity to change	Land potentially required	Potential severance impact	Potential impact on farm infrastructure	Potential scale of effect
Ellesmere Dairy Farm	Phase 2b affects these four holdings for a temporary period only during construction			
Heath Farm				
The Moss				
Oakhanger Hall				
Land south of Parkers Road Medium sensitivity	High	Negligible	Negligible	Major/moderate adverse
Winton Equestrian Centre Medium sensitivity	High	Negligible	High	Major/moderate adverse
Land north of WEC Low sensitivity	High	Negligible	Negligible	Moderate adverse
Land north of Crewe Medium sensitivity	High	Negligible	Negligible	Major/moderate adverse
Land east of WEC Medium sensitivity	High	Low	Negligible	Major/moderate adverse
Moss Lane grazing Medium sensitivity	Negligible	Low	Negligible	Minor adverse
Moss Farm Medium sensitivity	Medium	Low	Negligible	Moderate adverse

Holding name/ Sensitivity to change	Land potentially required	Potential severance impact	Potential impact on farm infrastructure	Potential scale of effect
Land south and east of Spring Plantation Low sensitivity	High	Low	Negligible	Moderate adverse
Spring Plantation Low sensitivity	High	Negligible	Negligible	Moderate adverse
Spring Plantation Low sensitivity	High	Negligible	Negligible	Moderate adverse
Spring Farm Medium sensitivity	Low	Low	Negligible	Minor adverse
Land east of WCML (gas) Medium sensitivity	Medium	Low	Negligible	Moderate adverse
Land east of Minshull Hall Court Medium sensitivity	High	Negligible	Negligible	Major/moderate adverse
Land north of Minshull Hall Court Medium sensitivity	Low	Negligible	Negligible	Minor adverse
Land at Parkfield Farm High sensitivity	Low	Low	Low	Moderate adverse
Park House Farm Medium sensitivity	High	High	Negligible	Major/moderate adverse
Newfield Hall Farm Medium sensitivity	Low	Negligible	Negligible	Minor adverse

4.4.27 Overall, the construction of the Proposed Scheme could potentially permanently affect 17 holdings in the Hough to Walley's Green area. On the basis of information currently available, 13 holdings could experience moderate or major/moderate adverse permanent effects from construction, which would be significant for each holding.

4.4.28 Thirteen holdings are currently expected to experience major/moderate or moderate adverse permanent effects due to the high proportion of land required for the Proposed Scheme. One holding (Winton Equestrian Centre) would be likely to cease operating due to the proportion of land required and property demolition.

4.4.29 Although financial compensation will be available under existing statutory arrangements, there can be no certainty that this would be used to reduce the above adverse effects by the purchase of replacement land or the construction of replacement buildings. Therefore, the above assessment should be seen as the worst

case, which could be reduced if the owner and/or occupier is able, and chooses, to use compensation payments to replace assets.

Other mitigation measures

4.4.30 Other mitigation would incorporate climate change adaptation and resilience measures, insofar as reasonably practicable. For example, restored soils in areas that could be prone to drought with climate change could potentially be replaced at greater depths than at present to make them resilient to drought.

4.4.31 A farm pack within the Phase 2b Farmers and Growers Guide would be provided to all farmers and landowners, setting out baseline conditions on the farm and the assurances and obligations that HS2 Ltd would accept upon entering the land. This would include advice and appropriate assistance where there is a need for the landowner to relocate or re-provide agricultural buildings displaced by the Proposed Scheme.

Summary of likely residual significant effects

4.4.32 Although the extent of land required permanently by ALC grade is not yet known in the Hough to Walley's Green area, current indications based on publicly available information are that the effect on BMV agricultural land would be moderate adverse temporarily during construction, which would be significant, and moderate adverse permanently from construction, which would be significant. The amount of land required by ALC grade will be assessed and reported in the formal ES.

4.4.33 Thirteen holdings are anticipated to experience moderate or major/moderate adverse temporary effects both temporarily during construction and permanently. This would be significant for each holding.

4.4.34 The effect of the construction of the Proposed Scheme on the four holdings already affected by Phase 2a would be negligible and would not result in any additional significant effect on those holdings.

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

4.5 Effects arising from operation

Avoidance and mitigation measures

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

Assessment of impacts and effects

4.5.2 Potential impacts arising from the operation of the Proposed Scheme would include:

- noise emanating from moving trains; and
- the propensity of operational land to harbour noxious weeds.

4.5.3 A single set of farm buildings at Parkfield Farm would lie within approximately 100m of the route of the Proposed Scheme. The potential for significant effects on sensitive livestock receptors from noise will be assessed and reported in the formal ES.

4.5.4 The propensity of linear transport infrastructure to harbour and spread noxious weeds is a consequence of:

- the management of the highway and railway land; and
- the propensity of the weeds to spread onto such land from adjoining land, which could be exacerbated by the effects of climate change.

4.5.5 The presence of noxious weeds (particularly ragwort) would be controlled using an appropriate management regime that identifies and remedies areas of weed growth that might threaten adjoining agricultural interests.

Other mitigation measures

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

Summary of likely residual significant effects

4.5.7 No residual significant effects on agriculture, forestry and soils have been identified at this stage as a result of the operation of the Proposed Scheme.

Monitoring

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

4.5.9 There are no area-specific requirements identified for monitoring agriculture, forestry and soil during the operation of the Proposed Scheme in the Hough to Walley's Green 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 Hough to Walley's Green area. Oxides of nitrogen (NOx) including nitrogen dioxide (NO2), fine particulate matter[37] (PM10, PM2.5) and dust have been considered in the assessment. Emissions of all or some of these air pollutants are likely to arise from construction activities, demolition, site preparation works and the use of site haul routes. Emissions would also arise from road traffic during construction and operation of the Proposed Scheme.

5.1.2 Engagement with Cheshire East Council (CEC) and Newcastle-Under-Lyme Borough Council has commenced and is ongoing. The purpose of this engagement has been to obtain relevant baseline information, which includes monitoring data in this area.

5.1.3 Maps showing the location of the key environmental features (Map Series CT-10) and the key construction (Map Series CT-05) and key operational (Map Series CT-06) features of the Proposed Scheme are provided in the Volume 2: MA01 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)[38].

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

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

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

[37] PM2.5 and PM10 describe two size fractions of airborne particles that can be inhaled and therefore are of concern for human health. The designations refer to particles of size less than 2.5 and 10 microns in diameter.
[38] Supporting document: HS2 Phase 2b Environmental Impact Assessment Scope and Methodology Report
[39] The assessment of construction dust emissions has been undertaken where sensitive receptors are located up to a distance of 350m from dust generating activities. The assessment of traffic emissions will be undertaken where sensitive receptors are located up to a distance of 200m from roads screened in for further assessment.

5.2.4 The assessment of construction traffic impacts will use traffic data based on an estimate of the average daily flows in the peak year during the construction period (2023-2032). The assessment will assume vehicle emission rates and background pollutant concentrations from year 2023. As pollutant emissions both from vehicle exhausts and from 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 Hough to Walley's Green area are emissions from road vehicles. The main roads within the area are the M6, the A500 Shavington Bypass, the A5020 University Way, the A534 Nantwich Road and the A530 Nantwich Road.

5.3.2 There are three industrial installations (regulated by the Environment Agency) with permits for emissions to air, namely Sandbach Power, Crewe Boiler House and Crewe Feed Mill. The contribution of all industrial processes and other emission sources to local air quality is included within the background concentrations.

5.3.3 Estimates of background air quality have been obtained from the Department for Environment, Food and Rural Affairs (Defra)[40] for the baseline year of 2017. The data are estimated for 1km grid squares for NOx, NO2, PM10 and PM2.5. Background concentrations are within the air quality standards for all pollutants within the Hough to Walley's Green area.

Local monitoring data

5.3.4 There are currently 62 local authority diffusion tube sites located within the Hough to Walley's Green area for monitoring NO2 concentrations. These are located along the M6, the A34 Congleton Road and along major roads in Crewe, Nantwich, Sandbach, Congleton and Alsager. Measured concentrations in 2016 were within the air quality standard[41].

Air quality management areas

5.3.5 There are four air quality management areas (AQMA) within the Hough to Walley's Green area: Nantwich AQMA, Nantwich Road AQMA, Wistaston Road Crewe AQMA and Earl Street Crewe AQMA. All AQMAs have been designated for exceedances of the annual mean NO2 standard.

5.3.6 The Nantwich AQMA covers the A534 Hospital Street from London Road to Prachitts Row and was declared in December 2006. The Nantwich Road AQMA covers an area encompassing the A534 Nantwich Road between the junctions of Eddleston Road and

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

Arthur Street, Crewe, and was declared in April 2008, then amended in May 2012. The Wistaston Road Crewe AQMA covers properties adjacent to a stretch of Wistaston Road and was declared in November 2011. The Earl Street Crewe AQMA covers properties adjacent to a stretch of the A532 Earle Street and was declared in January 2010, then amended in April 2012.

Receptors

5.3.7 Several locations have been identified in the area as sensitive receptors. These 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 Bright Stars Nursery, Mablins Lane Community Primary School, Brierley Primary School, Broad Street County Infant School and Oakfield Lodge School.

5.3.9 There are three statutory designated ecological sites identified within the Hough to Walley's Green area, namely Sandbach Flashes Site of Special Scientific Interest (SSSI), Wybunbury Moss SSSI, Special Area of Conservation (SAC) and Ramsar site and Black Firs and Cranberry Bog SSSI and Ramsar site. Further details of the ecological receptors are set out in Section 7, Ecology and biodiversity.

5.4 Effects arising during construction

Avoidance and mitigation measures

5.4.1 Emissions to the atmosphere will be controlled and managed during construction through the route-wide implementation of the Code of Construction Practice (CoCP). The draft CoCP[42] 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

[42] Supporting document: Draft Code of Construction Practice

fugitive dust;

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

5.4.3 The draft CoCP includes the requirement for site-specific traffic management measures, such as the use of site haul routes for construction vehicles to minimise the need to use public roads.

Assessment of impacts and effects

Temporary effects

5.4.4 Impacts from construction of the Proposed Scheme could arise from dust generating activities and emissions from construction traffic. As such, the assessment of construction impacts has been undertaken for dust and exposure to NO_2, PM_{10} and $PM_{2.5}$ concentrations.

Construction dust effects

5.4.5 The risks arising from demolition of existing buildings, earthworks, construction of new structures and trackout[43] have been assessed for their effect on dust soiling, human health[44] and ecological sites. There are residential and ecological receptors located within the Hough to Walley's Green area.

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

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

[43] Trackout refers to the transport of dust and dirt from the construction site(s) onto the public road network, where it may be deposited and then re-suspended by vehicles using the network.
[44] Human health effects relate mainly to short-term exposure to particles of size between 2.5µm to 10µm, measured as PM10.

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 M6 junction 16, the A51 Middlewich Road, the A500/A532 Weston Road, the A5078 Dunwoody Way, the A532 West Street, Parkers Road, the B5076 Bradfield Road, and Cowley Way would likely provide the primary access for construction vehicles in this area. An increase in traffic flows as a result of construction traffic is anticipated on the A530 Nantwich Road. The temporary closure of Parkers Road would divert traffic onto the B5076 Bradfield Road, Groby Road, Broughton Road and Mablins Lane. A detailed assessment of air quality impacts from traffic emissions in the area will be undertaken and reported in the formal ES.

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

Permanent effects

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

Other mitigation measures

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

Summary of likely residual significant effects

5.4.13 The methods outlined within the draft CoCP are considered effective at reducing dust emissions and therefore, no significant residual effects are 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 speed of road traffic and changes in road alignment.

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

Operational traffic effects

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

Other mitigation measures

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

Summary of likely residual significant effects

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

Monitoring

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

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

6 Community

6.1 Introduction

6.1.1 This section of the report describes the impacts and likely significant effects identified to date on local communities resulting from the construction and operation of the Proposed Scheme in the Hough to Walley's Green area.

6.1.2 The assessment draws on information gathered from engagement with the users and operators of community facilities including Bentley Manor Care Home and the Sherborne Court Neurological Centre, both on Sherborne Road, Crewe. The purpose of this engagement has been to understand how the facilities are used and to obtain relevant baseline information to inform the design development and assessment of the Proposed Scheme. Engagement will continue with these and other stakeholders to inform the formal ES.

6.1.3 Maps showing the location of the key environmental features (Map Series CT-10) and the key construction (Map Series CT-05) and key operational (Map Series CT-06) features of the Proposed Scheme are provided in the Volume 2: MA01 Map Book.

6.2 Scope, assumptions and limitations

6.2.1 The assessment scope, key assumptions and limitations for the community assessment are set out in Volume 1, Section 8 and the Scope and Methodology Report (SMR)[45].

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

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

6.2.4 Where reasonably practicable, public footpaths and routes would be reinstated or convenient alternatives provided. HS2 Ltd 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.

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

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

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

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

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

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

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

6.3 Environmental baseline

6.3.1 The Proposed Scheme through the Hough to Walley's Green area would be approximately 11km in length and would lie within the local authority area of Cheshire East Council (CEC). It would pass beneath the mainly urban settlement of Crewe in tunnel, emerging from the tunnel portal on the northern edge of Crewe. The Proposed Scheme would continue onwards north of Crewe through an area that is predominately rural in character. Settlements in this area include the villages and hamlets of Hough, Chorlton, Weston, Basford, Coppenhall Moss, Warmingham, Minshull Vernon, and Walley's Green.

Hough and surrounds

6.3.2 Hough and its surrounds covers the villages of Hough, Chorlton, Weston, Basford and surrounds, from the southern boundary of the Hough to Walley's Green area to the outskirts of urban Crewe.

6.3.3 Hough, which has approximately 350 residential properties, is located to the south-west of the route of the Proposed Scheme. The nearest residential properties would be approximately 600m from the route of the Proposed Scheme. Community resources within the village include Hough Methodist Church, Hough Village Hall and The White Hart public house.

6.3.4 Chorlton, which has approximately 260 residential properties, is located to the south-east of the route of the Proposed Scheme. The nearest residential properties would be approximately 750m from the route of the Proposed Scheme. Community resources within the village include Chorlton Methodist Church and Chorlton Golf Course.

6.3.5 Weston, which has approximately 350 residential properties, is located to the east of the route of the Proposed Scheme. The nearest residential properties would be approximately 650m from the route of the Proposed Scheme. Community resources within the village of Weston comprise the Church of All Saints, Weston Cemetery and Weston Village Primary School.

6.3.6 Basford, which has approximately 100 residential properties, is located to the west of the route of the Proposed Scheme. The nearest residential properties would be along the route of the Proposed Scheme. There are no community facilities within the village of Basford.

6.3.7 The Crewe and Nantwich Circular Walk – a 47km promoted walking route that circles the towns of Crewe and Nantwich – passes through Weston and Hough in the south, where it is also part of the South Cheshire Walk, another promoted route. The Crewe and Nantwich Circular Walk would be crossed by the route of Proposed Scheme to the north of Crewe near to the villages of Warmingham and Minshull Vernon. National Cycle Route 70 also passes through Hough.

Crewe

6.3.8 Crewe is a town with approximately 30,000 residential properties. The route of the Proposed Scheme would run beneath Crewe in tunnel, before emerging at a tunnel portal on the northern edge of the town. Community resources within Crewe include nurseries and over 30 primary and secondary schools, an engineering college, and the Cheshire Campus of Manchester Metropolitan University. There are several places of worship, community centres, libraries, medical facilities, and public houses, as well as a police station, fire station and British Transport Police station.

6.3.9 The Middlewich Street vent shaft site would be located to the north-east of the junction of Middlewich Street and Henry Road. Bentley Manor Care Home, a residential nursing home for elderly residents requiring physical or mental support, and Sherborne Court Neurological Centre, a care home for adults with neurological diseases, are located nearby, on Sherborne Road in the Maw Green area of Crewe. The Crewe Cemetery and Crematorium is located 100m to the west of the route of the Proposed Scheme and Middlewich Street vent shaft. North-west of the urban area of Crewe is Leighton Hospital, approximately 1.6km from the route of the Proposed Scheme.

6.3.10 Within Crewe there is also a range of recreational, leisure and open space facilities consisting of playing fields, sports clubs and centres, recreational grounds and allotments. Notable facilities within the study area include the Crewe Alexandra Football Club football ground; and the Cumberland Arena and adjacent playing fields. Outside of the study area are the Crewe Golf Club; Queens Park and Queens Park Golf Club. To the north of Crewe, the Winton Equestrian Centre would be on the route of the Proposed Scheme. National Cycle Route 451, which runs from Nantwich to Sandbach, passes through Crewe. The Crewe and Nantwich Circular Walk would be crossed by the route of the Proposed Scheme at the northern edge of Crewe.

Walley's Green and surrounds

6.3.11 This area covers the villages of Warmingham, Minshull Vernon, Walley's Green and surrounds.

6.3.12 Warmingham is located to the north-east of the Proposed Scheme, which would be 1.7km from the nearest residential properties in the village. The village comprises approximately 50 residential properties, and several community facilities, including St Leonard's Church and Warmingham Church of England Primary School. The area around Warmingham is largely comprised of agricultural land. National Cycle Route 5 (linking Reading to Holyhead) passes through Warmingham.

6.3.13 Minshull Vernon and Walley's Green are located on the A530 Middlewich Road running parallel to the west of the route of Proposed Scheme. Minshull Vernon has fewer than ten residential properties. The nearest residential properties would be 50m from the route of the Proposed Scheme. Walley's Green has approximately 30 residential properties, and the nearest residential properties would be 550m from the route of the Proposed Scheme. Community facilities in these areas include, the Minshull Vernon United Reformed Church, St Peter's Church, and the Verdin Arms public house in Walley's Green

6.3.14 As noted above, the Crewe and Nantwich Circular Walk crosses the route of Proposed Scheme near Warmingham and Minshull Vernon. The River Weaver and the Shropshire Union Canal Middlewich Branch pass to the west of these settlements, approximately 3km from the route of the Proposed Scheme. The Shropshire Union Canal Middlewich branch is a popular recreational corridor for walking, cycling and boating. The Old Hough Coarse Fishery is open to the public for day fishing and has a caravan park; it is located just over 1km to the east of Walley's Green and 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)[46] includes a range of provisions that will help mitigate community effects associated with construction within this area, including:

[46] Supporting document: Draft Code of Construction Practice

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

Assessment of impacts and effects

Temporary effects

Residential properties

6.4.2 As part of the construction of the Proposed Scheme, it would be necessary to carry out minor utility works or minor highways works within land that falls within the boundaries of residential properties. The scale of impact will be small, and the duration short (up to three months), resulting in minor adverse effects, which are not significant at a community level.

Community facilities

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

Open space and PRoW

6.4.5 Construction of the Coppenhall embankment would intersect the 47km Crewe and Nantwich Circular Walk to the north of Crewe. Construction activity is expected to last for at one year and six months, with part of the Crewe and Nantwich Circular Walk being diverted. The Crewe and Nantwich Circular Walk would however remain accessible during the construction period. Proposed mitigation and an assessment of the likely effects will be reported in the formal ES.

6.4.6 The Middlewich Street vent shaft satellite compound (to construct the Middlewich Street vent shaft and headhouse) would require the temporary use of an area of

informal open space between the West Coast Main Line (WCML) and Middlewich Street for a period of five years and nine months. The land is currently accessed by paths from the Cranborne Road residential area in the north and Audley Street, Ridgeway Street and Mellor Street in the east. The total 0.6ha of informal open space would be required during construction. A children's playground approximately 350m north-west of the Middlewich Street vent shaft site is located outside of the land required for the construction of the Proposed Scheme and may provide an alternative play area. As there are limited areas of informal open space nearby, the temporary loss of this open space would result in a moderate adverse effect, which would be significant.

Permanent effects

Residential properties

6.4.7 Land required to construct the Parkers Road overbridge would require the demolition of two residential properties on Parkers Road in Crewe. These residential properties would be permanently lost.

Community facilities

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

Recreational facilities

6.4.9 Land required for the construction of the Parkers Road overbridge would require the demolition of the Winton Equestrian Centre, a livery yard situated adjacent to the route of the Proposed Scheme. The centre is open five days a week and provides private riding lessons and livery services, as well as organising regular competitions and show days. Due to the demolition of the buildings, the Winton Equestrian Centre would no longer be able to provide livery services, riding lessons and competitions. Other equestrian centres in the local area include Woodside Stables, Oakhanger Riding and Pony Club Centre and Smiths Green Livery and Rising Centre, which may reduce the impact on the community. The permanent land requirement would result in a moderate adverse effect, which would be significant.

Open space and PRoW

6.4.10 The Middlewich Street vent shaft would permanently require approximately 0.05ha of informal open space at the western end of Ridgeway Street. The total area of open space is 0.6ha and is primarily used for informal activities including dog walking and football. Following the requirement for 0.6ha during the construction phase, the remaining 0.55ha of land (90% of the area) would be returned for use as informal open space. The permanent loss of part of this open space would result in a minor adverse effect, which would not be significant.

Other mitigation measures

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

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

Summary of likely residual significant effects

6.4.13 Land required for the construction of the Proposed Scheme is likely to result in a temporary residual significant effect on informal open space between the WCML and Middlewich Street.

6.4.14 Land required for the construction of the Proposed Scheme is likely to result in a permanent residual significant effect due to the loss of the livery facilities at Winton Equestrian Centre.

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 the community, such that they change the experience of a considerable proportion of people within that community.

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

Monitoring

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

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

7 Ecology and biodiversity

7.1 Introduction

7.1.1 This section of the report identifies the predicted impacts and likely significant effects on species and habitats identified to date in the Hough to Walley's Green area as a consequence of the construction and operation of the Proposed Scheme. This includes effects on sites recognised or designated on the basis of their importance for nature conservation.

7.1.2 Engagement with stakeholders including Natural England, Environment Agency, The Woodland Trust, Forestry Commission and Cheshire Wildlife Trust has commenced and is ongoing. The purpose of this engagement has been to discuss the Proposed Scheme and potential effects, obtain relevant baseline information and consider alternative locations for environmental mitigation. Engagement with these stakeholders and other local groups will continue as part of the development of the Proposed Scheme and inform the formal ES.

7.1.3 Maps showing the location of the key environmental features (Map Series CT-10) and the key construction (Map Series CT-05) and key operational (Map Series CT-06) features of the Proposed Scheme are provided in the Volume 2: MA01 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)[47].

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 A total of 6.5km of the route of the Proposed Scheme in the Hough to Walley's Green area would be in tunnel beneath, and to the south of Crewe, and 4.5km would be

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

above ground to the north of Crewe. The Hough to Walley's Green area consists mainly of farms and agricultural land with small, isolated woodlands, which are connected by hedgerows with abundant trees. Areas of wet grassland are present and there are numerous ponds and occasional drains, but no large watercourses.

7.3.3 Statutory and non-statutory designated sites are shown on Map Series CT-10, Volume 2: MA01 Map Book.

Designated sites

7.3.4 There are three internationally important sites of potential relevance to the assessment in the Hough to Walley's Green area. They are:

- Midland Meres and Mosses Phase 1 Ramsar Site, covering an area of 510.9ha, which is designated for its nutrient-rich water bodies (meres), associated fringe habitats of reed swamp, fen carr and damp pasture, and quaking peat bog. The wide range of habitats supports numerous associated rare species of plants and invertebrates. The closest component unit of the Ramsar Site is Wybunbury Moss Site of Special Scientific Interest (SSSI), located 2.2km west of the land required for the Proposed Scheme in this area, which is beyond the SSSI Impact Risk Zone[48] relevant to railway infrastructure as identified by Natural England. Two further components of this Ramsar Site, The Mere, Mere SSSI and Tatton Mere SSSI are relevant to MA03 (Pickmere to Agden and Hulseheath) and MA06 (Hulseheath to Manchester Airport);
- Midland Meres and Mosses Phase 2 Ramsar Site, covering an area of 1,588ha, is designated for nutrient rich open water bodies (meres) with fringing habitats of reed swamp, fen, carr and damp pasture, and peatlands. The wide range of habitats supports nationally important flora and fauna. The closest component unit of the Ramsar Site is Black Firs and Cranberry Bog SSSI, located 2.2km east of the land required for the Proposed Scheme, which is beyond the SSSI Impact Risk Zone relevant to railway infrastructure as identified by Natural England; and
- West Midlands Mosses Special Area of Conservation (SAC), covering an area of 184.6ha and comprising four constituent SSSIs (of which three are also part of the Midland Meres and Mosses Phase 1 Ramsar Site and one is included in the Midland Meres and Mosses Phase 2 Ramsar Site). It is designated for natural dystrophic lakes and ponds, and transition mires and quaking bogs. The closest component unit of the SAC is Wybunbury Moss SSSI, 2.2km west of the land required for the Proposed Scheme.

7.3.5 One nationally important SSSI is relevant to the assessment in the Hough to Walley's Green area. For this site, the land required for the Proposed Scheme in this area is within the Impact Risk Zone relevant to railway infrastructure as identified by Natural England.

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

7.3.6 Sandbach Flashes SSSI, covering an area of 152.9ha over several distinct sites, is designated primarily for the extremely rare inland saline habitats and the unusual plants and animals associated with them. The flashes are important for notable aquatic invertebrates, as well as wildfowl and waders, supporting large numbers of wigeon, teal, lapwing, snipe and curlew. The site is located 66om east of the land required for the Proposed Scheme in this area. The site is also assessed in the Wimboldsley to Lostock Gralam area (MA02), where it is located 2.4km east of the land required for the Proposed Scheme.

7.3.7 There are six local wildlife sites (LWS) of potential relevance to the assessment in the Hough to Walley's Green area, each of which is of county/metropolitan value. Citations provided by relevant organisations have been used in the descriptions below, and where citations are outstanding, publicly available sources of information have been used. Details of site interest features and reasons for designation will be updated in the formal ES. The LWS are:

- Basford Brook and Mere Gutter LWS, covering an area of 10.8ha, is a single watercourse that is listed as one of three key sites for white-clawed crayfish within Cheshire and a local key area[49] for water vole. The LWS runs parallel to and is 455m east of the land required for the Proposed Scheme at its closest point. The Proposed Scheme would pass beneath the site in tunnel to the north of the existing Basford Hall sorting sidings;
- Basford Brook LWS, covering an area of 12.7ha, comprises marshy grassland, woodland and scrub adjacent to parts of Basford Brook. The LWS is located on the banks of the Mere Gutter and the Basford Brook at Weston Hall to the north and south of Newcastle Road, 475m east of the land required for the Proposed Scheme;
- Crewe Swift Colony LWS, covering an area of 13.3ha, comprises six streets in a 1930s housing development which, due to its construction (for example large, overhanging eaves), provide swifts with suitable nesting opportunities. The LWS is located 1.3km south-west of the land required for the Proposed Scheme but is located adjacent to the A532 West Street, a construction access route;
- Ridding Farm Pond LWS, covering an area of 0.3ha, comprises three well-vegetated ponds in an agricultural landscape. The LWS is located 360m north-east of the land required for the Proposed Scheme;
- Worsley Covert LWS, covering an area of 5.7ha, comprises a narrow stretch of broadleaved woodland through which flows 1.7km of a tributary of the River Weaver. The LWS includes areas of ancient semi-natural woodland: Worsley Covert and Polestead Wood. The LWS is located 300m south-west of land that has been identified for the purpose of habitat creation or enhancement, as part of the Proposed Scheme, and is also 150m west of the

[49] National Water Vole Steering Group (2013): 'Likely Key Areas to support water vole'.

A530 Middlewich Road, a construction access route; and

- Shropshire Union Canal Middlewich Branch LWS covering an area of 14.2ha, comprises a 7.1km stretch of the canal and follows a rural route passing through a primarily agricultural landscape. The LWS is located adjacent to land that has been identified for the purpose of habitat creation or enhancement, as part of the Proposed Scheme.

7.3.8 There are three Ancient Woodland Inventory Sites (AWIS) relevant to the assessment in this area. Due to the habitats and species present, these sites are considered to be up to county/metropolitan value. They are:

- Worsley Covert AWIS (which also forms part of the aforementioned Worsley Covert LWS), comprising an area of 3.8ha of ancient semi-natural woodland, is located 550m south-west of the land required for the Proposed Scheme and 150m west of the A530 Middlewich Road, a proposed construction access route;
- Polestead Wood AWIS (which also forms part of the aforementioned Worsley Covert LWS), comprising an area of 6.1ha of ancient semi-natural woodland, is located 300m south-west of land that has been identified for the purpose of habitat creation or enhancement, as part of the Proposed Scheme; and
- Weaver Bank AWIS, comprising an area of 6.4ha of Plantation on Ancient Woodland Site (PAWS), is located 70m west of the land required for the Proposed Scheme in the Hough to Walley's Green area. The site is also located 20m west of land that has been identified for the purpose of habitat creation or enhancement, as part of the Proposed Scheme, within the adjacent Wimboldsley to Lostock Gralam area (MA02).

7.3.9 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

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

Woodland

7.3.11 In addition to the aforementioned woodlands, there are four other areas of lowland deciduous woodland relevant to the assessment in this area which are not designated sites but are likely to qualify as habitats of principal importance[50], and local Biodiversity Action Plan (BAP)[51] habitat. These include:

- an area near Basford Hall sorting sidings and an area to the north of the A534 Nantwich Road, both of which are located above the section of the Proposed Scheme that would be in tunnel;

[50] Section 41 of the Natural Environment and Rural Communities Act 2006
[51] Cheshire Region Biodiversity Action Plan (BAP).

- an area located north of Newfield Hall Farm, which is also partially within the Wimboldsley to Lostock Gralam area (MA02). This woodland is within the land required for the Proposed Scheme, and part is in an area required for habitat creation or enhancement, within which the woodland would be retained; and
- a small area of isolated woodland located north of Coppenhall Junction partially within the land required for the Proposed Scheme.

7.3.12 These woodlands are small in extent, but on a precautionary basis, pending the findings of field surveys, these woodlands are considered to be of up to district/borough value.

Grassland

7.3.13 Grasslands outside designated sites occur within the land required for the Proposed Scheme. This includes areas of grassland near Spring Plantation and north of Moss Bridge, which may qualify as a habitat of principal importance and local BAP habitat. On a precautionary basis, pending the findings of field surveys (which may identify these as unimproved grasslands) these grasslands are considered to be of up to district/borough value.

Hedgerows

7.3.14 Many of the hedgerows in the Hough to Walley's Green area are likely to qualify as a habitat of principal importance and a local BAP habitat. Some may also meet the wildlife and landscape criteria to be 'important' hedgerows as defined in the Hedgerows Regulations 1997[52]. In addition, they could also provide commuting corridors for wildlife and nesting and feeding habitat. On a precautionary basis, pending the findings of field surveys, the hedgerow network is considered to be of up to district/borough value.

Watercourses

7.3.15 Several minor watercourses including unnamed brooks and drainage ditches would be crossed by the Proposed Scheme. On a precautionary basis, pending the findings of field surveys, these watercourses are considered to be of up to district/borough value.

Water bodies

7.3.16 There are 16 ponds that would be located within, or partly within, the land required for the Proposed Scheme, of which five are within land identified for habitat creation or enhancement. Some may qualify as habitats of principal importance, or local BAP habitats (e.g. if they support fauna species of high conservation importance such as great crested newts). On a precautionary basis, pending the findings of field surveys, these ponds have been considered to be of up to county/metropolitan value.

[52] *Statutory Instrument 1997 No. 1160"* Hedgerows Regulations 1997

Ancient and veteran trees

7.3.17 Pending the results of the field surveys, it is possible that ancient and veteran trees are present within the land required for the Proposed Scheme and, on a precautionary basis, have been considered to be of up to district/borough value. This will be confirmed in the formal ES.

Protected and notable species

7.3.18 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 9.

Table 9: Species potentially relevant to the assessment within the Hough to Walley's Green area

Resource/feature	Value	Rationale
Aquatic invertebrates	Regional	Suitable habitat for aquatic invertebrates is present throughout the Hough to Walley's Green area and includes ponds and ditches as well as along watercourses including Gresty Brook and Basford Brook, smaller watercourses and associated floodplains. Lesser silver water beetle has been recorded from surveys on a pond north of Parkers Road, Moss Bridge, within the land required for the Proposed Scheme. The lesser silver water beetle is rare in the UK with Cheshire being one of only a few locations known to support the species; it is classified as endangered[53] and is a local BAP species. Other notable species including the depressed river mussel, mud snail, club-tailed dragonfly, downy emerald dragonfly and variable damselfly are known to occur in Cheshire. No records of these species exist within the Hough to Walley's Green area; however, they could potentially occur in suitable habitat within the land required for the Proposed Scheme.
Bats	Up to regional	The Cheshire Bat Group[54] state that up to 11 species of bats are likely to be present in the county. Interconnecting areas of woodland, ditches and hedgerows with scattered trees provide a mosaic of suitable foraging and commuting habitats. There are a number of buildings and mature trees within the land required for the Proposed Scheme, many of which are likely to have potential to support roosting bats. Existing records of bats are concentrated along the Basford Brook near Weston, north of Shavington, and near Coppenhall Moss within 1km of the land required for the Proposed Scheme. There is also a common pipistrelle and whiskered bat roost recorded at a location near Warmingham, 720m east of the land required for the Proposed Scheme. Records confirm there are at least four other species of bat throughout the area: Brandt's bat, brown long-eared bat, noctule and soprano pipistrelle.

[53] Listed as endangered in the Red Data Book of British Insects (Shirt 1987)
[54] RECORD Local Biological Records Centre for Cheshire, Halton, Warrington and Wirral, Cheshire Bat Group. Available online at: http://www.record-lrc.co.uk/c1.aspx?Mod=Article&ArticleID=G00020001

Resource/feature	Value	Rationale
Great crested newt	County/metropolitan	Suitable habitats are present in the Hough to Walley's Green area with at least 39 ponds present within 250m of the land required for the Proposed Scheme, of which 16 ponds are within the land required, including five ponds that are in land identified for habitat creation and enhancement. The species is widespread throughout Cheshire, probably due to the relative abundance of farm ponds and suitable terrestrial habitat throughout the county[55]. Records of great crested newt in the area are concentrated east and west of Basford Hall sorting sidings and north of Coppenhall Junction. Two positive results from environmental DNA (eDNA) surveys were recorded, one near Park House Farm and the other near Spring Plantation. The latter record is within land that has been identified for the purpose of habitat creation or enhancement, as part of the Proposed Scheme, and the pond would therefore likely be retained.
Birds	County/metropolitan	The landscape of mixed farming, hedgerows and small areas of woodland provide suitable habitat for breeding and wintering birds. Species associated with these habitats and with records in the area include lapwing, barn owl, skylark, tree sparrow, yellow wagtail, linnet and yellowhammer, which breed in low numbers in farmland habitats, and a range of typical common woodland breeding and wintering birds. Wintering bird surveys carried out in arable and wetland habitat have recorded large flocks of fieldfare and redwing, as well as large numbers of lapwing in the fields near Bradfield Green. A juvenile barn owl was recorded near Spring Farm, north of Leighton.
Otter	Up to county/metropolitan	Habitat suitable for otter is likely to be present along Gresty Brook, Basford Brook, Valley Brook and the Shropshire Union Canal Middlewich Branch. There are records of otter presence near Valley Brook, west of the A5020 University Way located 900m from the land required for the Proposed Scheme, and along Basford Brook, north and south of the A500 Shavington Bypass located 750m from the land required for the Proposed Scheme.
Water vole	Up to county/metropolitan	Water vole are widespread and locally common in Cheshire[56], favouring backwater streams, ponds and canals. Habitat suitable for water vole is likely to be present along Gresty Brook, Basford Brook, Valley Brook and interconnecting drainage ditches. There are records of their presence near Valley Brook, west of the A5020 University Way located 1km from the land required for the Proposed Scheme, and near Basford Brook, north of the A500 Shavington Bypass located 1.3km from the land required for the Proposed Scheme.

[55] Cheshire Wildlife Trust. (2018). Great crested Newt - Local Biodiversity Action Plan. Available online at: https://www.cheshirewildlifetrust.org.uk/sites/default/files/2018-06/Great%20crested%20newt.pdf
[56] Water vole Local Biodiversity Action Plan – Cheshire Wildlife Trust., Available online at: https://www.cheshirewildlifetrust.org.uk/sites/default/files/2018-06/Water%20vole.pdf

Resource/feature	Value	Rationale
Polecat	Up to county/metropolitan	Polecat are considered rare but are recolonising in Cheshire[57]. Habitat suitable for this species is present in the area including hedgerows, farmland and woodland. There is a single record of this species near Minshull Vernon located 500m west of the land required for the Proposed Scheme and within 100m of the A530 Middlewich Road, a proposed construction access route.
White-clawed crayfish	Up to county/metropolitan	Suitable habitat is present along Gresty Brook and Basford Brook. There are records of white-clawed crayfish from both of these watercourses within 1km of the land required for the Proposed Scheme.
Terrestrial Invertebrates	Up to district/borough	There are records of notable invertebrates within 1km of the land required for the Proposed Scheme south of Crewe. These include three species of beetle and one species of fly that are nationally scarce. There are also records of local BAP butterfly species present in this area including dingy skipper and ringlet and a record of white-letter hairstreak near Basford. Grassland and hedgerow habitats that are likely to be suitable for these species are present in the Hough to Walley's Green area, particularly near Spring Plantation and Moss Bridge.
Reptiles	Up to district/borough	Areas of suitable habitat for widespread reptile species are present within the Hough to Walley's Green area, such as north of Moss Bridge and near Spring Plantation. Grass snakes have been recorded near Coppenhall within 600m of the land required for the Proposed Scheme.

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: MA01 Map Book, along the rail corridor which would be largely a mixture of woodland/scrub and grassland), and would contribute towards mitigating the losses of habitat and effects on species:

- construction of Crewe tunnel would avoid direct effects to Basford Brook and Mere Gutter LWS;
- Crewe tunnel would avoid direct effects to lowland deciduous woodlands near Basford Hall sidings and north of the A534 Nantwich Road, which are likely to qualify as habitats of principal importance and local BAP habitats;
- construction of Crewe tunnel south of Crewe would also avoid direct effects to three watercourses; Basford Brook, Gresty Brook and Valley Brook, and would ensure free passage for wildlife along these watercourses and that their banks are maintained;
- new woodland planting would contribute towards compensation for the

[57] Polecat Local Biodiversity Action Plan – Cheshire Wildlife Trust. Available online at: https://www.cheshirewildlifetrust.org.uk/sites/default/files/2018-06/Polecat.pdf

losses of woodland (e.g. from north of Newfield Hall Farm and the small area of woodland north of Coppenhall Junction), and to enhancing connectivity between remaining woodlands. These include 1ha of planting at Spring Plantation, south of Spring Farm; 1.2ha between Burnt Cover and Larch Wood, north of Coppenhall Junction; and 1.6ha north of Newfield Hall Farm;

- provision of new ponds to replace those lost including those south of Parkers Road and north of Parkfield;
- provision of new species-rich hedgerows, using appropriate native species, to contribute towards compensation for the loss of hedgerows, and re-connecting the ecological network in the surrounding areas, including along the margins of the route; and
- provision of new grassland habitats, including some species-rich grasslands to contribute towards compensation for the losses from the Proposed Scheme. Grassland habitat creation areas would comprise a matrix of grassland, ponds, ditches and other scattered habitats such as scrub and trees and would incorporate and enhance existing features such as drains and hedgerows. Proposed areas include 4ha north of Moss Bridge; 3ha south of Spring Plantation, south of Spring Farm; 6.5ha south of Larch Wood, north-west of Coppenhall Junction; and 1.8ha south of Park Hall Farm. These areas would also provide habitat for reptiles and invertebrates.

7.4.2 The assessment assumes implementation of the measures set out within the draft Code of Construction Practice (CoCP)[58], 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

[58] Supporting document: Draft Code of Construction Practice

trusts and relevant planning authorities prior to and during construction; and

- compliance with all wildlife licensing requirements, including those for protected and invasive species and designated sites.

Assessment of impacts and effects

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

Designated sites

7.4.5 A Habitats Regulations Screening Assessment was undertaken for Midland Meres and Mosses Phase 1 Ramsar Site[59] during the Appraisal of Sustainability[60] stage of project development. This was undertaken in consultation with Natural England and the Environment Agency. It was considered that, with avoidance measures implemented by design, the impacts on the groundwater regime would be insignificant, and Wybunbury Moss SSSI, the closest component unit of the Ramsar Site, would be unaffected. Consequently, there would be no likely significant effect to the Midland Meres and Mosses Phase 1 Ramsar site and Appropriate Assessment is not required. HS2 Ltd will continue to consult with these bodies (and other relevant key stakeholders) as the design develops to ensure that the submitted design in the hybrid Bill complies with the Habitats Regulations 2017. Where required, further assessment will be undertaken and an appropriate design will be developed through an iterative process.

7.4.6 The Midland Meres and Mosses Phase 2 Ramsar Site was scoped out from the HRA screening process during the Appraisal of Sustainability stage of project development. This was on the basis that Black Firs and Cranberry Bog SSSI, the nearest component of the Ramsar Site, was sufficiently distant from the Proposed Scheme that there would be no significant effects. This conclusion was reached for HS2 Phase 2a, where Black Firs and Cranberry Bog SSSI is located 1.1km away. Black Firs and Cranberry Bog SSSI is 2.2km from the land required for the Proposed Scheme in the Hough to Walley's Green area. On this basis no further HRA assessment has been undertaken for this site.

7.4.7 The West Midlands Mosses SAC comprises four constituent SSSIs. Abbots Moss SSSI is a constituent of the Midland Meres and Mosses Phase 2 Ramsar Site which was scoped out from the HRA screening process in the Phase Two Sustainability Statement. The remaining SSSIs (Chartley Moss, Clarepool Moss and Wybunbury Moss) are constituents of Midland Meres and Mosses Phase 1 Ramsar Site. As described above, HS2 Ltd will ensure that the submitted design in the hybrid Bill complies with the Habitats Regulations 2017 in relation to this site. No adverse effects are expected at Chartley Moss, Clarepool Moss and Wybunbury Moss SSSI and it

[59] HS2 (2012). *HRA Screening Report for Midland Meres and Mosses Phase 1 Ramsar Site*.
[60] HS2 (2013). *Sustainability Statement. Volume 1: Main report of the Appraisal of Sustainability*.

would therefore follow that there would be no significant effect on the West Midlands Mosses SAC as a result of the Proposed Scheme.

7.4.8 Wetland habitats at Sandbach Flashes SSSI are potentially vulnerable to changes in surface water and groundwater flow and waterborne pollution. It is anticipated that implementation of measures in the draft CoCP would reduce the magnitude of impacts from waterborne pollution to a level where there would be no significant effect. The construction of the Proposed Scheme could result in potential obstruction to surface water flows to the SSSI from the west. However, the alignment of the route in this area would principally be on an embankment and the assessment of impacts on both surface and groundwater, as provided in Section 15, Water resources and flood risk, concludes that there would be no significant adverse effects on either surface water or groundwater flow to this site. Therefore, there would be no adverse effect on the integrity of Sandbach Flashes SSSI as a result of construction in the Hough to Walley's Green area.

Habitats

Woodland

7.4.9 Realignment of the A530 Nantwich Road would result in the loss of 0.4ha of lowland broadleaved deciduous woodland north of Newfield Hall Farm, of which 0.2ha is within the Hough to Walley's Green area. There would also be further loss of 0.1ha from the small, isolated area of woodland north of Coppenhall Junction for the construction of Minshull Vernon embankment. This would result in a permanent adverse effect that is significant at up to the district/borough level. It is considered that the aforementioned woodland habitat creation areas, which would connect remaining areas of woodland, would reduce the effect on broadleaved woodland to a level that is not significant, unless the ongoing review identifies any of the woodlands as ancient in which case there would be a permanent adverse effect at up to the county/metropolitan level.

Grassland

7.4.10 Construction of the Proposed Scheme would result in the loss of grassland outside of designated sites. It has been assumed that none of the grassland lost would be unimproved. The loss of grassland habitats would result in a permanent adverse effect that is significant at up to the district/borough level. It is considered that the provision of the new grassland habitat areas, including some species-rich grasslands and meadow creation, north of Moss Bridge, south of Spring Plantation, south of Larch Wood, and south of Park Hall Farm, once established, would reduce the adverse effect on grassland habitats to a level that is not significant.

Hedgerows

7.4.11 The construction of the Proposed Scheme would result in the loss of hedgerows that are located throughout the area, some of which may be 'important' hedgerows. The land required for construction of the Proposed Scheme would result in the permanent loss of hedgerows, and would result in severance of the network in many places, adversely affecting connectivity with the surrounding area. The length of hedgerow loss will be confirmed in the formal ES. The Proposed Scheme includes new hedgerow

planting, which would help compensate for losses. Further hedgerow planting will be proposed as part of the design development. In the absence of mitigation, the loss of these hedgerows would result in a permanent adverse effect on the conservation status of the hedgerow network that would be significant at up to the district/borough level.

Watercourses

7.4.12 The construction of the Proposed Scheme would result in the loss of sections of unnamed brooks and drainage ditches and severance of watercourse corridors due to culverts, which would result, on a precautionary basis, in a permanent adverse effect that would be significant at up to the district/borough level.

Water bodies

7.4.13 Eleven ponds would be lost as a result of the construction of the Proposed Scheme. The loss of these ponds could result, on a precautionary basis, in an impact that would be significant at up to county/metropolitan level, if it is confirmed through field surveys that they support great crested newts and/or other priority species. However, it is considered that the aforementioned pond and grassland habitat creation areas would be sufficient to reduce the effect of the loss of these ponds to a level that is not significant.

Ancient and veteran trees

7.4.14 It is assumed that ancient and veteran trees within the land required for the Proposed Scheme in the Hough to Walley's Green area would be permanently lost. Ancient and veteran trees are an irreplaceable resource and their potential loss would result in a permanent adverse effect that is significant at the district/borough level in each case.

Species

Aquatic invertebrates

7.4.15 The construction of the Proposed Scheme would result in the loss of water bodies and sections of watercourses that could provide suitable habitat for notable aquatic invertebrate species. The aquatic invertebrate assemblage in the Hough to Walley's Green area includes the lesser silver water beetle; a rare species with limited distribution in the UK, which has been recorded in a pond north of Parkers Road, Moss Bridge, within the land required for the Proposed Scheme. The impacts on the aquatic invertebrate assemblage would result in a permanent adverse effect on conservation status that would be significant at the regional level.

Bats

7.4.16 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. This could particularly affect breeding populations of at least six bat species known to be present within the area. Bats may also be affected by lighting associated with construction works, although it is anticipated that this would be controlled through measures described in the draft CoCP. On a precautionary basis, in the absence of further survey information, it has been assumed that impacts could affect scarce species and would result in a

permanent adverse effect on the conservation status of the bat populations, which would be significant at up to the regional level.

Great crested newt

7.4.17 It has been assumed that all 11 ponds (and surrounding terrestrial habitat) within the land required for construction of the Proposed Scheme may support great crested newts, and would be lost during construction. The loss of ponds supporting great crested newts and associated terrestrial habitat could result in the isolation and severance of breeding populations of great crested newts across this area. On a precautionary basis, in the absence of further survey information, it has been assumed that all ponds that would be lost support great crested newts. Where great crested newts are present, two new ponds would be created for every one lost to the permanent works, and this would contribute towards reducing the effects to not significant. Additional ponds would also be required (also on a two to one basis), where other great crested newt ponds would be lost outside the area required for the permanent works associated with the Proposed Scheme, but within the land required for construction of the Proposed Scheme. 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 be undertaken as part of scheme design development and included in the formal ES. 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 the county/metropolitan level.

Birds

7.4.18 The Proposed Scheme would result in the loss of nesting and foraging habitat for a range of breeding and wintering birds, predominantly farmland and woodland species. These are likely to include barn owl, a Schedule 1 species[61], which has been recorded near Spring Farm within 500m of the land required for the Proposed Scheme. On a precautionary basis, and in the absence of further survey information, it has been assumed that the Proposed Scheme would result in a permanent adverse effect that would be significant at the county/metropolitan level.

Water vole

7.4.19 Water vole have been recorded in the area near Valley Brook and Basford Brook. Although these two watercourses are not likely to be affected by the Proposed Scheme in the Hough to Walley's Green area, habitat potentially suitable for water vole may be removed in several smaller watercourses that would be crossed by the Proposed Scheme. It is anticipated that indirect effects from construction activities that may result in disturbance to water vole during construction would be controlled through measures in the draft CoCP. However, on a precautionary basis, in the absence of survey information, impacts to water voles would result in an adverse

[61] Birds listed under Schedule 1 of the Wildlife and Countryside Act (1981) for which it is an offence to intentionally or recklessly disturb at, on or near an 'active' nest.

effect on the conservation status of this species that would be significant at up to the county/metropolitan level.

Polecat

7.4.20 The loss of woodland and hedgerows along with grassland and arable land could affect polecat, a species which has been recorded within the Hough to Walley's Green area near Minshull Vernon. On a precautionary basis, in the absence of survey information, the effects of permanent habitat loss on this species would be significant at up to the county/metropolitan level.

White-clawed crayfish

7.4.21 The Proposed Scheme would not directly affect the Gresty Brook and Basford Brook where white-clawed crayfish have been recorded, and the potential indirect impacts to these watercourses would be controlled through measures set out in the draft CoCP. Habitat suitable for white-clawed crayfish could be present in smaller and unnamed watercourses, particularly north of Newfield Hall Farm. Loss and severance of these habitats would occur where these watercourses are placed into culverts. On a precautionary basis, in the absence of survey information, it has been assumed that the Proposed Scheme would result in a permanent adverse effect on the conservation status of this species that would be significant at up to the county/metropolitan level.

Terrestrial invertebrates

7.4.22 The Proposed Scheme would result in the loss of habitats near Spring Plantation and Moss Bridge that would be suitable for terrestrial invertebrates, including species of principal importance as identified in Section 41 of the Natural Environment and Rural Communities (NERC) Act (2006)[62] and local BAP species. On a precautionary basis, in the absence of survey information, it has been assumed that the Proposed Scheme would result in a permanent adverse effect that would be significant at up to the district/borough level.

Reptiles

7.4.23 There are records of grass snake within 1km of the land required for the Proposed Scheme and suitable habitat for widespread reptiles, including grassland, scrub and ditches, present within the land required for the Proposed Scheme. On a precautionary basis, and in the absence of further survey information, the scheme would have a significant adverse effect that is significant at up to the district/borough level. However, it is considered that the aforementioned grassland habitat creation areas, which would comprise a matrix of grassland, ponds and scattered scrub, and incorporate and enhance existing features such as drains and hedgerows, would mitigate for the loss of suitable reptile habitats and reduce the effect on reptiles to a level that is not significant.

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

[62] Section 41 of the Natural Environment and Rural Communities (NERC) Act 2006. London, Her Majesty's Stationery Office.

7.4.25 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

7.4.26 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:

- creation and enhancement of riparian habitat to compensate for the loss from minor watercourses affected by new culverts, providing replacement habitat for water vole and aquatic invertebrates, for example south of Parkers Road, near Spring Plantation and north of Newfield Hall Farm;
- considering the need for inclusion of structures to reduce severance effects on bats;
- provision of additional measures to facilitate connectivity where significant foraging or commuting routes of fauna species would be affected;
- design of watercourse culverts and underpasses to allow the free passage of wildlife;
- provision of alternative roosting habitat for bats; and
- provision of additional ponds (on a two to one basis where existing ponds supporting great created newts are lost), outside the area required for the permanent works but within the land required for construction of the Proposed Scheme, and suitable terrestrial habitat around these ponds with habitat links to allow dispersal.

7.4.27 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

7.4.28 Taking into account mitigation proposed in the design of the Proposed Scheme set out above, the anticipated significant residual ecological effects during construction are described in Table 10.

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

Resource/feature	Residual effect	Level at which the effect would be significant
Woodland	Potential for residual adverse effect on unidentified ancient woodlands.	Up to county/metropolitan
Hedgerows	Permanent adverse effect from loss of hedgerows and fragmentation of hedgerow network.	Up to district/borough
Watercourses	Permanent adverse effect from loss and fragmentation of minor watercourses.	Up to district/borough
Ancient and veteran trees	Permanent adverse effect from potential loss of ancient and veteran trees.	Up to district/borough
Aquatic invertebrates	Permanent adverse effect on conservation status due to loss of habitat.	Regional
Bats	Potential permanent adverse effect on conservation status due to loss of roosts, foraging habitat and fragmentation.	Up to regional
Great crested newt	Loss of 11 ponds and surrounding terrestrial habitat, which may support great crested newts.	County/metropolitan
Breeding and wintering birds	Potential permanent adverse effect on conservation status due to loss of habitat.	County/metropolitan
Water vole	Potential permanent adverse effect on conservation status due to loss and fragmentation of habitat along minor watercourses.	Up to county/metropolitan
Polecat	Potential permanent adverse effect on conservation status due to loss of habitat.	Up to county/metropolitan
White-clawed crayfish	Potential permanent adverse effect on conservation status due to loss and severance of habitat.	Up to county/metropolitan
Terrestrial invertebrates	Potential permanent adverse effect on conservation status due to loss of habitat.	Up to district/borough

7.5 Effects arising during operation

Avoidance and mitigation measures

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

Assessment of impacts and effects

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

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

7.5.4 Barn owls are at risk of colliding with trains, particularly north of Moss Bridge, where there is suitable grassland foraging habitat. The grassland vegetation that would grow along the embankments of the Proposed Scheme may encourage barn owls to forage close to trains, with the risk that they may be killed. Mortality, even if infrequent, could affect the conservation status of this Schedule 1 species and the ongoing reduction in numbers would result in a permanent adverse effect that would also be significant at up to county/metropolitan level.

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

Other mitigation measures

7.5.6 Additional mitigation measures currently being considered include:

- structures to reduce mortality to bats; and
- updating the HS2 barn owl mitigation plan[63] which is being developed to provide measures that will be implemented to reduce the effects of the Proposed Scheme to a level that is not significant. This is likely to include seeking opportunities to provide barn owl nest boxes and where feasible habitat enhancement opportunities at least 3km from the Proposed Scheme in consultation with local landowners.

Summary of likely residual significant effects

7.5.7 Taking into account mitigation included as part of the Proposed Scheme design, the anticipated significant residual ecological effects during operation are detailed in Table 11.

Table 11: 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 risk of collision with trains.	Up to regional
Barn owl	Potential permanent adverse effect on conservation status due to risk of collision with trains.	Up to county/metropolitan

Monitoring

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

7.5.9 There are no area-specific requirements for monitoring ecology and biodiversity effects or mitigation during the operation of the Proposed Scheme in the Hough to Walley's Green area.

[63] Currently in development for Phase One of HS2

8 Health

8.1 Introduction

8.1.1 This section identifies the communities within the Hough to Walley's Green area that would be subject to impacts associated with the Proposed Scheme and describes the changes that are considered to be potentially important for the health and wellbeing of people within these communities, where these effects are considered to be consequential.

8.1.2 Engagement with key public health bodies is underway, including with Public Health England, Directors of Public Health and Health and Wellbeing Boards. The purpose of the engagement has been to increase the understanding of health issues that may not be identified solely through a review of publicly available data. Engagement with key public health bodies will continue as part of the development of the Proposed Scheme.

8.1.3 This section deals specifically with impacts and effects at a local level within the Hough to Walley's Green 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: MA01 Map Book.

8.2 Scope, assumptions and limitations

8.2.1 The scope, assumptions and limitations for the health assessment are set out in Volume 1, Section 8 and the Scope and Methodology Report (SMR)[64].

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.

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

8.2.4 The health determinants of relevance within the Hough to Walley's Green area are:

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

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 Hough to Walley's Green area

8.3.1 The route of the Proposed Scheme would run underground from Hough, emerging in the north of Crewe and continuing through mainly rural areas including Warmingham, Minshull Vernon and Walley's Green.

8.3.2 For the purposes of the health assessment, the study area is divided into the communities described below. A description of community facilities is provided in Section 6, Community.

Hough and surrounds

8.3.3 Located to the south-east of Crewe, this area is largely rural and mainly comprises agricultural land and residential farms. Villages in this area include Hough, Chorlton and Weston and Basford.

8.3.4 The Crewe and Nantwich Circular Walk – a 47km promoted walking route that circles the towns of Crewe and Nantwich – passes through Weston and Hough in the south, where it is also part of the South Cheshire Walk, another promoted route. The Crewe and Nantwich Circular Walk would be crossed by the route of Proposed Scheme to the north of Crewe near to the villages of Warmingham and Minshull Vernon. Regional Route 70 of the National Cycle Network also passes through Hough.

Crewe

8.3.5 Crewe is a town with approximately 30,000 residential properties. The route of the Proposed Scheme would run beneath Crewe in tunnel, before emerging at a tunnel portal on the northern edge of the town. Community resources within Crewe include nurseries and over 30 primary and secondary schools, an engineering college, and the Cheshire Campus of Manchester Metropolitan University. The proposed Middlewich Street vent shaft site would be located to thee north-east of the junction of Middlewich Street and Henry Road. Bentley Manor Care Home, a residential nursing home for elderly residents requiring physical or mental support, and Sherborne Court Neurological Centre, a care home for adults with neurological diseases, are located on Sherborne Road in the Maw Green area of Crewe. North-west of the urban area of Crewe is Leighton Hospital, approximately 1.6km from the route of the Proposed Scheme. The Winton Equestrian Centre would be on the route of the Proposed Scheme. National Cycle Route 451, which runs from Nantwich to Sandbach, passes through Crewe. The Crewe and Nantwich Circular Walk would be crossed by the route of the Proposed Scheme at the northern edge of Crewe.

Walley's Green and surrounds

8.3.6 This area largely comprises agricultural land and has a small number of community facilities. The area includes the settlements of Warmingham, Minshull Vernon, Walley's Green and surrounds.

8.3.7 As noted above, the Crewe and Nantwich Circular Walk crosses the route of the Proposed Scheme near Warmingham and Minshull Vernon. The River Weaver and the Shropshire Union Canal Middlewich Branch pass to the west of these settlements, approximately 3km from the Proposed Scheme. The Shropshire Union Canal Middlewich branch is a popular recreational corridor for walking, cycling and boating. The Old Hough Coarse Fishery is open to the public for day fishing and has a caravan park; it is located just over 1km to the east of Walley's Green and the route of the Proposed Scheme.

Demographic and health profile of the Hough to Walley's Green area

8.3.8 The local communities potentially affected by the Proposed Scheme in the Hough to Walley's Green area have a relatively high population density in Crewe and, for the remaining area, a low population density commensurate with the rural nature of the area.

8.3.9 Data provided by the Office for National Statistics[65] show that this population has a broadly similar health status compared with the national (England) averages.

8.3.10 The population is slightly less deprived than the national average with regard to the combined indices of multiple deprivation[66], and the health domain (a sub-set of the indices of multiple deprivation).

8.3.11 This area as a whole is considered to be slightly more resilient than 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.

8.3.12 The available data provide detail down to ward level and enables a profile to be made of the population within the Hough to Walley's Green area. The description of the whole population, and the populations within wards, does not exclude the possibility that there will be some individuals or small groups of people who do not conform to the overall profile.

8.4 Effects arising during construction

Avoidance and mitigation measures

8.4.1 Consideration of potential health issues is an integral part of the planning and design of the Proposed Scheme, alongside consideration of other environmental, community and economic issues. Insofar as reasonably practicable, mitigation measures have been incorporated into the design of the Proposed Scheme with the aim of avoiding or reducing adverse effects. Examples of the mitigation measures incorporated into the design of the Proposed Scheme include the following:

- reducing the loss of property and community assets, insofar as reasonably practicable;
- reducing visual intrusion and noise, insofar as reasonably practicable;
- incorporating landscape design and screening into the design; and
- permanent realignment and diversions of a number of public rights of way (PRoW) and roads to maintain access (see Section 14, Traffic and transport for further detail).

[65] The Office for National Statistics (ONS) provides spatial data on levels of deprivation, using indicators of: 'multiple deprivation', 'employment', 'education', 'barriers to housing and social services', 'crime' and 'living environment'. These data are available by Lower Super Output area.
[66] Department for Communities and Local Government (2015) English Indices of Deprivation 2015. Available online at: https://www.gov.uk/government/statistics/english-indices-of-deprivation-2015

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

8.4.3 HS2 Ltd would require its contractors to comply with the environmental management regime for the Proposed Scheme, which would include the measures set out in the draft Code of Construction Practice (CoCP)[67], 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, while taking into account the specific needs of protected groups (as defined in the Equality Act 2010).

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

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

Assessment of impacts and effects

Neighbourhood quality

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

8.4.8 The construction of the Proposed Scheme will affect neighbourhood quality through impacts such as noise, air emissions, visual impacts and additional traffic, including heavy goods vehicles (HGV). These will be assessed in the relevant sections of the

[67] Supporting document: Draft Code of Construction Practice

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 significant adverse effects with respect to the effects of construction activities on dust soiling and human health within the Hough to Walley's Green area, taking account of mitigation measures contained in the draft 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[68] impacts on neighbourhood quality in areas close to construction sites, including those at Hough, Chorlton and Crewe (near to the vent shaft sites and Coppenhall Moss area). Impacts on neighbourhood quality have the potential to affect the wellbeing of residents adversely during the construction phase, by giving rise to negative feelings in relation to quality of life and the local environment, and potentially changing behaviours, such as deterring the use of outdoor space.

8.4.13 Construction noise would have the potential to generate a noticeable change in noise at outdoor areas and at neighbourhoods in proximity to the route of the Proposed Scheme, as listed in Section 13, Sound, noise and vibration. It is currently expected that the construction of the Proposed Scheme may be visible from a number of locations, as listed in Section 11, Landscape and visual. These impacts have the potential to contribute to impacts on neighbourhood quality. This will be assessed in the formal ES.

8.4.14 Traffic and transport impacts in the Hough to Walley's Green area would include:

- construction vehicle movements to and from the various construction

[68] The SMR defines temporary changes (impacts) to health determinants as short term (<6 months), medium term (6 months – 2 years), and long term (2 years +). Permanent impacts have not been defined in the SMR. A change in a health determinant lasting 4 years or more will be considered as a permanent impact. A professional judgement will be made as to when an impact would lead to a permanent effect on the health of the population.

compounds and sites;

- temporary and permanent road closures and associated diversions; and
- temporary and permanent alternative routes for PRoW.

8.4.15 Construction traffic, including heavy goods vehicles (HGV), would be present on a number of roads in this area, as listed in Section 14, Traffic and transport.

8.4.16 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

8.4.17 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.

8.4.18 Crewe 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.

8.4.19 The remaining area is predominantly rural in character. Typically there is a reliance on shops and services in nearby towns and villages. Opportunities to access alternative services and facilities are limited, resulting in the necessity to travel longer distances to access alternative facilities. There is potential for communities to experience increased difficulty in accessing shops and community services (such as post offices, banks, libraries) as a result of increased journey times during construction. This will be assessed and reported in the formal ES.

Access to green space, recreation and physical activity

8.4.20 There is moderate evidence to show that access to green space contributes to good mental health. There is also moderate evidence that environmental factors such as access to high quality green space, safety and local amenity, can influence participation in physical activity. Physical activity is strongly linked to health outcomes.

8.4.21 Construction of the Proposed Scheme may impact on levels of access to green space and physical activity, including:

- impacts on PRoW, including temporary closures, diversions and loss of amenity, which may deter the use of these routes by walkers, cyclists and

equestrians;

- any loss of green space or facility used for physical activity; and
- the presence of construction traffic, including HGVs, on the local road network, which may deter their use by walkers, cyclists and equestrians.

8.4.22 It is currently anticipated that the route of the Proposed Scheme would intersect a number of PRoW in the Hough to Walley's Green 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 reported in the formal ES.

8.4.23 Construction traffic would mainly use site haul routes along the route of the Proposed Scheme in rural areas and, like urban areas, some construction traffic (including HGVs) would be present on local roads. This could obstruct or deter pedestrians, cyclists and equestrians from using these routes. Health effects associated with these impacts, including consideration of levels of use and available alternative routes for active travel and recreation, will be assessed in the formal ES.

8.4.24 The Middlewich Street vent shaft satellite compound (to construct the Middlewich Street vent shaft and headhouse) would require the use of open space between the West Coast Main Line (WCML) and Middlewich Street. The land is currently informal open space, accessed by paths from the north – the residential area of Cranborne Road – and access from the east via Audley Street, Ridgeway Street and Mellor Street. The informal open space comprises approximately 0.6ha and all of this would be required during the period of construction (approximately five years and nine months). A small section of the land – 0.05ha at the western end of Ridgeway Street would be required for the permanent siting of the tunnel vent shaft. A children's playground is located north-east of the vent shaft site and would not be affected by the land required for the Proposed Scheme There are limited areas of nearby informal open space. The land has the potential to be used for physical activity for surrounding residents, although open space surveys have not yet been completed. The permanent loss of this open space is not expected to result in an adverse health effect, however, the temporary loss of this open space for a period of five years and nine months has the potential to result in an adverse health effect.

8.4.25 Land required for the construction of the Parkers Road overbridge would require the demolition of the Winton Equestrian Centre, a livery yard situated on the route of the Proposed Scheme. The centre is open five days a week and provides private riding lessons and livery services, as well as organising regular competitions and show days. Due to the demolition of the buildings, the Winton Equestrian Centre would no longer be able to provide livery services, riding lessons and competitions and therefore may reduce the opportunity for physical activity for equestrians. Other equestrian centres in the local area include Woodside Stables, Oakhanger Riding and Pony Club Centre and Smiths Green Livery and Rising Centre, which may provide alternatives. However, the permanent land requirement has the potential to result in an adverse health effect.

Social capital

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

'In general terms, social capital represents social connections and all the benefits they generate. Social capital is also associated with civic participation, civic-minded attitudes and values which are important for people to cooperate, such as tolerance or trust'[69].

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

8.4.28 The villages along the route of the Proposed Scheme support small, well-established communities. The size of the temporary construction workforce may be substantial relative to the size of these local communities. During the day, the workforce would be present on construction sites and compounds throughout the area, including the main compound and satellite compounds in the vicinity of the settlements of Hough, Chorlton and area north of Crewe (near to the vent shaft sites and Coppenhall Moss area). The duration of the works at each site would range from approximately one year and six months to approximately six years and three months. The presence of construction workers is likely to be noticeable (outside the urban area of Crewe), with construction vehicles using local roads to access compounds and workers using facilities such as shops, restaurants and public houses within all local villages.

8.4.29 The introduction of a temporary construction workforce into communities has the potential to alter people's perceptions of and interactions within their communities, modifying behaviour and the value they place on social capital. Such a reduction in social capital has the potential to adversely affect wellbeing, and may influence behaviours that are beneficial to wellbeing such as the use of community facilities.

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

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

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

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

8.4.33 Two residential properties would be demolished on Parkers Road in Crewe. These losses do not represent a sizable proportion of the community, and therefore, no health effects are anticipated on the remaining community. Effects on residents directly impacted by demolitions are assessed in Volume 3, Section 7, Health.

8.4.34 Road closures and diversions required for the construction of the Proposed Scheme would have the potential to reduce community connectivity by increasing journey times between rural communities.

Other mitigation measures

8.4.35 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.

8.4.36 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.

8.4.37 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 Hough to Walley's Green area will be reported in the formal ES.

Assessment of impacts and effects

Neighbourhood quality

8.5.2 Operational noise would have the potential to generate a noticeable change in noise at outdoor areas and at neighbourhoods in proximity to the route of the Proposed Scheme, as listed in Section 13, Sound, noise and vibration. The permanent features of the Proposed Scheme would be visible from nearby neighbourhoods, as described in Section 11, Landscape and visual. These impacts have the potential to contribute to impacts on neighbourhood quality. This will be assessed in the formal ES.

Other mitigation measures

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

Monitoring

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

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

9 Historic environment

9.1 Introduction

9.1.1 This section of the report provides a description of the current baseline for heritage assets and the likely impacts and significant effects identified to date resulting from the construction and operation of the Proposed Scheme within the Hough to Walley's Green area. Consideration is given to the extent and value of heritage assets including archaeological and palaeo-environmental remains, historic buildings, the built environment and historic landscape.

9.1.2 Engagement has been undertaken with Historic England, Cheshire East Council (CEC), and Cheshire Archaeology Planning Advisory Service. The purpose of this engagement has been to discuss the assessment approach, to obtain relevant baseline information and to inform the design development and assessment of the Proposed Scheme. Engagement will continue as part of the development of the Proposed Scheme and to inform the formal assessment.

9.1.3 Maps showing the location of the key environmental features (Map Series CT-10) and the key construction (Map Series CT-05) and key operational (Map Series CT-06) features of the Proposed Scheme are provided in the Volume 2: MA01 Map Book. Only designated heritage assets within the Hough to Walley's Green area are shown on maps CT-10-301 to CT-10-304a. 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). 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)[70], 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.

[70] 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 250m in urban areas and 500m in rural areas. This is referred to in the remainder of this assessment as the 250m or 500m study areas.

9.2.4 The study area within which a detailed assessment of all assets, designated and non-designated, has been carried out in the vicinity of bored or mined tunnels is defined as 100m either side of the extent of tunnelling. This is referred to in the remainder of this assessment as the 100m study area.

9.2.5 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.

9.2.6 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.

9.2.7 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.

9.2.8 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.

9.2.9 At this stage of the design development, heritage assets within the land required to construct the Proposed Scheme are assumed to require complete removal and the assessment has been undertaken on that basis. However, an exception to this is the Roman Road (Nantwich to Middlewich), where although it is within 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.

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

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

- field surveys are ongoing, and are subject to land access and site conditions. The result of field surveys will be included as part of the formal ES;

- desk-based assessment is ongoing and data on non-designated heritage assets will be described more fully in the formal ES and accompanying technical appendices; and
- intra-project topic assessments are ongoing and will be considered as part of the assessment of historic environment effects as part of the formal ES.

9.2.12 At the time of writing the Cheshire HER data were not available and will be reported in full in the formal ES.

9.3 Environmental baseline

Existing baseline

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

- the NHLE (Historic England register of designated heritage assets);
- Cheshire historic environment record;
- conservation area appraisals; and
- historic maps and aerial photography.

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

Designated assets

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

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

- Minshull Vernon moated site, fishpond and connecting channel (NHLE 1012077), a scheduled monument of high value;
- Crewe Hall (NHLE 1138666), a Grade I listed building of high value;
- six Grade II* listed buildings of high value comprising Hough Hall (NHLE 1138509); Gates, Piers, Screen and Wall at Hough Gates (NHLE 1137036); Hollyhedge Farmhouse (NHLE 1312453); Former Stables at Crewe Hall (NHLE 1138667); Church House (NHLE 1310880) and Church of St Leonard (NHLE 1330059);
- forty-five Grade II listed buildings of moderate value including the 1867 buildings at Crewe Railway Station (NHLE1436435); large groupings of rural farmhouses and buildings around Weston, Shavington, Church Minshull, Minshull Vernon, Warmingham; several buildings and structures associated with Crewe Hall (NHLE 1138666); several buildings in Crewe and Coppenhall; numerous bridges, aqueducts and weirs associated with the Middlewich Branch Canal; Basford Bridge Cottage (NHLE 1330164) and Park House, Middlewich Road (NHLE 1159752);

- three conservation areas of moderate value comprising Weston Conservation Area, Church Minshull Conservation Area and Warmingham Conservation Area;
- Queen's Park (NHLE 1001412), a Grade II* registered park and garden of high value; and
- Crewe Hall (NHLE 1000124), a Grade II registered park and garden of moderate value.

Non-designated assets

9.3.5 One non-designated heritage asset of moderate value, a Roman Road (Nantwich to Middlewich), is located partially or wholly within the land required for the Proposed Scheme.

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

- the site of a farmstead south of Heath Farm;
- embankment west of Warmingham Moss; and
- Coppenhall Junction, west of Warmingham Moss.

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

- one locally listed public houses of low value;
- ten assets of low value including archaeological remains associated with earthworks south of Minshull Hall (MCH5865), Basford and Crewe Hall (NCH5790);
- sites of former houses on Warmingham Moss;
- industrial and World War II sites; six assets of low value relating to early railway heritage associated with the Grand Junction Railway including bridges, embankments, sheds and signal boxes; and
- three assets of low value which are rural 19th century buildings such as Parkfield Farmhouse and Weaverbank Cottages.

Historic environment overview

9.3.8 The superficial geology of the area is formed of glacial tills deposited at the end of the last Ice Age. Within these formed 'kettle holes', sediment filled bodies of water that over time became wetland environments known as mosses. Within the study area examples of these are found with place names such as Coppenhall Moss and Warmingham Moss. Mosses can contain peat deposits that preserve organic remains such as pollen or insects.

9.3.9 There is no recorded archaeological evidence from the before the Iron Age within the study area. Evidence for agricultural practices, settlement and landscapes of

monumental or funerary structures (such as burial mounds or stone graves), typical of the Neolithic and Bronze Age, are absent from the study area.

9.3.10 Iron Age sites in the study area include field or settlement enclosures surrounded by ditches. The first evidence for salt production is identified at sites in the Wheelock, Weaver and Dane Valleys. Pottery of a type used in salt production has been widely identified at sites across Cheshire and beyond. By the end of the 1st millennium BC the study area had become the territory of the *Cornovii* Celtic tribe.

9.3.11 The Romano-British period began in Cheshire with the expansion of Roman occupation north of the midlands from AD70. Cheshire became the focus of industrial production, in particular salt-making, in support of the Roman fortress of *Deva Vitrix* established at Chester in AD74 – 75. A Roman road connected Middlewich (*Salinae*) and Nantwich. A salt-working site may have existed at Shavington outside Crewe as evidenced by the discovery of lead salt pans (a pan filled with brine and heated to evaporate water, leaving salt). Outside of the major settlements were rural enclosed farmsteads.

9.3.12 In the early medieval period archaeological evidence becomes increasingly scant and is dependent on documentary sources. Cheshire became part of unified England by the early 10th century. The Domesday Book records the settlements of Shavington, Weston, Chorlton, Leighton, Coppenhall, Minshull Vernon and Warmingham, in the study area and it is possible that these existed from the early medieval period.

9.3.13 Ecclesiastical establishments and manorial centres were the major landholders during the medieval period. Manor houses surrounded by moats emerge in the 12th century in mid Cheshire and include the scheduled monument at Minshull Vernon (NHLE1012077), an important example of one of these sites. During the medieval period agricultural land was poor across much of the study area, particularly the areas of wetland mosses which led to sparse settlement and mixed subsistence farming based on irregular field patterns. The pattern of small villages and isolated farmsteads that was present in the 12th century was largely unchanged until the post-medieval period.

9.3.14 During the post-medieval period an increase in dairy farming occurred as cheese and butter were sold to growing urban markets. This required improved agricultural land and led to the enclosure of marginal land such as mosses and heathland. This process was done at a slower rate than other areas because of the poor quality of the mid Cheshire soils. Eventually even marginal land, such as mosses, was brought into agricultural use and was largely completed by the 19th century. Settlement included villages and isolated rural farmhouses such as Park House, Middlewich Road (NHLE1159752). Transport links were improved during this period as towns and industry flourished in mid-Cheshire and farms were connected to urban markets. The Middlewich Branch of the Shropshire Union Canal was completed in 1827. The A530 Nantwich to Middlewich Road was turnpiked in 1835. The present town of Crewe developed alongside the construction of the Grand Junction Railway. The Birmingham to Warrington line was completed in 1837. Four railway lines including the Grand Junction Railway soon terminated at Crewe and in 1867 a new station was built. The town developed around the railway including hotels, engine sheds and repair shops.

9.3.15 In the modern period, following the nationalisation of the railways in (1948, the Grand Junction Railway was officially renamed the West Coast Main Line (WCML)). The line was modernised and electrified in stages from 1959 to 1974.

9.4 Effects arising during construction

Avoidance and mitigation measures

9.4.1 The design of the Proposed Scheme is ongoing and will consider the impact on heritage assets insofar as reasonably practicable.

9.4.2 Section 8 of the draft Code of Construction Practice (CoCP)[71] 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 No significant effects are expected to occur as a result of temporary impacts on designated or non-designated heritage assets.

Permanent effects

9.4.5 Permanent significant effects can occur either as a result of physical impacts on heritage assets within the land required for the Proposed Scheme, or through changes to the setting of heritage assets through the presence of the Proposed Scheme.

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

9.4.7 The site of a post-medieval farmstead of low value lying south of Heath Farm is partially located within the land required for the Proposed Scheme. It would be

[71] Supporting document: Draft Code of Construction Practice

physically impacted by the land required for the Crewe tunnel south satellite compound. This would constitute a high adverse impact resulting in a moderate adverse effect.

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

9.4.9 Park House, Middlewich Road (NHLE1159752) is a Grade II listed building of moderate value located 135m from the edge of the land required for the Proposed Scheme. The 19th century farmhouse derives its significance from its historic and architectural value as an example of farm architecture from that period. The farmhouse is set at the southern end of an existing group of farm buildings of 19th and 20th century date. The southern buildings are associated with the farmhouse but have now been converted for domestic accommodation. The wider setting is arable farmland of medium sized fields lined by hedgerows. The existing WCML is located 320m to the west. The rural setting contributes to the historic context of the asset as it continues to be, and can be appreciated as, a working farm. The setting of the asset would be changed by the construction of the Minshull Vernon embankment, which would result in the encroachment of the infrastructure corridor and loss of adjacent fields and the rural context of the asset. This would constitute a medium adverse impact resulting in a moderate adverse effect.

Other mitigation measures

9.4.10 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

9.4.11 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.

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

9.5 Effects arising from operation

Avoidance and mitigation measures

9.5.1 The following 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: MA01 Map Book:

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

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 Park House, Middlewich Road (NHLE1159752) that there would be no significant effects as a result of the operation of the Proposed Scheme and that therefore the significance of effect would remain as described for the permanent construction phase effect.

Other mitigation measures

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

Summary of likely residual significant effects

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

Monitoring

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

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

10 Land quality

10.1 Introduction

10.1.1 This section of the report presents the baseline conditions that exist along the Proposed Scheme in the Hough to Walley's Green area in relation to land quality, and reports the likely impacts and significant effects identified to date resulting from construction and operation of the Proposed Scheme. Consideration is given to land that potentially contains contamination and land that has special geological significance, either from a scientific, historical, mineral exploitation or mineral resources point of view including geological sites of special scientific interest (SSSI) and local geological sites (LGS), areas of historical brine extraction 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, Cheshire East Council (CEC), Chester West and Chester Council (CWCC), the Environment Agency, Fera Science Ltd (FSL)[72] 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 are provided in the Volume 2: MA01 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)[73].

10.2.2 In accordance with the SMR, a risk based approach was undertaken to identify contamination that may have an impact upon the construction of the Proposed Scheme. To support this, a desk based assessment has been undertaken for the study area, defined as the land required for construction of the Proposed Scheme plus a 250m buffer. In the case of groundwater abstractions, this buffer is increased up to 1km.

10.2.3 The majority of new and diverted utilities would be laid in the boundaries of existing highways within normal road construction layers and natural soils below. These have

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

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

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

10.2.5 The location of the Proposed Scheme was viewed from points of public access initially. In addition, visits to some key sites have been undertaken to verify desktop information.

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

10.2.7 The minerals assessment is based upon the mineral resources[74] identified on published minerals plans, and existing planning or licensed areas. Any inference of minerals provided by geological maps/reports is excluded (except where these are covered by the Minerals Plan).

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

10.3 Environmental baseline

Existing baseline

10.3.1 Baseline data have been collected from a range of sources including Ordnance Survey mapping, the BGS, the Environment Agency, Coal Authority, Oil and Gas Authority (OGA), Public Health England (PHE), CEC, Natural England, FSL, Ministry of Defence, Network Rail, petroleum officers and the APHA records as well as web sources such as local geological trusts and publicly available minerals plans.

Geology

10.3.2 This section describes the underlying ground conditions within the Hough to Walley's Green area. Recent changes in lithostratigraphic classifications by the BGS have been incorporated where appropriate.

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

10.3.3 Table 12 provides a summary of the geology (made ground, superficial and bedrock units) underlying the land required for the Proposed Scheme in the study area.

Table 12: Summary of the geology underlying the land quality study area

Geology	Distribution	Formation description	Aquifer classification
Made ground			
Made ground	Along railway land in Crewe.	Artificial ground comprising variable deposits of reworked natural and man-made materials	Not classified
Superficial			
Alluvium	Along the base of the valleys of the Gresty Brook, Valley Brook, Leighton Brook and Hoggins Brook.	Organic rich clay, silt, sand and gravel	Secondary A
River terrace deposits	Isolated strip in the valley of the Gresty Brook.	Sand and gravel	Secondary A
Glaciofluvial sheet deposits	A large area outcrops in the vicinity of Weston and Hough (to the south of the A500 Shavington Bypass) at the southern extent of the study area.	Sand and gravel	Secondary A
Glacial till	Located across the majority of the study area with the exception of the area to the south of the A500 Shavington Bypass.	Sandy silty clay with gravel	Secondary (Undifferentiated)
Bedrock			
Mercia Mudstone Group - Sidmouth Mudstone Formation - Wilkesley Halite Member	Located at the southern extent of the study area to Casey Bridge.	Halite with mudstone	Unproductive strata
Mercia Mudstone Group - Sidmouth Mudstone Formation	Located from Casey Bridge to the northern extent of the study area.	Mudstone, siltstone and sandstone	Secondary B

Made ground

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

10.3.5 Made ground is indicated on the BGS artificial ground mapping[75] along the railway land in the south of Crewe. Although not recorded along the rest of the study area,

[75] British Geological Survey 1:10,000 Artificial ground mapping

localised deposits of made ground are likely to be present across the majority of Crewe.

10.3.6 No known farm burial and pyre sites associated with the 1967 and 2001 outbreak of foot and mouth disease (FMD) are known to be present within the Hough to Walley's Green study area. In all cases, publicly available records (including APHA Foot and Mouth Disease County Status Maps)[76] do not provide an exact location for the burial or pyre sites. However, older unrecorded sites may be present from the 1967 outbreak. Similarly, anthrax-infected cattle burials may be present, generally relating to burials over 50 to 100 years ago. However, no records have been found of such burials.

Superficial geology

10.3.7 The majority of the Hough to Walley's Green area is underlain by glacial till[77] (Devensian). These deposits comprise predominantly poorly sorted sandy, silty clay but can contain gravel rich or laminated sand layers. Where glacial till is not mapped, the following superficial deposits are identified.

10.3.8 Glaciofluvial sheet deposits, comprising sand and gravel, locally with lenses of silt, clay and organic material, are present in the area surrounding Weston and Hough, to the south of the A500 Shavington Bypass.

10.3.9 Alluvium, which variably comprises silty clay, silt, sand and gravel and are often organic in nature, are mapped along various watercourses.

10.3.10 River terrace deposits comprising sand and gravel are also present in a limited strip in the valley of Gresty Brook.

Bedrock geology

10.3.11 The bedrock geology in the study area comprises the Wilkesley Halite Member and Sidmouth Mudstone Formation, both of the Mercia Mudstone Group.

10.3.12 The Wilkesley Halite Member is a deposit comprising halite (salt) with mudstone partings[78]. It is present to the south of Casey Bridge in the far south of the study area. Elsewhere, the Sidmouth Mudstone Formation is present beneath the study area.

10.3.13 The boundary between the Wilkesley Member and the Sidmouth Mudstone Formation in the south of the study area is characterised by the presence of geological faults.

[76] Animal and Plant Health Agency (2001) Foot and Mouth Disease 2001 - County Status Maps. Available online at: https://data.gov.uk/dataset/1c7ae62d-3268-467d-a2df-e8c5a6d93ab3/foot-and-mouth-disease-2001-county-status-map-29-10-2001.
[77] Glacial till is sometimes described as "diamicton" in the BGS lexicon. This term relates to sediment deposited from land based erosion (such as from landslides and debris flows). In this case the term "glacial till" refers to diamicton of glacial origin.
[78] Partings refers to "bands" or "fine layers"

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[79].

10.3.15 The formal ES will include an assessment of areas where there are 5% of homes estimated to have radon levels at or above 200Bq/m. The study area is located in a lower probability radon area with less than 1% of homes estimated to have radon levels at or above the action level of 200 becquerels per cubic metre of air (200Bq/m^3), as defined by Public Health England's UK Radon online map, therefore radon will not be considered further.

Groundwater

10.3.16 Three categories of aquifer have been identified within the study area, as defined by the Environment Agency:

- the river terrace deposits, alluvium and the glaciofluvial sheet deposits are designated as Secondary A aquifers;
- the Mercia Mudstone Group underlying the majority of the study area is designated as a Secondary B aquifer; and
- glacial till is designated as a Secondary Undifferentiated aquifer.

10.3.17 The Environment Agency reports that there are no groundwater abstraction licences for public water supply located within the study area.

10.3.18 There are no groundwater source protections zones (SPZ)[80] identified within the study area. There are also no private groundwater abstraction licences registered in the study area.

10.3.19 According to the Environment Agency, there are no drinking water safeguard zones[81] for groundwater within the study area.

10.3.20 Details of licensed abstractions are provided in Section 15, Water resources and flood risk. It should be noted that all abstractions that are used directly or indirectly for human consumption are by default designated as SPZ. In such cases the abstraction point qualifies for a default 10m radius for SPZ1 and a default 250m radius for SPZ2. There is no default SPZ3 for total catchment with respect to this type of abstraction.

10.3.21 Further information on the groundwater in the Hough to Walley's Green area is provided in Section 15, Water resources and flood risk.

[79] Available at: http://www.bgs.ac.uk/radon/hpa-bgs.html. Accessed 09/05/2018. This dataset underpins P H E'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 online at www.ukradon.org/information/ukmaps.
[80] 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.
[81] Environment Agency (2017) Drinking Water Safeguarding Zones mapping. Available online at: https://environment-agency.cloud.esriuk.com/farmers/. Accessed July 2018

Surface water

10.3.22 Gresty Brook and Valley Brook are main rivers within the study area, and would be crossed by the route of the Proposed Scheme in Crewe. Other watercourses present within the study area include; Swill Brook, Hoggins Brook and tributaries of Fowle Brook.

10.3.23 A number of unnamed streams, tributaries, drains, ponds and culverts are also located within the study area.

10.3.24 Surface water bodies in the Hough to Walley's Green area are described in more detail in Section 15, Water resources and flood risk.

10.3.25 There are no licensed surface water abstractions located within the study area. No private water supplies from surface water sources have been identified within the study area.

10.3.26 According to Environment Agency records, there are no drinking water safeguard zones for surface water within the study area.

Current and historical land use

10.3.27 Current potentially contaminative land uses within the study area include a total of 76 identified sites. The key potentially contaminative sites are: active railway lines together with sidings, carriage and engine sheds, and buildings associated with Crewe Gates Farm Industrial Estate.

10.3.28 Historical land uses identified within the study area with the potential to have caused contamination include one landfill, three mining sites and 78 other identified potentially contaminative sites. The key historical potentially contaminative sites are: tanks for likely fuel storage, a gasometer at Grand Junction Retail Park; and industrial areas and depots in central and northern Crewe.

10.3.29 Further details of these key current and historical contaminative land uses within the study area are shown in Table 13, Table 14 and Table 15.

Table 13: Current and historical landfill sites located in the study area

Name and area reference	Location	Description
British Railways tip, Tommys Lane, Crewe (MA01-67)	The landfill is located on the route of the Proposed Scheme, approximately 200m north of Crewe Station.	Closed landfill. The Environment Agency does not hold information on the licensing of the landfill or the wastes deposited. The Environment Agency historical landfill reference is EAHLD17784.

Table 14: Current and historical mining, mineral sites and colliery spoil sites located in the study area

Name and area reference	Location	Description
Brick Works, Crewe (MA01-132)	In the location of the current Cumberland Arena.	Brick field, named on mapping between 1874 and 1899 but workings still marked until 1958. Now public sports ground.
Brick field, Crewe (MA01-148)	Located 160m east of Crewe Cemetery and Crematorium, 60m east of land	Brick field, active between 1874 and 1899. Since been redeveloped to residential housing.

Name and area reference	Location	Description
	required for the construction of the Proposed Scheme.	
Britannia Brick works, Crewe (MA01-168)	Located 240m north of Crewe Cemetery and Crematorium, 210m south of land required for the construction of the Proposed Scheme	Brick field, active between 1898 and 1953. Pits have since been infilled, now public open space.

Table 15: Current and historical industrial sites located in the study area

Name and area reference	Location	Description
Railway land and associated infrastructure (MA01-21, MA01-23, MA01-80)	Through central Crewe	Current railway as well as historical works and depots associated with the railway. Infrastructure present since 1911.
Works, Crewe Gates Farm Industrial Estate, Crewe (MA01-35)	In southern Crewe along Weston Road	Current industrial estate comprising industrial units, warehousing, tanks and electrical sub-stations. Present since 1959.
Former gas works/gasometer with tanks, Crewe (MA01-84, MA01-69)	In Grand Junction Retail Park East of A5019 Mill Street	Historical gasworks. Present between 1898 and 1953. Redeveloped into a retail park. Historical gas works and coke works. Present between 1874 and 1938. Redeveloped into warehousing.
Fuel storage and petrol filling station (various) (MA01-53, MA01-98, MA01-137, MA01-180)	Various around central Crewe	Historical and current tanks and petrol filling stations marked on mapping.
Depot, Henry Street, Crewe (MA01-141)	In the north of Crewe	Historical depot with unknown use. Present on mapping between 1982 and 1993.
Industrial area, Crewe (MA01-101)	In Grand Junction Retail Park	Industrial area: garages, scrap metal yards, warehouses, factories, sub-stations, depots. Active between 1959 and 1995. Redeveloped into a retail park.
Abattoir (MA01-122)	Car park to north of The Market Centre, Crewe	Historical abattoir, present between 1959 and 1966. Now a car park.
Marshland (MA01-94)	On western side of Grand Junction Retail Park	Recorded as marshland on historical mapping around 1899. Now area contains railway land and retail park.
Mound of unknown material (MA01-184)	Alongside existing railway. To the north-west of Coppenhall	Area of raised topography that first appeared on mapping in 1909. Approximately 0.5ha in size.

10.3.30 Contaminants commonly associated with sites in Table 13, Table 14 and Table 15 could include metals, semi-metals, asbestos, organic and inorganic compounds.

Additionally, infilled pits and landfills could also give rise to landfill gases such as methane or carbon dioxide and leachate.

Other regulatory data

10.3.31 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).

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

10.3.33 There are no recorded major, significant and minor incidents in the Hough to Walley's Green area.

10.3.34 The Environment Agency reports that there are three consented discharges to groundwater within the study area, none of which are within the land required for the construction of the Proposed Scheme. Further details on the groundwater in the Hough to Walley's Green study area can be found in Section 15, Water resources and flood risk.

10.3.35 There are three discharge consents to surface water within the study area, none of which are within the land required for the construction of the Proposed Scheme.

10.3.36 There is one nationally important ecological designation, as defined in the land quality section of the SMR[73], located within the study area. This is Weaver Bank, an area of ancient replanted woodland, located within the northern extent of the study area.

10.3.37 Further information on ecology can be found in Section 7, Ecology and biodiversity.

Mining/mineral resources

10.3.38 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).

Minerals plans

10.3.39 Cheshire County Council was responsible for the overall minerals and waste local plans for the study area. The Cheshire Replacement Minerals Local Plan[82] was adopted in June 1999 and sets out the policies aimed at controlling mineral related developments within the Cheshire East and Cheshire West and Chester Boroughs up to the year 2006. No further revisions of the plan were published by Cheshire County Council prior to its dissolution in 2009. No replacement plans have been published by CEC to date.

[82] Cheshire County Council (1999) *The Cheshire Replacement Minerals Local Plan*.

10.3.40 The Cheshire Mineral Resource Information map[83] presents the extent of all mineral extraction planning permissions and brinefields.

10.3.41 The location of specific mineral and mining resources within the study are described below.

Sand, gravel and clay deposits

10.3.42 There are many recorded quarries within the study area; quarrying glaciofluvial sheet deposits for sand in the south of the study area, and the Sidmouth Mudstone Formation for common clay and shale in the area north of the A500 Shavington Bypass.

10.3.43 There is a sand and gravel mineral safeguarding area associated with Valley Brook that would be crossed by the route of the Proposed Scheme in central Crewe.

Salt deposits

10.3.44 The route of the Proposed Scheme would be adjacent to the Hill Top Farm, Warmingham brine[84] extraction permission, as well as the Hole House Farm brine extraction permission, immediately to the east of Hill Top Farm.

10.3.45 The following resource allocations are recorded in the study area:

- a preferred extension to the controlled brinefield underlying land required for the construction of the Proposed Scheme, in the area to the south-west of Warmingham;
- a preferred extension to the controlled brinefield underlying the route of the Proposed Scheme at the northern extent of the Hough to Walley's Green area, to the north-west of Warmingham; and
- the entire study area is within a mineral safeguarding area (MSA) for salt.

10.3.46 Areas of natural dissolution of the salt rockhead may be present in the study area as soluble rocks are present.

10.3.47 The study area is located in a brine compensation area which indicates there is the potential for subsidence resulting from the historical pumping of brine.

Coal mining

Open cast coal mining

10.3.48 Shallow coal (located at less than 50m depth) is not recorded as a resource in the study area, and therefore, there is no known open cast coal mining in the study area.

Deep coal mining

10.3.49 Deep coal (located at more than 1,200m depth) is recorded as a resource in the study area.

[83] Norton, GE *et al* (2006) *Mineral Resources Information for National, Regional and Local Planning: Cheshire (comprising Cheshire and the Boroughs of Halton and Warrington*. British Geological Survey Commissioned Report CR/05/090N.
[84] A high concentration solution of salt in water

10.3.50 Available records from the Coal Authority show that the route of the Proposed Scheme would not be located in areas of recorded current or historical underground coal mining activities.

PEDLs/Hydrocarbons

10.3.51 The OGA indicates that the route of the Proposed Scheme passes through three PEDL areas; PEDL292, PEDL293, and PEDL295. The PEDL areas are associated with extraction wells for conventional oil and gas. However, none of the extraction wells associated with the PEDL are located in the study area.

Geo-conservation resources

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

Receptors

10.3.53 The sensitive receptors that have been identified within the study area are summarised in Table 16. A definition of receptor sensitivity is given in the SMR.

Table 16: Summary of sensitive receptors

Issue	Receptor type	Receptor description	Receptor sensitivity
Land contamination	People	Residents of existing properties, nurseries, schools, study centres, play areas, parks and public open space	High
		Employees and visitors at commercial areas, retail parks and areas, hotels	Moderate
		Workers at and visitors to industrial premises	Low
	Groundwater	Secondary A aquifers (river terrace deposits, alluvium and glaciofluvial sheet deposits)	Moderate
		Secondary (undifferentiated) aquifer (glacial till), Secondary B aquifer (Mercia Mudstone Group)	Low
	Surface waters	Gresty Brook, Valley Brook	High
		Hoggins Brook, Swill Brook	Moderate
		Tributary of Fowle Brook and other unnamed watercourses	Low
	Ecological designations	Area of ancient replanted woodland (Weaver Bank)	Moderate
	Built environment	Underground structures and buried services	Low

Impacts on mining/mineral and petroleum (gas) sites (severance and sterilisation)	Mining/mineral sites	Salt MSA, sand and gravel MSA, PEDL	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)[85]. 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 (Section 5, 11 and 16);
- the management of human exposure for both construction workers and people living and working nearby (Section 5, 7, 11, 13 and 14);
- methods for the storage and handling of excavated materials (both contaminated and uncontaminated) (Sections 6, 7, 11 and 15);
- management of any unexpected contamination found during construction (Section 11 and 15);
- a post-remediation permit to work system (Section 11);
- storage requirements for hazardous substances such as oil (Section 5, 11 and 16);
- traffic management to ensure that there is a network of designated site haul routes to reduce compaction/degradation of soils (Section 5, 6 and 14);
- methods to monitor and manage flood risk and other extreme weather events which may affect land quality during construction (Section 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

[85] Supporting document: Draft Code of Construction Practice

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[86] and British Standards BS10175[87] and BS8576[88].

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[89]. The preferred option would then be developed into a remediation strategy.

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

Assessment of impacts and effects

10.4.6 Construction of the Proposed Scheme in this area would require earthworks, utility diversions, deep foundations, grouting, ground stabilisation and other activities, including the construction of the various viaducts and road infrastructure works. These aspects of the Proposed Scheme, along with other construction features, are shown on the Map Series CT-05 in the Volume 2: MA01 Map Book.

Land contamination

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

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

- whether the site is located on or off the route of the Proposed Scheme or associated off line works;

[86] Environment Agency, (2004), *CLR11 Model Procedures for the Management of Land Contamination*.
[87] British Standard, (2011), *BS10175+A2:2017 Investigation of Potentially Contaminated Sites*.
[88] British Standard, (2013) *BS8576 Guidance on investigations for ground gas – Permanent gases and Volatile Organic Compounds (VOCs).*
[89] Sustainable Remediation Forum UK, (2010), *A Framework for Assessing the Sustainability of Soil and Groundwater Remediation.*

- 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 17. The potential impacts and baseline risks quoted are those before any mitigation is applied. The assessed baseline risk is based on the information provided at the time of the assessment. Where limited information is available, the assessment is based on precautionary, worst case assumptions and may therefore report a higher risk than that which actually exists. A screening assessment of the effects of contamination has been completed by comparing the detailed CSM developed for potential contaminated areas at baseline with construction and post-construction stages.

Table 17: Summary of baseline CSM for sites which may pose a contaminative risk for the Proposed Scheme[90]

Area reference[91]	**Area name**	**Human health risk**	**Ground water risk**	**Surface water risk**	**Buildings risk**
On-site[92]					
MA01-17/ MA01-21/ MA01-80/ MA01-205/ MA01-230	Railway land	Very low to moderate/low	Very low to moderate/low	Moderate/low	Very low to low
MA01-35/ MA01-50/ MA01-55/ MA01-101/ MA01-136/ MA01-139/ MA01-141/ MA01-146	Current and former industrial estate, depots, wharf, garage and works	Low to moderate/low	Very low to moderate/low	Low	Low
MA01-84	Former gas works	Moderate/low to moderate	Low	Low	Low to moderate/low
MA01-40/ MA01-78	Tanks, likely for fuel storage	Very low to moderate/low	Very low	Low	Low
MA01-189/ MA01-190/	Farms, including tanks	Very low to moderate/low	Very low	N/A	Low

[90] Risks to ecosystem receptors were all deemed to be not applicable and therefore the receptor has been removed from the table
[91] Each potentially contaminated site is allocated a unique reference number.
[92] 'On-site' is within the area of land required for construction of the Proposed Scheme.

Area reference[91]	Area name	Human health risk	Ground water risk	Surface water risk	Buildings risk
MA01-193/ MA01-215					
MA01-184	Historically infilled land	Very low to moderate/low	Very low	N/A	Very low to low
MA01-94	Marshland	Very low to moderate/low	N/A	N/A	Very low
MA01-67	Historic landfill	Very low to moderate	Moderate	Moderate	Low to moderate/low
Off-site[93]					
MA01-18/ MA01-24/ MA01-32/ MA01-37/ MA01-42/ MA01-53/ MA01-73/ MA01-77/ MA01-81/ MA01-88/ MA01-98/ MA01-100/ MA01-126/ MA01-137/ MA01-180/ MA01-203/ MA01-212	Tanks, likely for fuel storage, petrol filling stations and power station	Low to moderate/low	Very low to moderate/low	Low	Low
MA01-191	Farm	Very low to moderate/low	Very low to moderate/low	N/A	Low
MA01-69	Former gas works/coke works	Low to moderate	Moderate	Moderate	Low
MA01-122	Abattoir	Very low to moderate/low	Very low	N/A	Low
MA01-28/ MA01-48/ MA01-118/ MA01-188/ MA01-195/ MA01-199	Current and former works, garage and scrapyard	Very low to moderate/low	Very low to moderate/low	Low	Low
MA01-149	Cemetery	Very low to moderate/low	Moderate/low	Low	Low

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

Temporary effects

10.4.11 In order to identify potential temporary effects, the baseline and construction CSM have been compared to determine the change in level of risk at receptors during the construction stage, and thus to define the level of effect at the construction stage.

10.4.12 Where there is no change between the main baseline risk and the main construction risk, the temporary effect significance is deemed to be negligible even if the risk is deemed to be high. For example, this would be the case where the construction of the Proposed Scheme does not alter the risks from an existing potentially contaminated site that is outside the area required for construction.

10.4.13 A worsening risk at construction stage compared to baseline would result in a negative effect, and conversely, an improvement would result in a positive effect. The assessment assumes that contamination would be controlled through the general measures in the draft CoCP.

10.4.14 All of the sites set out in Table 17 have been assessed for the change in impact associated with the construction stage of the work and were found to have non-significant (neutral) effects.

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

10.4.16 Construction compounds located in this study area could include the storage of potentially hazardous substances, such as fuels and lubricating oils, and may also be used for temporary storage of potentially contaminated soils. Mitigation measures set out within the draft CoCP include management of risks from the storage of such materials resulting in no significant effects.

Permanent effects

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

10.4.18 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.

10.4.19 All of the sites set out in Table 17 have been assessed for the change in impact associated with the permanent post construction stage and were found to have non-significant (neutral or minor beneficial) effects.

Mining/mineral resources

10.4.20 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[94] or isolation that may occur during the construction phase of the Proposed Scheme, possibly continuing through to its operation.

10.4.21 The route of the Proposed Scheme would cross a small MSA for sand and gravel associated with Valley Brook in Crewe, and an extensive MSA for salt, including minerals sites for salt extraction, inactive underground planning permissions for salt extraction and a preferred extension to the controlled brinefield (Warmingham Brinefield at Hill Top Farm). The entire study area is within the salt MSA, whilst the extraction sites are present on land required for the Proposed Scheme from the north-west of Coppenhall Moss to the north of the study area.

Temporary effects

10.4.22 There are no shallow coal resources in the study area, and no construction compounds located in areas of sand, gravel or clay deposits, therefore no temporary effects from the construction of the Proposed Scheme on these resources would occur.

Salt deposits

10.4.23 The effect of construction of the Proposed Scheme on the identified salt deposits would be negligible where the Proposed Scheme bisects a CEC defined minerals site, inactive planning permission and the preferred extension to the controlled brinefield.

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

10.4.25 The following compounds fall within the MSA:

- Crewe tunnel South satellite construction compound;
- Crewe tunnel South portal satellite construction compound;
- Cowley Way vent shaft satellite construction compound;
- Middlewich Street vent shaft satellite construction compound; and
- Crewe tunnel north main construction compound.

[94] 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.

Coal mining - deep

10.4.26 Deep coal at more than 1,200m depth is recorded as a resource in the study area, however, there are no identified deep coal mines, and therefore, there would be no effects from the construction of the Proposed Scheme.

Petroleum Extraction Development Licences

10.4.27 The effect of construction of the Proposed Scheme on the identified PEDLs would be negligible as it is unlikely that construction of the Proposed Scheme, would place a constraint on future exploitation of potential sources of shale gas or other forms of hydrocarbon resource. This is due to the large extent of the PEDL and the limited area of land that would restrict potential well locations.

Permanent effects

10.4.28 There are no identified shallow coal resources in the study area, therefore, there would be no permanent effects from the Proposed Scheme on these resources.

Sand and gravel deposits

10.4.29 The effects of construction of the Proposed Scheme on the sand and gravel MSA would be permanent where underlain by the footprint of the permanent works at surface, with a strip of mineral becoming sterilised.

10.4.30 However, the effect on the MSA is considered to be negligible as the Proposed Scheme is in tunnel at the point it intersects the MSA and therefore would not interact with the near surface resources. However, should an off-set to the land required for the Proposed Scheme be required from any proposed future exploitation (which would sterilise resources), the overall effect would still be negligible as it would represent a minor loss of a moderate sensitivity/value resource. Mitigation measures (if any) would be discussed in advance of the works with the Mineral Planning Authority, CEC and the mineral owner.

Salt deposits

10.4.31 The effects of the Proposed Scheme on the identified salt deposits would be negligible to moderate adverse.

10.4.32 The Parkfield Farm extension to Warmingham Brinefield has planning permission for seven salt caverns. The safeguarding zone of the Proposed Scheme could potentially impact on the viability of four of these caverns. This could represent a major loss of this resource (a moderate impact) which is a high sensitivity receptor giving a moderate adverse effect, which is significant.

10.4.33 The Proposed Scheme and associated safeguarding area would potentially sterilise a narrow strip of each of the preferred extensions to the Warmingham Brinefield (less than 3% of each). This is a minor impact on a high value resource resulting in a minor adverse effect, which is not significant.

10.4.34 Additionally, the sterilisation of a strip of salt MSA within the land required for the Proposed Scheme would potentially occur. This would be a minor impact on a medium value resource giving a negligible effect, which is not significant.

Coal mining - deep

10.4.35 Deep coal at more than 1,200m depth is recorded as a resource in the study area, however, there are no identified deep coal mines. The presence of the permanent works would have a negligible impact upon this low sensitivity receptor. Therefore, there will be no effects on deep coal resources as a result of the Proposed Scheme.

Petroleum Extraction Development Licences

10.4.36 The effects of the Proposed Scheme on the identified PEDLs would be negligible as it is unlikely that the Proposed Scheme would place a constraint on future exploitation of potential sources of shale gas or other forms of hydrocarbon resource. This is due to the large extent of the PEDL and the limited area of land that would restrict potential well locations.

10.4.37 Table 18 reports the assessment of permanent effects from construction on the mining and mineral resources identified.

Table 18: Summary of effects for mining and mineral resources

Site name	Status	Description	Sensitivity/ value	Magnitude of impact	Effect and significance (Y/N)
Sand and gravel MSA, Crewe	MSA	MSA for sand and gravel extraction, defined by CEC	Medium	Minor	Negligible effect (N)
Warmingham Brinefield at Parkfield Farm	Mineral site	Preferred extension to the controlled brinefield at Warmingham	High	Moderate	Moderate adverse (Y)
Warmingham Brinefield preferred extensions	Mineral site	Inactive underground planning permissions for salt extraction	High	Minor	Minor adverse (N)
Salt MSA, Cheshire	MSA	MSA for salt extraction, defined by CEC	Medium	Negligible	Negligible effect (N)
Deep coal	No designation	Deep coal at more than 1,200m	Low	Negligible	Negligible effect (N)
PEDL292, PEDL293, PEDL295	PEDL	Petroleum exploration and development licence areas	Medium	Negligible	Negligible effect (N)

10.4.38 There would be negligible to minor adverse effects on the majority of mineral resources located in the study area, which are not significant.

10.4.39 However, there is a moderate adverse effect on the Parkfield Farm proposed salt caverns which is significant.

Geo-conservation sites

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

Other mitigation measures

10.4.41 At this stage, no additional measures are considered necessary to mitigate risks from land contamination during the construction stage beyond those that are set out in the draft CoCP and/or instigated as part of the site specific remediation strategies that would be developed at the detailed design stage, if required. These measures would ensure that risks to people and property from contaminants in the ground would be controlled such that they would not be significant. For example, measures might include excavation and treatment of contaminated soils or controls to manage movement of landfill gas and leachate.

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

10.4.43 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 two auto-transformer stations, located at Cowley Way, Crewe and Broughton Road, Crewe. An auto-transformer station, feeder stations and sub-stations can, in principle, be a source of contamination through accidental discharge or leaks of coolant. However, in common with other modern sub-stations, secondary containment appropriate to the level of risk would be included in the installed design.

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

Other mitigation measures

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

Summary of likely residual significant effects

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

Monitoring

10.5.7 Volume 1, Section 9 sets out the general approach to environmental monitoring during operation of the Proposed Scheme. Requirements for monitoring would be determined as part of the investigation, treatment and validation of contamination on a site specific basis as part of the detailed design process. Monitoring requirements may include water quality, air quality and/or (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 Hough to Walley's Green 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 the Canal & River Trust and Cheshire East Council (CEC) 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: MA01 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), 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)[95].

11.2.2 Summer surveys for the landscape and visual assessment were undertaken from July 2017 to inform the assessment. Winter Surveys were carried out from February 2018. Further surveys will be undertaken to inform the assessment and will be reported in the formal ES. At this stage it has not been possible to complete surveys of all publicly accessible land in this area; therefore, for the working draft ES an assumption has been made about the level of sensitivity and magnitude of change on a case by case

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

basis. This will be adjusted, as appropriate, on the basis of survey results to inform the formal ES.

11.2.3 The extent of the study area has been informed by construction and operational phase zones of theoretical visibility (ZTV). The ZTV have been produced in line with the methodology described in the SMR and are an indication of the theoretical visibility of the Proposed Scheme. In some locations, extensive vegetation cover means the actual extent of visibility is substantially less than that shown in the ZTV, and professional judgement has been used to further refine the study area to focus on likely significant effects.

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

11.2.5 Landscape and visual receptors within approximately 1.5km of the Proposed Scheme have been assessed as part of the study area. This includes long distance views from settlement edges at Crewe, Bradfield Green, Lane Ends and Walley's Green.

11.2.6 The assessment of visual effects during construction covers the situation in winter at peak activity. The assessment of operational visual effects covers the situation in winter and summer of year 1 and summer of year 15. The assessment of landscape effects is undertaken for the construction phase and for the operational phase at both year 1 and year 15. The landscape assessment does not consider seasonal variations e.g. winter/summer, since these do not affect character. Likely significant landscape and visual effects for year 30 will be reported in the formal ES.

11.2.7 The assessment has been carried out on the basis that design of structures would, insofar as reasonably practicable, integrate with existing skyline features and would make use of a simple, clean and coherent palette of materials to help structures fit in the landscape.

11.2.8 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.

11.3 Environmental baseline

Existing baseline

Landscape baseline

11.3.1 The study area extends from the village of Hough, on the rural southern fringe of Crewe to Walley's Green in the north of the area. It is a lowland agricultural landscape of generally flat or gently undulating farmland surrounding Crewe. Typical of much of the Cheshire landscape, it forms part of a wider lowland plain, broadly separated by

sandstone ridges and crossed by shallow river valleys, the latter converging north and west towards Northwich and the Mersey Estuary.

11.3.2 The landscape character and the agricultural prosperity of the plain owes much to its glacial origins, with an underlying geology rich in rock salt covered by a thick layer of glacial till and productive clay soils. Increases in wealth based on agriculture from the 12th century onwards accompanied the growth of market towns including Nantwich and Middlewich, while later industrial activity from salt abstraction led to further urban expansion of these centres. The construction of the Shropshire Union Canal in the late 18th century for the transport of pottery, coal and salt played a significant part in this industrial transformation. The later advent of rail led to the urban expansion of Crewe as a settlement at a major railway junction in the 1840s. Rail corridors, in particular the West Coast Main Line (WCML), are a feature of the open landscapes surrounding the town.

11.3.3 The southern urban fringe of Crewe includes the settlements of Weston, Willaston and Shavington. Much of the area comprises degraded urban fringe farmland close to the A500 Shavington Bypass, along with commercial development and infrastructure associated with the WCML. Between Crewe Road and the Basford Hall sidings yard, areas of new housing and commercial development are under construction across areas of former farmland. To the south of the A500 Shavington Bypass, the landscape retains a more rural character, with small, well established villages and a number of scattered or isolated dwellings and farmsteads.

11.3.4 Crewe town centre has a compact civic and commercial core, set within a close-knit pattern of residential terraces and small green spaces. The railway infrastructure is a prominent aspect of this urban landscape, with rail corridors and extensive sidings converging on Crewe Station, south-east of the modern town centre.

11.3.5 The northern, largely residential fringe of Crewe gives way abruptly to a flat and open agricultural landscape of improved mosslands composed of medium sized, often rectilinear, fields with a mix of managed and outgrown, occasionally fragmented hedges. This transitions to a pattern of larger fields with managed hedgerows and mature individual trees, creating the appearance of a well-wooded landscape; this despite woodland cover being relatively scarce. Large farmhouses are locally prominent, with a dispersed settlement pattern of hamlets and scattered, often distinctive individual residential properties.

11.3.6 The Crewe and Nantwich Circular Walk long distance route connects Crewe to the Shropshire Union Canal to the west. The Four Counties Ring and Cheshire Ring tourist boating circuits both use the length of the Shropshire Union Canal between Middlewich and Barbridge. The Cheshire Ring Canal Walk follows the same canal route as the boating circuit. The National Cycle Route 451 runs from the centre of Crewe and eastwards to Haslington, while National Cycle Route 551 runs between Shavington and Weston to the south of Crewe.

11.3.7 The LCAs have been determined as part of an integrated process of environmental characterisation, informed by a review of historic landscape mapping and the outcome from other topics including ecological assessments. These LCAs will be

refined as appropriate upon review of available historic landscape characterisation data and will be included in the formal ES. Use has been made of published landscape character assessments and a wide range of supporting GIS data, aerial photography and Ordnance Survey mapping, plus desk study and fieldwork. Landscape character assessments reviewed include the relevant National Landscape Character Areas[96] and the Cheshire Landscape Character Assessment[97]. These published LCAs have been adapted for this assessment to provide LCAs of an appropriate and consistent scale. Minor amendments have also been made to some published LCA boundaries to reflect existing conditions.

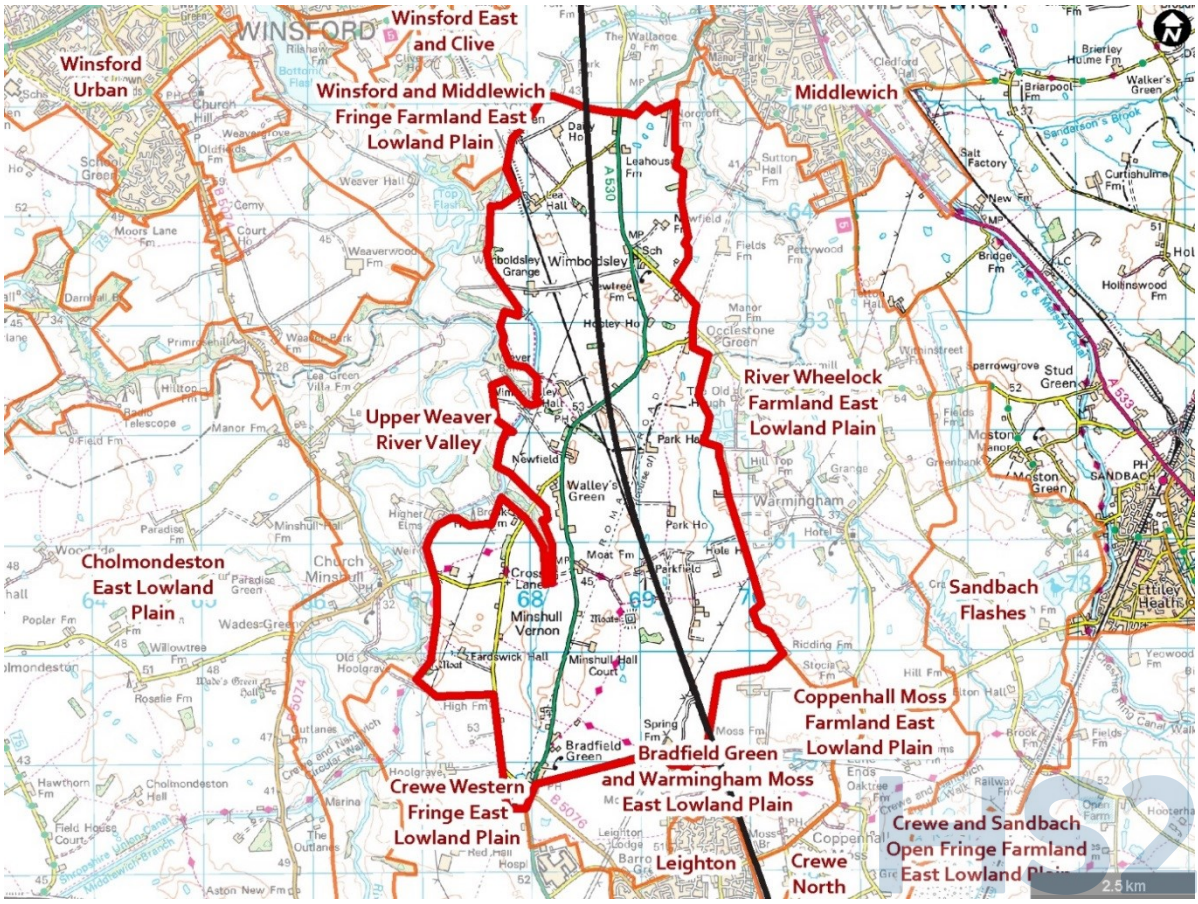
11.3.8 For the purposes of this assessment, the study area for Hough to Walley's Green has been subdivided into sixteen LCAs. These LCAs are draft and subject to review in consultation with local planning authorities. Full descriptions of all LCAs will be provided in Volume 5 of the formal ES. Fifteen of the sixteen LCAs would not be significantly affected by the Proposed Scheme on account of their relative proximity, or sensitivity to this type of development and/or due to the Proposed Scheme being in tunnel at Crewe, between Hough and Leighton. The Wimboldsley Open Farmland East Lowland Plain LCA would be significantly affected by the Proposed Scheme and is included in Volume 2: Community area report MA02: Wimboldsley to Lostock Gralam as the features of the Proposed Scheme that give rise to significant effects, the construction of the Crewe North rolling stock depot (RSD), are primarily located in this neighbouring community area.

11.3.9 Based on the current design, it is anticipated that significant landscape effects are expected for one LCA in the Hough to Walley's Green area. A summary of the LCA that would be significantly affected is provided in Table 19

[96] 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
[97] Cheshire County Council (2008), *Cheshire Landscape Character Assessment*. Available online at: https://www.cheshireeast.gov.uk/environment/heritage_natural_environment/landscape/landscape_character_assessment.aspx

Table 19: Summary of significantly affected LCAs

Wimboldsley Open Farmland East Lowland Plain



View from the A530 Nantwich Road at Wimboldsley Village, showing managed hedges and mature isolated trees along hedges and within fields.

Broad, open field pattern towards Dairy Farm near Clive Green, viewed from the Shropshire Union Canal.

The Wimboldsley Open Farmland East Lowland Plain LCA is a mainly flat agricultural landscape, characterised by medium and large fields of a semi-regular pattern bordered by well-maintained hedges and mature hedgerow trees. There are occasional small clumps of woodland. The almost flat terrain lies between the rivers Weaver to the west and Wheelock to the east. The incised valley of the River Weaver is well wooded along its margins, forming a distinct alignment whereas that of the River Wheelock in the neighbouring LCA is of a less distinct form. The settlement pattern is of scattered houses and hamlets. Large individual properties, including farmhouses, are a common feature of the landscape. The Middlewich Branch of the Shropshire Union Canal is a distinctive feature within the landscape, a contour canal that follows the landform of the valley with few locks and level changes. The relatively flat landscape, in

combination with a succession of hedgerows, screens longer views. The Peak District hills and the sandstone ridge of the Peckforton Hills on the distant horizon contribute to a wider sense of place and form a scenic backdrop to the view.

Throughout the plain, the WCML railway on raised embankment is locally prominent, along with the A530 Nantwich Road and overhead power lines, which all run generally north to south. These features tend to detract locally from an otherwise rural, tranquil and generally unlit landscape.

The LCA has a medium landscape value based on its intact, largely agricultural landscape, historic components (including the canal corridor), large farms and distinctive sense of place.

Visual baseline

11.3.11 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: MA01 Map Book, Map Series 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[98, 4]: Transport, 5: Hotels/healthcare/education and 6: Employment.

11.3.12 Views are experienced by residents in northern residential fringes of Crewe and urban areas within the town; villages and hamlets including Hough, Basford, Weston, Coppenhall Moss, Minshull Vernon and Walley's Green. Views are also experienced from individual, often large, farmhouses and estate houses throughout the East Lowland plain to the north of Crewe; and individual and clustered properties alongside the A530 Middlewich Road and along rural lanes. Residents' views comprise open or filtered views across rural landscapes from urban fringe locations, villages, hamlets and isolated properties. Residents in properties within the urban setting of Crewe have contained views across neighbouring residential areas and railway corridors.

11.3.13 Views experienced by recreational receptors using the Cheshire Ring Canal Walk, Shropshire Union Canal Middlewich Branch, Four Counties Ring and Cheshire Ring tourist boating circuits are contained to the canal corridor by boundary hedges and canalside vegetation, with occasional open views across the low lying agricultural landscape of the Weaver Valley. Views from the National Cycle Routes 451, 551 and Regional Cycle Route 70 are open across the rural fringe agricultural landscape to the south of Crewe and contained within the urban context of the town. Views from the Crewe and Nantwich Circular Walk and the Cheshire Way range from open, wide ranging views across the agricultural Cheshire Plain landscape north of Crewe, to more varied middle and near distance views within the undulating fringe agricultural landscape and settlements to the south of the town.

11.4 Temporary effects arising during construction

11.4.1 As is commonplace with major infrastructure works, the scale of the construction activities means that works would be visible from many locations and would have the potential to give rise to significant temporary effects that cannot practicably be mitigated. Such effects are temporary and would vary over the construction period

[98] 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.

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

11.4.2 The effects associated with the peak construction stage in this area are generally considered to be medium-term, based on the indicative construction programme in Section 2.3. It is currently anticipated that the peak civil engineering stage in this area would be undertaken between 2025 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)[99] 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[100];
- use of well-maintained hoardings and fencing;
- prevention of damage to the landscape features adjacent to the construction sites due to movement of construction vehicles;
- designing lighting to avoid unnecessary intrusion onto adjacent buildings and other land uses; and
- replacement of any trees intended to be retained which may die as a consequence of nearby construction works.

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

Assessment of temporary impacts and effects

11.4.6 The most apparent changes to the landscape and to the views experienced by visual receptors during construction would relate to the presence of construction plant, compounds and soils and material storage and stockpiling. Key construction activities that would give rise to the most apparent changes to landscape and visual receptors are: the excavation of cuttings and tunnel portals, the construction of vent shafts, auto-transformer stations, embankments, overbridges, road and power line

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

diversions, the removal of trees and hedgerows, the demolition of buildings, retrieval of the tunnel boring machine (TBM) and the closure and diversion of existing public highways and PRoW.

Landscape assessment

11.4.7 Based on the current design it is anticipated that one LCA, Wimboldsley Open Farmland East Lowland Plain LCA, would be significantly affected during construction of the Proposed Scheme.

11.4.8 The Wimboldsley Open Farmland East Lowland Plain LCA lies within both MA01, Hough to Walley's Green area and MA02 Wimboldsley to Lostock Gralam area. The assessment for this LCA is reported in Volume 2: Community area report MA02, Wimboldsley to Lostock Gralam as the feature of the Proposed Scheme that would give rise to significant effects, the construction of the Crewe North RSD, is primarily located in this neighbouring community area.

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 Table 20 describes the construction phase potentially significant visual effects based on the current design of the Proposed Scheme. Viewpoint locations are shown in Map Series LV-03 in the Volume 2 MA01 Map Book.

Table 20: Construction phase potentially significant visual effects

Views from residences east of Hough, PRoW Chorlton Footpath 7 and 8 (part of the Crewe and Nantwich Circular Walk) and Chorlton Footpath 1 and 12 (VPs 300-02-003 and 300-03-001) **Map number: LV-03-300**	**High sensitivity receptors**
Residents and walkers on PRoW would experience a noticeable change to existing near and middle-distance views due to the introduction of the Crewe tunnel south satellite compound and associated construction activity into the view. The compound, due to its large scale and extent, would be a prominent new feature in existing open views of flat farmland, mature hedgerows and the overhead line equipment of the WCML and would alter the skyline. There would therefore be an overall medium magnitude of change and moderate adverse effect.	**Level of effect:** Moderate adverse (significant)
Views from residences on Casey Lane (VP 301-02-006) and residences in Newcastle Road, Hough and from PRoW Basford Footpaths 5,7, 8 and 10 (VP 300-02-005) **Map numbers: LV-03-300 and LV-03-301**	**High and medium-high sensitivity receptors**
Residents on Casey Lane would experience a substantial alteration to existing near and middle-distance views due to the introduction of the Crewe tunnel south portal satellite compound and associated construction activity into the view. The compound, due to its large scale and extent, would be a prominent new feature in existing open views of flat farmland, mature hedgerows and the overhead line equipment of the WCML would alter the skyline. There would therefore be an overall high magnitude of change and major adverse effect.	**Level of effect:** Major adverse (significant)
Residents in Newcastle Road properties would have near, filtered views of construction traffic on the Crewe tunnel south satellite compound site haul route and of the Crewe tunnel south portal satellite compound in the middle distance. Despite the proximity of the WCML in the background of the view, the intensity of construction activity means that vehicles using the site haul routes would introduce uncharacteristic movement into views. There would therefore be an overall medium magnitude of change and moderate adverse effect.	**Level of effect:** Moderate adverse (significant)
Views from residences on Middlewich Street, Audley Street West, Ridgway Street and Rosedale Manor Nursing Home Crewe, local footpaths and the WCML (VPs 303-02-001, 303-02-002, 303-03-003) **Map number LV-03-303**	**High, medium-high and medium sensitivity receptors**
Residents, pedestrians and rail users would experience a substantial alteration to close views as a result of the construction of the Middlewich Street vent shaft. The construction works would be prominent in existing views of a playing field, bordered by rough grassland between Middlewich Street and the WCML. Views from the ground floor of the Rosedale Manor Nursing Home (VP 303-02-002) would be largely screened by the intervening boundary fence and vegetation. There would therefore be an overall high magnitude of change and major adverse effect.	**Level of effect:** Major adverse (significant)
Views west from residences and new residential development along Broughton Road at Coppenhall Moss (VP 304-02-002) **Map number LV-03-304**	**High sensitivity receptors**
Residents of properties along Broughton Road and on the edge of new residential development off Broughton Road would experience a substantial alteration to views as a result of the construction of the Crewe tunnel north portal and the Crewe tunnel cutting. The Crewe tunnel north main compound would be a large-scale new feature in the view, truncating existing views across open farmland, hedges and the WCML on the horizon. Construction activity would be highly visible within the direct frame of view.	**Level of effect:** Major adverse (significant)

There would therefore be an overall high magnitude of change and major adverse effect.	
Views from farmsteads and residences at Warmingham Moss, PRoW Crewe Footpath 28, Crewe Footpath 29, Crewe Footpath 30 (also part of the Crewe and Nantwich Circular Walk) and Warmingham Footpath 16 (VPs 304-02-007 and 304-03-005) **Map number LV-03-304**	**High and medium-high sensitivity receptors**
Residents at Warmingham Moss and walkers would experience a noticeable change in near and middle-distance views over gently undulating farmland divided by hedgerows and the WCML and overhead power lines in the background as a result of the construction of the Proposed Scheme. Construction work would take place along the WCML and there would be a loss of field boundary vegetation which would increase the visibility of the existing railway line from the west. The large scale construction works on the Coppenhall embankment and the Minshull Vernon Footpath 8 accommodation overbridge would be prominent in the field of view from properties and footpaths, although partially filtered by intervening field boundary vegetation and pockets of scrub. There would therefore be an overall medium magnitude of change and moderate adverse effect.	**Level of effect:** Moderate adverse (significant)
Views from Moss Lane, PRoW Leighton Footpath 7 and Minshull Vernon Footpath 2 (part of the Crewe and Nantwich Circular Walk) (VPs 304-02-006 and 304-02-009) **Map number LV-03-304**	**High and medium-high sensitivity receptors**
Residents in Moss Lane and PRoW users would experience a noticeable change in near to middle distance existing views over a flat, open agricultural landscape framed by tree-lined hedges, the WCML and woodland growing on the urban edge of Crewe at Leighton as a result of the construction of the Proposed Scheme. Construction of the Coppenhall embankment and the Minshull Vernon Footpath 8 accommodation overbridge, would result in the loss of mature vegetation, opening up views. The large-scale construction works on the Coppenhall embankment and the Minshull Vernon Footpath 8 accommodation overbridge would be prominent in the field of view from properties and footpaths, although partially filtered by intervening field boundary vegetation and pockets of scrub. There would therefore be an overall medium magnitude of change and moderate adverse effect.	**Level of effect:** Moderate adverse (significant)
Views west from residences at Park House Farm and Park Hall Farm, and PRoW Minshull Vernon Footpath 8 (VP 305-02-005) **Map number LV-03-305**	**High and medium-high sensitivity receptors**
Occupants of residential properties and walkers would experience substantial changes to near and middle distance views across open fields, hedgerows, mature trees and the WCML as a result of the construction of the Proposed Scheme. The large-scale construction works on the Walley's Green embankment and the Parkfield overbridge would be prominent in the field of view from residential properties and the footpath, although partially filtered by intervening field boundary vegetation and pockets of scrub. The construction works on the Crewe North RSD and the A530 Middlewich Road overbridge (in the Wimboldsley to Lostock Gralam area (MA02)) would be new features in distant views partly filtered by intervening vegetation. There would therefore be an overall high magnitude of change and major adverse effect.	**Level of effect:** Major adverse (significant)

Other mitigation measures

11.4.13 To further reduce the significant effects described above, consideration will be given during the detailed design stage to where planting can be established early in the construction programme, 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, users of PRoW and cycle routes within the study area.

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

- there is one significantly affected LCA reported in this area, Wimboldsley Open Farmland East Lowland Plain LCA .This LCA lies within both MA01, Hough to Walley's Green area and MA02 Wimboldsley to Lostock Gralam area; the assessment of this LCA is reported in Volume 2 MA02 Wimboldsley to Lostock Gralam as the features of the Proposed Scheme that give rise to significant effects are primarily located in this neighbouring community area;
- major adverse effects in relation to five residential viewpoints;
- moderate adverse effects in relation to five residential viewpoints;
- major adverse effects in relation to one recreational viewpoints; and
- moderate adverse effects in relation to two recreational viewpoints.

11.5 Permanent effects arising from operation

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

Avoidance and mitigation measures

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

- design of engineering earthworks for embankments (such as Walley's Green embankment and the A530 Nantwich Road overbridge) to tie into their wider

landscape context and to mitigate views of structures and overhead line equipment from sensitive receptors, where reasonably practicable;

- compensatory woodland habitat creation and landscape mitigation planting in areas of loss, using the same species composition to provide habitat connectivity and enhanced landscape/green infrastructure connectivity (such as at Spring Plantation to north of Leighton and Burnt Covert/Larch Wood near Minshull Vernon) where reasonably practicable, and to soften the appearance of embankments; and
- hedgerow replacement and restoration in areas of loss to restore connectivity and landscape pattern where reasonably practicable; compensation for loss of field ponds with new wetlands, ecological ponds and biodiversity wetland features and wetland enhancement at Warmingham Moss and Minshull Vernon.

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 route of the Proposed Scheme in cutting and on embankment; tunnel portals; vent shafts; auto transformer stations; overhead line equipment; noise barriers; the realignment of highways/access/PRoW and associated infrastructure; and the Crewe North RSD reception tracks (note that the Crewe North RSD would be situated within the Wimboldsley to Lostock Gralam area (MA02) and is discussed in full in Volume 2 Community area report MA02 Wimboldsley to Lostock Gralam).

Landscape assessment

11.5.4 Based on the current design it is anticipated that one LCA, Wimboldsley Open Farmland East Lowland Plain LCA, would be significantly affected during operation of the Proposed Scheme.

11.5.5 The Wimboldsley Open Farmland East Lowland Plain LCA lies within both MA01, Hough to Walley's Green area and MA02 Wimboldsley to Lostock Gralam area. The assessment is reported in Volume 2 MA02 Wimboldsley to Lostock Gralam as the features of the Proposed Scheme that give rise to significant effects, the presence of the Crewe North RSD, are primarily located in this neighbouring community area.

Visual assessment

Introduction

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

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

11.5.8 Potential visual impacts arising from additional lighting at night during operation of the Proposed Scheme within the area may arise from continuous working and/or overnight working associated with the Crewe North RSD, within MA02 Wimboldsley to Lostock Gralam. Night time surveys will be undertaken to inform the assessment in the formal ES.

11.5.9 Table 21 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: MA01 Map Book.

Table 21: Operation phase significant visual effects

Views from residences along Broughton Road and Coppenhall Moss (High sensitivity receptors) (VP 304-02-002) **Map number LV-04-304**	**High sensitivity receptors**
Year 1 – winter and summer: Residents of properties along Broughton Road would experience substantial changes to open views across farmland divided by hedgerows and the WCML as a result of the operation of the Proposed Scheme. The Crewe tunnel north portal building and rescue area, auto-transformer station and the Crewe north cutting would be new features, with the auto-transformer station and boundary treatments alongside the top of cutting visible in near and middle-distance views. Mitigation planting would not be sufficiently mature to contribute to any visual integration or enclosure between the properties and the route of the Proposed Scheme at this stage. There would therefore be an overall high magnitude of change and major adverse effect.	**Level of effect:** Major adverse (significant)
Year 15 - summer The maturing landscape mitigation planting would partially filter views towards the area of the Crewe tunnel north portal and the boundary line of the Crewe north cutting, and would re-establish the hedge and field pattern between the properties and the route of the Proposed Scheme. The auto-transformer station would however remain visible above the planting in the near and middle-distance views from properties, in particular to the southern end of Broughton Road. The magnitude of change would reduce to medium and there would be a moderate adverse effect.	**Level of effect:** Moderate Adverse (significant)
Views from farmsteads and residences at Warmingham Moss, from PRoW Crewe Footpath 28, Crewe Footpath 29, Crewe Footpath 30 (part of the Crewe and Nantwich Circular Walk) and Warmingham Footpath 16 (VPs 304-02-007 and 304-03-005) **Map number LV-04-304**	**High sensitivity receptors**
Year 1 – winter and summer: Residents and PRoW users would experience a noticeable change in the near to middle distance of view as a result of the operation of the Proposed Scheme. Although rail infrastructure is a characteristic feature of existing views, the WCML has a relatively low-key presence in views because it is screened by boundary vegetation. The Coppenhall embankment would be on a larger scale than the WCML and along with the noise fence barriers, overhead line equipment and the movement of trains would be seen against the skyline, altering key characteristics of the existing view. The Minshull Vernon Footpath 8 accommodation overbridge would be a	**Level of effect:** Moderate adverse (significant)

new feature in the view. Mitigation planting would not be sufficiently mature to contribute to any visual integration or enclosure at this stage. There would therefore be an overall medium magnitude of change and moderate adverse effect.	
Year 15 - summer Due to the growth of mitigation planting, visual effects would reduce to non-significant by year 15.	**Level of effect:** Non-significant
Views Park House Farm, Park Hall Farm and PRoW Minshull Vernon Footpath 8 (high sensitivity receptor) (VP 305-02-005) **Map number LV-04-305**	**High sensitivity receptors**
Year 1 – winter and summer. Residents and PRoW users would experience a noticeable change to near and middle-distance views over fields, hedgerows, mature trees and the WCML as a result of the operation of the Proposed Scheme. Although rail infrastructure is a characteristic feature of existing views, the WCML has a relatively low-key presence in views because it is screened by boundary vegetation. The Walley's Green embankment would be on a larger scale than the WCML and, along with the noise fence barriers, overhead line equipment and the movement of trains, would be seen against the skyline, altering key characteristics of the existing view. The Minshull Vernon Footpath 8 accommodation overbridge would be a new feature in the view and the approaches to the Crewe North RSD and the A530 Middlewich Road overbridge (in the Wimboldsley to Lostock Gralam area (MA02)) would be visible in distant views, partly filtered by intervening vegetation. Mitigation planting would not be sufficiently mature to contribute to any visual integration or enclosure at this stage. There would therefore be an overall medium magnitude of change and moderate adverse effect.	**Level of effect:** Moderate adverse (significant)
Year 15 - summer Due to the growth of mitigation planting, visual effects would reduce to non-significant by year 15.	**Level of effect:** Non-significant

Other mitigation measures

11.5.10 The permanent effects of the Proposed Scheme on landscape and visual receptors have been reduced through integration of the measures described in this section. Effects in Year 1 may also be further reduced through establishing planting early or in advance of the main construction programme. Other features such as additional earthworks, planting or greenspace, 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

11.5.11 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:

- There is one significantly LCA reported in this area, Wimboldsley Open Farmland East Lowland Plain LCA. This LCA however lies within both MA01, Hough to Walley's Green area and MA02 Wimboldsley to Lostock Gralam area; the assessment of this LCA is reported in Volume 2 MA02 Wimboldsley to Lostock Gralam as the features of the Proposed Scheme that give rise to significant effects are primarily located in this neighbouring community area; and
- moderate adverse significant visual effects at one viewpoint location (residential).

Monitoring

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

11.5.13 There are no area-specific requirements for monitoring landscape and visual mitigation during the operation of the Proposed Scheme in the Hough to Walley's Green 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 Hough to Walley's Green area. The assessment considers existing businesses, community organisations, local employment and local economies, including planned growth and development.

12.1.2 Engagement with Cheshire East Council (CEC) has been undertaken as part of the development of the Proposed Scheme. The purpose of the engagement was to increase the understanding of socio-economic characteristics identified through a review of publicly available data. Engagement will continue as part of the development of the Proposed Scheme and to inform the formal assessment.

12.1.3 The socio-economic effects on employment at a route-wide level are reported in Volume 3: Route-wide effects, Section 12.

12.1.4 Maps showing the location of the key environmental features (Map Series CT-10) and the key construction (Map Series CT-05) and key operational (Map Series CT-06) features of the Proposed Scheme are provided in the Volume 2: MA01 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)[101].

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

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

12.3 Environmental baseline

Existing baseline

Study area description

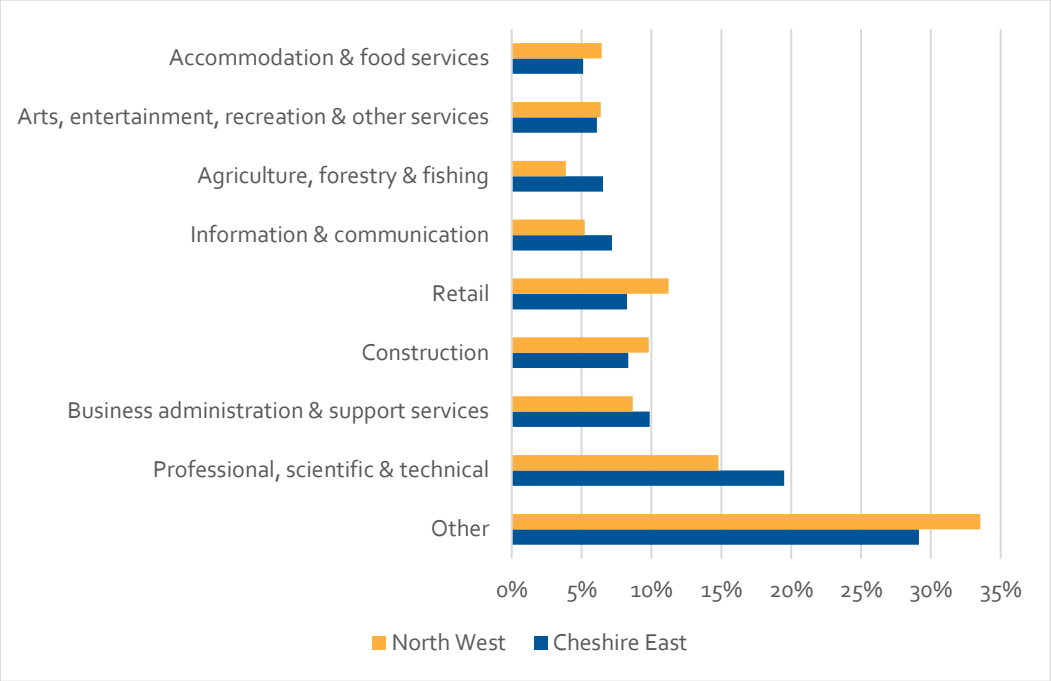
12.3.1 The following provides a brief overview of employment, economic structure, labour market and business premises availability within the Hough to Walley's Green area. It lies within the administrative area of CEC. It also falls entirely within the Cheshire and Warrington Local Enterprise Partnership (LEP) area[102] and the North West region.

[101] Supporting document: HS2 Phase 2b Environmental Impact Assessment Scope and Methodology Report
[102] Cheshire and Warrington Enterprise Partnership (2017). *Cheshire and Warrington Local Enterprise Partnership* [online] Available online at: http://www.871candwep.co.uk/

Business and labour market

12.3.2 Within the CEC area there is a wide spread of organisation types reflecting a diverse range of commercial activities. In 2017, the professional, scientific and technical sector accounted for the largest proportion of organisations (20%). Business administration and support services were the second largest (10%), followed by both construction and retail (8% each)[103]. This is shown in Figure 8. For comparison, in the North West region, the largest sectors were professional, scientific and technical (15%), followed by retail (11%) and construction (10%).

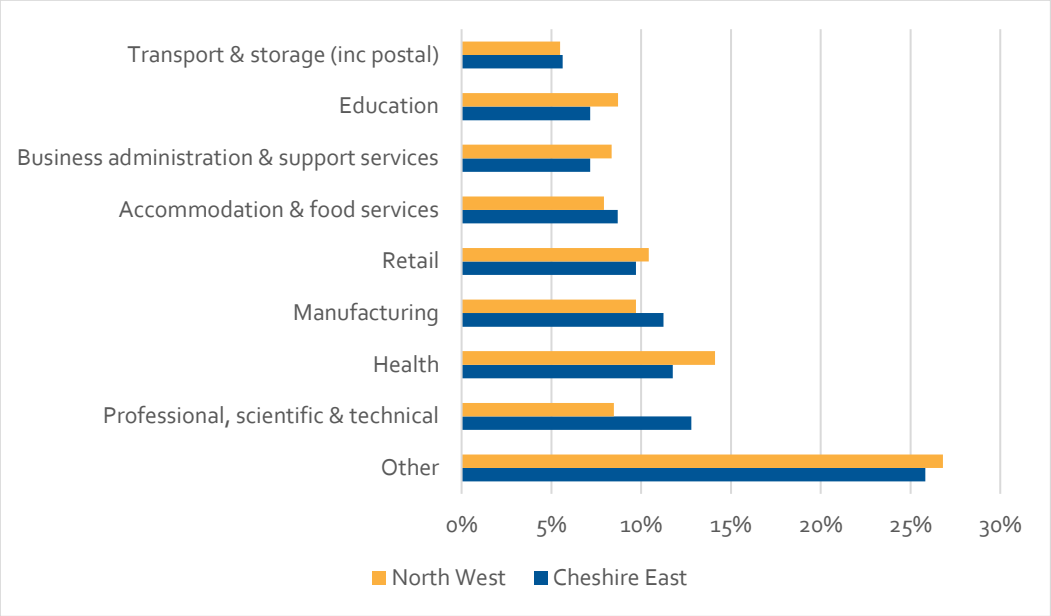
Figure 8: Business sector composition in the CEC area and the North West[104, 105]



12.3.3 In 2016[106], approximately 195,000 people worked in the CEC area. According to the Office for National Statistics Business Register and Employment Survey 2016, the largest sectors in terms of share of employment in CEC area were: professional, scientific and technical (13%), health (12%) and manufacturing (11%)[107]. This is compared with the largest sectors for the North West region, which were health (14%), retail, and manufacturing (both 10%) and education (9%).This is shown in Figure 9.

[103] Office for National Statistics; (2017); UK Business Count – Local Units. Available online at: http://www.nomisweb.co.uk
[104] Office for National Statistics; (2017); UK Business Count – Local Units. Available online at: http://www.nomisweb.co.uk
[105] 'Other' includes: Health; Wholesale; Manufacturing; Property; Transport and storage (inc postal); Motor trades; Financial and insurance; Education; Public administration and defence; Mining, quarrying and utilities
[106] Office for National Statistics; (2016); Business Register and Employment Survey. Available online at: http://www.nomisweb.co.uk; this number includes both residents and non-residents of CEC who work within its boundaries
[107] Office for National Statistics; (2016); Business Register and Employment Survey. Available online at: http://www.nomisweb.co.uk; this number includes both residents and non-residents of CEC who work within its boundaries

Figure 9: Employment by industrial sector in the CEC area and the North West[108, 109]



12.3.4 According to the Annual Population Survey (2016)[110], the employment rate[111] within the CEC area was 76% (170,900 people). This is higher than that estimated for the North West (72%) and England (74%). In 2016, unemployment in the CEC area was 4.5%, which is lower than that estimated for the North West (5.3%) and England (5%).

12.3.5 The survey also shows that 39% of CEC residents aged 16-64 were qualified to National Vocational Qualification Level 4 (NVQ4) and above. This is compared to 34% in the North West and 38% in England. Six per cent of residents had no qualifications, which is lower than the North West (10%) and England (8%).

Property

12.3.6 A review of employment land in 2012[112] identified a need for 15.4ha a year to 2030 of general business land in the CEC area. While there is a potential shortfall of employment land across the borough, Crewe has one of the largest employment land supplies in the CEC area and has sufficient employment land available. It has both industrial and office space available to the market, including at Crewe Business Park.

12.3.7 The importance of providing a portfolio of readily available and market responsive employment land to support growth has been highlighted in the LEP Strategic and Economic Plan[113].

[108] Office for National Statistics; (2016); Business Register and Employment Survey. Available online at: http://www.nomisweb.co.uk; this number includes both residents and non-residents of CEC who work within its boundaries
[109] Percentage of employees within broad industrial groups. 'Other' includes: Financial and insurance; Arts, entertainment, recreation and other services; Construction; Information and communication; Wholesale; Public administration and defence; Motor trades; Property; Mining, quarrying and utilities; Agriculture, forestry and fishing. Percentage of employees within broad industrial groups.
[110] Annual Population Survey (2016), NOMIS. Available online at: https://www.nomisweb.co.uk
[111] The proportion of residents aged 16-64 that are in employment
[112] Arup (2012), *Cheshire East Employment Land Review*. Based on upper range (includes 30% flexibility factors) covering 2009-2030.
[113] Cheshire and Warrington Enterprise Partnership (2014), *Cheshire and Warrington Matters: A Strategic and Economic Plan for Cheshire and Warrington*. Available online at: http://www.871candwep.co.uk/content/uploads/2015/05/Strategic-and-Economic-Plan-and-Growth-Plan-for-Cheshire-and-Warrington.pdf

12.3.8 The average vacancy rate for industrial and warehousing property in the CEC area in March 2018 has been assessed as 24% based on marketed space against known stock[114].

12.4 Effects arising during construction

Avoidance and mitigation measures

12.4.1 The draft Code of Construction Practice (CoCP)[115] includes a range of provisions that would help mitigate socio-economic effects associated with construction within this area, including:

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

Assessment of impacts and effects

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

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

[114] 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)
[115] Supporting document: Draft Code of Construction Practice

Temporary effects

Construction employment

12.4.3 It is currently expected that there would be one main construction compound, the Crewe tunnel north main compound, four satellite compounds and four rail system compounds in the Hough to Walley's Green area. The works undertaken at and managed from these sites would result in the creation of up to 2,100 person years of construction employment[116], which is broadly equivalent to 210 full-time jobs[117]. Depending on skill levels required and the skills of local people, the employment is potentially accessible to residents in the locality and to others living further afield. The impact of the direct construction employment creation will be considered as part of the route-wide assessment (see Volume 3: Route-wide effects).

12.4.4 Construction and the related direct employment could also lead to opportunities for local businesses to supply the Proposed Scheme or to benefit from the expenditure of construction workers. The impact of the indirect construction employment creation will be considered as part of the route-wide assessment (see Volume 3: Route-wide effects).

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

Permanent effects

Businesses

12.4.6 Businesses directly affected, comprising those that lie within land required for the Proposed Scheme, are reported in groups, where possible, to form defined resources based on their location and operational characteristics. A group could contain either one or a number of businesses reflecting the fact that a building may have more than one occupier or that similar businesses and resources are clustered together.

12.4.7 Four business accommodation units or sites in the study area would experience direct impacts as a result of the Proposed Scheme. These four units or sites, together, form three defined resources including:

- Cowley Way (two units engaged in the provision of HGV parking and associated café);
- Moss Bridge (one unit engaged in the provision of boarding kennels and cattery); and
- Moss Bridge (one unit engaged in the provision of horse riding and livery).

12.4.8 From an employment perspective, no significant direct effects on non-agricultural employment have been identified within the area.

[116] 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
[117] Based on the convention that 10 employment years is equivalent to one full time equivalent job

12.4.9 Employment related to mining or underground gas storage at Warmingham brine fields, owned and operated by British Salt Limited, a subsidiary company of Tata Chemicals Europe, may be directly affected by the Proposed Scheme. This will be assessed in the formal ES.

12.4.10 Among all the affected resources (excluding employment associated with mining/gas storage activities), whether significantly affected or not, it is estimated that ten jobs[118] would either be displaced or possibly lost within the Hough to Walley's Green area. There is a reasonable probability that businesses would be able to relocate to places that would still be accessible to residents, due to the general availability of vacant premises and sites. However, there may be cases where alternative locations are problematic. 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 District authority (approximately 195,000 jobs) and the scale of economic activity and opportunity in the area.

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

Other mitigation measures

12.4.12 Businesses displaced by the Proposed Scheme would be compensated in accordance with the Compensation Code. HS2 Ltd recognises the importance of businesses, displaced from their existing premises, being able to relocate to suitable alternative premises and at this stage it assumes that it would, therefore, adopt a policy to offer additional support over and above statutory requirements to facilitate this process as it has done on Phases One and 2a.

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

Summary of likely residual significant effects

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

12.5 Effects arising from operation

Avoidance and mitigation measures

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

[118] Employment within businesses has been estimated through a combination of sources, for example, surveys of businesses, the Experian employment dataset, employment floor space and the Homes and Communities Agency (HCA) Employment Densities Guide 3rd Edition (2015). The estimate is calculated using standard employment density ratios and estimates of floor areas and may vary significantly from actual employment at the sites.

Assessment of impacts and effects

Resources with direct effects

12.5.2 It is currently expected that no resources would experience significant direct socio-economic effects during the operation of the Proposed Scheme.

Operational employment

12.5.3 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.

12.5.4 The impact of operational employment creation will be assessed and reported at a route-wide level in Volume 3: Route-wide effects.

Other mitigation measures

12.5.5 Any further mitigation measures will be reported in the formal ES.

Summary of likely residual significant effects

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

Monitoring

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

12.5.8 There are no area-specific requirements for monitoring socio-economic effects during the operation of the Proposed Scheme in the Hough to Walley's Green area.

13 Sound, noise and vibration

13.1 Introduction

13.1.1 This section reports the initial assessment of the noise and vibration likely significant effects arising from the construction and operation of the Proposed Scheme within the Hough to Walley's Green 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[119]; and
- 'non-residential receptors'[120] such as:
  - community facilities including schools, hospitals, places of worship and 'quiet areas'[121]; 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[122], planning policy, planning practice guidance on noise (PPGN) [123] and EIA Regulations as described in the Scope and Methodology Report[124] (SMR).

13.1.3 Engagement has been undertaken with Cheshire East Council (CEC) 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 Hough to Walley's Green 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: MA01 Map Book. Map series SV-01

[119] '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.
[120] 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.
[122] Noise Policy Statement for England, (2015) Department for Environment, Food & Rural Affairs
[123] Department for Communities and Local Government (DCLG) (2014), Planning Practice Guidance – Noise. Available online at: https://www.gov.uk/guidance/noise--2
[124] Supporting document: HS2 Phase 2b Environmental Impact Assessment Scope and Methodology Report

also presents key 'non-residential receptors'. These receptors will be reviewed and developed further to incorporate, where appropriate, consultation feedback and ongoing stakeholder engagement.

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

13.2 Scope, assumptions and limitations

13.2.1 The approach to assessing sound, noise and vibration and identifying envisaged mitigation is outlined in Volume 1, Section 8 and Section 9 and the SMR.

13.2.2 In this assessment 'sound' is used to describe the acoustic conditions that people experience as a part of their everyday lives. Noise is taken as unwanted sound and hence adverse effects are noise effects and mitigation is, for example, by noise barriers.

13.2.3 Effects can either be temporary from construction or permanent from the operation of the Proposed Scheme. These effects may be direct, resulting from the construction or operation of the Proposed Scheme, and/or indirect, resulting from changes in traffic patterns on existing roads or railways that result from the construction or operation of the Proposed Scheme.

13.2.4 The effects of construction noise and vibration are assessed qualitatively, based on construction compound locations, construction routes, initial construction estimates and professional judgement. No quantitative assessment has been undertaken for the construction of the Proposed Scheme at this stage. The quantitative assessment will be reported in the formal ES.

13.2.5 The effects on operational noise and vibration are assessed quantitatively based on forecast noise emission from the Proposed Scheme combined with outline baseline information and professional judgement. As baseline information is limited at this stage 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 Hough to Walley's Green area is characterised as a predominantly urban setting due to the presence of the large town of Crewe. There also a mix of small towns, villages, hamlets and isolated residential properties in the area surrounding Crewe that is characterised as a predominantly rural setting. The sound environment is generally dominated by local and distant road traffic, trains, and local neighbourhood sources, with contributing natural and agricultural sounds.

13.3.3 There are several main roads that contribute to the sound environment within the Hough to Walley's Green area: the A531 that runs through Betley, Chorlton and

Weston and Basford; the A500 Shavington Bypass that runs through Barthomley, Weston and Basford, Shavington and Willaston; the A534 Nantwich Road that runs through Crewe connecting Willaston and Sandbach; the A5020 University Way that connects the A500 Shavington Bypass to the A534 in Crewe; the A532 Weston Road to Coppenhall Lane that runs through Crewe; and the A530 Middlewich Road that connects Nantwich to Middlewich.

13.3.4 There are also a number of railways contributing to the sound environment in the area: the West Coast Main Line (WCML) running in a south to north direction; and railways connecting Crewe with Chester, Elworth, Alsager and Nantwich respectively.

13.3.5 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.

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

13.3.7 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[125], Roads[126] or Railways[127]. HS2 Ltd will engage with the Competent Authorities responsible for the relevant Important Areas. Map Series SV-01 (Volume 2: MA01 Map Book) shows any noise Important Areas in the Hough to Walley's Green 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)[128]. The assessment focuses on the initial identification of communities that may be affected by construction noise. The formal ES will include the assessment of likely significant effects from construction noise and/or vibration on individual receptors and communities.

13.4.2 The following assumptions have also been made in relation to the construction methods specific to the Hough to Walley's Green area.

13.4.3 At Crewe tunnel, tunnelling support activities (including erection of the tunnel boring machine (TBM), support for the TBM as it excavates, excavated material handling, installation of tunnel lining and tunnel fit-out) would require 24 hour working for

[125] Noise Action Plan: Agglomerations (large urban areas) (2014) Department for Environment, Food & Rural Affairs
[126] Noise Action Plan: Roads (including major roads) (2014) Department for Environment, Food & Rural Affairs
[127] Noise Action Plan: Railways (including major railways) (2014) Department for Environment, Food & Rural Affairs
[128] Supporting document: Draft Code of Construction Practice

reasons of safety, engineering practicability and/or to reduce the impact on existing transport.

13.4.4 As the rotating head of the TBM 'cuts' through the ground, the TBM could give rise to ground-borne noise and vibration that is perceptible, albeit only for short periods of time (generally a matter of days as the TBM approaches and passes) in the nearest receptors. The project will use modern TBMs that control vibration and ground-borne noise generation at source. In line with the draft CoCP, advanced notification would be given to residents prior to TBM activity. Taking account of this measure and the short duration of potential ground-borne noise or vibration effects (two years and six months), significant effects on residential receptors are considered unlikely. The potential effects of vibration and ground-borne noise on non-residential receptors is being assessed and will be presented in the formal ES.

13.4.5 Equipment and materials (including tunnel lining segments) are likely to be transported from the surface to the TBM using a low speed construction railway. Excavated material is likely to be transported to the surface by conveyor. Similar measures to those used by Crossrail (such as rolling stock suspension, management of rail joints and resilient elements between rail and tunnel) would control ground-borne noise and vibration otherwise caused by the construction of the railway. No likely significant effects are therefore anticipated on residential receptors. The potential effects of vibration and ground-borne noise arising on non-residential receptors due to the construction railway are being assessed and will be presented in the formal ES.

13.4.6 There are two ventilation shafts which would each involve construction works in proximity to Cowley Way and Middlewich Street in the centre of Crewe, respectively. The works would include construction of the piling platform, piling, pile cap construction, bulk excavation and concreting during core daytime hours and extending into the evening hours. Some activities have also been assumed to be undertaken at night-time (e.g. adit construction). This evening and night time working is for reasons of safety, engineering practicability and/or to reduce the impact on existing transport.

13.4.7 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

13.4.8 The assessment assumes the implementation of the principles and management processes set out in the noise and vibration section of the draft CoCP[129] (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

[129] Supporting document: Draft Code of Construction Practice

neighbouring residential properties and other sensitive receptors[130].

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

13.4.9 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.

13.4.10 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.

[130] Including local businesses and quiet areas designated by the local authority

Assessment of impacts and effects

13.4.11 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: MA01 Map Book):

- Basford and Weston, Chorlton, Hough and Hough Common arising from construction activities including TBM removal;
- Crewe (centre) including residential properties on roads leading off Goode Way and B5071 Gresty Road, between the A534 Nantwich Road and Basford Road, arising from construction activities such as vent shaft construction;
- Crewe (centre) including residential properties on Middlewich Street, and neighbouring streets including Sherborne Road, Henry Street and Badger Avenue arising from construction activities such as vent shaft construction;
- Crewe (north), Leighton, Coppenhall and Coppenhall Moss, arising from construction activities such as tunnel portal construction, TBM launch and retaining wall formation; and
- Walley's Green, including residential properties in the vicinity of the A530 Nantwich Road between Walley's Green and Occleston Green, arising from construction activities such as overbridge construction, embankment formation, road realignments, operation of transfer nodes and Crewe rolling stock depot (RSD) railway systems construction.

13.4.12 Map Series SV01 (Volume 2: MA01 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):

- Premier Inn Crewe Central, Crewe;
- YMCA Crewe, Crewe;
- Bentley Manor Care Home, Crewe;
- Sherborne Court Neurological Centre, Crewe;
- Crewe Cemetery and Crematorium, Crewe; and
- Bright Stars Children's Day Nursery, Crewe.

13.4.13 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.

13.4.14 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:

- Casey Lane between Weston and Casey Bridge;

- Newcastle Road between Chorlton and Hough;
- the B5076 Middlewich Street from Vernon Way to Remer Street in Crewe;
- the B5076 North Street from Remer Street to Broughton Road in Crewe;
- the B5076 Bradfield Road from Broughton Road to Smithy Lane in Crewe;
- the B5076 Flowers Lane from Smithy Lane to the A530 in Leighton;
- Broughton Road from the B5076 Bradfield Road/North Street to Parker Road in Coppenhall; and
- Parkers Road from Broughton Road to the B5076 Bradfield Road in Leighton.

13.4.15 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

13.4.16 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

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

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 Hough to Walley's Green 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 nine trains per hour in each direction on the main lines with an operating speed of 330kph for 90% of services and 360kph for 10% of services. This number of

services is assumed 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. This will include reduction of aerodynamic noise from the pantograph that otherwise would occur above 300kph (186mph) with current pantograph designs, drawing on proven technology in use in East Asia where reasonably practicable. Overall it is assumed that proven international technology would reduce noise emissions by approximately 3dB at 360kph (225mph) compared to the current minimum European standards[131].

13.5.6 The Proposed Scheme would incorporate noise barriers, in the form of either landscape earthworks and/or noise fence barriers to avoid or reduce significant adverse airborne noise effects. The assessment has been based on the assumption that noise fence barriers are acoustically absorbent on the railway side and are located 5m from the outer rail. The envisaged noise barrier locations based upon the currently available information are shown on Map Series SV-01 (Volume 2: MA01 Map Book) and described in Section 2.2.

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

13.5.8 Noise effects would also be reduced in other locations along the route by engineering structures and landscape earthworks provided to avoid or reduce significant visual effects.

13.5.9 As required by statute, noise insulation measures would be offered for qualifying buildings as defined in the Noise Insulation (Railways and Other Guided Transport Systems) Regulations 1996 and the Noise Insulation Regulations 1975 ('the NI Regulations'). Additionally, HS2 Ltd will apply more onerous criteria, to provide the

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

same mitigation as defined in 'the NI Regulations' at residential buildings where[132] noise from the use of the Proposed Scheme measured outside a dwelling exceeds the Interim Target defined by the World Health Organization's (WHO) Night Noise Guidelines for Europe[133] or the maximum noise level criteria[134] defined in the SMR. Noise insulation is designed to avoid residents experiencing any residual significant effect on health and quality of life from resulting noise inside their dwelling.

13.5.10 Noise can be generated at exits from tunnels due to pressure waves created inside the tunnel as the train enters. This is a well understood phenomenon and is mitigated by appropriate design and construction techniques. Porous tunnel portals, tunnels and vent shafts (where required) will be designed to avoid any significant airborne noise effects caused by the trains entering the tunnel.

13.5.11 The Crewe RSD would be designed and operated to control noise and vibration and hence avoid significant effects.

Ground-borne noise and vibration

13.5.12 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

13.5.13 Map Series SV-01 (Volume 2: MA01 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.

13.5.14 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.

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

[132] Following Government's National Planning Practice Guidance. Available online at: https://www.gov.uk/government/collections/planning-practice-guidance
[133] World Health Organization (2010), *Night time Noise Guidelines for Europe*.
[134] Dependent on the number of train passes.

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

Other mitigation measures

13.5.17 Further work is being undertaken to confirm the extent, location and type of the noise mitigation to be included within the Proposed Scheme, which will be reported in the formal ES.

Summary of likely residual significant effects

13.5.18 Mitigation, including landscape earthworks and noise fence barriers, described in Volume 1, Section 9, Section 2.2 and presented in Map Series SV-01 (Volume 2: MA01 Map Book) and Map Series CT-06 (Volume 2: MA01 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.

13.5.19 Taking account of the avoidance and mitigation measures this initial assessment has identified effects on a precautionary basis with the potential to be considered significant on a community basis due to increased airborne noise levels in line with the SMR at or around Leighton, Crewe at occupants of residential properties located closest to the Proposed Scheme on the east and north side of Leighton, Crewe, identified by MA01-C02 on Map SV-01-303 (Volume 2: MA01 Map Book).

13.5.20 The initial assessment indicates that, the forecast noise from long-term railway operation may exceed the daytime threshold set by the Noise Insulation Regulations, the night-time Interim Target identified in the WHO Night Noise Guidelines for Europe 2009 or the maximum noise levels criteria set out in the SMR, at individual residential properties closest to the Proposed Scheme at or around Parkfield Farm in the vicinity of Middlewich Road (identified on Map Series SV-01 (Volume 2: MA01 Map Book) on Map SV-01-303).

13.5.21 Map Series SV-01 (Volume 2: MA01 Map Book) shows key non-residential properties for the assessment of operational airborne noise impacts in the formal ES. The initial assessment indicates that there are no significant effects identified at any non-residential receptors in this community area as a result of operational noise.

13.5.22 The envisaged mitigation (especially track design) would substantially reduce the potential ground-borne noise and vibration effects that would otherwise arise from the Proposed Scheme. Nonetheless, this initial assessment has identified a potential likely significant effect on a community basis due to ground-borne noise and vibration above the tunnel sections of the Proposed Scheme at Crewe located closest to the Proposed Scheme comprising occupants of residential properties on Brierley Street, North Stafford Street, Wallis Street, Sheppard Close, Earle Street, B5076 Middlewich Street, Henry Street, Audley Street, Greenacres, Crossway, Greenway, Sherborne Road, Cranborne Road, Hazel Grove, Chapelmere Court, Broughton Road, North Street, Castlemere Drive, Churchmere Drive and Broad Street, identified by MA01-

C01 on Map SV-01-302 (Volume 2: MA01 Map Book). Consideration of mitigation, including further track design, is ongoing.

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

13.5.24 HS2 Ltd will continue to seek reasonably practicable measures to further reduce or avoid these significant effects, which may include consideration of trackform. 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

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

13.5.26 Operational noise and vibration monitoring would be carried out at different times during the lifetime of the Proposed Scheme at a combination of carefully selected monitoring locations including: adjacent or attached to moving vehicles, at fixed positions or in the vicinity of individual assets; and locations within the surrounding areas and communities alongside the railway corridor.

13.5.27 The expected noise and vibration performance of the Proposed Scheme, operational noise and vibration measurement data, associated asset information, description of corrective actions, results of measured performance compared to expected conditions, and monitoring reports would be shared with the relevant local authorities at appropriate intervals.

14 Traffic and transport

14.1 Introduction

14.1.1 This section considers the likely impacts on all forms of transport and the potential likely significant effects identified to date on transport users arising from the construction and operation of the Proposed Scheme through the Hough to Walley's Green area.

14.1.2 Engagement with Highways England and Cheshire East Council (CEC) 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 are provided in the Volume 2: MA01 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)[135].

14.2.2 The study area for traffic and transport includes the communities of Basford, Bradfield Green, Crewe, Occlestone Green, Warmingham, Weston and Minshull Vernon together with Crewe and Sandbach railway stations.

14.2.3 The study area also includes all roads potentially affected by the Proposed Scheme. The strategic roads are: the M6 junction 16 and the A500 Shavington Bypass.

14.2.4 The local roads in the study area include: the A5019 Vernon Way, the A5078 Dunwoody Way, the A530 Nantwich Road/ Middlewich Road, the A531 near Weston, the A532 Weston Road/West Street/Earle Street/Vernon Way/Coppenhall Lane, the B5076 Bradfield Road/Middlewich Street, Broughton Road, Casey Lane, Clive Green Lane and Parkers Road.

14.2.5 The potential effects on traffic and transport have been assessed qualitatively, based on the Proposed Scheme design, proposed construction routes, initial estimates of construction traffic and professional judgement.

14.2.6 No quantitative assessment has been undertaken at this stage. A quantitative assessment will be presented in the formal ES.

[135] 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 and CEC (including provision of information on public transport, public rights of way (PRoW) and accident data and desktop analysis.

Surveys

14.3.2 Traffic surveys, comprising junction turning counts and queue surveys and automatic traffic counts, were undertaken in June, July and November 2017. These data have been supplemented by existing traffic data from other sources, including from Highways England and CEC as appropriate. Assessment of these data indicate that the peak hours in the area are 07:45-08:45 and 17:00-18:00. However, there are only small differences (typically less than 3%) between the observed peak hours and the periods 08:00-09:00 and 17:00-18:00, the periods when HS2 construction traffic movements and workforce arrivals and departures would have the maximum impact. Consequently, the hours 08:00-09:00 and 17:00-18:00 have been used as the assessment hours representing a reasonable worst case.

14.3.3 PRoW surveys were undertaken in August and November 2017 to establish their nature and usage by non-motorised users (pedestrians, cyclists and equestrians). The surveys included PRoW and roads that would cross the route of the Proposed Scheme, and any additional PRoW and roads that may be affected by the Proposed Scheme. The majority of the PRoW surveys were undertaken during the weekend, at times when recreational use is expected to be highest, but where routes are likely to be used for non-leisure uses such as commuting, surveys were undertaken on a weekday.

Strategic and local highway network

14.3.4 The only strategic route that passes through the area is M6 and the A500 Shavington Bypass which runs north of Hough and Shavington and connects to the M6 at junction 16 to the east. The strategic road network in and around the Hough to Walley's Green 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 A5078 Dunwoody Way, the A530 Middlewich Road, the A531 near Weston, the A532 West Street, the B5076 Middlewich Street, Bradfield Road, Broughton Road, Casey Lane, Middlewich Road, Parkers Road and Weston Road. The local road network in this area generally operates well, although some localised delays can be experienced, particularly at peak times.

14.3.6 Relevant accident data for the road network subject to assessment have been obtained from the Department for Transport[136]. Data for the three-year period (2014-2016) have been assessed and any identified clusters (i.e. where there are nine or more accidents in the three-year period) have been examined.

[136] STAT19 Road Safety Data 2014-2016 Department for Transport

14.3.7 Three accident clusters were identified within the Hough to Walley's Green area:

- the A532 between A530 and A5078 Dunwoody Way - nine accidents, including one with serious casualties;
- the A532 between Vernon Way and A5078 Dunwoody Way - 15 accidents, including three with serious casualties; and
- Weston Road between Nantwich Road and A5020 David Whitby Way – ten accidents, including one with a serious casualty.

14.3.8 The route of the Proposed Scheme would cross nine roads with footways within the Hough to Walley's Green area. These are: A500 Shavington Bypass; A532 Earle Street; A534 Nantwich Road; B5076 Bradfield Road; B5076 Middlewich Street; Broad Street; Casey Lane; Parkers Road; and Weston Lane.

Parking and loading

14.3.9 Within the Hough to Walley's Green area, there is parking in a number of areas including: the B5076 Middlewich Street and Ridgeway Street; and in the vicinity of Broughton Road, Weston Road and Cowley Way. At Crewe Station there are approximately 780 car parking spaces. These are located in two areas; the first accessed from Pedley Street, the second accessed from the A532 Weston Road. Further car parking spaces are available in privately operated car parks off the A532 Weston Road, where there is also a taxi waiting area.

Public transport network

14.3.10 One bus route operates on one road that would be crossed by the route of the Proposed Scheme in the Hough to Walley's Green area. This is route 78 (Nantwich - Leighton Hospital - Sandbach - Rode Heath) at Parkers Road. There are also bus stops primarily located to serve the main built up area.

14.3.11 National and local rail services are accessible via Crewe Station and local rail services are accessible via Sandbach stations. Crewe Station provides access to national services to London, Birmingham, Manchester, Liverpool, Glasgow and Edinburgh. Nantwich and Sandbach stations provide access to local services to Wrenbury, Whitchurch, Prees, Wem, Yorton, and Shrewsbury.

Non-motorised users

14.3.12 There are pedestrian footways adjacent to many of the roads in the built-up areas of the Hough to Walley's Green area, including alongside Broughton Road, Parkers Road, B5076 Bradfield Road/Middlewich Street, A532 Weston Road/West Street and the A5078 Dunwoody Way. Footways vary in width and condition within these areas. Where there is no formal footway provision adjacent to a road, non-motorised user numbers are generally low.

14.3.13 The route of the Proposed Scheme would cross five PRoW within the Hough to Walley's Green area that could be affected either temporarily or permanently. This may be due to, for example, temporary diversion of PRoW during construction and permanent diversions or upgrades for maintenance access to the Proposed Scheme.

The surveys undertaken to inform the assessment showed that there were fewer than 10 people per day recorded on three of the PRoW. The route with the greatest usage was Crewe Footpath 29, near Parkers Road, Crewe, which was used by 68 pedestrians during the survey day.

14.3.14 In the Hough to Walley's Green area, there is a network of advisory cycle routes connecting Crewe with surrounding settlements. There are cycle routes along: the A532 Macon Way, the A534 Crewe Road/Nantwich Road and Crewe Green Road (route 451), Weston Lane (National Cycle Route 551, Newcastle to Nantwich and Winsford) and Casey Lane and Wrinehill Road (Regional route 70).

Waterways and canals

14.3.15 There are four navigable waterways in the Hough to Walley's Green area, the Shropshire Union Canal is located west of the land required for the Proposed Scheme and the Trent and Mersey Canal is located east of the land required for the Proposed Scheme. The River Weaver runs parallel and to the west, and the River Wheelock runs east of the land required for the Proposed Scheme. It is not currently expected that the Proposed Scheme would have a significant effect upon navigable waterways or canals in the Hough to Walley's Green area. Consequently, this topic is not considered further in this assessment.

Air transport

14.3.16 There is no relevant air transport in the Hough to Walley's Green area. Consequently, this topic is not considered further in this assessment.

14.4 Effects arising during construction

Avoidance and mitigation measures

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

- new highways (roads and PRoW) would be constructed and operational prior to the permanent closure of any existing highways, insofar as reasonably practicable;
- the majority of roads crossing the route of the Proposed Scheme would be maintained or locally diverted during construction to limit the need for diversion of traffic onto alternative routes;
- traffic management measures would be implemented to limit any disruption;
- road closures would be restricted to overnight and weekends, insofar as reasonably practicable;
- temporary alternative routes for PRoW would be provided during construction, insofar as reasonably practicable, where either the existing or final proposed route is not available;
- where reasonably practicable, site haul routes would be created adjacent to the route of the Proposed Scheme to transport construction materials and

equipment to reduce heavy goods vehicle (HGV) movements on public roads with access taken via the main road network;

- HGV would be routed, insofar as reasonably practicable, along the strategic and/or primary road network;
- the use of the local road network would, insofar as reasonably practicable, be limited to use for site set-up, access for surveys and on-going servicing (including refuse collection and general deliveries to compounds) during construction;
- the reuse of excavated material along the route of the Proposed Scheme, insofar as reasonably practicable;
- highway measures including junction improvements, passing places and carriageway widening would be provided, as required, to manage the safe passing of construction vehicles on construction HGV routes; 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)[137] 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.

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

[137] Supporting document: Draft Code of Construction Practice

framework travel plan that would require construction workforce travel plans[138] 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 Hough to Walley's Green area are likely to include:

- construction vehicle movements to and from the various construction compounds;
- road closures and associated realignments and diversions;
- alternative routes for PRoW; and
- possessions on the conventional rail network.

14.4.9 The construction assessment has also considered any impacts in the Hough to Walley's Green area that arise from construction of the Proposed Scheme in the adjoining community areas.

14.4.10 Construction vehicle movements required to construct the Proposed Scheme would include the delivery of plant and materials, movement of excavated materials and site worker trips. Works would include utilities diversions, earthworks, underpass, viaduct, bridge and highway construction.

14.4.11 Construction activities would be managed from compounds. Details of the construction compounds are provided in Section 2.3. The locations of the compounds are shown in Map Series CT-05 in the Volume 2: MA01 Map Book.

[138] 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.

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 M6 junction 16;
- the A500 Shavington Bypass;
- the A5078 Dunwoody Way;
- the A51 Middlewich Road;
- the A532 Weston Road/ West Street;
- the B5076 Bradfield Road;
- Broughton Road;
- Cowley Way; and
- Parkers Road.

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: temporary closure of Parkers Road.

14.4.14 Permanent changes to highways are reported under operation.

14.4.15 Changes in traffic have the potential, at some locations, to result in increased travel distance, congestion and delays and increased traffic severance for non-motorised users. The assessment of these changes will be reported in the formal ES.

14.4.16 Assessment of the traffic and transport impacts from utilities works, either separately or in combination with other works, will be reported in the formal ES.

Accidents and safety

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

Parking and loading

14.4.18 It is currently expected that the Proposed Scheme could have impacts on parking. Designated parking spaces for commercial and residential use of B5076 Middlewich Street and Ridgeway Street, and in the vicinity of Broughton Road, Weston Road and Cowley Way, would be suspended during construction works. Some roads that could

be used as construction routes and have on-street parking could be affected. Any significant effects will be reported in the formal ES.

Public transport network

14.4.19 It is expected that construction of the Proposed Scheme would require bus route diversions, including bus route 78, during closure of Parkers Road for construction. 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 West Coast Main Line (WCML) including rail freight services. The majority of the rail possessions would have little or no impact on the operation of rail services as they would be relatively minor localised works, such as work on and adjacent to track when not in use. Rail possessions would be required to undertake localised works to the WCML. This could 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.

Non-motorised users

14.4.21 The construction works associated with the Proposed Scheme would require the temporary closure or diversion/realignment of PRoW and roads. There would be temporary alternative routes for a number of PRoW in the vicinity of the Proposed Scheme. Where necessary, PRoW would be re-routed around construction compounds.

14.4.22 There would be temporary alternative routes for a number of PRoW in the vicinity of the Proposed Scheme. It is currently expected that the following PRoW would be temporarily diverted/realigned or closed:

- Crewe Footpath 29, near Parkers Road, Crewe, would be temporarily closed until a footbridge over the route of the Proposed Scheme is constructed;
- Leighton Footpath 7 between Moss Lane and Parkers Road to be temporarily closed;
- Warmingham Footpath 16, near Warmingham Moss, would be temporarily closed until completion of overbridge over the route of the Proposed Scheme; and
- Minshull Vernon Footpath 8, near Parkfield, would be temporarily closed until completion of footbridge over the route of the Proposed Scheme.

14.4.23 Permanently diverted PRoW are reported under operation although these PRoW could also be subject to temporary closure or diversion/realignment.

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

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

14.4.27 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 A500 Shavington Bypass; the A5078 Dunwoody Way; the A51 Middlewich Road; the A530 Nantwich Road; the A532 Weston Road/ West Street; the B5076 Bradfield Road; Broughton Road; Casey Lane; Cowley Way; and Parkers Road. Increases in traffic could also result in increased traffic severance for non-motorised users of the routes and changes in traffic could result in changes in accident risk.

14.4.29 Construction of the Proposed Scheme is expected to result in temporary closure of Parkers Road.

14.4.30 Construction of the Proposed Scheme is expected to affect parking off the B5076 Middlewich Street/Ridgeway Street and in the vicinity of Broughton Road, Weston Road and Cowley Way.

14.4.31 Construction of the Proposed Scheme is expected to require diversion of bus route 78.

14.4.32 Construction of Proposed Scheme is expected to include works that would require possession on the WCML for short periods that could affect users of the WCML.

14.4.33 Construction of the Proposed Scheme is expected to require temporary diversion or closure of Crewe Footpath 29, Minshull Vernon Footpath 8, Warmingham Footpath 16 and Leighton Footpath 7.

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

14.5 Effects arising from operation

Avoidance and mitigation measures

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

- reinstatement of roads on or close to their existing alignments, where reasonably practicable; and
- replacement, diversion or realignment of PRoW.

Assessment of impacts and effects

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

Key operation transport issues

14.5.3 The operation of the Proposed Scheme would be unlikely to have any substantial impacts within this area due to increased traffic, as there are no stations or depots proposed within the Hough to Walley's Green area. The maintenance of the Proposed Scheme would generate limited vehicular trips and the effect would not be significant.

14.5.4 The operational impacts are therefore primarily related to permanent diversion, realignment and closure of roads and the diversion or closure of PRoW.

Highway network

Strategic and local highway network

14.5.5 The Proposed Scheme would result in a number of permanent highway changes. These include a new overbridge at Parkers Road crossing over the WCML and the realigned A530 Nantwich Road. However, these are not expected to result in any significant effects.

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

Accidents and safety

14.5.7 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

14.5.8 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 could include permanent loss of some of the parking lost during construction at the B5076 Middlewich Street and Ridgeway 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.

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

Public transport network

14.5.10 The permanent realignment of roads could increase travel distances for bus passengers. However, as the realignments would be less than 1km in length, it is not

currently expected that there would be significant effects on public transport within the Hough to Walley's Green area.

14.5.11 The Proposed Scheme is not expected to have any further effects on public transport operations in the Hough to Walley's Green area.

Non-motorised users

14.5.12 A number of PRoW that cross the route of the Proposed Scheme would be either permanently realigned/diverted or closure including:

- Minshull Vernon Footpath 13, which would be closed from north west of Hole House, with users diverted to the Minshull Vernon Footpath 8 overbridge; and
- Minshull Vernon Footpath 8, which would be realigned from east of Parkfield with users diverted to the Minshull Vernon Footpath 8 overbridge.

14.5.13 The realignment of some of the PRoW would increase journey distance and time for non-motorised users and may result in significant effects. It is expected that the increase in journey distance would be likely to be in excess of an additional 500m for users of PRoW Minshull Vernon Footpath 13 and Minshull Vernon Footpath 8. The assessment PRoW changes will be reported in the formal ES.

Other mitigation measures

14.5.14 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.

14.5.15 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

14.5.16 Operation of the Proposed Scheme is expected to result in permanent loss of car parking and/or loading areas at the B5076 Middlewich Street and Ridgeway Street.

14.5.17 Operation of the Proposed Scheme would result in Minshull Vernon Footpath 8 PRoW and Minshull Vernon Footpath 13 PRoW being permanently realigned and closed respectively.

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

Monitoring

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

14.5.20 There are no other area-specific monitoring requirements currently proposed for traffic and transport.

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 Hough to Walley's Green area. The likely impacts and significant effects identified to date arising from the construction and operation of the Proposed Scheme on surface water and groundwater bodies and their associated water resources are reported. The likely impacts and significant effects of the Proposed Scheme on flood risk and land drainage are also reported.

15.1.2 Engagement has been undertaken with the Environment Agency, Cheshire East Council (CEC), which is the Lead Local Flood Authority (LLFA) and United Utilities 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: MA01 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, Section 16, Water resources and flood risk 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)[139].

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)[140].

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

[139] DCLG (2015), *National Planning Policy Framework*
[140] Supporting document: HS2 Phase 2b Environmental Impact Assessment Scope and Methodology Report

this report. In the Hough to Walley's Green area, the study area overlaps with that of HS2 Phase 2a. The assessment includes consideration of the Crewe tunnel from its start in the south of the Hough to Walley's Green area but excludes the tunnel portal within HS2 Phase 2a[141]. The study area has also been extended to include the closest feature of the Sandbach Flashes SSSI.

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 tributary of Fowle Brook.

15.2.6 Groundwater levels have been inferred from the available Environment Agency groundwater level monitoring boreholes, historic borehole logs and topographic data, as well as from spring and watercourse locations.

15.2.7 Impacts on biological receptors such as aquatic fauna and flora are assessed in Section 7, Ecology and biodiversity.

15.2.8 The assessments in this working draft ES are based on professional judgement using the information that is currently available. A precautionary approach has been adopted with regard to assessing the potential for adverse impacts to occur. The surveys, analysis and modelling work currently in progress, and the results of the consultation process, will be used to refine the assessments reported in the formal ES.

15.3 Environmental baseline

Existing baseline - Water resources and WFD

Surface water

15.3.1 All surface water bodies in the study area fall within the Weaver Gowy management catchment of the North West river basin district (RBD).

[141] HS2 Ltd (2017): High Speed Rail (West Midlands to Crewe) Environmental Statement Volume 2: Community Area Report. CA5: South Cheshire. Available online at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/627569/E17_Volume_2_CA5_South_Cheshire_WEB.pdf

15.3.2 The river basin management plan[142] identifies the chemical[143] and ecological[144] status of surface water bodies, and the quantitative[145] and chemical[146] 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 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 22. The receptor value attributed to each individual water body is based on the methodologies set out in the SMR.

Table 22: Surface water body receptors

Water body name and location[147]	**Designation**	**Q95 value (m^3/s)[148]**	**Receptor value**	**Parent WFD water body name and identification number[149]**	**Current WFD status / Objective[150]**
Gresty Brook WR-01-301 D6	Main river	0.06	High	Wistaston Brook GB112068055280	Bad / Good by 2027
Valley Brook (Englesea Brook to Weaver) WR-01-301 E6	Main river	0. 1	High	Valley Brook (Englesea Brook to Weaver) GB112068055310	Moderate / Good by 2027
Tributary of Fowle Brook 1 WR-01-301 I6	Ordinary watercourse	<0.002	Low	Fowle Brook GB112068055400	Poor / Good by 2027

[142] Environment Agency (2015), *Water for life and livelihoods Part 1: Humber river basin district: River basin management plan*.
[143] The chemical status of surface waters reflects concentrations of priority and hazardous substances present.
[144] 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.

[145] 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.
[146] 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.
[147] The feature locations are indicated by the grid coordinates on the relevant Volume 2: MA01 Map Book figures (in this case WR-01).
[148] This is the flow within the watercourse that is exceeded for 95% of the time.
[149] The Environment Agency has attributed each surface water and groundwater body a unique water body identification (ID) number.
[150] Status and objectives are based on those set out in the 2015 River basin management plan.

Water body name and location[147]	Designation	Q95 value (m^3/s)[148]	Receptor value	Parent WFD water body name and identification number[149]	Current WFD status / Objective[150]
Tributary of River Weaver 1 WR-01-302a D5	Ordinary watercourse	n/a[151]	Low	Weaver (Marbury Brook to Dane) GB112068060460	Poor / Good by 2027
Hoggins Brook WR-01-301 J6	Ordinary watercourse	0.003	Moderate	Wheelock (Fowle Brook to Dane) GB112068055380	Poor / Good by 2027

Abstractions and permitted discharges (surface water)

15.3.6 There are no licensed surface water abstractions in the study area.

15.3.7 Records of private unlicensed surface water abstractions, which comprise those for quantities less than 20m3 per day, have been obtained from the local authorities. 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 surface water supplies may be present. Private water supplies would be assessed as high value receptors unless details obtained from the owner indicate otherwise.

15.3.8 There are 18[152] 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 23. Unless stated otherwise, the geological groups listed would all be crossed by the Proposed Scheme. Table 23 also identifies the receptor values attributed to each groundwater receptor based on the methodologies set out in the SMR.

[151] The Q95 value is unavailable, as insufficient LiDAR data is available to delineate the catchment, and perform the calculation.
[152] Note that the number of consents listed in Section 10: Land quality may be different to that stated here. This is because the Water resources and flood risk study area comprises all the land within 1km of the centreline of the Proposed Scheme, whereas the Land quality study area for surface water comprises all land with 250m of the boundary of the Proposed Scheme. The default study area may be extended where potential for wider pathways exists.

Table 23: Summary of geology and hydrogeology in the study area

Geology[153]	Distribution	Formation description	Aquifer classification	WFD body (ID) and current overall status[154]	WFD status objective[155]	Receptor value
Superficial deposits						
Alluvium	Along the valleys of most rivers and tributaries	Clay, silt, sand and gravel	Secondary A	Weaver and Dane Quaternary sand and gravel aquifer (GB41202G991700) Poor	Good by 2027	Moderate
River terrace deposits	Along the valley of the Gresty Brook	Sand and gravel	Secondary A			Moderate
Glaciofluvial sheet deposits	At Weston and Hough at the southern end of the study area. Isolated patches in other valleys	Sand and gravel	Secondary A			Moderate
Glacial till	Across much of the study area	Sandy silty clay	Secondary (undifferentiated)			Moderate
Bedrock						
Mercia Mudstone Group - Sidmouth Mudstone Formation	Across the majority of the study area	Mudstone and siltstone with some halite-bearing units, and presence of sandstone.	Secondary B	Not assessed by the Environment Agency	Not assessed by the Environment Agency	Moderate
Mercia Mudstone Group - Sidmouth Mudstone Formation – Wilkesley Halite Member	At the southern and eastern edges of the study area	Halite with mudstone parting	Unproductive	Not assessed by the Environment Agency	Not assessed by the Environment Agency	Low

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 23, is outlined briefly as alluvium, river terrace

[153] In recent years the British Geological Survey has revised the nomenclature used to describe the geological materials present in Great Britain, with the publication of a series of lithostratigraphic framework reports. Some of these reports cover an entire geological period e.g. The Carboniferous and others cover a single group e.g. the Triassic Mercia Mudstone. The nomenclature used in these reports supersede the nomenclature introduced in the 1980s. While some traditional names have been retained by this process, many new names have also been generated, and many geological maps have not yet been updated. Some stratigraphic units have been renamed twice in the last 35 years. To reflect this, the previous name used for geological units (if different) is shown in brackets.
[154] As stated in the 2015 River basin management plan.
[155] As stated in the 2015 River basin management plan.

deposits, glacial till and glaciofluvial sheet 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 23 is outlined briefly as follows:

- the Mercia Mudstone Group has traditionally been regarded as predominantly impermeable, or at best a poor aquifer. Limited quantities of groundwater suitable for domestic or agricultural use are, however, occasionally obtainable within this formation which has therefore been classified as a moderate value receptor; and
- the Wilkesley Halite Member (which has historically been mined for deep rock salt deposits) is classified as unproductive strata and is unlikely to provide baseflow to rivers or support groundwater abstraction. It has therefore been classified as a low 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 groundwater bodies in the superficial deposits within the study area is provided in Table 23. The value attributed to each of these receptors is also indicated.

Abstraction and permitted discharges (groundwater)

15.3.13 There are no groundwater abstractions licensed for public water supply in the study area. There are no source protection zones (SPZ) associated with public water supplies within the study area.

15.3.14 There are no private groundwater abstraction licences registered in the study area.

15.3.15 Records of private unlicensed groundwater abstractions, which comprise those for quantities less than 20m3 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. 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.

15.3.16 There are three[156] consented discharges to groundwater within the study area. These discharges have been assessed as low value receptors.

[156] 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.

Groundwater - surface water interactions

15.3.17 Desk-based assessment using Ordnance Survey maps and detailed river network data provided by the Environment Agency identified seven features within the study area that had potential to be springs. Access was not possible to inspect any of these features at this stage.

15.3.18 The seven potential spring features that have yet to be inspected are assumed to be high value receptors on a precautionary basis. One of the potential spring features yet to be inspected is within the land required for the Proposed Scheme, a spring 260m west of Park Hall Farm, Minshull Vernon.

15.3.19 There are 16 ponds within the land required for the Proposed Scheme. The nature and relative value of these features, the magnitude of the impacts that the Proposed Scheme would have on them, and the mitigation proposed, are outlined in Section 7, Ecology and biodiversity.

Water dependent habitats

15.3.20 There is one nature conservation site within the study area which is potentially groundwater dependent. The site is Sandbach Flashes Site of Special Scientific Interest (SSSI), which includes several separate water dependent features at locations to the east of the route. The closest feature to the route is along the banks of the Fowle Brook (1.3km to the east).

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.

15.3.22 Further details of the ecology of Sandbach Flashes, including the reporting on the effects and associated other mitigation, if required, are provided in Section 7, Ecology and biodiversity.

Existing baseline - flood risk and land drainage

15.3.23 The Environment Agency's Flood map for planning (rivers and sea)[157] 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).

15.3.24 The updated Flood map for surface water[158] 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[159]. The British Geological

[157] Gov.uk (2018) Flood map for planning. Available online at: https://flood-map-for-planning.service.gov.uk/

[158] Gov.uk (2018) Learn more about this area's flood risk. Available online at: https://flood-warning-information.service.gov.uk/long-term-flood-risk/

[159] Gov.uk (2018) Learn more about this area's flood risk. Available online at: https://flood-warning-information.service.gov.uk/long-term-flood-risk/

Survey's (BGS) Groundwater flooding susceptibility data set[160], has been used to assess the future risk of groundwater flooding.

15.3.25 The following reports were used to help determine the baseline flood risk within the study area:

- Cheshire East Preliminary Flood Risk Assessment (PFRA) (2011)[161];
- Cheshire East Council Strategic Flood Risk Assessment (SFRA) (2014)[162]; and
- Cheshire East Local Flood Risk Management Strategy (LFRMS) (2017)[163].

River flooding

15.3.26 The study area includes substantial areas of floodplain (Flood Zone 2 or 3) associated with Gresty Brook, Valley Brook and Hoggins Brook. Table 24 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 24: River flood risk sources and receptors

Source	Location description and figure/coordinate[164]	Receptor potentially affected	Receptor value / sensitivity to flooding
Valley Brook	Valley Brook WR-01-301 E6	Multiple offices and businesses close to Herald Park	Moderate
		Electricity sub-stations along Macon Way and Herald Drive	Very high
		Residential properties along Ludlow Avenue and Grange Close	High
Hoggins Brook	Hoggins Brook WR-01-301 J6	Development site close to Moss Lane	Moderate

Surface water flooding

15.3.27 There are numerous areas that are susceptible to surface water flooding within the study area. The key sources and receptors with potential to be affected are shown in Table 25. The value of these receptors, based on Table 57 of the SMR, is also indicated.

[160]British Geological Survey (2017) BGS groundwater flooding. Available online at: http://www.bgs.ac.uk/products/hydrogeology/groundwaterFlooding.html
[161]Jacobs (2011), *Cheshire East Preliminary Flood Risk Assessment (PFRA)*
[162] JBA Consulting (2013), *Cheshire East Council Strategic Flood Risk Assessment (SFRA)*
[163] Cheshire East Council (2017), *Cheshire East Local Flood Risk Management Strategy (LFRMS). Draft for Public Consultation*
[164] This is the location at which the source intersects the Proposed Scheme, as indicated by the grid coordinates on the relevant Volume 2: MA01 Map Book figure (in this case WR-01).

Table 25: Surface water flood risk sources and receptors

Source	Location description and figure/coordinate[165]	Receptor potentially affected	Receptor value
Tributary of Fowle Brook 1	Barrows Green WR-01-301 I6	Residential properties along Thorn and Perry Fields	High
		Roads north of Parkers Road	Moderate

Artificial water bodies

15.3.28 Flooding from artificial water bodies may occur due to failure of an impounding structure, such as a dam or canal embankment. There are no artificial water bodies with potential implications for flood risk within the study area.

Groundwater flooding

15.3.29 Information related to historical incidents of groundwater flooding in the study area is included in the CEC SFRA[162] and LFRMS[163]. The SFRA states that there is no history of groundwater flooding within the CEC area while the LFRMS does not indicate incidents near the Proposed Scheme.

15.3.30 The BGS Groundwater flooding susceptibility data set indicates that there is some potential for groundwater flooding to occur at Crewe along the route of the Proposed Scheme due to the nature of the superficial deposits (glacial till).

Land drainage

15.3.31 Existing topography, soils and land drainage systems within the study area are described in Section 4, Agriculture, forestry and soils. The rivers and watercourses within the area are connected to an extensive network of existing open drains. Subsurface drainage systems are also likely to be present in fields used for agriculture. The land drainage function of these systems, which is important for crop productivity, is potentially sensitive to increases in water levels within the receiving watercourses.

15.4 Effects arising during construction

Avoidance and mitigation measures

15.4.1 The principal strategy adopted to limit the temporary and permanent effects of the Proposed Scheme is through avoidance of sensitive receptors wherever reasonably practicable. Where receptors could not be avoided, mitigation measures have been incorporated where appropriate and reasonably practicable, to limit the potential effects. Section 16 of the draft Code of Construction Practice (CoCP)[166] 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

[165] This is the location at which the source intersects the Proposed Scheme, as indicated by the grid coordinates on the relevant Volume 2: MA01 Map Book figure (in this case WR-01).
[166] Supporting document: Draft Code of Construction Practice

relevance to water resources and flood risk during construction are described in the following sections of this report.

Water resources and WFD

15.4.2 The avoidance of sensitive receptors has reduced the risks associated with the Proposed Scheme not complying with the requirements of the WFD. Examples of this strategy include:

- avoidance of channels and floodplain areas, where reasonably practicable – the route of the Proposed Scheme will avoid passing along river or stream valleys, such as that of River Weaver and River Wheelock and their associated floodplains;
- 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: MA01 Map Book have been informed by a detailed consideration of the water resources constraints and have sought to avoid sensitive features wherever reasonably practicable.

15.4.5 Watercourse realignments are proposed on two offline drains within the Hough to Walley's Green area.

15.4.6 Watercourse diversions, which would result in changes in flow regime within discrete sections of channel, have been avoided wherever possible. There are no diversions proposed within this study area.

15.4.7 The design of infrastructure required within or in proximity to an existing channel (including bridge abutments, intermediate piers and outfalls) will aim to reduce impacts on the natural hydromorphology of watercourse channels, as far as is reasonably practicable.

15.4.8 For watercourses that are not in their natural condition, the design aim for any realignments or would be to incorporate measures, where reasonably practicable, to improve their hydromorphological condition, provided this is compatible with their flood risk and land drainage functions.

15.4.9 The draft CoCP includes requirements to protect water bodies and their associated water resources from the potential impacts of pollution from construction site runoff, including where appropriate:

- provision of maps showing sensitive areas and buffer zones where no

pollutants are to be stored or used; and

- preparation of method statements for silt management, site drainage at compounds and satellite compounds, for the storage and control of oils and chemicals and the prevention of accidental spillages, in consultation with the Environment Agency, and if appropriate, the LLFA and other relevant authorities as part of the approvals process. These method statements will cover, where applicable:
  - the avoidance of discharges of site runoff to ditches, watercourses, drains, sewers or soakaways without the prior approval of the appropriate authority;
  - measures to prevent silt-laden runoff and other pollutants entering the water environment; and
  - restrictions or controls on excavation within watercourses to limit effects on water quality, sedimentation, fisheries and aquatic ecology.

15.4.10 Method statements will be required for all watercourse crossings and channel realignments required for site haul routes. The method statements will describe how potential changes to flood risk, water quality and channel hydromorphology will be managed during the establishment, use and decommissioning of all site haul routes.

15.4.11 Permanent culverts proposed on the smaller watercourse crossings within this study area include one culvert on Tributary of Fowle Brook 1, north of Crewe. The detailed design of the culvert will be developed in general accordance with Construction Industry Research and Information Association (CIRIA) and Environment Agency guidance and in consultation with Environment Agency specialists. The design has sought to mitigate the impact on the hydromorphology of the affected watercourses, as follows:

- drop inlet culverts and inverted siphons have been avoided;
- culvert lengths have been reduced as far as is reasonably practicable; and
- invert levels will be set below the firm bed of the watercourse to allow a natural substrate to develop along the bed of the culvert.

15.4.12 The wider issues associated with these culverts, and how their detailed design will aim to ensure no deterioration in the status of any of the relevant water bodies WFD quality elements, will be considered within the formal ES.

15.4.13 Existing groundwater abstraction boreholes or monitoring points will be protected from physical damage, insofar as reasonably practicable, including appropriate decommissioning of abandoned boreholes in order to prevent pollution pathways. If boreholes are to be decommissioned and replaced with alternatives, the contractors will follow the latest good practices. This principle will also be applicable to springs potentially affected by the Proposed Scheme, although additional measures may be required to mitigate temporary construction impacts. Wherever reasonably practicable, the design will aim to recreate affected spring features nearby.

15.4.14 Measures will be introduced, as required, to mitigate the temporary and permanent effects on groundwater flows and water quality during excavation and construction of foundations, tunnels and cuttings as far as is reasonably practicable. The types of measure likely to be adopted could include:

- installation of cut-off[167] 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;
- 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; and
- operation of the tunnel boring machine (TBM) in a closed face mode when tunnelling within water bearing strata, and design of the tunnel lining to reduce leakage rates as far as is reasonably practicable, thereby reducing the requirements for dewatering and drainage.

15.4.15 The exact requirements will be refined and method of mitigation will be designed following ground investigation at foundations, tunnels or cutting locations.

Flood risk and land drainage

15.4.16 The design of the Proposed Scheme will aim to mitigate permanent impacts on flood risk and land drainage as follows:

- the floodplain avoidance strategy will ensure that the impacts on flood flows within rivers and streams, and their floodplains, will be limited to those associated with the realignment of the A530 Nantwich Road within the Wimboldsley to Lostock Gralam area, which would cross over a small tributary of the River Weaver near Newfield Hall. The Proposed Scheme includes replacement floodplain storage areas to replace losses associated with the highway realignment;
- the temporary works shown in the Volume 2: MA01 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

[167] Impermeable barrier preventing water flow

flows beneath sections of raised embankment that will cross surface water flow paths where reasonably practicable. This will be achieved using perimeter drainage and culverts, with their inverts set below the likely level of any upstream field subsurface drainage systems;

- in locations where the route of the Proposed Scheme will cross watercourses, the design aim is for structures to accommodate flood flows up to and including the 1 in 100 (1%) annual probability flood with an allowance for climate change based on latest guidance issued by the Environment Agency[168];
- runoff from the footprint of the infrastructure could occur more rapidly post-construction due to steeper slope angles and the permeability of the newly-created surfaces. The design of drainage systems aims to ensure that there will be no significant increases in flood risk downstream, during storms up to and including the 1 in 100 (1%) annual probability design event, with an allowance for climate change based on the latest guidance issued by the Environment Agency;
- balancing ponds for new sections of highway and railway drainage have been sized on a precautionary basis, pending more detailed information about the permeability and runoff characteristics of existing and proposed ground surfaces;
- where the Proposed Scheme will pass in cutting, drainage measures will be provided with the aim of preventing flow into the cutting and diverting this water into its natural catchment. Where reasonably practicable, runoff from the cuttings will also be drained to the catchments to which this water would naturally drain, avoiding transfer of water from one water body to another, which could increase flood risk or impact on land drainage systems; and
- measures will be introduced to reduce any potentially significant effects on groundwater flood risk as far as is reasonably practicable, including the incorporation of passive hydraulic bypasses at cuttings and other below ground structures. These could for example comprise a 'blanket' of permeable material such as gravel.

15.4.17 The nominated undertaker will, insofar as reasonably practicable, ensure that flood risk is managed throughout the construction period and will consider flooding issues when planning sites and storing materials. If necessary, temporary provision will be made to reduce to the potential for impacts on existing land drainage systems during construction. Some of the specific measures referred to in the draft CoCP, include:

- preparation of flood risk assessments and method statements for temporary works, including main construction and satellite compound drainage, watercourse crossings and realignments and temporary realignments in consultation with the Environment Agency, and where applicable, the LLFA

[168] Environment Agency (2016), *Adapting to Climate Change. Advice for Flood and Coastal Erosion Risk Management Authorities*

and other relevant regulators;

- location of storage, machinery, equipment and temporary buildings outside flood risk areas where reasonably practicable;
- construction of outfalls during periods of low flow to reduce the risk of scour and erosion;
- design of temporary watercourse realignments with equivalent hydraulic capacity to the existing channels, ensuring that field subsurface drainage systems can be adapted to discharge into the new channel; and
- having regard to the requirement for construction activities to avoid any increases in flood risk to vulnerable receptors.

15.4.18 In accordance with Section 16 of the draft CoCP, monitoring will also be undertaken in consultation with the Environment Agency and, where applicable, the LLFA, to ensure that temporary structures are installed, maintained and removed in accordance with the relevant environmental approvals and that impact on existing land drainage systems are managed appropriately.

Assessment of impacts and effects

15.4.19 This section describes the significant effects following the implementation of the avoidance and mitigation measures. The majority of the potential temporary impacts on the water environment during construction will be avoided or mitigated by the working methods outlined in the draft CoCP. The mitigation embedded into the design has focused on reducing permanent impacts resulting from the presence of the Proposed Scheme to as low a level as is reasonably practicable.

Temporary effects – Water resources and WFD

Surface water

15.4.20 Potential temporary impacts on surface water quality, due to site runoff and increased pollution risk, are a key concern during construction and have the potential to affect abstractions and the water environment more generally. However, the practices outlined in the draft CoCP are considered adequate to mitigate any impacts, such that there are unlikely to be any significant effects.

Groundwater

Aquifers

15.4.21 The Crewe North cutting and Coppenhall cutting would intersect the Mercia Mudstone Group Secondary B aquifer and the glacial till Secondary (undifferentiated) aquifer. Whilst there could be minor localised impacts, the implementation of the measures outlined in the draft CoCP would mean that any impacts on the overall status of these aquifers would be negligible and not significant.

15.4.22 Where cuttings could affect local receptors, such as groundwater abstractions or springs, this is reported in the sections below.

Abstractions

15.4.23 There are no groundwater abstractions within the study area.

Groundwater - surface water interactions

15.4.24 No significant temporary effects on groundwater - surface water are anticipated in this study area as a result of construction of the Proposed Scheme.

Water dependent habitats

15.4.25 No temporary impacts on water dependent habitats are anticipated in this study area as a result of construction of the Proposed Scheme.

Temporary Effects - Flood risk and land drainage

15.4.26 Temporary effects related to flood risk and land drainage are not anticipated in the study area.

Permanent effects – Water resources and WFD

15.4.27 Permanent effects are those initially caused by activity to construct the Proposed Scheme but which would also remain after the Proposed Scheme has been constructed and is present in the area.

Surface water

15.4.28 No significant permanent effects on surface water are anticipated in this study area as a result of construction of the Proposed Scheme.

Groundwater

Aquifers

15.4.29 It is currently anticipated that implementation of the avoidance and mitigation measures would ensure that there are no permanent significant effects, related to the impact of the proposed cuttings on water levels and quality in the aquifers intercepted by the Proposed Scheme.

Abstractions

15.4.30 There are no groundwater abstractions within the study area.

Groundwater – surface water interactions

15.4.31 The Proposed Scheme would result in the permanent loss of the potential spring feature 260m west of Park Hall Farm, Minshull Vernon. Until the nature of this feature has been confirmed by a site survey, it has been assumed to be a high value receptor. On a precautionary basis, the assessment therefore identifies its loss as potentially resulting in a permanent major adverse effect, which is significant.

Water dependent habitats

15.4.32 No permanent impacts on water dependent habitats are anticipated in this study area as a result of construction of the Proposed Scheme.

Permanent effects - Flood risk and land drainage

15.4.33 Hydraulic modelling of the tributary of Fowle Brook is currently being undertaken to assess potential permanent effects related to flood risk. It is currently anticipated that the Proposed Scheme would result in negligible impacts on flood levels near the residential properties, which are high value receptors. This would result in negligible effects, which are not significant.

Other mitigation measures

15.4.34 Additional mitigation measures to further reduce the temporary and permanent impacts of construction stage activities, where there is potential for the Proposed Scheme to result in significant effects are described in the sections below.

Surface water

15.4.35 There are considered to be no further measures required to mitigate adverse effects on surface water resources.

Groundwater

15.4.36 A survey of the potential spring feature 260m west of Park Hall Farm, Minshull Vernon will be undertaken to determine its value and to identify whether further mitigation would be required. If it is confirmed to be a spring of high or moderate value, measures will be identified to reduce any adverse effects as far as is reasonably practicable.

Flood risk and land drainage

15.4.37 There are considered to be no further measures required to mitigate adverse effects on flood risk and land drainage.

Summary of likely residual significant effects

15.4.38 The assessment indicates that, as a result of the mitigation embedded into the design, there should be no residual significant effects related to water resources and flood risk during construction of the Proposed Scheme in this study area.

15.5 Effects arising from operation

Avoidance and mitigation measures

15.5.1 The principal issue of concern during operation of the Proposed Scheme is the potential for accidental spillages to occur that could result in the release of contaminants into the water environment. This issue has been assessed on a route-wide basis in Volume 3: Route-wide effects, Section 16, where the mitigation measures associated with this risk are described. A draft operation and maintenance plan for water resources and flood risk will be provided in the formal ES.

15.5.2 The design takes into account the policies in the NPPF and will aim to ensure that the Proposed Scheme is safe from flooding without increasing flood risk elsewhere. Evidence of application of the Sequential Test and Exception Tests in the NPPF is provided on a route-wide basis in Volume 3: Route-wide effects.

15.5.3 Sustainable drainage systems will be used where reasonably practicable. These will help to remove any suspended material within runoff from the Proposed Scheme through filtration, vegetative adsorption or settlement. The drainage systems proposed will aim to ensure that the quantity and quality of water draining from the Proposed Scheme during its operational phase will have a negligible impact on the water environment.

15.5.4 A summary of the route-wide WFD compliance assessment process is provided in Volume 3: Route-wide effects. This describes the ongoing assessment process and how measures will be embedded into the design that are specifically designed to ensure that the Proposed Scheme complies with the requirements of the WFD, where reasonably practicable. It is currently anticipated that the Proposed Scheme will be compliant with WFD legislation.

Assessment of impacts and effects

15.5.5 There are considered to be no significant adverse effects related to water resources and flood risk arising from operation of the Proposed Scheme.

Other mitigation measures

15.5.6 There are considered to be no further measures required to mitigate adverse effects on surface water resources, groundwater resources or flood risk.

Summary of likely residual significant effects

15.5.7 The assessment indicates that there would be no residual significant effects on surface water, groundwater or flood risk during operation of the Proposed Scheme.

Monitoring

15.5.8 Volume 1, Section 9 sets out the general approach to monitoring of water resources and flood risk during operation of the Proposed Scheme.

15.5.9 There are no area-specific requirements for monitoring water resources and flood risk during operation of the Proposed Scheme.

16 References

Animal and Plant Health Agency (2001) Foot and Mouth Disease 2001 - County Status Maps. Available at https://data.gov.uk/dataset/1c7ae62d-3268-467d-a2df-e8c5a6d93ab3/foot-and-mouth-disease-2001-county-status-map-29-10-2001

Arup (2012), Cheshire East Employment Land Review. Based on upper range (includes 30% flexibility factors) covering 2009-2030

Borough of Crewe and Nantwich. Replacement Local Plan (Adopted 2005). Available online at: http://www.cheshireeast.gov.uk/planning/spatial_planning/saved_and_other_policies/crewe_and_nantwich_local_plan/crewe_and_nantwich_local_plan.aspx

British Geological Survey 1:10,000 Artificial ground mapping

British Geological Survey (2017) BGS groundwater flooding. Available online at:http://www.bgs.ac.uk/products/hydrogeology/groundwaterFlooding.html

British Geological Survey (2017). Geology of Britain viewer. Available online at: http://mapapps.bgs.ac.uk/geologyofbritain/home.html

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

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

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

Cheshire and Warrington Enterprise Partnership (2014). Cheshire and Warrington Matters: A Strategic and Economic Plan for Cheshire and Warrington.p.45. Available online at: http://www.871candwep.co.uk/content/uploads/2015/05/Strategic-and-Economic-Plan-and-Growth-Plan-for-Cheshire-and-Warrington.pdf

Cheshire & Warrington Local Enterprise Partnership | Cheshire & Warrington Local Enterprise Partnership. Available online at: http://www.871candwep.co.uk/

Cheshire Bat Group (2018) Available online at: http://www.record-lrc.co.uk/c1.aspx?Mod=Article&ArticleID=G00020001

Cheshire County Council (2008), Cheshire Landscape Character Assessment. Available online at: http://www.cheshireeast.gov.uk/environment/heritage_natural_environment/landscape/landscape_character_assessment.aspx

Cheshire County Council (1999) Cheshire Replacement Minerals Local Plan 1999 (Adopted 1999). Available online at: http://www.cheshireeast.gov.uk/planning/spatial_planning/saved_and_other_policies/cheshire_minerals_local_plan/cheshire_minerals_local_plan.aspx

Cheshire East Local Plan Strategy 2010-2030 (Adopted 2017). Available online at: http://www.cheshireeast.gov.uk/planning/spatial_planning/cheshire_east_local_plan/local-plan-strategy/local_plan_strategy.aspx

Cheshire East Local Transport Plan Strategy 2011-2026 (Adopted 2011). Available online at: http://www.cheshireeast.gov.uk/public_transport/local_transport_plan/local_transport_plan.aspx

Cheshire Replacement Minerals Local Plan 1999 (Adopted 1999). Available online at: http://www.cheshireeast.gov.uk/planning/spatial_planning/saved_and_other_policies/cheshire_minerals_local_plan/cheshire_minerals_local_plan.aspx

Cheshire Replacement Waste Local Plan 2007 (Adopted 2007). Available online at: http://www.cheshireeast.gov.uk/planning/spatial_planning/saved_and_other_policies/cheshire_waste_local_plan/cheshire_waste_local_plan.aspx

Local Flood Risk Management Strategy (LFRMS). Draft for Public Consultation

Cheshire West and Chester Local Transport Plan 2011-2026 (Adopted 2011). Available online at: http://inside.cheshirewestandchester.gov.uk/policies_plans_and_strategies/local_transport_plan_20112026

Cheshire Wildlife Trust (2007), Cheshire Region Local Biodiversity Action Plan. Available online at: http://www.cheshirewildlifetrust.org.uk/sites/default/files/files/BAP%20list%20-%20updated%20April%202011.pdf

Cheshire Wildlife Trust. (2018). Great crested Newt - Local Biodiversity Action Plan. http://www.cheshirewildlifetrust.org.uk/sites/default/files/files/Great%20crested%20newt.pdf

Cheshire Wildlife Trust (2018). Polecat Local Biodiversity Action Plan – https://www.cheshirewildlifetrust.org.uk/sites/default/files/2018-06/Polecat.pdf

Cheshire Wildlife Trust (2018). Water vole Local Biodiversity Action Plan. https://www.cheshirewildlifetrust.org.uk/sites/default/files/2018-06/Water%20vole.pdf

Congleton Borough. Local Plan (Adopted 2005) Available online at: http://www.cheshireeast.gov.uk/planning/spatial_planning/saved_and_other_policies/congleton_local_plan/congleton_local_plan.aspx

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

DCLG (2014), Planning Practice Guidance – Noise. Available online at: https://www.gov.uk/guidance/noise--2

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

DCLG (2015) National Planning Policy Framework

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

Defra (2013) Defra Background Pollutant Concentration Maps. Available online at: https://uk-air.defra.gov.uk/data/laqm-background-maps?year=2013;

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

Defra (2009), Soil Strategy for England

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

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

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

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

Department for Transport. STAT19 Road Safety Data 2014-2016

Environment Agency (2016) Adapting to Climate Change. Advice for Flood and Coastal Erosion Risk Management Authorities

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

Environment Agency (2017) Drinking Water Safeguarding Zones mapping. Available at: https://environment-agency.cloud.esriuk.com/farmers/. Accessed July 2018

Environment Agency (2015), Water for life and livelihoods Part 1: Humber river basin district: River basin management plan

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

Gov.uk (2018) Flood map for planning. Available online at: https://flood-map-for-planning.service.gov.uk/

Gov.uk (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

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

HS2 (2012). HRA Screening Report for Midland Meres and Mosses Phase 1 Ramsar Site

HS2 (2013). Sustainability Statement. Volume 1: Main report of the Appraisal of Sustainability

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

HS2 Ltd (2017): High Speed Rail (West Midlands to Crewe) Environmental Statement Volume 2: Community Area Report. CA5: South Cheshire. Available online at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/627569/E17_Volume_2_CA5_South_Cheshire_WEB.pdf

HS2 (July 2017). High Speed Rail (West Midlands – Crewe). Environmental Statement Volume 2: Map CT-05-240, G4 to F4

HS2 Ltd Information for Farmers and Growers. Available online at: https://www.gov.uk/government/publications/hs2-guide-for-farmers-and-growers

Jacobs (2011) Cheshire West and Chester Preliminary Flood Risk Assessment (PFRA)

JBA Consulting (2016) Cheshire West and Chester Level 1 Strategic Flood Risk Assessment (SFRA)

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

National Water Vole Steering Group (2013): 'Likely Key Areas to support water vole'

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

Norton, GE et al (2006) Mineral Resources Information for National, Regional and Local Planning: Cheshire (comprising Cheshire and the Boroughs of Halton and Warrington. British Geological Survey Commissioned Report CR/05/090N

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

Office for National Statistics; (2016); Business Register and Employment Survey. Available online at: http://www.nomisweb.co.uk

Office for National Statistics (2014)- Measuring Social Capital: Available online at: http://webarchive.nationalarchives.gov.uk/20160105160709/http://www.ons.gov.uk/ons/dcp171766_371693.pdf

Office for National Statistics (2017) UK Business Count – Local Units. Available online at https://www.nomisweb.co.uk

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

Supporting document: Draft Code of Construction Practice

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

The Hedgerow Regulations 1997

UK Maps of Radon, Public Health England. Available online at: www.ukradon.org/information/ukmaps

Weston and Basford Neighbourhood Plan (Adopted 2017). Available online at: http://www.cheshireeast.gov.uk/planning/neighbourhood-plans/neighbourhood-plans-n-z/weston-and-basford-neighbourhood-plan.aspx

Wistaston Neighbourhood Plan (Adopted 2017). Available online at: http://www.cheshireeast.gov.uk/planning/neighbourhood-plans/neighbourhood-plans-n-z/wistaston-neighbourhood-plan.aspx

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

HS2

www.hs2.org.uk

High Speed Two (HS2) Limited
Two Snowhill,
Snow Hill Queensway,
Birmingham B4 6GA
Freephone: 08081 434 434
Minicom: 08081 456 472
Email: HS2enquiries@hs2.org.uk