



High Speed Rail (West Midlands - Crewe)

Environmental Statement

Volume 2: Community Area report
CA5: South Cheshire



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Department for Transport

High Speed Two (HS2) Limited has been tasked by the Department for Transport (DfT) with managing the delivery of a new national high speed rail network. It is a non-departmental public body wholly owned by the DfT.

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

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Preface

The Environmental Statement

This document forms part of Volume 2 of the Environmental Statement (ES) that accompanies the deposit of the hybrid Bill for Phase 2a of High Speed Two (HS2). Phase 2a comprises the second section of the proposed HS2 rail network, between the West Midlands and Crewe, and is referred to in this ES as the 'Proposed Scheme'. The ES sets out the Proposed Scheme, its likely significant environmental effects and the measures proposed to mitigate those effects.

Phase 2b comprises the remainder of Phase Two, between Crewe and Manchester and between the West Midlands and Leeds, completing what is known as the 'Y network'. Phase 2b will be the subject of a separate hybrid Bill and therefore is not the subject of this ES.

The hybrid Bill for Phase One of the HS2 network, between London and the West Midlands, was the subject of an ES submitted in November 2013, followed by subsequent ESs deposited with Additional Provisions to that Bill in 2014 and 2015. The Bill received Royal Assent in February 2017 and initial works on Phase One have commenced.

Consultation on the Environmental Statement

The public has an opportunity to comment on this ES as part of the hybrid Bill submission. The period of public consultation on the ES extends for at least 56 days (eight weeks) following the first newspaper notices that follow deposit of Bill documents in Parliament.

Structure of the HS2 Phase 2a Environmental Statement

This report is part of the suite of documents that make up the Environmental Statement (ES) for Phase 2a of the proposed High Speed Two (HS2) rail network between the West Midlands and Crewe (the Proposed Scheme). The structure of the ES is shown in Figure 1.

The ES documentation comprises the following:

Non-technical summary

This provides:

- a summary in non-technical language of the Proposed Scheme and the reasonable alternatives studied;
- the likely significant effects of the Proposed Scheme;
- the means to avoid, prevent 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 ES documentation.

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;
- 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; and
- a summary of the reasonable alternatives studied (including local alternatives studied prior to the November 2015 route announcement). Local alternatives studied post November 2015 are discussed in the relevant Volume 2 community area reports.

Volume 2: Community area reports and map books

These cover the following community areas: 1 Fradley to Colton; 2 Colwich to Yarlet; 3 Stone and Swynnerton; 4 Whitmore Heath to Madeley; and 5 South Cheshire. The reports provide the following for each area:

- 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 studied since November 2015;
- a description of the environmental baseline;
- a description of the likely significant environmental effects of the Proposed Scheme;
- the proposed means to avoid, prevent or reduce the likely significant adverse environmental effects; and
- 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 separate Volume 2 map books. These maps should be read in conjunction with the relevant community area report. These maps include the location of the key environmental features (Map Series CT-10), key construction features (Map Series CT-05) and key operational features (Map Series CT-06) of the Proposed Scheme. There are also specific maps showing viewpoint and photomontage locations (Map Series LV, to be read in conjunction with Section 11, Landscape and visual of the Volume 2: community area reports) and noise contours (Map Series SV, to be read in conjunction with Section 13, Sound, noise and vibration of the Volume 2: community area reports).

Volume 3: Route-wide effects

This describes the significant environmental effects that are likely to occur at a geographical scale greater than the community areas described in Volume 2.

Volume 4: Off-route effects

This provides an assessment of the likely significant environmental effects of the Proposed Scheme at locations beyond the Phase 2a route corridor and its associated local environment. The maps relevant to the assessment of off-route effects are provided in a separate map book.

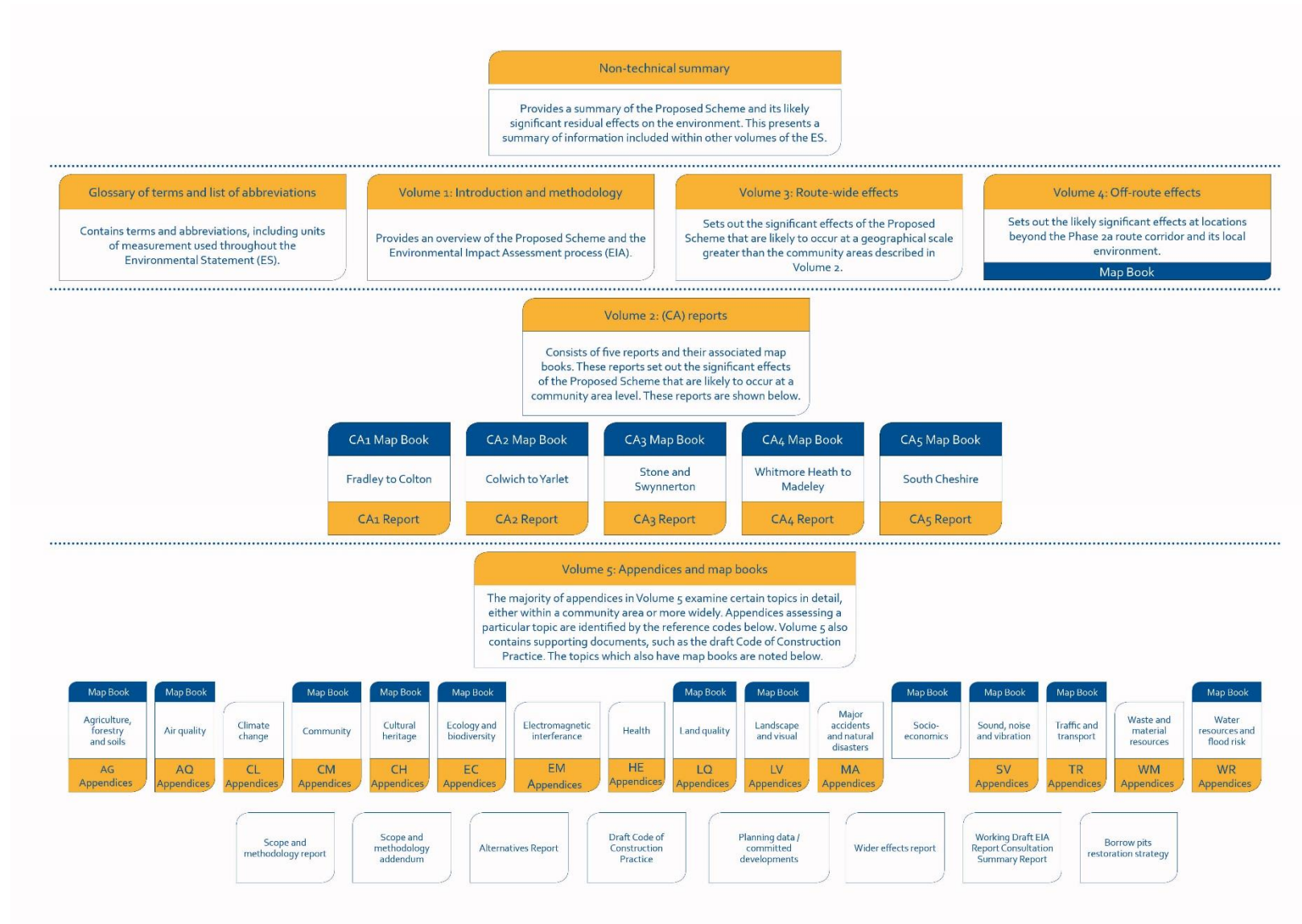
Volume 5: Appendices and map books

This contains supporting technical information and associated map books to be read in conjunction with the other volumes of the ES.

Background information and data (BID)

Certain reports and maps containing background information and data (BID) have been produced, which do not form part of the ES. These documents are available on the HS2 website. The BID reports and maps present relevant survey information, collated from published and unpublished sources, and other relevant background material.

Figure 1: Structure of the Environment Statement



1 Introduction

1.1 Introduction to HS2

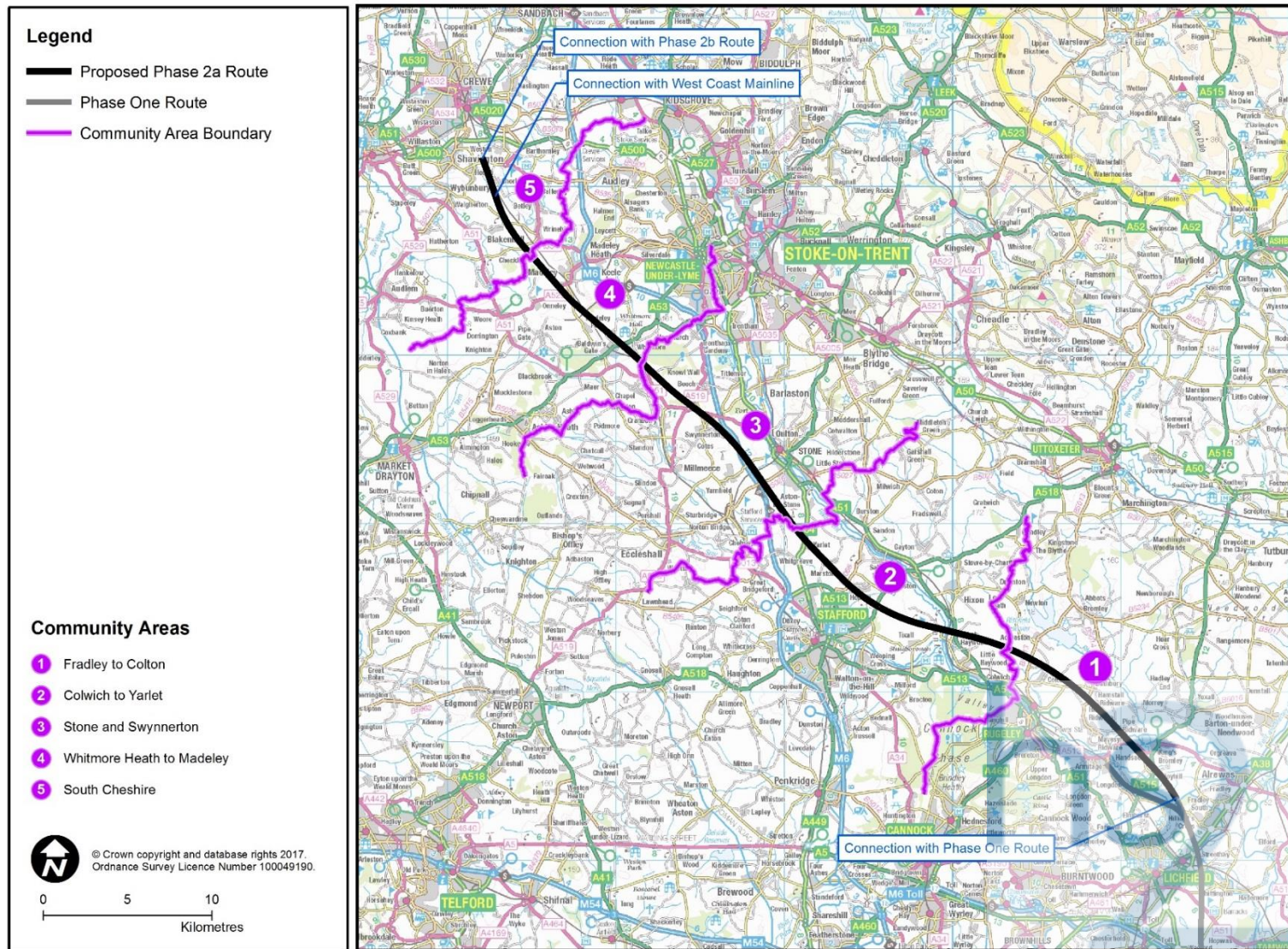
- 1.1.1 High Speed Two (HS2) is a new high speed railway proposed by the Government to connect major cities in Britain. Stations in London, Birmingham, Leeds, Manchester and East Midlands will be served by high speed trains running at speeds of up to 225mph (360kph). Trains will also run beyond the HS2 network to serve destinations including South Yorkshire, Liverpool, Glasgow, Edinburgh, Newcastle and York.
- 1.1.2 HS2 will be built in phases. Phase One comprises the first section of the HS2 rail network of approximately 143 miles (230km) between London, Birmingham and the West Midlands and is planned to become operational in 2026. It was the subject of an Environmental Statement (ES) deposited with the High Speed Two (London – West Midlands) Bill in 2013. Subsequent ESs were deposited with Additional Provisions to that Bill in 2014 and 2015. The High Speed Two (London – West Midlands) Bill received Royal Assent in February 2017 and initial works on Phase One have commenced.
- 1.1.3 Phase Two of HS2 will extend the line to the north-west and north-east: to Manchester with connections to the West Coast Main Line (WCML) at Crewe and Golborne, and to Leeds with a connection to the East Coast Main Line approaching York, completing what is known as the ‘Y network’.
- 1.1.4 Phase Two will be constructed in two phases:
- Phase 2a (the Proposed Scheme): the western section of Phase Two between the West Midlands and Crewe, comprising approximately 36 miles (58km) of HS2 main line (including the section which would connect with and form the first part of Phase 2b) and two spurs (approximately 4 miles (6km)) south of Crewe that will allow trains to transfer between the HS2 main line and the existing WCML. Construction of the Proposed Scheme will commence in 2020, ahead of the rest of Phase Two, with operation planned to start in 2027, six years earlier than originally planned bringing more of the benefits of HS2 to the North sooner; and
 - Phase 2b: comprising the remainder of Phase Two, between Crewe (where it would connect with the Proposed Scheme) and Manchester and between the West Midlands and Leeds. Phase 2b will be the subject of a separate hybrid Bill with construction expected to commence in 2023 and operation planned to start by 2033.
- 1.1.5 The Proposed Scheme will connect with Phase One at Fradley, to the north-east of Lichfield, and to the WCML south of Crewe, providing onward services beyond the HS2 network and between the north-west of England and Scotland.
- 1.1.6 The Proposed Scheme has been the subject of an environmental impact assessment (EIA). During the development of the Phase 2a proposals, a working draft EIA Report was consulted on to help inform the design and assessment of the Proposed Scheme.

- 1.1.7 The findings of the assessment of the Proposed Scheme are reported in an Environmental Statement (the ES), of which this Volume 2 report forms a part. The ES has been deposited alongside a hybrid Bill for Phase 2a, in accordance with the requirements of Parliamentary Standing Order 27A (SO27A)^{1,2}.
- 1.1.8 For the purposes of environmental assessment and community engagement, the Proposed Scheme has been divided into five community areas. These are shown in Figure 2.

¹ Standing Order 27A of the Standing Orders of the House of Commons relating to private business (environmental assessment) - 2015, House of Commons.

² Standing Orders of the House of Lords - Private Business – 2015, House of Lords.

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



1.2 Purpose of this report

- 1.2.1 This report presents the likely significant effects of the construction and operation of the Proposed Scheme on the environment within the South Cheshire area. The report also describes the means to avoid, prevent or reduce the likely significant effects of the Proposed Scheme on the environment within the area, along with any proposed monitoring measures.

1.3 Structure of this report

- 1.3.1 This report is divided into the following sections:

- Section 1 – an introduction to HS2 and the purpose and structure of this report;
- Section 2 – overview of the community area, description of the Proposed Scheme within the community area and its construction and operation, and a description of the local alternatives studied;
- 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);
 - cultural heritage (Section 7);
 - ecology and biodiversity (Section 8);
 - health (Section 9);
 - land quality (Section 10);
 - landscape and visual (Section 11);
 - socio-economics (Section 12);
 - sound, noise and vibration (Section 13);
 - traffic and transport (Section 14); and
 - water resources and flood risk (Section 15).

- 1.3.2 Each environmental topic section comprises:

- an introduction to the topic;
- a description of the existing and future environmental baseline within the community area;
- a description of the impacts and likely significant environmental effects arising during construction and operation of the Proposed Scheme, including cumulative effects; and

- a description of proposed mitigation and any monitoring measures that have been identified.

- 1.3.3 Environmental effects have been assessed in accordance with the methodology set out in Volume 1 (Section 8), the EIA Scope and Methodology Report (SMR) (Volume 5: Appendix CT-001-001) and the EIA SMR Addendum (Volume 5: Appendix CT-001-002). The purpose of the SMR Addendum is to set out where the assessment methodology presented within the SMR has been amended or developed, for example, as a result of changes in legislation or industry best practice guidance or where methodologies have undergone refinement in the course of preparation of the ES.
- 1.3.4 The Proposed Scheme in the South Cheshire area is shown in Volume 2: CA5 Map Book on the Map Series CT-05 (construction) and CT-06 (operation), and should be read in conjunction with this report. There is some flexibility during detailed design to alter the horizontal and vertical alignments and other details within the limits shown on the plans and sections submitted to Parliament and as set out in the Bill. This flexibility is included within the scope of the environmental assessment. Further explanation is provided in Volume 1, Section 1.
- 1.3.5 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. An assessment of potential environmental effects beyond the Phase 2a route corridor and its associated local environment has also been undertaken and this 'off-route' assessment is reported in Volume 4.
- 1.3.6 Supporting technical information, including technical appendices and map books, relating to the assessment in this Volume 2 report is provided in Volume 5 of the ES.
- 1.3.7 In addition to the technical appendices and map books in Volume 5, certain reports and maps containing background information and data (BID) have been produced, which do not form part of the ES. These documents are available on the HS2 Ltd website. The BID reports and maps present survey information, collated from published and unpublished sources, and other background analysis, and are referenced at various places within the ES.

2 Overview of the area and description of the Proposed Scheme

2.1 Overview of the area

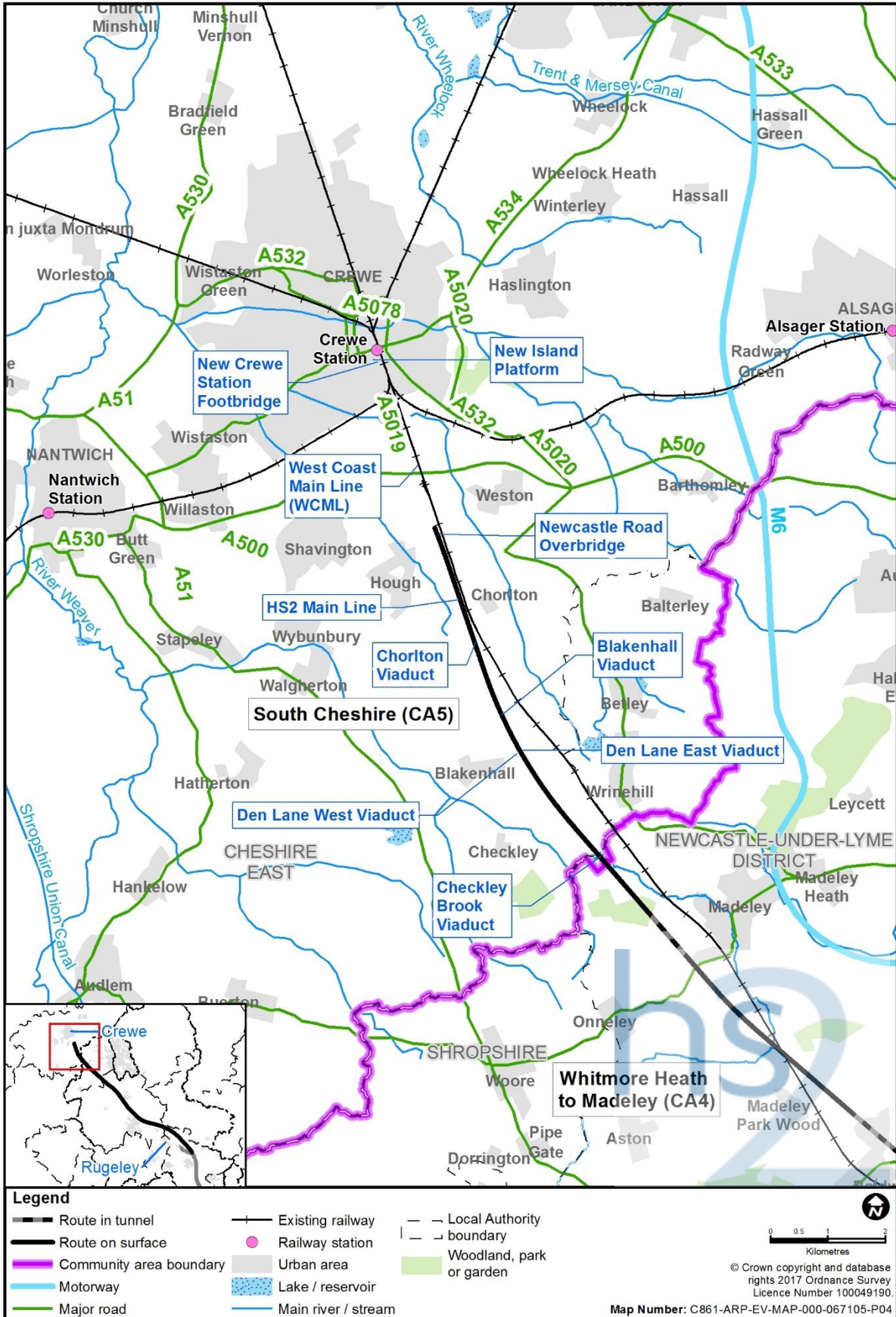
General

- 2.1.1 The South Cheshire area covers an approximately 6.6km section of the HS2 main line and two spurs approximately 6km in length, passing through the parishes of Checkley cum Wrinehill, Blakenhall, Hough and Chorlton, and Weston and Basford, and within the local authority areas of Cheshire East Council (CEC) and Staffordshire County Council (SCC). As shown in Figure 3, the boundary between Madeley parish and Checkley cum Wrinehill parish forms the boundary between the Whitmore Heath to Madeley area (CA4) and South Cheshire area (CA5).
- 2.1.2 The route will continue north towards Crewe where it will connect with the existing WCML via two spurs south of the A500 Shavington Bypass. Construction of the HS2 main line will then continue north and will provide for the future extension of the route to Manchester as part of Phase 2b. There will be associated works to the WCML to facilitate the new connection to the Proposed Scheme. There will also be works at Crewe Station to facilitate the additional services running through Crewe on the WCML as a result of the Proposed Scheme.

Settlement, land use and topography

- 2.1.3 The southern extent of the South Cheshire area is predominantly rural in character, with agriculture being the main land use, interspersed with small villages and a scattering of isolated dwellings and farmsteads. The northern extent of the South Cheshire area becomes mostly urban towards Crewe, which is a large town of approximately 84,000 residents, with a range of services and community facilities, including a railway station, the Crewe Alexandra football stadium, shopping centres and a university campus. Other residential areas within the South Cheshire area include Wrinehill, Chorlton, Hough, Basford and Weston.
- 2.1.4 The Proposed Scheme in this area will extend from Madeley in the south to the Crewe urban fringe in the north. The area encompasses a rolling to flat landscape of settled river valleys and slopes, with urban fringe influences increasing towards Crewe. Wooded stream valleys and small tracts of woodland, including ancient woodland, are features in the landscape, notably Checkley Wood and Basford Brook. The main topographical feature is a largely level, low-lying plain extending throughout the area north-west of Betley. In the south, the topography is around 80m to 90m above Ordnance Datum (AOD), falling to 65m to 70m AOD at Chorlton and to 50m AOD to the south of Crewe.
- 2.1.5 Other key features are the highly valued landscape of Crewe Hall, a Grade II Registered Historic Park and Garden forming the setting for the Grade I listed hall. Wychwood Park and Border Fisheries are designed landscapes that have influenced the wider rural setting. The village of Betley has a diverse range of natural and historic features that contribute to local landscape value and a number of settlements are associated with the rural lane network, notably Hough, Checkley and Wrinehill.

Figure 3: Area context map



Key transport infrastructure

- 2.1.6 Principal highways within this area include the M6, the A500 Newcastle Road/Shavington Bypass, the A51 Nantwich Bypass, the A532 Weston Road, the A534 Crewe Road and the A531 Newcastle Road, which provide links to Crewe and the wider transport network and surrounding towns such as Nantwich and Sandbach. Local roads include the B5071 Jack Mills Way/Gresty Road, the B5472 Weston Road, Checkley Lane, Den Lane, Chorlton Lane, Newcastle Road, Casey Lane, and Weston Lane.
- 2.1.7 National and local rail services are accessible at Crewe Station, which is a major rail interchange. At Crewe Station, the WCML connects with the Crewe to Derby Line, the Crewe to Manchester Line and the North Wales Coast Line. These connections provide access to major destinations, including London, Liverpool, Manchester, Birmingham, Cardiff and Glasgow.
- 2.1.8 Within the area there are a number of public rights of way (PRoW) including footpaths, bridleways and local access roads, which provide important links between scattered rural dwellings and villages.

Socio-economic profile

- 2.1.9 The South Cheshire area lies within the administrative area of CEC and the Cheshire and Warrington Local Enterprise Partnership (LEP) area. Within the CEC area there is a wide spread of business types reflecting a diverse range of commercial activities. Professional, scientific and technical businesses account for the largest proportion (19%), followed by retail (9%) and construction (8%)³.
- 2.1.10 According to the Annual Population Survey (2016)⁴, the employment rate⁵ within the CEC area was 77% (173,000 people) and unemployment in the CEC area was 3%, which is lower than the West Midlands and England.
- 2.1.11 According to the Annual Population Survey (2015)⁶, 38% of CEC area residents aged 16-64 were qualified to National Vocational Qualification Level 4 and above, while 8% of residents had no qualifications.

Notable community facilities

- 2.1.12 The main concentrations of community facilities are located within the villages of Wrinehill, Hough, Weston and Chorlton. Notable community facilities are located in the village centres and include GP surgeries and community meeting places. There are no schools within 1km of the route of the Proposed Scheme, although Weston Village Primary School is located approximately 1.1km from the route.
- 2.1.13 The town of Crewe, located in the northern extent of the South Cheshire area, contains a larger range of shops, services and community facilities. Notable community facilities include Crewe Station, the Crewe Alexandra football stadium, shopping centres, Manchester Metropolitan Cheshire university campus, South

³ Office for National Statistics (2015) UK Business Count – Local Units. Available online at <http://www.nomisweb.co.uk>

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

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

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

Cheshire Language School, Westminster Street County Nursery School, and Ruskin Community High School.

Recreation, leisure and open space

- 2.1.14 The Proposed Scheme will cross three promoted⁷ PRoW (Crewe and Nantwich Circular Walk, Two Saints Way and South Cheshire Way) in the South Cheshire area, which follow the route of Chorlton Footpath 7 as it crosses the WCML to the west of Chorlton. There are also recreational cycle routes in this area, which include: the Regional Cycle Route 70, which follows Casey Lane; and National Cycle Route 551, which follows Basford Lane.

Policy and planning context

Planning framework

- 2.1.15 HS2 is not included or referred to in many local plans, given that it is being developed on a national basis to meet a national need. Relevant local plan documents and policies have nevertheless been considered in relation to environmental topics, as part of considering the Proposed Scheme in the local context.
- 2.1.16 The following local policies have been considered and are referred to where appropriate to the assessment:
- The Cheshire Replacement Minerals Local Plan 1999 (Adopted 1999 – saved policies)⁸;
 - The Cheshire Replacement Waste Local Plan (Adopted 2007 – saved policies)⁹;
 - Staffordshire and Stoke-on-Trent Joint Waste Core Strategy 2010 - 2026 (Adopted 2013)¹⁰;
 - The Minerals Local Plan for Staffordshire 2015 to 2030 (Adopted 2017)¹¹;
 - Newcastle-under-Lyme Local Plan 2011 (Adopted 2003 – saved policies 2007)¹²;
 - Newcastle-under-Lyme and Stoke-on-Trent Core Spatial Strategy (Adopted 2009)¹³;

⁷ Promoted PRoW refers to those PRoW which are “promoted” destinations in their own right as a recreational resource.

⁸ Cheshire Replacement Minerals Local Plan 1999 (Adopted 1999 – saved policies). Available online at:

http://www.cheshireeast.gov.uk/planning/spatial_planning/saved_and_other_policies/cheshire_minerals_local_plan/cheshire_minerals_local_plan.aspx

⁹ The Cheshire Replacement Waste Local Plan (Adopted 2007 – saved policies). Available online at:

http://www.cheshireeast.gov.uk/planning/spatial_planning/saved_and_other_policies/cheshire_waste_local_plan/cheshire_waste_local_plan.aspx

¹⁰ Staffordshire and Stoke-on-Trent Joint Waste Core Strategy 2010 - 2026 (Adopted 2013). Available online at:

<https://www.staffordshire.gov.uk/environment/planning/policy/thedevelopmentplan/wastelocalplan/Staffordshire-and-Stoke-on-Trent-Joint-Waste-Local-Plan-2010-to-2026-adopted-March-2013.pdf>

¹¹ The Minerals Local Plan for Staffordshire 2015 to 2030 (Adopted 2017). Available online at:

<https://www.staffordshire.gov.uk/environment/planning/policy/thedevelopmentplan/mineralslocalplan/mineralsLocalPlan.aspx>

¹² Newcastle-under-Lyme Local Plan 2011 (Adopted 2003 – saved policies 2007). Available online at: https://www.newcastle-staffs.gov.uk/sites/default/files/IMCE/Planning/Planning_Policy/Saved%20Policies%20of%20the%20Newcastle-under-Lyme%20Local%20Plan%20154KB.pdf

¹³ Newcastle-under-Lyme and Stoke-on-Trent Core Spatial Strategy (Adopted 2009). Available online at: https://www.newcastle-staffs.gov.uk/sites/default/files/IMCE/Planning/Planning_Policy/SpatialStrategy/Core%20Strategy%20Final%20Version%20-%2028th%20October.pdf

- Cheshire West and Chester Local Plan (Part One) Strategic Policies Adopted Core Strategy (Adopted 2015)¹⁴;
- Vale Royal Borough Local Plan (Adopted 2001 – saved policies)¹⁵;
- Borough of Crewe and Nantwich Replacement Local Plan 2011 (Adopted 2005 – saved policies)¹⁶; and
- Sandbach Neighbourhood Development Plan 2010 – 2030 (Adopted 2016)¹⁷.

2.1.17 Emerging policies are not considered as part of the assessment.

2.1.18 There are a number of key planning designations in the area. These include conservation areas, listed buildings, scheduled monuments, important archaeological assets listed on the National Heritage List for England (NHLE), mineral safeguarding areas (MSA) and ancient woodland.

Committed development

2.1.19 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. Allocations and MSA in the submission drafts of the Minerals Local Plan for Staffordshire (2015) and the Plan for Stafford Borough: Part 2 (2015) have also been included as committed developments. These are listed in Volume 5: Appendix CT-004-000, Planning data and are shown in Volume 5 Planning Data/Committed Development Map Book: Maps CT-13-115b to CT-13-118-R1.

2.1.20 Where it is likely that committed developments will have been completed by 2020, these have been identified as 'future baseline' schemes and have been taken into account for the purpose of assessing the likely significant environmental effects of the Proposed Scheme, for example, as new receptors as appropriate. Where these developments have a particular relevance to an assessment topic, this is noted in Volume 5: Appendix CT-004-000.

2.1.21 Where there are committed developments that are considered likely to be constructed between 2020 and 2027, i.e. at the same time as the Proposed Scheme, they are considered to be receptors for the operation of HS2, but also potentially to give rise to cumulative impacts with the Proposed Scheme during construction. These 'potential cumulative' developments are noted in Volume 5: Appendix CT-004-000.

2.1.22 The potential cumulative development listed in Table 1 is considered relevant to the cultural heritage assessment in the South Cheshire area, presented in Section 7, Cultural heritage.

¹⁴ Cheshire West and Chester Local Plan (Part One) Strategic Policies Adopted Core Strategy (Adopted 2015). Available online at:

http://consult.cheshirewestandchester.gov.uk/portal/cwc_ldf/adopted_cwac_lp/lp_1_adopted?tab=files

¹⁵ Vale Royal Borough Local Plan (Adopted 2001 – saved policies). Available online at:

http://consult.cheshirewestandchester.gov.uk/portal/cwc_ldf/adopted_cwac_lp/valeroyal_lp_29115?pointId=2535161

¹⁶ Borough of Crewe and Nantwich Replacement Local Plan 2011 (Adopted 2005 – saved policies). 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

¹⁷ Sandbach Neighbourhood Development Plan 2010 – 2030 (Adopted 2016). Available online at:

http://www.cheshireeast.gov.uk/planning/neighbourhood_plans/sandbach-neighbourhood-plan.aspx

Environmental Statement Volume 2: Community area 5, South Cheshire

Table 1: Summary of potential cumulative developments for the South Cheshire area

Map book reference ¹⁸	Planning reference	Description
CA5/36	15/1537N	Mixed-use development comprising up to 325 dwellings and employment uses. Associated development includes a local community facility, retail uses, public house/restaurant, access, open space and landscaping.

2.1.23 In addition, the interface between the Proposed Scheme and Crewe Hub, a potential cumulative development, has been considered in this assessment, and is described in further detail below.

2.1.24 Where a committed development lies wholly or partly within the land required for the Proposed Scheme, consideration has been given as to whether it will be commenced or completed in its proposed form. These developments are noted in Volume 5: Appendix CT-004-000.

2.1.25 Planning applications yet to be determined and sites that are proposed allocations in development plans that have yet to be adopted, on or close to the Proposed Scheme, are termed 'proposed developments'. These are listed in Volume 5: Appendix CT-004-000, but are not included in the assessment.

Interface with Crewe Hub

2.1.26 Network Rail, working closely with the Department for Transport (DfT), CEC and other stakeholders, are in the process of developing proposals for an enhanced transport hub at Crewe ('Crewe Hub').

2.1.27 At the time the Phase 2a assessment was undertaken, the proposals for Crewe Hub were limited to a preferred location at the existing Crewe Station as announced by the Secretary of State (SoS) for Transport in November 2016. This reflects the outline proposal for modernisation of Crewe Station in the Borough of Crewe and Nantwich Replacement Local Plan 2011 (Adopted 2005 – saved policies).

2.1.28 Crewe Hub does not form part of the Proposed Scheme. It will be confirmed in due course how any necessary development consent would be secured for these emerging proposals, which would include an assessment of the effects arising from Crewe Hub.

2.1.29 As a proposal for Crewe Hub has some status in local policy, this assessment treats it as a 'committed development' for the purposes of considering cumulative effects. However, as the proposals for a scheme and/or a design of Crewe Hub are currently limited, there is insufficient information on which a robust assessment of the cumulative effects can be made. In order that some assessment can be made, HS2 Ltd has undertaken an assessment of the combined construction impacts of the Proposed Scheme and the Crewe Hub proposal. This considers the potential increase in construction traffic that could arise on roads that could interface with HS2 Phase 2a construction traffic routes in the event of an overlap in the construction programmes of the two schemes. This is set out further in Section 14, Traffic and transport.

¹⁸ Volume 5 Map Book: Maps CT-13-115b to CT-13-118-R1.

Interface with Phase 2b

- 2.1.30 The route which will be constructed as part of Phase 2a will terminate at a portal headwall¹⁹. Provision is made in the design of the Proposed Scheme for the future extension of the route to Manchester as part of Phase 2b.
- 2.1.31 Development of HS2 Phase 2b will require a separate hybrid Bill and ES at a later date. The Phase 2b assessment will consider any potential effects at the interface between the Proposed Scheme and Phase 2b or any cumulative effects that could arise from the construction and operation of both schemes.
- 2.1.32 The Proposed Scheme includes modifications to be made to the WCML, which will allow conventional compatible trains using the Proposed Scheme to access Crewe Station and onward connections.

Changes to the design since the working draft EIA Report

- 2.1.33 Since the working draft EIA Report was published a number of changes have been introduced to the Proposed Scheme. The key changes include (all dimensions below are approximate):

- the removal of the HS2 Crewe Infrastructure Maintenance Depot (IMD) and associated reception track and the resulting road and footpath crossing modifications from the South Cheshire area. A permanent maintenance facility will be located near Stone in the Stone and Swynnerton area (Volume 2: Community area 3, Stone and Swynnerton). As a result the following works described in the working draft EIA Report will no longer be required:
 - the realignment of the A500 Shavington Bypass, Weston Lane, Crotia Mill Road and the permanent closure of the B5071 Jack Mills Way;
 - the demolition of 40 properties²⁰ at the Basford West Development site; and
 - the loss of four balancing ponds required for surface water collection from the B5071 Jack Mills Way, Crewe Road, and Basford West Development Site.
- the vertical alignment of the route of the Proposed Scheme has been raised for an approximate distance of 2.7km between Checkley Brook viaduct and Gonsley Green Farm. The raising will vary along this section and will be up to 7.2m in height. This will remove the need for retaining walls and reduce the area of land required for drainage and maintenance infrastructure associated with the Proposed Scheme;
- the removal of the South Crewe auto-transformer feeder station from the South Cheshire area as a result of development of the power connections required for operation of the Proposed Scheme. In its place, the South Crewe mid-point auto-transformer station has been included in the design, 200m north of Gonsley Green Farm;
- the proposed Crewe South portal has been relocated 340m south of the

¹⁹ A vertical wall located at the start or the end of a tunnel and built perpendicular in order to retain the ground above.

²⁰ Under construction at the time of the working draft EIA Report, as reported in High Speed Two Phase 2a: West Midlands to Crewe Working Draft Environmental Impact Assessment Report Volume 2: Community Area report CA5: South Cheshire, September 2016

location presented in the working draft EIA Report, 960m south of the A500 Shavington Bypass. This will avoid the need for realignment of the A500 Shavington Bypass and diversion works to other public roads;

- the extent of the WCML modifications has been reduced by 1.4km near Lower Den Farm. As a result this removes the need to rebuild the existing Den Lane overbridge;
- a new island platform will be located at Crewe Station, 110m in length, in order to accommodate some conventional rail services to allow high speed trains to pass through or stop at existing platforms at Crewe Station;
- the introduction of a borrow pit to the north of Checkley Lane, which will be used to extract sand and gravel for construction, (see Volume 2: Map CT-05-235, A1 to D6 and Map CT-05-236, F3 to J4);
- temporary worker accommodation for up to 240 workers will be provided at the Basford cutting main compound; and
- transfer nodes for the storage, loading and unloading of bulk earthworks materials will be located at the Basford cutting main compound.

2.1.34 The number, location and configuration of construction compounds, stockpiles and site haul routes have been considered as part of the design development. In addition, mitigation such as noise barriers, landscape earthworks, compensatory planting and replacement ponds and wetlands has been included throughout the South Cheshire area to reduce effects on receptors.

2.2 Description of the Proposed Scheme

General

2.2.1 The following section describes the main permanent features of the Proposed Scheme in the South Cheshire area, including the proposed environmental mitigation measures that have been identified. Further 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. Some of the ecological mitigation described in this section has been provided on a precautionary basis. This is set out in Section 8, Ecology and biodiversity.

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

Overview

2.2.3 The Proposed Scheme within the South Cheshire area has four main components:

- the HS2 main line: the route of the Proposed Scheme, continuing from the northern boundary of the Whitmore Heath to Madeley area (CA4) and continuing northwards towards Crewe;
- HS2 spurs: spurs that will connect the HS2 main line to the WCML northbound towards Crewe, referred to as the HS2 spur (northbound); and southbound

towards London, referred to as the HS2 spur (southbound);

- WCML modifications: a new section of WCML and modifications to the existing conventional rail network; and
- a new island platform and associated footbridges at the existing Crewe Station.

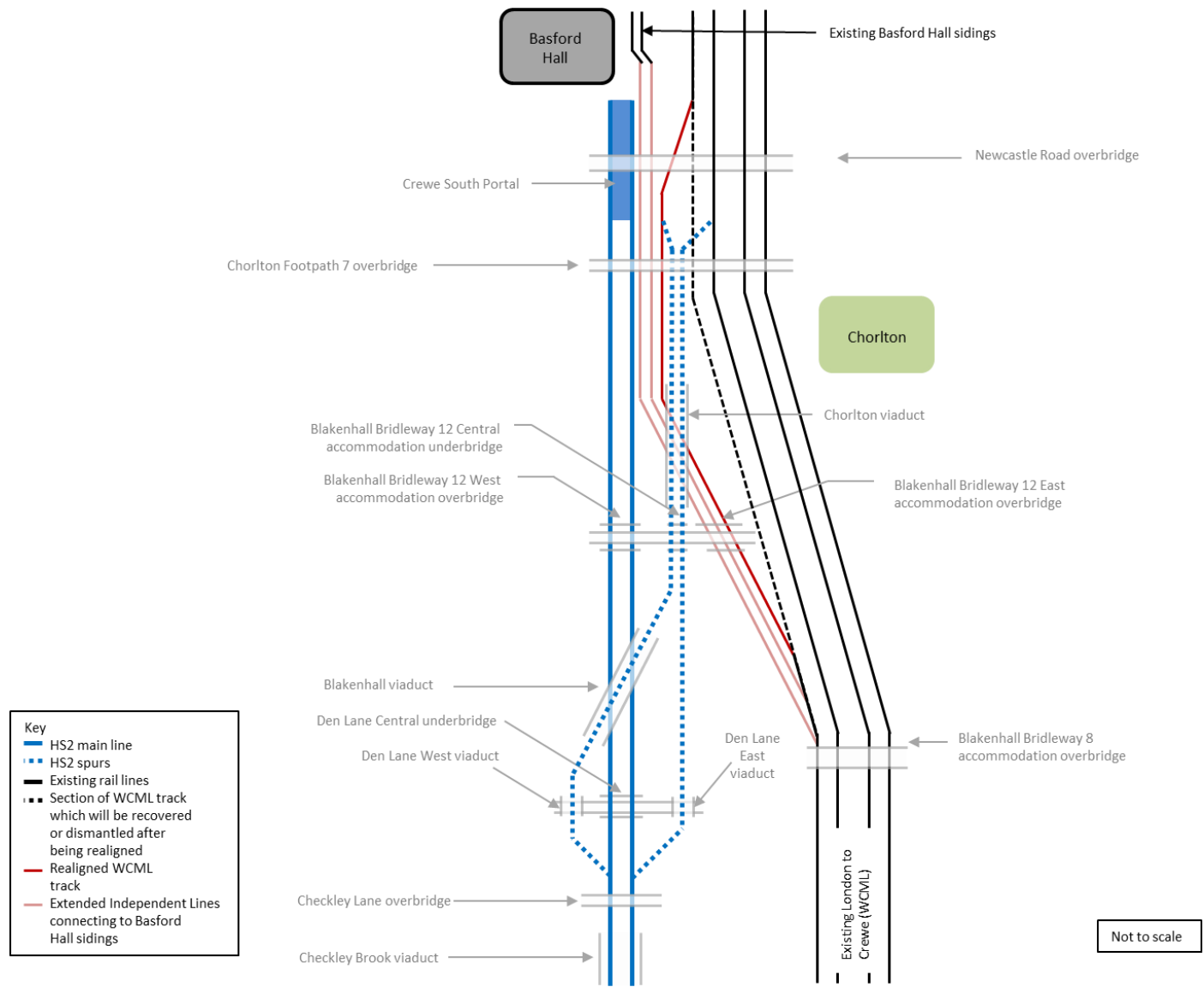
2.2.4 Each of these components and their key features are set out in the following sections. Where key features are associated with more than one component of the Proposed Scheme, they are described within the section they are first associated with. Where reference is made to the Proposed Scheme, this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

2.2.5 In the South Cheshire area, the route of the Proposed Scheme will enter in a south-east to north-west orientation and turn north as it travels towards Crewe. In general, features are described along the route of the Proposed Scheme from south-east to north-west and to the western and eastern sides of the route as they cross the Proposed Scheme, as shown on Map Series CT-06 in the Volume 2: CA5 Map Book.

2.2.6 The route of the Proposed Scheme, referred to in this section of the report as the HS2 main line, will continue from the boundary of the Whitmore Heath to Madeley area, south-west of Wrinehill, and continue northwards towards Crewe. The HS2 main line will end to the south of Crewe in a retained cutting at a headwall to the south of Crewe.

2.2.7 Key permanent features of the route of the Proposed Scheme in the South Cheshire area are shown in Figure 4.

Figure 4: Key permanent features of route of the Proposed Scheme in the South Cheshire area



- 2.2.8 To facilitate the HS2 spurs connection to the WCML, modifications will be required to the existing WCML infrastructure in the South Cheshire area. This will include a new section of the WCML to incorporate the realignment of an existing northbound track along the WCML and an extension of the existing connection to the Basford Hall sidings.
- 2.2.9 A number of rail systems modifications will also be required along the WCML. This will include new track works, realignment of existing tracks, new switches and crossings, the relocation or addition of overhead line equipment, and modifications to signalling equipment.
- 2.2.10 In order to accommodate the new HS2 rail services at Crewe Station, a new island platform will be built to accommodate some conventional rail services.
- 2.2.11 The Proposed Scheme is illustrated on maps CT-06-235 to CT-06-241a in the Volume 2: CA5 Map Book.
- 2.2.12 All dimensions in the sections below are approximate.
- 2.2.13 Embankments and cuttings have been labelled according to their predominant physical characteristics. It is important to note that a number of embankments and cuttings vary as to their depth of cutting or height of embankment as a result of the topography through which the railway passes. Moreover, there are some sections of cutting over which the railway passes at grade or above ground and some sections of embankment which are at grade or below ground level. In the South Cheshire area, this applies to the following embankments and cuttings:
- Blakenhall cutting has some sections where the railway passes up to 3m above existing ground level;
 - Chorlton cutting has some sections where the railway passes up to 4m above existing ground level;
 - Blakenhall Northbound Spur cutting has some sections where the railway passes up to 8.5m above existing ground level;
 - Blakenhall Southbound Spur embankment has some sections where the railway passes up to 3.5m below existing ground level; and
 - Chorlton North embankment has some sections where the railway passes at grade.

HS2 main line

- 2.2.14 In the South Cheshire area, the HS2 main line will be carried on the following features:
- viaduct for a length of 180m (Checkley Brook viaduct);
 - cuttings for a combined length of 6km (Crewe South cutting and Crewe South portal retained cutting); and
 - embankment for a length of 400m (Checkley North embankment).
- 2.2.15 The HS2 main line is described in five separate sections below.

Checkley Brook to Den Lane Central underbridge

- 2.2.16 The HS2 main line within this section will continue from the northern boundary of the Whitmore Heath to Madeley area (CA4) on the Checkley Brook viaduct and along the Checkley North embankment before passing into the Crewe South cutting. The HS2 main line will pass under Checkley Lane overbridge and continue towards Den Lane Central underbridge.
- 2.2.17 This section of the route is illustrated on Maps CT06-235 and CT-06-236.
- 2.2.18 Key features of this 2.4km section will include:
- Checkley Brook viaduct, 180m in length and up to 17m in height (see Volume 2: Map CT-06-235, H6 to I6);
 - a replacement floodplain storage area, located to the west of the HS2 main line and 30m south of the River Lea. Following excavation the area will be re-graded back to tie into existing ground level (see Volume 2: Map CT-06-235, H7 to I7);
 - diversion of Checkley cum Wrinehill Footpath 8, 250m to the east of its existing alignment, to cross the HS2 main line under the Checkley Brook viaduct, before joining the Checkley cum Wrinehill Footpath 4 for 220m to the west of the HS2 main line. The diversion will increase the length of the journey by 400m (see Volume 2: Map CT-06-235, H7 to G5);
 - Checkley North embankment, 400m in length and up to 15m in height with landscape earthworks and landscape mitigation planting on both sides of the embankment. The planting will help integrate the Proposed Scheme into the surrounding landscape (see Volume 2: Map CT-06-235, H6 to F6);
 - grassland habitat creation around two existing ponds located on the eastern side of the HS2 main line immediately north of Checkley Brook and east of Checkley North embankment, to provide replacement habitat for amphibians (see Volume 2: Map CT-06-235, H5 to G5);
 - Randilow South culvert, 250m south of the existing Checkley Lane, for surface water drainage under the HS2 main line (see Volume 2: Map CT-06-235, F6 to F7);
 - Wrinehill package substation²¹, 4m x 4m in area, 75m north of the Randilow South culvert on the eastern side of the HS2 main line. Access will be provided from Checkley Lane (see Volume 2: Map CT-06-235, F6);
 - a section of Crewe South cutting, 1.8km in length, up to 6m in depth and 52m in width in this section. Landscape mitigation planting on both sides of the HS2 main line will help integrate the Proposed Scheme into the surrounding landscape (see Volume 2: Map CT-06-235, A7 to F6 and Map CT-06-236, F6 to D6);
 - diversion of Checkley cum Wrinehill Footpath 5, north of its existing alignment

²¹ Provides non-traction power to the Proposed Scheme.

via a maintenance access route for the Wrinehill package substation. The footpath will join Checkley Lane to the east of the HS2 main line, increasing the length of the journey by 135m (see Volume 2: Map CT-06-235, F6 to E5);

- realignment of Checkley Lane, 50m south of its existing alignment, for 650m, to cross over the HS2 main line on the Checkley Lane overbridge. The Checkley Lane overbridge will be 10m in height above track level and 5m above the existing ground level. The realignment will decrease the length of journey by 17m (see Volume 2: Map CT-06-235, F4 to E9);
- three ecological mitigation ponds and grassland habitat creation, to provide replacement habitat for amphibians, to the north-east of the HS2 main line, adjacent to Randilow Farm (see Volume 2: Map CT-06-235, E4);
- four ecological mitigation ponds and grassland habitat creation, to provide replacement habitat for amphibians, 450m north-east of the HS2 main line, west of the WCML, to the north of Checkley Lane (see Volume 2: Map CT-06-235, F3 to C2);
- two areas of grassland habitat creation around existing ponds, 250m to the south-west of the HS2 main line, adjacent to the junction of Checkley Lane and Turncocks Lane to provide habitat connectivity and replacement habitat for amphibians (see Volume 2: Map CT-06-235, F9 to E9);
- realignment of Checkley cum Wrinehill Footpath 9, 50m west of its existing alignment, to join Checkley Lane to the north-east of the HS2 main line, increasing the length of the journey by 30m (see Volume 2: Map CT-06-235, E2 to E3);
- diversion of Blakenhall Footpath 17, 600m south-east of its existing alignment along the southern side of the HS2 main line to join the realigned Checkley Lane, increasing the length of the journey by 700m. Blakenhall Footpath 17 will be closed on the northern side of the HS2 main line (see Volume 2: Map CT-06-235, E7 to B7);
- accommodation access for Randilow Farm, located to the east of the HS2 main line, will be provided from the realigned Checkley Lane (see Volume 2: Map CT-06-235, E5);
- accommodation access for agricultural land at Grange Farm, located on the east of the HS2 main line, will be provided from the realigned Checkley Lane (see Volume 2: Map CT-06-235, E6 to D6);
- an area of woodland habitat creation on the northern side of the HS2 main line and to the west of Randilow Farm, to help integrate the Proposed Scheme into the surrounding landscape and provide visual screening at Randilow Farm (see Volume 2: Map CT-06-235, E5 to D6);
- Randilow North culvert, 200m north-west of the existing Checkley Lane, for surface water drainage under the HS2 main line (see Volume 2: Map CT-06-235, D6);
- raising of an 860m section of a Scottish Power Energy Networks 132kV

overhead line to cross over the Proposed Scheme 1km north of the Checkley Lane overbridge (see Volume 2: Map CT-06-235, A6 to E3 and Map CT-06-236, J2 to C10);

- Blakenhall South culvert, 950m north-west of the existing Checkley Lane, for diversion of an unnamed watercourse under the HS2 main line and HS2 spur (southbound) (see Volume 2: Map CT-06-236, H5);
- Blakenhall spur culvert, 720m south-east of Den Lane West viaduct, for the diversion of an unnamed watercourse under the HS2 spur (northbound) (see Volume 2: Map CT-06-236, H6);
- six ecological mitigation ponds with an area of grassland habitat, located to the west of the Proposed Scheme to provide replacement habitat for amphibians (see Volume 2: Map CT-06-236, H6 to F8);
- two balancing ponds for railway drainage located to the north-east of the HS2 main line and HS2 spur (southbound), with access via Den Lane (see Volume 2: Map CT-06-236, G6 to F5);
- Blakenhall drop inlet culvert²², 400m south of Den Lane Central underbridge, for surface water drainage under the HS2 main line and HS2 spur (northbound) (see Volume 2: Map CT-06-236, F5 to F6); and
- diversion of a National Grid gas transmission 1,050mm high pressure gas pipeline, for 750m in length, to pass under the HS2 main line 250m south of the Den Lane Central underbridge, and crossing under Den Lane to the north-east of the HS2 main line (see Volume 2: Map CT-06-236, F6 to D4).

2.2.19 This section of the HS2 main line will include one emergency access point, located adjacent to a balancing pond for railway drainage accessed from Den Lane and six maintenance access points allowing vehicle access to the route. There will also be maintenance access routes and hedgerow planting throughout this section. There will also be minor utilities works within this section, which may include works to low voltage overhead or underground lines, gas pipes, sewers and telecommunication cables.

2.2.20 Construction of this section will be managed from Checkley North embankment satellite compound and Blakenhall Northbound Spur embankment satellite compound, which are described in Section 2.3, and shown on maps CT-05-235 and CT-05-236.

Den Lane Central underbridge to Blakenhall Bridleway 12 West accommodation overbridge

2.2.21 The HS2 main line in this section will continue in the Crewe South cutting from the Den Lane Central underbridge with the HS2 spur (northbound) to the south-west and HS2 spur (southbound) to the north-east. The HS2 main line will pass under the Blakenhall viaduct, which will carry the HS2 spur (southbound) to the north-east of

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

the HS2 main line. The HS2 main line will then continue towards the Blakenhall Bridleway 12 West accommodation overbridge.

2.2.22 This section of the route is illustrated on Maps CT-06-236 and CT-06-237.

2.2.23 Key features of this 1.5km section will include:

- continuation of Crewe South cutting, for 1.5km length, up to 6m in depth and 58m in width in this section. On the west side of the HS2 main line there will be a noise fence barrier, 3m in height, running along a section of the base of the cutting, 500m north-east of Den Lane Central underbridge (see Volume 2: Map CT-06-236, D6 to A5 and CT-06-237, J5 to D6);
- realignment of Den Lane, 230m to the south of its existing alignment, to join Mill Lane to the western side of the HS2 main line. The realigned Den Lane will pass under the HS2 main line via the Den Lane central underbridge. The realigned Den Lane will be crossed by the Den Lane East viaduct and Den Lane West viaduct, which will carry the HS2 Spurs (see Volume 2: Map CT-06-237, E4 to B7);
- Den Lane West viaduct, 67m in length and up to 4m in height above existing ground level, will carry the HS2 spur (northbound) over Den Lane, west of the HS2 main line (see Volume 2: Map CT-06-236, D6);
- Den Lane East viaduct, 67m in length and up to 9m in height above existing ground level, will carry the HS2 spur (southbound) over Den Lane, to the east of the HS2 main line (see Volume 2: Map CT-06-236, D5);
- a balancing pond for highway drainage with an area of grassland habitat creation to provide replacement habitat, located to the east of the HS2 spur (southbound). Access will be provided from Den Lane (see Volume 2: Map CT-06-236, E4 to D4);
- a highway pump station located adjacent to the west of Den Lane Central underbridge for surface water drainage on Den Lane (see Volume 2: Map CT-06-236, D6);
- diversion of Blakenhall Footpath 9, 125m north of its existing alignment, to join the realigned Den Lane to the western side of the HS2 main line and HS2 spur (northbound), increasing the length of the journey by 35m (see Volume 2: Map CT-06-236, D7 to D8);
- Den Lane spur culvert, located 50m north of Den Lane West viaduct, for surface water drainage under the HS2 spur (northbound) (see Volume 2: Map CT-06-236, D6);
- diversion of a 900mm diameter National Grid Transmission high pressure gas pipeline for 850m under the HS2 main line, 65m north of the Den Lane Central underbridge (see Volume 2: Map CT-06-236, E7 to C4);
- landscape earthworks with mitigation planting, located east of the HS2 spur (southbound), starting north of the Den Lane Central underbridge and continuing to the Blakenhall Bridleway 12 East accommodation overbridge, to

help integrate the Proposed Scheme into the surrounding landscape (see Volume 2: Map CT-06-236, A4 to D5 and Map CT-06-237, J5 to E6);

- a landscape bund with mitigation planting, 200m in length and up to 3m in height, located to the west of the HS2 spur (northbound). The bund will help integrate the Proposed Scheme into the surrounding landscape and will provide visual and acoustic screening for residential properties along Wrinehill Road and Mill Lane (see Volume 2: Map CT-06-236, D7 to C7);
- raising of a 750m section of a Scottish Power Energy Networks 132kV overhead line to cross over the Proposed Scheme 625m north of the Den Lane Central underbridge (see Volume 2: Map CT-06-236, C10 to A4 and Map CT-06-237, J8 to E1);
- retaining walls to provide structural support to the Proposed Scheme, as follows:
 - Blakenhall retaining wall 1, 227m in length and up to 15m in height, of which up to 12m will be above existing ground level, located to the west of the HS2 main line, between Den Lane Central underbridge and Blakenhall viaduct (see Volume 2: Map CT-06-236, C6 to A6); and
 - Blakenhall retaining wall 2, 639m in length and up to 15m in height, of which up to 13m will be above existing ground level, located to the east of the HS2 main line, 80m east of Gonsley Green Farm (see Volume 2: Map CT-06-237, H6 to E6);
- a landscape bund²³ with mitigation planting, 100m in length and up to 4m in height, located on the western side of the HS2 spur (northbound), north of Wrinehill Road. The landscape bund will help integrate the Proposed Scheme into the surrounding landscape and provide visual screening for residential properties along Wrinehill Road and Mill Lane (see Volume 2: Map CT-06-236, B6 to B7);
- twelve ecological mitigation ponds and grassland habitat creation, to provide replacement habitat for amphibians, to the west of the HS2 main line, north of Wrinehill Road (see Volume 2: Map CT-06-236, B7 to A6 and Map CT 206-237, I7 to G7);
- Gonsley drop inlet culvert, 600m north-west of the Den Lane Central underbridge, to divert an unnamed watercourse underneath the HS2 main line (see Volume 2: Map CT-06-237, I6);
- a landscape bund with mitigation planting, 340m in length and up to 4m in height, located to the west of the HS2 main line. The landscape bund will help integrate the HS2 main line into the surrounding landscape and provide visual screening for residents of Gonsley Green Farm (see Volume 2: Map CT-06-237, H6 to F6);
- five ecological mitigation ponds and grassland habitat creation, to provide replacement habitat for amphibians, to the west of the HS2 main line,

²³ A bund is an earthworks structure designed to provide either visual screening or noise attenuation to receptors in proximity.

adjacent to Gonsley Green Farm and extending along the diverted Blakenhall Bridleway 12 (see Volume 2: Map CT-06-237, G9 to E6);

- South Crewe mid-point auto-transformer station, on the western side of the HS2 main line, 200m north of Gonsley Green Farm. Access will be provided via an access road from Chorlton Lane to the north-west (see Volume 2: Map CT-06-237, E6); and
- two landscape bunds, one 105m in length and up to 3m in height and one 70m in length and up to 2m in height, adjacent to the South Crewe mid-point auto-transformer station to the west of the HS2 main line. The landscape bunds will help integrate the South Crewe mid-point auto-transformer station into the surrounding landscape and provide visual screening for residents of Gonsley Green Farm (see Volume 2: Map CT-06-237, E6).

2.2.24 This section of the route of the Proposed Scheme will include one emergency access point, located to the north of Gonsley Green Farm, and three maintenance access points allowing vehicle access to the route. There will also be maintenance access routes and hedgerow planting throughout this section. There will also be minor utilities works within this section, which may include works to low voltage overhead or underground lines, gas pipes, sewers and telecommunication cables.

2.2.25 Construction of this section will be managed from Blakenhall Northbound Spur embankment satellite compound, and Crewe South cutting satellite compound, which are described in Section 2.3, and shown on maps CT-05-236 and CT-05-237.

Blakenhall Bridleway 12 West accommodation overbridge to Chorlton Footpath 7 overbridge

2.2.26 The HS2 main line will continue northwards in the Crewe South cutting from the Blakenhall Bridleway 12 West accommodation overbridge towards Crewe. One kilometre into this section, the HS2 main line will run in parallel with the HS2 spurs, the new section of the WCML, and the existing WCML towards the Chorlton Footpath 7 overbridge.

2.2.27 This section of the route is illustrated on Maps CT-06-237, CT-06-238 and CT-06-239.

2.2.28 Key features of this 2km section will include:

- continuation of Crewe South cutting, 2km in length, up to 6m in depth and 60m in width in this section. On the east side of the HS2 main line there will be a noise fence barrier, 3m in height, running along a section of the base of the cutting 500m north-east of Blakenhall Bridleway 12 West accommodation overbridge. On the western side of the HS2 main line there will be two noise fence barriers, 3m in height, running along the top of the cutting adjacent to Chorlton Lane. These barriers will provide acoustic screening for residents of Chorlton (see Volume 2: Map CT-06-237, D6 to A6 and CT-06-238, J6 to D6);
- diversion of Blakenhall Bridleway 12, 350m to the west of its existing alignment. The diverted Blakenhall Bridleway 12 will cross over the HS2 main line via the Blakenhall Bridleway 12 West accommodation overbridge, 10m in height above existing ground level and track level. The diverted Blakenhall

Bridleway 12 will pass under the HS2 spurs via the Blakenhall Bridleway 12 Central accommodation underbridge, with a height clearance of 4.5m to the base level of the underbridge. It will then cross over the new section of the WCML via the Blakenhall Bridleway 12 East accommodation overbridge, 9m in height above track level and 6m above existing ground level. This diversion will increase the length of the journey by 90m (see Volume 2: Map CT-06-237, G10 to D4);

- diversion of Blakenhall Footpath 11, 110m west of its existing alignment on the western side of the HS2 main line, to meet the diverted Blakenhall Bridleway 12 400m north-west of where it currently joins (see Volume 2: Map CT-06-237, E7 to D6);
- retaining walls to provide structural support to the Proposed Scheme, as follows:
 - Chorlton retaining wall 1, 232m in length and up to 6m in height, of which up to 4m will be above existing ground level, located between the HS2 main line and the Chorlton South embankment (see Volume 2: Map CT-06-237, D6 to C6);
 - Chorlton retaining wall 2, 194m in length and up to 16m in height, of which up to 9m will be above existing ground level, located between the HS2 spurs and new section of the WCML, 40m north-west of the Blakenhall Bridleway 12 East accommodation overbridge (see Volume 2: Map CT-06-237, D5 to C5);
 - Chorlton retaining wall 3, 525m in length and up to 12m in height, of which up to 6m will be above existing ground level, located between the HS2 spurs and new section of the WCML, 640m north of Blakenhall Bridleway 12 West accommodation overbridge (see Volume 2: Map CT-06-238, I5 to F5);
 - Chorlton retaining wall 4, 9m in length and up to 6m in height, of which up to 6m will be above existing ground level, located between the HS2 spurs and the existing WCML (see Volume 2: Map CT-06-238, F5);
 - Chorlton retaining wall 5, 9m in length and up to 3m in height, of which up to 3m will be above existing ground level, located between the HS2 spurs and the existing WCML, 100m south-west of Jubilee Farm (see Volume 2: Map CT-06-238, D5); and
 - Chorlton retaining wall 6, 829m in length and up to 6m in height, of which up to 4m will be above existing ground level, to separate the new section of the WCML from the HS2 main line on its approach to the Crewe South portal retained cutting. The retaining wall will start approximately 175m north of Dairy Farm (see Volume 2: Map CT-06-238, E6 to A6);
- Half Moon inverted siphon²⁴, 100m north-west of the Blakenhall Bridleway 12 West accommodation overbridge, for diversion of a tributary of Swill Brook underneath the Proposed Scheme (see Volume 2: Map CT-06-237, D6);
- an area of woodland habitat creation to the west of the HS2 main line, to help

²⁴ A form of culvert used on level ground where the water level has to be lowered to pass under the route, other railway or a road access; constructed using enclosed chambers on both sides of the route.

integrate the Proposed Scheme into the surrounding landscape (see Volume 2: Map CT-06-237, D6 to C6);

- two balancing ponds for railway drainage, to the west of the HS2 main line, one within an area of woodland habitat creation to provide replacement habitat 290m west of the Blakenhall Bridleway 12 West accommodation overbridge, and one 600m north-west of the Blakenhall Bridleway 12 West accommodation overbridge with an area of woodland habitat on its west side. Access will be provided via an access road from Chorlton Lane to the north-west (see Volume 2: Map CT-06-237, C7 to A6);
- a HS2 pump station and a Network Rail pump station with a surrounding area of grassland habitat creation to provide replacement habitat, located to the west of the HS2 main line, 400m north-west of the Blakenhall 12 West accommodation overbridge. Access will be provided via an access road from Chorlton Lane to the north-west (see Volume 2: Map CT-06-237, C6 to B6);
- areas of landscape mitigation planting to the west of the HS2 main line, to help integrate the Proposed Scheme into the surrounding landscape (see Volume 2: Map CT-06-238, J6 to D6 and G7);
- six ecological mitigation ponds and an area of grassland habitat creation, to provide replacement habitat for reptiles and amphibians, on the western side of the HS2 main line, 200m to the south of the diverted Chorlton Lane (see Volume 2: Map CT-06-238, H7 to G7);
- two landscape bunds with landscape mitigation planting, located on the western side of the HS2 main line and on both sides of an access road from Chorlton Lane. The bunds will be 65m and 56m in length respectively, and 3m in height. The bunds will provide visual screening for Dairy Farm and residential properties along Chorlton Lane (see Volume 2: Map CT-06-238, G7 to F6);
- closure of a section of Chorlton Lane to the eastern side of the HS2 main line where it crosses the Proposed Scheme. To the western side of the route, Chorlton Lane will be diverted 1.5km to the north-west, running adjacent to the HS2 main line to join Newcastle Road. At its northern extent, the existing Chorlton Lane on the eastern side of the route, will be extended by 60m to join Newcastle Road (see Volume 2: Map CT-06-238, A6 to F6; Map CT-06-239, J6 to H6 and H2);
- closure of Chorlton Footpath 12 to the east of the HS2 main line where it crosses the Proposed Scheme, users will be diverted from Chorlton Lane via the diverted Chorlton Footpath 13 (see Volume 2: Map CT-06-238, F5 to B5);
- a landscape bund with landscape mitigation planting, on the western side of the HS2 main line, 175m in length and up to 4m in height. The bund will provide visual screening for Dairy Farm and residential properties along Chorlton Lane (see Volume 2: Map CT-06-238, F6 to E6);
- a balancing pond for railway drainage, within an area of grassland habitat creation around an existing pond to provide habitat replacement, located to

the west of the HS2 main line, 250m north-west of Dairy Farm. Access will be provided from the diverted Chorlton Lane (see Volume 2: Map CT-06-238, E7 to D6);

- diversion of Chorlton Footpath 13 to the east of the HS2 main line. The diverted Chorlton Footpath 13 will join Chorlton Footpath 9 to the north, and Chorlton Lane to the south (see Volume 2: Map CT-06-238, F5 to C5);
- diversion of a National Grid Gas Transmission 600mm diameter high pressure gas pipeline by 425m, to pass under the Proposed Scheme, 75m south of Jubilee Farm (see Volume 2: Map CT-06-238, D5 to D7);
- a landscape bund with landscape mitigation planting, 341m in length and up to 3m in height, located to the west of the HS2 main line, to provide visual screening for residents of Heath Farm and help integrate the Proposed Scheme into the surrounding landscape (see Volume 2: Map CT-06-238, D6 to B6);
- a balancing pond for railway drainage and a surface water pump station, within an area of grassland habitat creation to provide replacement habitat, located 150m west of the HS2 main line 175m south-east of Heath Farm. Access will be provided via the diverted Chorlton Lane (see Volume 2: Map CT-06-238, C7);
- eight ecological mitigation ponds and an area of grassland habitat creation, to provide replacement habitat for reptiles and amphibians, to the west of the HS2 main line 100m south of Heath Farm (see Volume 2: Map CT-06-238, C9 to B7);
- diversion of Chorlton Footpath 9, 25m east of its existing alignment to join Chorlton Footpath 7, with an overall increase in journey length of 20m (see Volume 2: Map CT-06-238, C5 to B5); and
- an area of landscape mitigation planting located 75m to the west of the HS2 main line and 60m south of Heath Farm, to help integrate the Proposed Scheme into the surrounding landscape (see Volume 2: Map CT-06-238, B7).

2.2.29 This section of the route of the Proposed Scheme will include one emergency access point, located along the diverted Chorlton Lane, and six maintenance access points allowing vehicle access to the route. There will also be maintenance access routes and hedgerow planting throughout this section. There will also be minor utilities works within this section, which may include works to low voltage overhead or underground lines, gas pipes, sewers and telecommunication cables.

2.2.30 Construction of this section will be managed from Crewe South cutting satellite compound, which is described in Section 2.3, and shown on map CT-05-237.

Chorlton Footpath 7 overbridge to the northern end of the HS2 main line

2.2.31 The HS2 main line will continue in the Crewe South cutting before entering the Crewe South portal retained cutting. Upon entering the Crewe South portal retained cutting, the HS2 main line will pass underneath the realigned Newcastle Road before terminating at the portal headwall.

2.2.32 This section of the route is illustrated on Maps CT-06-238, CT-06-239, CT-06-239-R1 and CT-06-239-L1.

2.2.33 Key features of this 720m section will include:

- continuation of the Crewe South cutting, for 197m, up to 10m in depth and 56m in width in this section (see Volume 2: Map CT-06-238, B6 to A6 and Map CT-06-239, J6 to I6);
- diversion of Chorlton Footpath 7, 20m to the north of its existing alignment, to cross the Proposed Scheme on the Chorlton Footpath 7 overbridge. The Chorlton Footpath 7 overbridge will be 9m above existing ground level and 14m in height above track level. Chorlton Footpath 7 will join Chorlton Footpath 9 to the east of the HS2 main line, with no overall increase in journey length (see Volume 2: Map CT-06-238, B5 to B7);
- a landscape bund with landscape mitigation planting, 205m in length and up to 3m in height, to the west of the HS2 main line, to provide visual screening for residents of Heath Farm and help integrate the Proposed Scheme into the surrounding landscape (see Volume 2: Map CT-06-238, B6 to A6);
- Crewe South portal retained cutting, 524m in length and up to 22m in depth and 42m in width, including a rescue area at ground level to accommodate emergency evacuation of passengers and allow vehicular access for emergency services to these points (see Volume 2: Map CT-06-239, I6 to F6);
- a balancing pond for highway drainage within an area of woodland habitat creation for replacement habitat and to help integrate the Proposed Scheme into the surrounding landscape, located 550m east of the HS2 main line. Access will be provided from the realigned Newcastle Road (see Volume 2: Map CT-06-239, I1);
- closure of Chorlton Footpath 17 where it crosses the HS2 main line and new section of the WCML, with users diverted along the existing Newcastle Road, the realigned Newcastle Road, the diverted Basford Footpath 5, and Casey Lane, increasing journey length by 250m (see Volume 2: Map CT-06-239, H5 to H6);
- closure of Chorlton Footpath 11 where it crosses the HS2 main line, with users diverted along the existing Newcastle Road, the realigned Newcastle Road, the diverted Basford Footpath 5, and Casey Lane, increasing journey length by 250m (see Volume 2: Map CT-06-239, H5 to E7);
- a balancing pond for highway drainage, located 620m west of the HS2 main line, within an area of landscape mitigation planting, to provide visual screening for residents of Hough, and help integrate the Proposed Scheme into the surrounding landscape. Access will be provided from Casey Lane (see Volume 2: Map CT-06-239, G10, Map CT-06-239-L1, G1 to G2);
- realignment of Newcastle Road, 250m north of its existing alignment to cross the Proposed Scheme and the existing WCML via the Newcastle Road overbridge. The Newcastle Road overbridge will be 14m above existing ground

level and 28m in height above track level. Landscape earthworks on both sides with mitigation planting will help integrate the Proposed Scheme into the surrounding landscape. A section of the existing Newcastle Road will be closed where it intersects the Proposed Scheme. The existing Newcastle Road overbridge which crosses the WCML will also be demolished in this location (see Volume 2: Map CT-06-239, J1 to G10, Map CT-06-239-L1, G1 to G2 and Map CT-06-239-R1, J10);

- areas of woodland and habitat creation adjacent to Newcastle Road, on both sides of the Proposed Scheme, to provide replacement habitat (see Volume 2: Map CT-06-239, H3 to I2 and G8 to G9);
- a landscape bund with landscape mitigation planting, 250m in length and up to 1m in height, located west of the HS2 main line along the realigned Newcastle Road, to provide visual screening for residential properties along Newcastle Road and help integrate the Proposed Scheme into the surrounding landscape (see Volume 2: Map CT-06-239, G7 to G8);
- two landscape bunds with mitigation planting, located to the west of the HS2 main line and on both sides of the realigned Newcastle Road. The bunds will be 165m and 110m in length respectively, and up to 3m in height. The bunds will provide visual screening for residential properties along Newcastle Road and Casey Lane, and at Heath Farm and help integrate the Proposed Scheme into the surrounding landscape (see Volume 2: Map CT-06-239, H6 to F6);
- diversion of Basford Footpath 5, 350m west of its existing alignment, to the west of the HS2 main line, joining Casey Lane to the north and the realigned Newcastle Road to the south, increasing the length of the journey by 250m (see Volume 2: Map CT-06-239, G7 to F8);
- a balancing pond for railway drainage within an area of landscape mitigation planting to help integrate the Proposed Scheme into the surrounding landscape, located at the end of the HS2 main line. Access will be provided from Casey Lane (see Volume 2: Map CT-06-239, F6 to E6);
- diversion of Regional Cycle Network Route 70 along Back Lane and Weston Lane (see Volume 2: Map CT-06-239 L1, G2 to B1).

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

2.2.35 Construction of this section will be managed from Crewe South cutting satellite compound, Chorlton cutting satellite compound, Crewe South portal satellite compound, and Basford cutting main compound, which are described in Section 2.3, and shown on maps CT-05-237, CT-05-239 to CT-05-240.

HS2 spurs

2.2.36 The HS2 spurs will diverge from the HS2 main line on both sides at the point where the HS2 main line passes into the Crewe South cutting, to the north-east of Grange

Farm. The HS2 spur (southbound) will initially run along the east side of the HS2 main line and the HS2 spur (northbound) will initially run along the west side.

- 2.2.37 The HS2 spur (northbound) will cross over the HS2 main line and the two spurs will then converge on the east side of the HS2 main line, 500m north of the Blakenhall viaduct. The HS2 spurs will continue together for 3km before connecting into the existing WCML, 200m north of the Newcastle Road overbridge.
- 2.2.38 The HS2 spurs are illustrated on Maps CT-06-235 to CT-06-238.
- 2.2.39 Key features of this section will include:
- a section of Checkley North embankment, 200m in length and up to 15m in height, which will carry the HS2 spurs from where they begin to diverge from the HS2 main line 200m to the north of Checkley Brook viaduct (see Volume 2: Map CT-06-235, G6 to F6);
 - a section of Crewe South cutting, 310m in length, up to 6m in depth and 60m wide, where the HS2 spurs will run parallel to the HS2 main line (see Volume 2: Map CT-06-235, F6 to E6);
 - the HS2 spur (northbound) will split from the Crewe south cutting 200m to the north of Checkley Brook viaduct and will pass into:
 - Blakenhall Northbound Spur cutting, 1.3km in length, up to 5m in depth and 50m wide, with landscape mitigation planting along the west side of the HS2 spur (northbound) to help integrate the Proposed Scheme into the surrounding landscape (see Volume 2: Map CT-06-235, D7 to A7 and Map CT-06-236, J6 to F6);
 - Blakenhall Northbound Spur embankment, 1.1km in length and up to 14m in height, with landscape earthworks with mitigation planting along the west side of the HS2 spur (northbound) to help integrate the Proposed Scheme into the surrounding landscape. A noise fence barrier up to 2m in height will be located on the west side of the HS2 spur (northbound). The noise fence barrier will provide acoustic screening for properties on Wrinehill Road and Mill Lane (see Volume 2: Map CT-06-236, F6 to B6); and
 - Blakenhall viaduct, 290m in length and up to 14m in height, located 630m north-west of the Den Lane central underbridge. Blakenhall viaduct will carry the HS2 spur (northbound) over the HS2 main line, to allow it to converge with the HS2 spur (southbound) (see Volume 2: Map CT-06-236, B6 to A5 and Map CT-06-237, I6 to H6);
 - the HS2 spur (southbound) will split from the Crewe south cutting 200m to the north of Checkley Brook viaduct and will pass onto Blakenhall Southbound Spur embankment, 2.4km in length and up to 8m in height. Hedgerow planting, landscape earthworks, and landscape mitigation planting along the east side of the HS2 spur (southbound) will help integrate the Proposed Scheme into the surrounding landscape (see Volume 2: Map CT-06-235, A6 to F6, Map CT-06-236, J5 to A5 and Map CT-06-237, J5 to H5);
 - the HS2 spurs (northbound and southbound) will join to run parallel on the

Chorlton South embankment, 935m in length and up to 8m in height, which will carry the HS2 spurs to the east side of the HS2 main line. A noise fence barrier up to 2m in height will be located on the east side of the HS2 spurs and will provide acoustic screening for residential properties along Waybutt Lane, Chorlton (see Volume 2: Map CT-06-237, H6 to C5);

- Chorlton viaduct, 340m in length and up to 10m in height, will carry the HS2 spurs over the new section of the WCML. A noise fence barrier up to 2m in height will be located on the east side of Chorlton viaduct and will provide acoustic screening for residential properties along Waybutt Lane, Chorlton (see Volume 2: Map CT-06-237, D5 to A5); and
- Chorlton North embankment, 1.5km in length and up to 9m in height, on which the HS2 spurs will continue until they connect into the WCML. A noise fence barrier up to 2m in height will be located to the east of the embankment. The noise fence barrier will provide acoustic screening for the residents of Chorlton village (see Volume 2: Map CT-06-238, I5 to A5).

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

2.2.41 Construction of this section will be managed from the Checkley North embankment satellite compound, Blakenhall Northbound Spur embankment satellite compound and Crewe South cutting satellite compound, which are described in Section 2.3, and shown on maps CT-05-235, CT-05-236, and CT-05-237.

Modifications to the WCML in the South Cheshire area

2.2.42 To facilitate the connection of the Proposed Scheme to the existing WCML, modifications will be required to the existing conventional rail infrastructure in the South Cheshire area.

2.2.43 This section of the Proposed Scheme is illustrated on Maps CT-06-236 to CT-06-239.

2.2.44 Key features of this section will include:

- a new section of the WCML, 4.2km in length, located to the west of the existing WCML between the Blakenhall Bridleway 8 accommodation overbridge and Crewe South portal retained cutting. This will include:
 - the realignment of one WCML track, which currently forms part of the existing WCML, and an extension of two tracks that are currently used regularly only by freight trains, providing access to the existing Basford Hall sidings. The new section of the WCML, incorporating all three tracks, will diverge from the existing WCML north of the Blakenhall Bridleway 8 accommodation overbridge. The new tracks will be extended and pass in the Blakenhall cutting for 1.8km in a north-west direction, before passing under the Chorlton viaduct, which will carry the HS2 spurs (see Volume 2: Map CT-06-236, D2 to A3, Map CT-06-237, J2 to A5);
 - the three new tracks will continue in the Blakenhall cutting for 350m, passing between the HS2 main line to the west and HS2 spurs to the east, before continuing

- into the Chorlton cutting, 2km in length and up to 4m in depth (see Volume 2: Map CT-06-238, I6 to A5);
- one of the new tracks will realign back into the WCML corridor, 250m north of the realigned Newcastle Road, heading north towards Crewe (see Volume 2: Map CT-06-238, D5 to A5); and
 - the two remaining tracks will continue into the Basford cutting, 515m in length, up to 4m in depth and 34m wide, before connecting into the existing freight facilities at Basford Hall (see Volume 2: Map CT-06-239, J5 to D6);
- diversion of Blakenhall Bridleway 8, 75m to the north-west of its existing alignment, crossing the existing WCML via the replacement Blakenhall Bridleway 8 accommodation overbridge, increasing the journey length by 5m. Blakenhall Bridleway 8 accommodation overbridge will be 12m in height above track level, and 12m above existing ground level. The existing Lower Den Farm accommodation overbridge crossing over the WCML will be demolished. Access to Lower Den Farm will be provided via the new Blakenhall Bridleway 8 accommodation overbridge. There will be an area of landscape mitigation planting to the south-east of the overbridge to help integrate the Proposed Scheme into the surrounding landscape (see Volume 2: Map CT-06-236, C1 to C2);
 - extension of four existing culverts under the existing and new sections of the WCML (see Volume 2: Map CT-06-236, B2 and Map CT-06-237, I3, D4 to E5);
 - a maintenance access road on the south-west side of the existing WCML, running adjacent to the existing WCML, extending from Blakenhall Bridleway 8 accommodation overbridge to the Blakenhall Bridleway 12 east accommodation overbridge (see Volume 2: Map CT-06-236, C2 to A3 and Map CT-06-237, J2 to D5);
 - Blakenhall New Bridleway, a 1.3km section of new bridleway to connect between Blakenhall Bridleway 8 and Blakenhall Bridleway 12, which will run along the southern side of the new section of the WCML (see Volume 2: Map CT-06-237, J2 to D5);
 - four ecological mitigation ponds within an area of grassland habitat creation, to the east of the existing WCML 625m north-west of the Blakenhall Bridleway 8 overbridge, to provide replacement habitat for amphibians (see Volume 2: Map CT-06-237, G3 to F2);
 - diversion of Blakenhall Footpath 7, 250m to the north-west of its existing alignment, to join the Blakenhall Bridleway 12, increasing the length of journey by 765m (see Volume 2: Map CT-06-237, G4 to E4);
 - areas of landscape mitigation planting and grassland habitat creation, located to the north of the existing WCML to provide visual screening for residential properties along Waybutt Lane, Chorlton and help integrate the Proposed Scheme into the surrounding landscape (see Volume 2: Map CT-06-237, A5 to G4 and Map CT-06-238, J4 to F5);

- a maintenance access road with an area of grassland habitat to provide replacement habitat. The access road will be 740m in length, running to the south of the WCML from the diverted Blakenhall Bridleway 12 (see Volume 2: Map CT-06-237, E4 to A5);
- three landscape bunds with mitigation planting, located to the north of the existing WCML. Two landscape bunds 260m each in length and up to 4.5m in height will be located along the south side of Waybutt Lane. The third landscape bund, 135m in length and up to 4m in height, will be located on the north side of Waybutt Lane. The three landscape bunds will provide visual screening for residential properties along Waybutt Lane, Chorlton (see Volume 2: Map CT-06-237, D3 to A4);
- extension of Chorlton Bridleway 2 by 1.3km to meet Chorlton Lane on the north side of the WCML (see Volume 2: Map CT-06-237, A4 to D3, Map CT-06-238, J3 to F5);
- diversion of Chorlton Footpath 3, 450m south of its existing alignment, to cross the Proposed Scheme via the Blakenhall Bridleway 12, this diversion will increase the length of the journey by 1.2km (see Volume 2: Map CT-06-237, E4 to B5);
- eleven ecological mitigation ponds with an area of grassland habitat, to the north-east of the existing WCML, to provide replacement habitat for amphibians (see Volume 2: Map CT-06-238, H4 to F4);
- two landscape bunds with landscape mitigation planting, to the north-east of the existing WCML and west of Chorlton. One bund will be 185m in length and up to 2m in height, and the second will be 470m in length and up to 4.5m in height. The bunds will provide visual screening for residential properties along Chorlton Lane and in Chorlton village (see Volume 2: Map CT-06-238, G4 to C5);
- diversion of Basford Footpath 4, to tie in diversions to the diverted Casey Lane, north of the WCML. This diversion will increase the length of the journey by 32m (see Volume 2: Map CT-06-239, G4 to E4);
- closure of Casey Lane, where it crosses the Proposed Scheme, including the demolition of an existing overbridge. Casey Lane will be diverted to the east of the Proposed Scheme from its existing junction with Weston Lane to the realigned Newcastle Road, 650m north of its existing alignment (see Volume 2: Map CT-06-239, G4 to C4);
- areas of woodland habitat creation on the eastern side of the Proposed Scheme, along Basford Footpath 3 and Casey Lane (see Volume 2: Map CT-06-239, E2 to C3);
- a balancing pond for highway drainage within an area of landscape mitigation planting to help integrate the Proposed Scheme into the surrounding landscape, located to the east of the existing WCML. Access will be provided from the diverted Casey Lane (see Volume 2: Map CT-06-239, E4);

- a balancing pond for railway drainage within an area of grassland habitat creation to provide replacement habitat, located to the east of the WCML. Access will be provided from the diverted Casey Lane (see Volume 2: Map CT-06-239, D4 to D5); and
- an access road for Network Rail maintenance of the WCML, 1km in length, running to the east of the WCML via the A5020 David Whitby Way. The access road will pass over the Basford Brook via the Basford Brook bridge, located approximately 250m north of Crotia Mill Farm. The access road will pass over a drainage ditch via the Network Rail maintenance access road culvert, located approximately 300m north-west of Crotia Mill Farm (see Volume 2: Map CT-06-240-R1, G4 to D9).

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

2.2.46 Construction of this section will be managed from the Blakenhall cutting satellite compound, Chorlton cutting satellite compound, Crewe South portal satellite compound and Basford cutting main compound, which are described in Section 2.3, and shown on maps CT-05-236, CT-05-237, and CT-05-239.

Works at Crewe Station

2.2.47 In order to accommodate additional rail services at Crewe Station, the existing Cardiff to Manchester Piccadilly services will be diverted via the Manchester Independent Lines tunnel at Crewe. A new island platform will be constructed at Crewe Station to accommodate this service. Minor works within the existing Crewe Station will include provision of new signage and information systems.

2.2.48 This section is illustrated on Maps CT-06-240 to CT-06-241a.

2.2.49 Key features will include:

- a new island platform, 110m in length, to accommodate conventional rail services for trains up to four carriages long (up to 96m in length). This new island platform will be situated to the west of the existing Crewe Station platforms (see Volume 2: Map CT-06-241a, E6);
- lowering of an existing track for conventional rail services (on independent railway lines), by up to 1m below existing track level to accommodate the new platform (see Volume 2: Map CT-06-241a, H7 to E6);
- Crewe retaining wall 1, 140m in length and up to 2m in height, located south-east of the new island platform (see Volume 2: Map CT-06-241, H7 to G7);
- lowering of an existing track for conventional rail services (on independent railway lines), by up to 1.4m below existing track level to accommodate the new platform (see Volume 2: Map CT-06-241a, E6 to H7);
- Crewe retaining wall 2, 220m in length and up to 4m in height, located north of

the new island platform (see Volume 2: Map CT-06-241a, F6 to E6);

- a new Crewe Station footbridge, 74m in length and with a minimum clearance of 6.2m above track level, to provide public access via stairs and lift to the new island platform. The new footbridge will provide access from the west of the existing station and cross over an existing access road (with a minimum clearance of 5.8m), car park, and rail lines (see Volume 2: Map CT-06-241a, F6);
- a footbridge providing a secondary means of exit from the new platform for emergency evacuation, 37m in length and with a minimum clearance of 6.2m above track level, to be located at the north end of the new island platform (see Volume 2: Map CT-06-241a, E6); and
- modifications to the signalling, overhead lines, cable routes and other railway systems within the area to facilitate the Proposed Scheme.

2.2.50 Construction of this new island platform and supporting infrastructure will be managed from the Motorail Terminal main compound and Alexandra Stadium satellite compound, which are described in Section 2.3, and shown on maps CT-05-241a.

Demolitions

2.2.51 Demolition of five commercial and business properties (including farm outbuildings) and four other structures will be required to construct the permanent features in the South Cheshire area. Demolitions will 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 South Cheshire area. It includes:

- an overview of the construction process;
- a description of the advance works;
- a description of the engineering works to build the Proposed Scheme;
- information on construction waste and material resources;
- a description of how the Proposed Scheme will be commissioned;
- an indicative construction programme; and
- monitoring arrangements during the construction period.

2.3.2 The construction arrangements described in this section provide the basis for the assessment presented in this ES.

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

- 2.3.4 Land will be required permanently for the key features of the Proposed Scheme described in Section 2.2.
- 2.3.5 During the construction phase, public roads and PRow routes will remain open for public use wherever reasonably practicable. Where such routes cross the Proposed Scheme and require diversion, the alternative road or PRow crossing the Proposed Scheme will be constructed prior to any closure of existing roads or PRow, wherever reasonably practicable. Where they 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 will be provided where it is safe and reasonably practicable to do so.
- 2.3.6 Volume 1, Section 5 and Section 6 provide details of the 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

- 2.3.7 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 general control measures and standards to be implemented throughout the construction process.
- 2.3.8 A draft CoCP has been prepared and is published as part of this ES, in Volume 5: Appendix CT-003-000. It will remain a draft document through the parliamentary process and will be finalised at Royal Assent. The CoCP sets out measures to be implemented by the nominated undertaker.

Overview of the construction process

- 2.3.9 Building and preparing the Proposed Scheme for operation will comprise the following general stages:
- advance works including: site investigations further to those already undertaken and preliminary mitigation works;
 - civil engineering works including: extraction of sand and gravel from borrow pits; establishment of construction compounds; site haul routes, site preparation and enabling works; main earthworks and structure works; site restoration; removal of construction compounds where the compound is not required for railway installation works; and associated utility diversions;
 - railway installation works including: establishment of construction compounds; infrastructure installation; connections to utilities; changes to the existing rail network; and removal of construction compounds;
 - site finalisation works; and
 - systems testing and commissioning.

2.3.10 General information about the construction process is set out in more detail in Volume 1, Section 6, and the following sections of the draft CoCP (see Volume 5: Appendix CT-003-000) 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

2.3.11 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;
- 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; and
- site establishment with temporary fence construction; along with soil stripping and vegetation removal.

Engineering works

Introduction

2.3.12 Construction of the Proposed Scheme will 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, erection of bridges and viaducts and works to public roads; and
- works to install, test and commission railway systems, including track, overhead line equipment, communications and signalling equipment and traction power supply.

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

2.3.14 The construction of the Proposed Scheme will be divided into sections, each of which will be managed from compounds. The compounds will act as the main interface between the construction work sites and the public highway, as well as performing other functions as described below. Compounds will either be main compounds or

satellite compounds. Satellite compounds are generally smaller. Compounds will either be used for civil engineering works, for railway installation works, or for both.

- 2.3.15 One main civil engineering compound and six civil engineering satellite compounds will be located in the South Cheshire area. Three of the civil engineering satellite compounds will continue to be used as compounds for railway systems works following the completion of civil engineering works, with two continuing as satellite compounds and one as a main compound (known as the Checkley Lane East main compound). In addition, there will be a further 13 additional satellite compounds and one main compound used for railway systems works.
- 2.3.16 Of the total 15 satellite compounds used for railway systems works, 14 will be managed from the Checkley Lane East main compound and one, the Alexandra Stadium satellite compound used for works to Crewe Station, will be managed from the Motorail Terminal main compound.
- 2.3.17 Figure 5 shows the management relationship for civil engineering works compounds and Figure 6 for the railway installation works. Figure 7 shows the management relationship for the railway installation works at Crewe Station. Details about the works associated with individual compounds are provided in subsequent sections of this report.
- 2.3.18 Figure 8 provides a programme of works which will be managed from each construction compound. All dates and durations of activities set out in this section are indicative.

General overview of construction compounds

- 2.3.19 Main compounds will be used by core project management staff (i.e. engineering, planning and construction delivery) and commercial and administrative staff. These teams will directly manage some works and coordinate the works at the satellite compounds. In general, a main compound will 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.
- 2.3.20 In the South Cheshire area accommodation will be provided at the Basford cutting main compound for the construction workforce. Details of the location and duration of worker accommodation are provided in the description of the compound.
- 2.3.21 Satellite compounds will 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.

- 2.3.22 The storage of soil, stripped as part of the works prior to it being re-used when the land is reinstated, requires land for the duration of construction. The location of soil storage areas will generally be within and 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-05-235 to CT-05-241a in the Volume 2: CA5 Map Book.
- 2.3.23 Further information on the function of compounds is provided in Section 6 of Volume 1 and Section 5 of the draft CoCP. This includes general provisions for the operation of compounds, such as security fencing, lighting, utilities supply, site drainage and codes of worker behaviour.

Construction traffic routes, site haul routes and transfer nodes

- 2.3.24 The movement of construction vehicles, whether to carry materials, plant, other equipment and workforce, or moving empty, will 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 work sites will be on designated site haul routes within the site, often along the line of the route of the Proposed Scheme or running parallel to it.
- 2.3.25 The proposed railhead near Stone (in the Stone and Swynnerton area (CA3)) will connect with the existing railway network for the delivery of large materials required for the construction of the railway systems and the movement of excavated materials. This will reduce the volume of construction vehicles using the public road network.
- 2.3.26 The construction compounds will provide the interface between the construction works and the public road or railway network. The likely road routes to access compounds in the South Cheshire 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 will be used as construction traffic routes, but which are at a distance from the route of Proposed Scheme. These minor works are reported in Volume 4, Off-route effects.
- 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 will allow transfer of material between road vehicles and site vehicles during construction to balance traffic movements on the road network. These areas are referred to as transfer nodes and are shown on maps CT-05-235 to CT-05-241a in the Volume 2: CA5 Map Book.

Use of borrow pits

- 2.3.29 The Proposed Scheme will require high quality aggregate for construction. This will be provided, in part, through excavation of cuttings and other earthworks. However, it is unlikely that excavation across the Proposed Scheme will generate sufficient volume of suitable quality materials. As a result, it would be necessary to import material, either from further distances across the Proposed Scheme or from other sources. In

some locations this would be likely to result in significant adverse transport effects during construction on minor roads used by local communities. Therefore, six borrow pits in proximity to the route of the Proposed Scheme are proposed along the length of the route, of which one will be located in the South Cheshire area.

- 2.3.30 A borrow pit is an area where material, usually sand and gravel, is excavated for use in the construction of nearby infrastructure projects. In most cases the sand and gravel is used for road or rail earthworks. The use of borrow pits is intended to reduce the need for longer distance transport and import of materials, therefore, reducing the volume and impact of road traffic on local roads and communities.
- 2.3.31 For the purpose of this assessment, it has been assumed that borrow pit sites will be restored to existing ground level and land use once excavation has been completed. It is anticipated that borrow pits will be restored with materials generated from construction of the Proposed Scheme, typically clay, which does not have suitable characteristics for use as construction or engineering fill. Further information on the need, use and restoration strategy for borrow pits is provided in Volume 1, Section 6.
- 2.3.32 In the South Cheshire area, one borrow pit will be used to extract sand and gravel for construction, located near Checkley Lane, north of Randilow Farm, shown on Volume 2: Maps CT-05-235, D6 to A1 and CT-05-236, J4 to F3.
- 2.3.33 The borrow pit will (all dimensions are approximate):
- be excavated across an area of up to 40ha, to a depth of 1m above existing groundwater level²⁵. Topsoils and subsoils will be stripped from the borrow pit area and be stored and used in the restoration of the borrow pit; and
 - be accessed initially during site set up from Checkley Lane. The main access will then be via site haul routes, along the route of the Proposed Scheme.
- 2.3.34 The borrow pit will be excavated over a period of four years and will be progressively backfilled during this period. During the period of operation of the borrow pit, processes such as dewatering, crushing and materials blending may be carried out on the site. The borrow pit site will be restored to a condition suitable for a return to its existing land use.
- 2.3.35 The majority of material being excavated from the borrow pit will be used within the South Cheshire area and transported along the route of the Proposed Scheme via site haul routes. It may also be transported to construct parts of the Proposed Scheme in the Stone and Swynnerton area (CA3) and Whitmore Heath and Madeley (CA4). The material to infill the borrow pit for restoration (which will be material excavated from cuttings and other earthworks to construct the Proposed Scheme) will be provided from more distant locations across the route, as such it may be necessary to transport some material along public roads.

²⁵ Or alternative method agreed with the relevant stakeholders to ensure that there will be no significant impact to the flow or quality of groundwater and surface water reaching Betley Mere SSSI. If it can be confirmed that there is no hydrological connectivity between the borrow pit area and Betley Mere, this measure may not be required, subject to agreement with relevant stakeholders.

Figure 5: Construction compounds showing key civil engineering works within the South Cheshire area

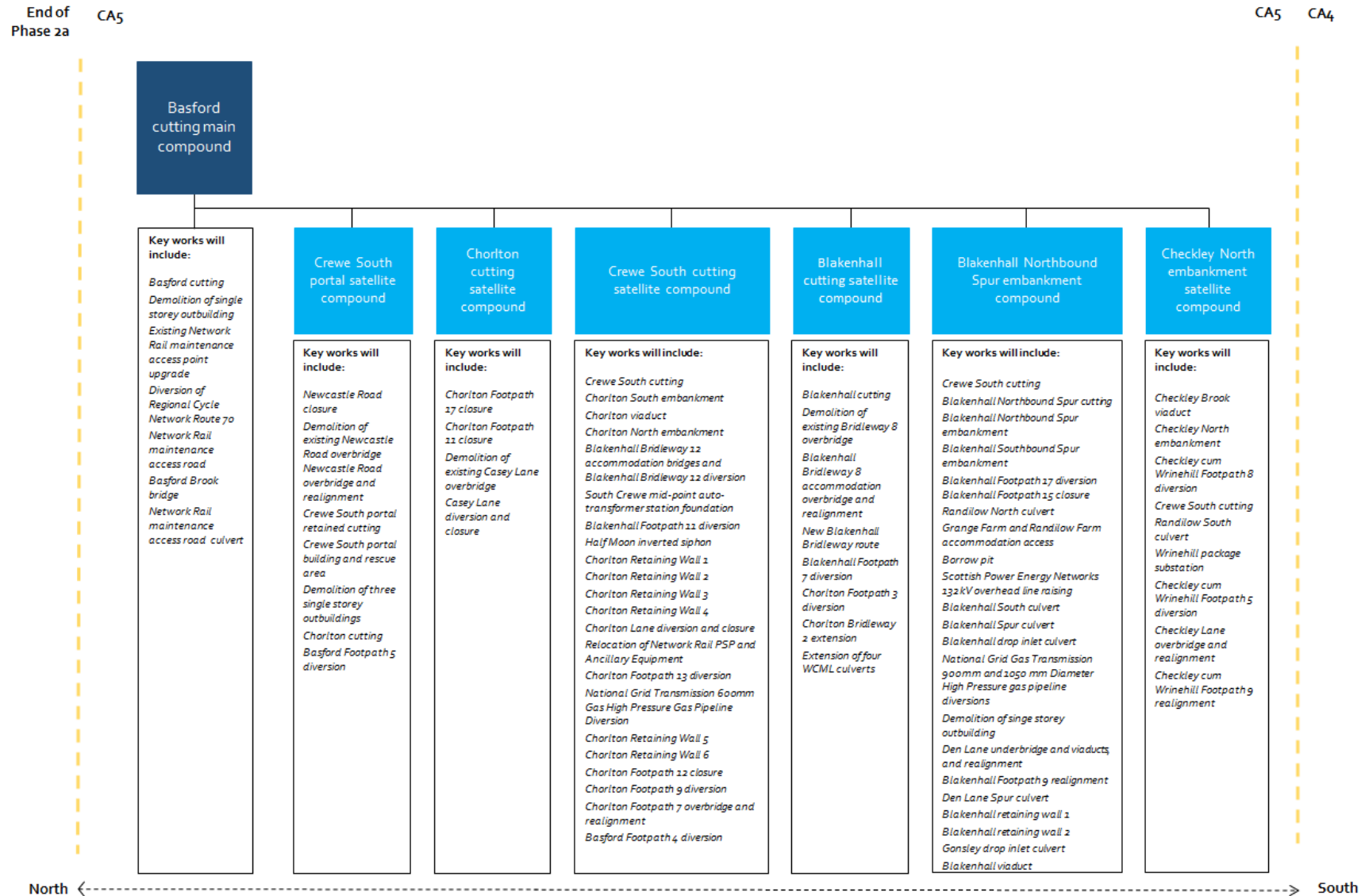


Figure 6: Construction compounds within the South Cheshire Area for railway installation works

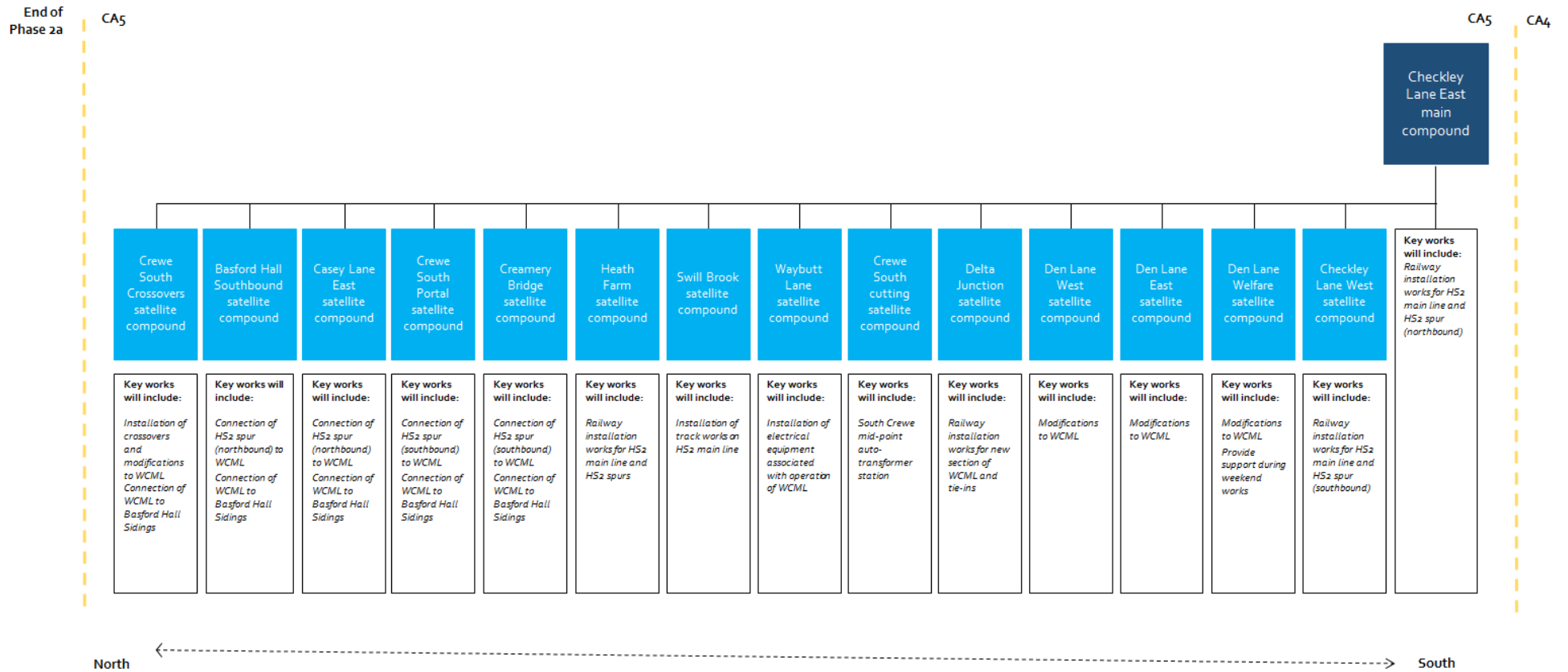
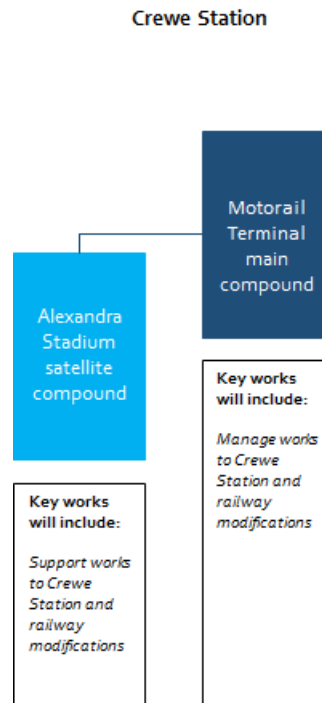


Figure 7: Construction compounds for railway installation works showing key works at Crewe Station



2.3.37 This section provides details of the works to be managed from the construction compounds in the South Cheshire area, including duration of works, number of workers and a summary of the works to be undertaken. All dates and durations of activities and number of workers are indicative.

Checkley North embankment satellite compound/Checkley Lane East main compound

2.3.38 This compound (see Volume 2: Map CT-05-235, F5) will be used for civil engineering and railway installation works. Civil engineering works will be managed from the Checkley North embankment satellite compound. After the civil engineering works are complete, this compound will reduce in size to form the Checkley Lane East main compound, which will manage 14 railway systems compounds in the South Cheshire area. This compound will:

- be operational for six years, commencing during 2020. Civil engineering works will be managed from this compound for a period of four years and three months, followed by railway installation works for a period of one year and nine months;
- support 20 civil engineering workers per day (30 workers at peak times);
- support 35 railway systems installation workers per day (50 workers at peak times);
- be accessed via site haul routes to the east and west of the HS2 main line, connecting to Checkley Lane; and
- provide three temporary material stockpile areas (see Volume 2: Map CT-05-235, G8 to E4).

2.3.39 There will be no worker accommodation associated with this compound.

2.3.40 The works to be managed from this compound will not require demolition of any buildings.

2.3.41 The compound will be used to manage the construction of the following bridges and viaducts:

- Checkley Brook viaduct, which will take two years and nine months to complete; and
- Checkley Lane overbridge, which will take one year and nine months to complete.

2.3.42 The compound will be used to manage construction of the following earthworks:

- Checkley North embankment, which will take one year and nine months to complete; and
- Crewe South cutting, which will take two years and three months to complete.

2.3.43 Materials for the Checkley North embankment will be received from the Crewe South cutting, from cuttings elsewhere along the Proposed Scheme and/or from borrow pits.

- 2.3.44 The works to be managed from this compound will require the permanent realignment of Checkley Lane, which will take one year to complete. The realignment will be built offline²⁶ and on completion of construction, a temporary diversion for 50m on both ends of the realignment, which will be 25m to the north of the existing road on the east side of the realignment, and 25m to the south of the existing road on the west end of the realignment) and traffic management measures will be required for a period of three months to enable connection to the new realigned Checkley Lane.
- 2.3.45 The works to be managed from this compound will require the following works to PRow:
- two temporary diversions of Checkley cum Wrinehill Footpath 8 for a period of three years during construction. The first temporary diversion will be a local diversion of 250m, to divert users onto Checkley Lane, around the area required for construction. The second temporary diversion will divert users south-east towards Checkley Brook before joining the Madeley Footpath 7 temporary diversion (managed from the Checkley South embankment satellite compound within the Whitmore Heath to Madeley area (CA4)) south of Checkley Brook. On completion of construction, the Checkley cum Wrinehill Footpath 8 will be permanently diverted by 250m to the south-east of its existing alignment, increasing the journey length by 400m;
 - temporary diversion of Checkley cum Wrinehill Footpath 4 for a period of three years during construction. The diversion will direct users 25m south of the existing alignment, to the west of the HS2 main line, to avoid interacting with a site haul route. On completion of construction, the Checkley cum Wrinehill Footpath 4 will be returned to its existing alignment;
 - temporary diversion of Checkley cum Wrinehill Footpath 5 for a period of three years during construction. Users will be diverted north-east along Checkley Lane to use Checkley cum Wrinehill Footpath 8. On completion of construction, Checkley cum Wrinehill Footpath 5 will be permanently diverted 100m north-east of its existing alignment; and
 - permanent realignment of Checkley cum Wrinehill Footpath 9, 50m west of its existing alignment.
- 2.3.46 Construction of Randilow South culvert for surface water drainage will be managed from this compound and will take six months to complete.
- 2.3.47 The compound will be used to manage the construction and installation of the Wrinehill package substation, which will take six months to complete. Access to these works will be from Checkley Lane.
- 2.3.48 During the period of railway systems works, this compound will be used to manage the track installation associated with the HS2 main line and the HS2 spur (northbound).

²⁶ Offline works are works which are generally constructed along or nearby the existing routes, which will remain open during construction.

2.3.49 Finalisation works will include site reinstatement, landscaping and planting.

Checkley Lane West satellite compound

2.3.50 The compound will be used to manage the track installation associated with the HS2 main line and the HS2 spur (southbound) (see Volume 2: Map CT-05-235, F7).

2.3.51 The compound will:

- be operational for one year and three months, commencing during 2025;
- support 15 railway systems installation workers per day (30 workers at peak times); and
- be accessed via site haul routes to the east and west of the HS2 main line, connecting to Checkley Lane.

2.3.52 There will be no worker accommodation associated with this compound.

2.3.53 The works to be managed from this compound will not require demolition of any buildings.

2.3.54 Other works that will be managed from this compound include enabling works and finalisation works including site reinstatement, fencing, planting, and landscaping.

Den Lane welfare satellite compound

2.3.55 This compound will be used to manage the railway system modifications to the WCML near Den Lane. This compound will also be used to provide support during weekend works to the WCML (see Volume 2: Map CT-05-236-R1, G10 to F10).

2.3.56 This compound will:

- be operational for six months, commencing during 2025;
- support 55 railway systems installation workers per day (110 workers at peak times) throughout the works period; and
- be accessed via Den Lane.

2.3.57 There will be no worker accommodation associated with this compound.

2.3.58 The works to be managed from this compound will not require demolition of any buildings.

2.3.59 Other works that will be managed from this compound include site clearance, enabling works, and finalisation works including site reinstatement, fencing, planting, and landscaping.

Den Lane East satellite compound

2.3.60 This compound will be used to support the railway system modification works to the WCML near Den Lane (see Volume 2: Map CT-05-236-R1, G10 to F10)

2.3.61 This compound will:

- be operational for two years and three months, commencing during 2024;

- support 10 railway systems installation workers per day (also 10 workers at peak) throughout the works period; and
- be accessed via Den Lane.

2.3.62 There will be no worker accommodation associated with this compound.

2.3.63 The works to be managed from this compound will not require demolition of any buildings.

2.3.64 Other works that will be managed from this compound include site clearance, enabling works, and finalisation works including site reinstatement, fencing, planting, and landscaping.

Den Lane West satellite compound

2.3.65 This compound (see Volume 2: Map CT-05-236, G1 to F1) will be used to support the railway system modification works to the WCML near Den Lane and will:

- be operational for two years and three months, commencing during 2024;
- support 20 railway systems installation workers per day (105 workers at peak times) throughout the works period; and
- be accessed via Den Lane.

2.3.66 There will be no worker accommodation associated with this compound.

2.3.67 The works to be managed from this compound will not require demolition of any buildings.

2.3.68 Other works that will be managed from this compound include site clearance, enabling works, and finalisation works including site reinstatement, fencing, planting, and landscaping.

Blakenhall Northbound Spur embankment satellite compound

2.3.69 This compound (see Volume 2: Map CT-05-236, D8 to C7) will provide for civil engineering works and will:

- be operational for four years and three months, commencing during 2020;
- support 85 civil engineering workers per day (120 workers at peak times);
- be accessed via site haul routes to the west of the HS2 main line, connecting into Den Lane; and
- provide seven temporary material stockpile areas (see Volume 2: Map CT-05-235, D7 to A7 and Map CT-05-236, F7 to D8).

2.3.70 There will be no worker accommodation associated with this compound.

2.3.71 Demolition of one building associated with one commercial property will be required as a result of the works to be managed from this compound, as described in Table 2.

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Table 2: Demolitions to be managed from the Blakenhall Northbound Spur embankment satellite compound

Description	Location	Feature resulting in the demolition
Commercial		
Single storey outbuilding, which is associated with Network Rail owned land	Den Lane, adjacent to where Den Lane crosses over the WCML, 250m south-east of Higher Den Farm.	Modifications to the WCML
2.3.72	This compound will be used to manage the works associated with the excavation, material extraction and backfilling of the borrow pit north of Checkley Lane, over a period of approximately four years. Access to the borrow pit will be directly from site haul routes along the east side of the HS2 main line and HS2 spur (southbound).	
2.3.73	<p>The compound will be used to manage the construction of the following bridges and viaducts:</p> <ul style="list-style-type: none"> • Blakenhall viaduct, which will take one year and nine months to complete; • Den Lane Central underbridge, which will take one year and nine months to complete; • Den Lane East viaduct, which will take one year and three months to complete; and • Den Lane West viaduct, which will take one year and six months to complete. 	
2.3.74	<p>The compound will be used to manage construction of the following earthworks:</p> <ul style="list-style-type: none"> • Crewe South cutting, which will take two years and three months to complete; • Blakenhall Northbound Spur cutting, which will take three years to complete; • Blakenhall Southbound Spur embankment, which will take two years and six months to complete; and • Blakenhall Northbound Spur embankment, which will take one year to complete. 	
2.3.75	Material for the Blakenhall Northbound Spur embankment and Blakenhall Southbound Spur embankment will be received from the Crewe South cutting, Blakenhall Northbound Spur cutting, from cuttings elsewhere along the Proposed Scheme and/or from borrow pits.	
2.3.76	<p>The compound will be used to manage construction of the following retaining walls:</p> <ul style="list-style-type: none"> • Blakenhall retaining wall 1, which will take one year and three months to complete; and • Blakenhall retaining wall 2, which will take one year and three months to complete. 	
2.3.77	The works to be managed from this compound will require the permanent realignment of Den Lane, 230m to the south of its existing alignment, which will take nine months to complete. The diversion will be built offline and on completion of construction, lane closures and traffic management measures will be required for a period of three months to enable connection to the diverted Den Lane.	

- 2.3.78 This compound will be used to manage the construction of accommodation access for Randilow Farm and Grange Farm to allow access to agricultural fields following completion of construction, which will take nine months to complete.
- 2.3.79 The works to be managed from this compound will require the following works to PRow:
- permanent closure of Checkley cum Winehill Footpath 15;
 - temporary diversion of the Blakenhall Footpath 17 for a period of three years during construction. This will divert users south-east, passing Grange Farm on the west of the HS2 main line around the area of construction to join Checkley Lane. On completion of construction, Blakenhall Footpath 17 will be permanently diverted 600m south-east of its existing alignment; and
 - temporary closure of Blakenhall Footpath 9 for a period of one year and six months during construction. Users will be diverted onto Mill Lane and Den Lane to avoid the area required for the construction of the Den Lane East viaduct, Den Lane Central underbridge and Den Lane West viaduct. On completion of construction, there will be a permanent diversion of Blakenhall Footpath 9, 125m north of its existing alignment.
- 2.3.80 The works to be managed from this compound will require the following drainage works and watercourse diversions:
- Randilow North culvert, for surface water drainage under the Proposed Scheme, which will take six months to complete;
 - Blakenhall South culvert, for surface water drainage, which will take six months to complete;
 - Blakenhall Spur culvert, for surface water drainage, which will take six months to complete;
 - Blakenhall drop inlet culvert, for surface water drainage, which will take nine months to complete;
 - Den Lane Spur culvert, for surface water drainage, which will take six months to complete; and
 - Gonsley drop inlet culvert, for diversion of an unnamed watercourse, which will take nine months to complete.
- 2.3.81 The works to be managed from this compound will require the following works to utilities:
- raising of a 132kV Scottish Power Energy Networks overhead line for 860m, to cross over the Proposed Scheme 1km north of the Checkley Lane overbridge, which will take one year to complete;
 - diversion of a National Grid gas transmission 1,050mm high pressure pipeline, for 750m in length, to pass under the HS2 main line 250m south of the Den Lane Central underbridge, which will take nine months to complete;

- diversion of a National Grid gas transmission 900mm high pressure pipeline, for 850m under the HS2 main line, 65m north of the Den Lane Central underbridge, which will take nine months to complete; and
- raising of a 132kV Scottish Power Energy Networks overhead line for 750m, to cross over the Proposed Scheme 625m north of the Den Lane Central underbridge, which will one year to complete.

2.3.82 Finalisation works will include site reinstatement, landscaping and planting.

Blakenhall cutting satellite compound

2.3.83 This compound (see Volume 2: Map CT-05-236, B1 to B2) will provide for civil engineering works and will:

- be operational for three years, commencing during 2020;
- support 35 civil engineering workers per day (50 workers at peak times), throughout the works period;
- be accessed off site haul routes to the north and south of the WCML, connecting to Den Lane and Chorlton Lane; and
- provide nine temporary material stockpile areas (see Volume 2: Map CT-05-236, C3 to A4).

2.3.84 There will be no worker accommodation associated with this compound.

2.3.85 Demolition of one structure will be required as a result of the works to be managed from this compound, as described in Table 3.

Table 3: Demolitions to be managed from the Blakenhall cutting satellite compound

Description	Location	Feature resulting in the demolition
Other		
Lower Den Farm overbridge (used to carry Blakenhall Bridleway 8) over the WCML.	Overbridge crosses the WCML, east of the HS2 main line and adjacent to the west of Lower Den Farm.	Modifications to the WCML.

2.3.86 The compound will be used to manage construction of the Blakenhall Bridleway 8 accommodation overbridge, which will take nine months to complete.

2.3.87 The compound will be used to manage construction of the Blakenhall cutting, which will take one year and three months to complete. Material from the Blakenhall cutting will be used as engineering material for construction locally within the South Cheshire area, insofar as reasonably practicable.

2.3.88 The works to be managed from this compound will require the following works to PRoW:

- temporary diversions of Blakenhall Bridleway 8 for a period of one year and six months during construction, diverting users around the area required for construction the Blakenhall Bridleway 8 accommodation overbridge and to the north of the Den Lane West viaduct. On completion of construction, Blakenhall Bridleway 8 will be permanently realigned by approximately 75m to the west of its existing alignment over the Blakenhall Bridleway 8

accommodation overbridge;

- construction of Blakenhall New Bridleway and maintenance access road, on the south-west side of the existing WCML, extending from Blakenhall Bridleway 8 accommodation overbridge to the Blakenhall Bridleway 12 east accommodation overbridge;
- permanent diversion of Blakenhall Footpath 7, 250m west of its existing alignment, along the west side of the existing WCML to join Blakenhall Bridleway 12;
- permanent diversion of Chorlton Footpath 3 west of the WCML, 450m south-east of its existing alignment along a maintenance access road from Blakenhall Bridleway 8 accommodation overbridge; and
- permanent extension of Chorlton Bridleway 2, to the west side of Waybutt Lane to Chorlton Lane.

2.3.89 This compound will be used to manage the extension of four existing WCML culverts under access tracks used to divert an unnamed existing watercourse.

2.3.90 Finalisation works will include site reinstatement, landscaping and planting.

Delta Junction satellite compound

2.3.91 This compound will be used to manage works associated with the new section of the WCML. This will include the installation of tracks and tie-ins to the existing WCML (see Volume 2: Map CT-05-237, G5 to F4).

2.3.92 This compound will:

- be operational for one year and three months, commencing during 2025;
- support 10 railway systems installation workers per day (also 10 workers at peak) throughout the works period; and
- be accessed via site haul routes to the east of the HS2 main line, connecting to Den Lane.

2.3.93 There will be no worker accommodation associated with this compound.

2.3.94 The works to be managed from this compound will not require demolition of any buildings.

2.3.95 Other works that will be managed from this compound include site clearance, enabling works, and finalisation works including site reinstatement, fencing, planting, and landscaping.

Crewe South cutting satellite compound

2.3.96 This compound (see Volume 2: Map CT-05-237, E7 to E8) will be used for civil engineering and railway installation works. After the civil engineering works are complete, this compound will reduce in size and be used to manage railway system works. This compound will:

- be operational for five years and three months, commencing during 2020. Civil

engineering works will be managed from this compound for a period of four years and three months. After the civil engineering works are complete, this compound will continue to be used to manage railway systems works for one year;

- support 80 civil engineering workers per day (115 workers at peak times), throughout the works period;
- support 30 railway systems installation works per day (45 workers at peak times), throughout the works period;
- be accessed via the diverted Chorlton Lane; and
- provide seven temporary material stockpile areas (see Volume 2: Map CT-05-237, D8 to A6 and Map CT-05-238, J6 to C7).

2.3.97 There will be no worker accommodation associated with this compound.

2.3.98 Demolition of one structure will be required as a result of the works to be managed from this compound, as described in Table 4.

Table 4: Demolitions to be managed from the Crewe South cutting satellite compound

Description	Location	Feature resulting in the demolition
Other		
Chorlton Footpath 7 footbridge	250m east of Heath Farm	HS2 main line, HS2 spurs and new section of WCML.

2.3.99 The compound will be used to manage the construction of the following bridges and viaducts:

- Chorlton viaduct, which will take one year and six months to complete;
- Blakenhall Bridleway 12 West accommodation overbridge, which will take six months to complete;
- Blakenhall Bridleway 12 Central accommodation underbridge, which will take nine months to complete;
- Blakenhall Bridleway 12 East accommodation overbridge, which will take nine months to complete; and
- Chorlton Footpath 7 overbridge, which will take six months to complete.

2.3.100 The compound will be used to manage construction of the following earthworks:

- Chorlton South embankment, which will take two years and three months to complete;
- Chorlton North embankment, which will take two years and three months to complete; and
- Crewe South cutting, which will take two years and six months to complete.

- 2.3.101 Material for the Chorlton South embankment and Chorlton North embankment will be received from the Crewe South cutting, from cuttings elsewhere along the Proposed Scheme and/or from borrow pits.
- 2.3.102 In addition, the compound will be used to manage construction of the following retaining walls:
- Chorlton retaining wall 1, which will take one year and three months to complete;
 - Chorlton retaining wall 2, which will take nine months to complete;
 - Chorlton retaining wall 3, which will take one year and nine months to complete;
 - Chorlton retaining wall 4, which will take one year and three months to complete;
 - Chorlton retaining wall 5, which will take six months to complete; and
 - Chorlton retaining wall 6, which will take one year and nine months to complete.
- 2.3.103 The works to be managed from this compound will require the permanent diversion of Chorlton Lane on the west side of the HS2 main line in a north-west direction to join Newcastle Lane, which will take nine months to complete. On completion of construction, a section of Chorlton Lane will be permanently closed where it crosses the Proposed Scheme.
- 2.3.104 The works to be managed from this compound will require the following works to PRoW:
- permanent diversion of Blakenhall Footpath 11, 150m south-west of its existing alignment, to the west of the HS2 main line along the South Crewe mid-point auto-transformer station access road;
 - temporary diversion of Hough Footpath 11 in two places for a period of one year and six months to pass around the area required for construction to connect into the diverted Blakenhall Bridleway 12. On completion of construction, the Hough Footpath 11 will be returned to its existing alignment;
 - temporary diversion of Blakenhall Bridleway 12 to the east of the new section of WCML for a period of one year and six months. This will divert users for 100m, 25m south of the existing alignment around Blakenhall Bridleway 12 construction works. On completion of construction, Blakenhall Bridleway 12 will be permanently diverted 550m to the west of its existing alignment;
 - permanent closure of a section of Chorlton Footpath 12 where it crosses the Proposed Scheme. Users will be diverted from Chorlton Lane via the diverted Chorlton Footpath 13;
 - permanent diversion of Chorlton Footpath 13 to the east of the HS2 main line to join the diverted Chorlton Footpath 9;

- permanent diversion of Chorlton Footpath 9, 25m east of its existing alignment, to join Chorlton Footpath 7;
- permanent realignment of Chorlton Footpath 7, 20m to the north of its existing alignment, over the Chorlton Footpath 7 overbridge; and
- temporary diversion of Basford Footpath 4 for a period of three years. This will divert users 30m east of the existing alignment around the area required for construction. On completion of construction, two sections of Basford Footpath 4 will be permanently diverted to run along a section of the diverted Casey Lane.

- 2.3.105 The compound will be used to manage construction of the Half Moon inverted siphon for realignment of a tributary attributed to the Swill Brook, which will take six months to complete.
- 2.3.106 The compound will be used to manage the diversion of a National Grid gas transmission 600mm high pressure pipeline by 425m, which will take one year to complete.
- 2.3.107 Key railway systems works to be managed from this compound will include construction and installation of the South Crewe mid-point auto-transformer station, located 200m north of Gonsley Green Farm. The construction of the South Crewe mid-point auto-transformer station foundations and building will take six months to complete. The installation of the South Crewe mid-point auto-transformer station railway systems equipment will take one year and six months to complete. Construction works for the South Crewe mid-point auto transformer station will be accessed from Tameside Drive.
- 2.3.108 Finalisation works will include site reinstatement, landscaping and planting.

Waybutt Lane satellite compound

- 2.3.109 This compound will be used to manage the installation of electrical equipment associated with the operation of the WCML (see Volume 2: Map CT-05-237, E4 to D4).
- 2.3.110 The compound will:
- be operational for one year, commencing during 2025;
 - support 30 railway systems installation workers per day (45 workers at peak times) throughout the works period; and
 - be accessed via site haul routes, connecting into Den Lane or Chorlton Lane.
- 2.3.111 There will be no worker accommodation associated with this compound.
- 2.3.112 The works to be managed from this compound will not require demolition of any buildings.
- 2.3.113 Other works that will be managed from this compound include site clearance, enabling works, and finalisation works including site reinstatement, fencing, planting, and landscaping.

Swill Brook satellite compound

- 2.3.114 This compound will be used to manage the installation of track works on the HS2 main line (see Volume 2: Map CT-05-237, B6).
- 2.3.115 The compound will:
- be operational for six months, commencing during 2026;
 - support 10 railway systems installation workers per day (15 workers at peak times) throughout the works period; and
 - be accessed via site haul routes to the west of the HS2 main line, connecting into the diverted Chorlton Lane.
- 2.3.116 There will be no worker accommodation associated with this compound.
- 2.3.117 The works to be managed from this compound will not require demolition of any buildings.
- 2.3.118 Other works that will be managed from this compound include site clearance, enabling works, and finalisation works including site reinstatement, fencing, planting, and landscaping.

Heath Farm satellite compound

- 2.3.119 This compound will be used to manage track installation associated with the HS2 main line and the HS2 spurs (see Volume 2: Map CT-05-238, D6).
- 2.3.120 This compound will:
- be operational for nine months, commencing during 2025;
 - support 15 railway systems installation workers per day (also 15 workers at peak) throughout the works period;
 - be accessed via the diverted Chorlton Lane and then via site haul routes; and
 - be managed from the Checkley Lane East main compound.
- 2.3.121 There will be no worker accommodation associated with this compound.
- 2.3.122 The works to be managed from this compound will not require demolition of any buildings.
- 2.3.123 Other works that will be managed from this compound include site clearance, enabling works, and finalisation works including site reinstatement, fencing, planting, and landscaping.

Chorlton cutting satellite compound

- 2.3.124 This compound (see Volume 2: Map CT-05-239, H3 to G4) will provide for civil engineering works and will:
- be operational for four years and three months, commencing during 2020;
 - support 20 civil engineering workers per day (30 workers at peak times) throughout the works period;

- be accessed via Newcastle Road; and
- provide two temporary material stockpile areas (see Volume 2: Map CT-05-239, H4 to E3).

2.3.125 There will be no worker accommodation associated with this compound.

2.3.126 Demolition of one structure will be required as a result of the works to be managed from this compound, as described in Table 5.

Table 5: Demolitions to be managed from the Chorlton cutting satellite compound

Description	Location	Feature resulting in the demolition
Other		
Highway bridge over the WCML via Casey Lane.	800m south of the A500 Shavington Bypass.	New section of the WCML and HS2 spurs.

2.3.127 The works to be managed from this compound will require a section of Casey Lane to be diverted to the east of the Proposed Scheme, by 250m, connecting to Weston Lane and Newcastle Road, and will be constructed offline. During this period, users will be diverted via Newcastle Road for a period of two years. On completion of construction, there will be tie-in works and traffic management for a period of three months to connect the existing road with the new diversion. On completion of construction, a section of Casey Lane will be permanently closed where it crosses the connection to the WCML.

2.3.128 The works to be managed from this compound will require the following works to PRoW:

- permanent closure of Chorlton Footpath 17 where it crosses the HS2 main line and new section of WCML;
- permanent closure of Chorlton Footpath 11 from the existing Newcastle Road to where it joins Chorlton Footpath 17; and
- there will be a temporary diversion of Basford Footpath 3 for a period of one year and six months during construction. This will divert users along the Basford Footpath 4 diversion, 500m south of existing alignment. On completion of construction, Basford Footpath 3 will be permanently reinstated on its existing alignment.

2.3.129 Finalisation works will include site reinstatement, landscaping and planting.

Creamery Bridge satellite compound

2.3.130 This compound will be used to manage the connection of the new section of WCML to the HS2 spur (southbound) (see Volume 2: Map CT-05-239, H5 to G5). The compound will also be used to manage the connection of the new section of WCML to the Basford Hall sidings.

2.3.131 This compound will:

- be operational for two years and nine months, commencing during 2024;
- support 15 railway systems installation works per day (55 workers at peak)

times) throughout the works period; and

- be accessed via Newcastle Road and then via site haul routes.

2.3.132 There will be no worker accommodation associated with this compound.

2.3.133 The works to be managed from this compound will not require demolition of any buildings.

2.3.134 Other works that will be managed from this compound include site clearance, enabling works, and finalisation works including site reinstatement, fencing, planting, and landscaping.

Crewe South portal satellite compound

2.3.135 This compound (see Volume 2: Map CT-05-239, F6 to F7) will be used for civil engineering and railway installation works. After the civil engineering works are complete, this compound will reduce in size and be used to manage railway systems works. This compound will:

- be operational for six years, commencing during 2020. Civil engineering works will be managed from this compound for a period of four years and three months, and the compound will then continue to be used for railway installation works for the remaining one year and nine months;
- support 15 civil engineering workers per day (25 workers at peak times) throughout the civil engineering works period;
- support 15 railway systems installation works per day (55 workers at peak times) throughout the railway systems works period;
- be accessed via Newcastle Road; and
- provide two temporary material stockpile areas (see Volume 2: Map CT-05-239 F7 to C6).

2.3.136 There will be no worker accommodation associated with this compound.

2.3.137 Demolition of three commercial buildings and one structure will be required as a result of the works to be managed from this compound, as described in Table 6.

Table 6: Demolitions to be managed from the Crewe South portal satellite compound

Description	Location	Feature resulting in the demolition
Commercial		
Three single storey outbuildings associated with Network Rail infrastructure	West of the WCML, 100m south-east of Basford Farm, Weston Lane.	Basford Hall Southbound satellite compound.
Other		
Highway bridge over the WCML via Newcastle Road.	300m north-east of Heath Farm.	HS2 main line, HS2 spurs, and new section of WCML.

2.3.138 The compound will be used to manage the construction of the Newcastle Road overbridge, which will take one year and three months to complete.

- 2.3.139 The compound will be used to manage construction of Chorlton cutting, which will take two years and nine months to complete. Material from the Chorlton cutting will be used as engineering material for construction locally within the South Cheshire area, insofar as reasonably practicable.
- 2.3.140 The compound will be used to manage the construction of the Crewe South portal retained cutting, which will take three years and three months to complete.
- 2.3.141 The compound will also be used to manage the construction of a tunnel portal building and rescue area, which will take six months to complete.
- 2.3.142 The works to be managed from this compound will require the following works to public roads:
- permanent realignment of Newcastle Road. The realignment will be 250m north of the existing alignment and will cross the Proposed Scheme via the new Newcastle Road overbridge. The existing Newcastle Road will remain open during the construction of the Newcastle Road overbridge, which will be constructed offline. On completion of construction, there will be tie-in works and traffic management for a period of six months to connect the existing road with the new alignment. A section of the existing Newcastle Road will remain open to provide access to properties; and
 - temporary closure of Weston Lane for a period of one month to allow for the installation of a temporary underbridge.
- 2.3.143 The works to be managed from this compound will require the following works to PRoW:
- temporary diversion of Basford Footpath 5 will be required as a result of the works to be managed from this compound for a period of one year and six months during construction. This will divert users 200m south-west of the existing alignment. On completion of construction, Basford Footpath 5 will be permanently diverted by 350m west of its existing alignment; and
 - temporary closure of Basford Footpath 11 for three years during the construction period. On completion of construction, the footpath will be reinstated on its existing alignment.
- 2.3.144 This compound will be used to manage the connection of the new section of WCML to the HS2 spur (southbound). The compound will also be used to manage the connection of the new section of WCML to the Basford Hall sidings.
- 2.3.145 Finalisation works will include site reinstatement, landscaping and planting.

Casey Lane East satellite compound

- 2.3.146 This compound (see Volume 2: Map CT-05-239, D4) will be used to manage the connection of the new section of WCML to the HS2 spur (northbound). The compound will also be used to support the works associated with the connection of the new section of WCML to the Basford Hall sidings. This compound will:
- be operational for two years, commencing during 2024;

- support 10 railway systems installation workers per day (also 10 workers at peak times) throughout the works period; and
- be accessed via Weston Lane or Newcastle Road and site haul routes.

2.3.147 There will be no worker accommodation associated with this compound.

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

2.3.149 Other works that will be managed from this compound include site clearance, enabling works, and finalisation works including site reinstatement, fencing, planting, and landscaping.

Basford Hall Southbound satellite compound

2.3.150 This compound (see Volume 2: Map CT-05-239, D6 to C6) will be used to manage the connection of the new section of WCML to the HS2 spur (northbound). The compound will also be used to support the works associated with the connection between the new section of WCML and the Basford Hall sidings. The compound will:

- be operational for two years and nine months, commencing during 2024;
- support 20 railway systems installation workers per day (55 workers at peak times); and
- be accessed via Weston Lane and Casey Lane for site set up and then via site haul routes.

2.3.151 There will be no worker accommodation associated with this compound.

2.3.152 The works to be managed from this compound will not require demolition of any buildings.

2.3.153 Other works that will be managed from this compound include site clearance, enabling works, and finalisation works including site reinstatement, fencing, planting, and landscaping.

Basford cutting main compound

2.3.154 This compound (see Volume 2: Map CT-05-240, I 10 to H8) will provide for civil engineering works and support six satellite compounds in the South Cheshire area and will:

- be operational for six years and three months, commencing during 2020;
- support 250 civil engineering workers per day (350 workers at peak times);
- provide temporary worker accommodation for 240 workers, including modular accommodation blocks, parking and welfare facilities, for a period of six years and three months;
- be accessed via the A500 Shavington Bypass;
- provide two transfer nodes, accessed via site haul routes west of the HS2 main line, connecting to the A500 Shavington Bypass. The transfer nodes will be

used for the storage, loading, and unloading of bulk earthworks materials, which will be moved to and from the site on public roads. These transfer nodes will be operational for a period of four years and three months (see Volume 2: Map CT-05-240, I6 to H8); and

- provide main compound support to six civil engineering satellite compounds in the South Cheshire area, as illustrated in Figure 5 for the civil engineering works.

2.3.155 Demolition of one building will be required as a result of the works to be managed from this compound, as described in Table 7.

Table 7: Demolitions to be managed from the Basford cutting main compound

Description	Location	Feature resulting in the demolition
Commercial		
Single storey outbuilding associated with Basford Hall Farm.	Basford Hall Farm, Weston Lane.	Site haul routes connecting into Basford cutting main compound.

- 2.3.156 The compound will be used to manage the construction of the Basford Brook bridge, which will take nine months to complete.
- 2.3.157 The compound will be used to manage construction of the Basford cutting, which will take one year and three months to complete. Material from the Basford cutting will be used as engineering material for construction locally within the South Cheshire area, insofar as reasonably practicable.
- 2.3.158 A temporary batching plant will be located within the compound (see Volume 2: Map CT-05-240, I7 to I8), which will provide concrete to the construction works across the Proposed Scheme for a period of four years and three months.
- 2.3.159 The works to be managed from this compound will require temporary local diversion of Basford Footpath 1 for a period of one month where it crosses the proposed Network Rail access road. There will also be crossing measures in place during the construction period. On completion of construction, the footpath will be reinstated on its existing alignment.
- 2.3.160 Permanent diversion of Regional Cycle Route 70 will be required as a result of the works to be managed from this compound. The diversion will not include any construction works to the public road network.
- 2.3.161 Construction of a Network Rail maintenance access road culvert for surface water drainage will be managed from this compound and will take three months to complete.
- 2.3.162 Finalisation works will include site reinstatement, landscaping and planting.
- Crewe South crossovers satellite compound*
- 2.3.163 This compound (see Volume 2: Map CT-05-240, G4 to F4) will be used to manage the installation of crossovers and railway system modifications on the WCML. The compound will also be used to support the installation of the connection between the new section of WCML and the Basford Hall sidings. This compound will:

- be operational for two years, commencing during 2024;
- support 25 railway systems installation workers per day (60 workers at peak times), throughout the works period; and
- be accessed via the A500 Shavington Bypass, the A5020 David Whitby Way, and a maintenance access road.

2.3.164 There will be no worker accommodation associated with this compound.

2.3.165 The works to be managed from this compound will not require demolition of any buildings.

2.3.166 Other works that will be managed from this compound include site clearance, enabling works, and finalisation works including site reinstatement, fencing, planting, and landscaping.

Motorail Terminal main compound

2.3.167 This compound (see Volume 2: Map CT-05-241a, G6 to E6) will be used to manage all construction activities associated with new infrastructure and railway system modifications in and around Crewe Station. This compound will also be used to manage the Alexandra Stadium satellite compound (as illustrated in Figure 7). This compound will:

- be operational for two years and nine months, commencing during 2020;
- support 70 railway systems installation workers per day (also 70 workers at peak) throughout the works period; and
- be accessed via the A534 Nantwich Road.

2.3.168 There will be no worker accommodation associated with this compound.

2.3.169 The works to be managed from this compound will not require demolition of any buildings.

2.3.170 Other works that will be managed from this compound include enabling works and finalisation works including site reinstatement and fencing.

Alexandra Stadium satellite compound

2.3.171 This compound (see Volume 2: Map CT-05-241a, F7) will be used to support the railway system works at Crewe Station. This compound will:

- be operational for two years and nine months, commencing during 2020;
- support 20 railway systems installation workers per day (also 20 workers at peak) throughout the works period; and
- be accessed via the B5071 Gresty Road.

2.3.172 There will be no worker accommodation associated with this compound.

2.3.173 The works to be managed from this compound will not require demolition of any buildings.

- 2.3.174 Other works that will be managed from this compound include enabling works and finalisation works including; site reinstatement and fencing.

Construction waste and material resources

- 2.3.175 Excavated material generated across the Proposed Scheme will be reused as engineering fill material or in the environmental mitigation earthworks of the Proposed Scheme, where reasonably practicable.
- 2.3.176 Forecasts of the amount of construction, demolition and excavation waste that will be produced during construction of the Proposed Scheme are reported in Volume 3, Route-wide effects.
- 2.3.177 Local excess or shortfall of excavated material within the South Cheshire area will be managed through the mitigation earthworks design adopted for the Proposed Scheme, as well as the use of borrow pits, with the aim of contributing to an overall balance of excavated material on a route-wide basis and help to reduce the amount of material transported on public roads. The overall balance of excavated material is presented in Volume 3, Section 14.

Commissioning of the railway

- 2.3.178 Commissioning is the process of testing the infrastructure to ensure that it operates as expected. It will be carried out in the period prior to opening. Further details are provided in Volume 1, Section 6.

Construction programme

- 2.3.179 A construction programme illustrating indicative periods for each of the core construction activities described above is provided in Figure 8.

Monitoring during construction

- 2.3.180 The appointed contractor will be required to undertake the necessary monitoring for each environmental topic to comply with the requirements of the CoCP and any additional consent requirements. Any actions that may be necessary for compliance will be reported to the nominated undertaker and remedial action identified.
- 2.3.181 The CoCP will 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, will be consulted on the monitoring procedures to be implemented prior to construction commencement, as appropriate.

2.4 Operation of the Proposed Scheme

Operational specification

Introduction

- 2.4.1 Volume 1, Section 4 describes the envisaged operational characteristics of the Proposed Scheme and how they may change when Phase Two, as a whole, is operational.

HS2 services

- 2.4.2 It is anticipated that there will be up to six trains per hour in each direction upon opening in 2027, increasing to up to 12 trains per hour each way passing through the South Cheshire area when from 2033 the full Phase Two route is operational. Services are expected to operate between 05:00 and 24:00 from Monday to Saturday and 08:00 and 24:00 on Sunday.
- 2.4.3 In this area, trains on the HS2 main line will run at speeds of up to 225mph (360kph). The trains will be either single zoom trains or two zoom trains coupled together (i.e. 400m), 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 will be undertaken using asset condition monitoring and unattended measurement systems fitted to the HS2 passenger rolling stock. Intrusive inspections will be carried out during the maintenance period. The maintenance approach will be a combination of risk based, preventative and reactive maintenance.
- 2.4.6 Provision for railway maintenance vehicles will be made at the HS2 Infrastructure Maintenance Base - Rail (IMB-R) near Stone in the Stone and Swynnerton area (CA3). Further information on the Stone IMB-R can be found in Volume 2: Community area 3, Stone and Swynnerton.

Operational waste and material resources

- 2.4.7 The assessment of the likely significant environmental effects associated with the disposal of operational waste has been undertaken for the Proposed Scheme as a whole in Volume 3, Section 15.
- 2.4.8 Forecasts of the amount of waste arising from track maintenance and ancillary infrastructure and the associated likely significant environmental effects are provided in Volume 5: Appendix WM-001-000.

Monitoring during operation

- 2.4.9 The nominated undertaker will be responsible for monitoring during operation of the Proposed Scheme. General monitoring measures during operation are set out in Volume 1, Section 9. Monitoring requirements and proposed monitoring measures relevant to the South Cheshire area are presented in Sections 4 to 15 of this report.

2.5 Route section alternatives

Introduction

- 2.5.1 Since November 2015, as part of the design development process, a series of potentially feasible amendments to the Proposed Scheme have been identified and reviewed within workshops attended by engineering, construction, planning and environmental specialists. During the workshops, a comparison was conducted of each design option, which included consideration of:
- engineering requirements: the degree of design complexity of the alternatives and the impact this would have on construction durations and construction and operational costs;
 - cost: whether the alternatives would be more cost effective or incur additional costs; and
 - potential environmental impact: whether the alternatives would have more or less environmental impact (e.g. sound, noise and vibration and landscape and visual).
- 2.5.2 The comparison also considered, as appropriate, feedback provided through stakeholder engagement and responses to the consultation between September and November 2016 on the working draft EIA Report and the Design Refinement Consultation.
- 2.5.3 The following sections detail the reasonable local alternatives studied and the main reasons for selecting the option to be taken forward into the Proposed Scheme. The environmental impacts of the option selected (the Proposed Scheme) are then presented, followed by the environmental impacts of the alternative options compared to those of the Proposed Scheme. Other considerations are also noted including engineering requirements and cost. In some cases a preliminary appraisal of options has been undertaken, whereby options have been considered in terms of whether they are reasonable against environmental, technical and design criteria, and should, therefore, be progressed for further consideration.
- 2.5.4 In considering the environmental impacts, all EIA topics have been taken into account, however, only those topics where there is a potential impact are reported. During the preparation of the EIA, alternatives were appraised against the baseline scheme, however in accordance with the new Environmental Impact Assessment (EIA) Directive (2014/52/EU) that was implemented by the Town and Country Planning (Environmental Impact Assessment) Regulations that came into force on 16 May 2017, the comparison is presented below against the Proposed Scheme.

Relocation of the permanent maintenance facility

- 2.5.5 The working draft EIA Report included a permanent maintenance facility in the South Cheshire area that would operate as a base for maintenance activities to support the railway infrastructure. Following a review of the alternatives and the consideration of the responses from the Design Refinement Consultation, the Secretary of State for Transport has concluded that the permanent maintenance facility will be relocated

near to Stone, within the Stone and Swynnerton area (CA3), in the form of the Stone IMB-R.

- 2.5.6 A permanent maintenance facility located at Crewe would only enable access to the Proposed Scheme in one direction, resulting in increased travel times during periods of maintenance with decreased efficiency in comparison to a permanent maintenance facility situated in the middle section of the route. For the final Phase Two scheme (with the route from Crewe extended to Manchester and Golborne), a permanent maintenance facility at Crewe would be approximately 30km north of the ideal position between the northern ends of the route and the maintenance facilities proposed for Phase One, making travel times during periods of maintenance to the southern end of the Phase 2a scheme longer, and necessitating maintenance loops at Pipe Ridware, in the Fradley to Colton area (CA1).
- 2.5.7 Locating the permanent maintenance facility near to Stone would result in cost savings and provide an effective maintenance strategy across the Proposed Scheme, as well as for the proposed HS2 Phase 2b scheme, as the IMB-R would be strategically positioned in the middle section of the Proposed Scheme and would enable access to the route in both directions. This option would make use of severed land between the M6 and the route of the Proposed Scheme, reducing the environmental impact that would result from the use of two separate areas of similar footprint. Maintenance loops located at Pipe Ridware, would also not be required enabling the height of the route of the Proposed Scheme in that area to be lowered, further reducing any environmental impacts.
- 2.5.8 The relocation of the permanent maintenance facility would avoid the disruption to the local road network, including the A500 Shavington Bypass, Weston Lane and the B5071 Jack Mills Way, which would no longer be required to be stopped up. The need to sterilise approved planning applications for commercial and residential development would also be avoided as would the need to demolish up to 40 residential properties at the Basford West Development Site off the B5071 Jack Mills Way.
- 2.5.9 Details of the options considered and the environmental impacts associated with the location of the Stone IMB-R are provided in Volume 2: Community area 3, Stone and Swynnerton.

HS2 spurs (crossing of and connection to the WCML)

- 2.5.10 During the design development process since the announcement of the preferred route to Crewe in November 2015, further consideration has been given to where the HS2 spurs would need to connect into the existing WCML infrastructure. This has included consideration of positioning the HS2 spurs in the optimum location and options relating to the best layout to connect into the WCML.
- 2.5.11 The route announced in November 2015 showed the HS2 main line running on viaduct over the entrance to the Basford freight yard at a similar level to the existing A500 Shavington Bypass, then dropping down to go through the Basford freight sidings, before dropping further to the retained cutting (which would connect into a tunnel portal and a tunnel – part of the proposed HS2 Phase 2b) in between the conventional

rail lines at Crewe South Junction. The northbound spur diverged from the HS2 main line near Weston Lane to the south of Crewe, before passing over or through some of the existing Basford Hall sidings, over the top of the HS2 main line and joining to the WCML just south of Crewe South Junction. The southbound spur diverged from the WCML near Weston Lane, before passing over a realigned line of the WCML on a viaduct near Newcastle Road and connecting to the HS2 main line near Chorlton.

- 2.5.12 In reviewing this part of the design in further detail it was considered that there were complex engineering and interfacing operational issues which required additional assessment. The proposed location of the crossing and connection into the WCML would result in an impact, during construction of the Proposed Scheme, on the operation of the WCML and Network Rail's regionally important freight and maintenance operations at Basford Hall, resulting in the permanent loss of land and loss of rail access to some sidings. The proposed location would additionally require major changes to the surrounding road network. This would incur significant expense to the project.
- 2.5.13 The importance of the interface with existing railway infrastructure, including Network Rail's freight operations at Basford Hall, and the need to reduce disruption, during construction and operation on the WCML, has been instrumental in considering the design in this area. Disruption to the surrounding road network and the proximity of the Proposed Scheme to Chorlton has also been an important consideration.
- 2.5.14 More detailed work on construction planning has shown that it would be less disruptive during the construction period to relocate the retained cutting (which would connect into a tunnel portal and a tunnel (part of the proposed HS2 Phase 2b) to the south of the A500 Shavington Bypass; simplifying the civil engineering works required with the previous design and removing the need to relocate the existing rail freight sidings.
- 2.5.15 A preliminary options appraisal was undertaken of 24 options, which considered different configurations of the following design proposals:
- relocating the retained cutting;
 - online and offline construction of the HS2 spurs;
 - the HS2 spurs crossing underneath and over the top of the WCML before connecting into the WCML; and
 - the HS2 spurs connecting into the WCML south or north of the Basford Hall Junction.
- 2.5.16 Of the 24 options considered, 20 options were not taken forward for further consideration as they were not considered to be reasonable alternatives for the following reasons:
- Options 1a, 1b, 2a, 2b, 3a, and 3b proposed online construction of the HS2 spurs connection into the WCML, which would result in a significant lengthening of the construction programme and disruption to passengers

using the WCML;

- Options 1b, 1d, 2b, 2d, 3b, and 3d proposed that the HS2 spurs would cross underneath the WCML before connecting into the WCML, which would result in a significant lengthening of the construction programme;
- Options 1h, 1j, 2a, 2b, 2g, 2h, 3a, 3b, 3c, and 3d proposed that the HS2 spurs connection into the WCML would be located south of the Basford Hall Junction. Due to the operational requirements of the WCML, a grade separated solution is required to avoid having a detrimental impact on existing services using the WCML. Therefore, the WCML connections must be located north of Basford Hall Junction;
- Option 1e and 1f represented a refinement to Option 1c; however, investigations into both options offered no technical improvement to Option 1c and as such these options were not taken forward for further consideration; and
- Option 2e and 2i represented a refinement to Option 2c; however, investigations into both options offered no technical improvement to Option 2c and as such these options were not taken forward for further consideration.

2.5.17 The following four options were taken forward to a more detailed appraisal where engineering and construction feasibility, cost and environmental impacts were considered:

- the route announced in November 2015: the retained cutting would be located immediately south of Crewe Station. The HS2 main line would be positioned to the west of the existing WCML. The HS2 northbound spur would connect into the WCML north of the A500 Shavington Bypass having crossed over the HS2 main line. The HS2 southbound spur would connect into the WCML just north of the A500 Shavington Bypass. The HS2 main line would approach the retained cutting on viaduct;
- Option 1c: the retained cutting would be located south of the A500 Shavington Bypass. The HS2 main line would be positioned to the west of the existing WCML. All tracks on the existing WCML, between Lower Den Farm overbridge and Chorlton Lane, would be realigned onto a new section of the WCML. The HS2 spurs would diverge from the HS2 main line near Checkley Lane, cross over the new section of the WCML on viaduct, before connecting into the existing WCML near the A500 Shavington Bypass. The existing WCML corridor would increase by 40m to the east of its existing location;
- Option 2c: the retained cutting would be located south of the A500 Shavington Bypass. The HS2 main line would be positioned to the west of the existing WCML. A new section of the WCML would be constructed offline and carry a realigned WCML track and two extended tracks, which would provide access to the Basford Hall sidings. The new section would be located to the west of the existing WCML between the Blakenhall Bridleway 8 accommodation overbridge and Crewe South portal retained cutting. The HS2 spurs would

diverge from the HS2 main line near Checkley Lane, cross over the new section of the WCML on viaduct, and connect into the WCML south of the A500 Shavington Bypass; and

- Option 3e: the retained cutting would be located south of the A500 Shavington Bypass. The HS2 main line would be positioned to the west of the existing WCML. All tracks on the existing WCML would be realigned between Lower Den Farm overbridge and Weston Lane. Two existing tracks would be extended between the Basford Hall sidings and Lower Den Farm overbridge. The HS2 spurs would diverge from the HS2 main line near Checkley Lane, cross over the realigned WCML tracks and new freight tracks on viaduct, before connecting into the existing WCML south of Casey Lane. The existing WCML corridor would increase by 40m to the east of its existing location.

2.5.18 Option 2c was taken forward into the Proposed Scheme as, on balance, it presented the most favourable environmental outcome. The route announced in November 2015, in comparison to Option 2c, would create greater environmental impacts, most notably visual effects for residents along Newcastle Road and in Chorlton. During construction, the announced option would introduce complex engineering and interfacing operational issues, in particular, a significant impact on the operation of the WCML and the depot at Basford Hall, and demolition and reconstruction of bridges on the A500 Shavington Bypass and Weston Lane. Option 1c, in comparison to Option 2c, would present an increase in environmental impacts, most notably visual effects for residents along Mill Lane, Den Lane, and in Chorlton. Construction of Option 1c would also have a significant impact on historic assets to the east of the WCML. Option 3e, in comparison to Option 2c, would present an increase in environmental impacts, most notably visual effects for residents along Mill Lane, Den Lane, and in Chorlton. Construction of Option 3e would also have a detrimental impact on surface water quality, increase the complexity and duration of the programme, and incur significantly higher costs.

2.5.19 The analysis of engineering, cost and potential environmental impacts associated with all four options is set out below, with the impacts of the option selected presented first.

Option 2c

2.5.20 During construction and operation, this option would introduce significant visual effects to communities and residential properties on both sides of the rail corridor, in particular, Chorlton, Wychwood Park, Casey Lane, Newcastle Road, and Weston Lane. The operational effects would change the landscape character of the area and visual effects arising from changes to the road network would be significant to the residential receptors listed above.

2.5.21 During construction, a number of historic assets and ecological receptors would be directly impacted. Construction works would also affect the historic landscape character to the south of the Proposed Scheme and Checkley Lane (a historic incised country lane). There would also be considerable disruption to agricultural holdings and potential impacts on Gresty Brook/Basford Brook (WFD designated waterbody)

due to the potential release of sediment and pollutant runoff to the watercourse, most notably as a result of extensions to existing WCML culverts. Additionally, there is potential for a surface water abstraction point and two licensed groundwater abstractions to be affected.

- 2.5.22 Option 2c does not introduce any technical or construction complexities, risks of safety hazards, or lengthening of the construction programme.

The route announced in November 2015

- 2.5.23 In comparison to Option 2c (the Proposed Scheme), embankments and viaducts proposed as part of this option would increase the visual effects on communities and residential properties, particularly properties along Newcastle Road and some residential areas of Chorlton. During construction, there would be the potential for two businesses to be demolished. During operation, receptors in Basford and Chorlton would receive higher noise levels. However, this option would reduce impacts on the surface water environment due to lower levels of infrastructure required for surface water crossings.
- 2.5.24 The route announced in November 2015 would introduce complex engineering and interfacing operational issues. During construction, there would be a significant impact on the operation of the WCML and Network Rail's regionally important freight and maintenance operations at Basford Hall.
- 2.5.25 This option would additionally require major changes to the surrounding road network, including reconstructed bridges on the A500 Shavington Bypass and Weston Lane, adding significant cost in comparison to Option 2c. The additional construction traffic generated by these works would have a significant impact on local road users.

Option 1c

- 2.5.26 In comparison to Option 2c (the Proposed Scheme), Option 1c presents a slight increase in visual effects on communities and residential properties along the route during construction and operation, particularly properties within Chorlton. This option would likely require the demolition of Bridge Cottage (Chorlton Lane), a commercial property off Newcastle Road, and Casey Bridge Farm. The southern viaduct structure would be closer to residential properties at the junction of Mill Lane and Den Lane; these receptors would, therefore, experience greater visual effects. There would be direct adverse physical effects on historic assets from construction works to the eastern side of the WCML. Construction works to the WCML would create greater visual effects on the Grade II listed Basford Bridge Cottage. The increase in the WCML corridor to the east would require additional land for construction of the Proposed Scheme, resulting in amenity impacts on properties to east of the existing WCML along Weston Lane, Casey Lane, and Newcastle Road.
- 2.5.27 Option 1c would introduce some construction complexities with the works required to connect to the WCML fast lines, however, this option would avoid any impacts on the Basford Hall sidings.

Option 3e

- 2.5.28 In comparison to Option 2c (the Proposed Scheme), Option 3e presents an increase in visual effects for communities and residential properties along the route, particularly properties within Chorlton during construction and operation. Construction activities would have a slightly greater effect on receptors that lie on the eastern aspect of the WCML, especially properties within Wychwood Park, along Newcastle Road, and Jubilee Farm. It is likely that Option 3e would require the demolition of Bridge Cottage (Chorlton Lane), a commercial property off Newcastle Road, and Casey Bridge Farm. However, there would likely be less disruption during the construction phase to receptors located alongside the existing WCML east of Wychwood Park, including Lower Den Farm. The additional viaduct structures would generate additional visual effects during construction and operation due to their height, extents, and positioning. This would have an increased impact on residential receptors, particularly on the western fringes of Wychwood Park and the junction of Den Lane and Mill Lane. The construction and operational impacts associated with this option would result in a moderate deterioration to waterbodies in the southern area of Wistaston Brook catchment based on a potentially significant increase in water channel disturbance. Dwellings in Chorlton may be subject to increases in noise and vibration as a result of construction works and the alignment of infrastructure moving further east.
- 2.5.29 Option 3e would introduce some construction complexities with the works required to connect to the WCML and the viaducts, which would significantly lengthen the construction programme. The cost of this option is significantly higher than that of the Option 2c.

Retention of the A500 Shavington Bypass Bridge and Weston Lane Bridge and relocation of the retained cut

- 2.5.30 During the design development following the publication of the working draft EIA Report, further consideration has been given to need to demolish and reconstruct the A500 Shavington Bypass Bridge and Weston Lane Bridge in order to minimise the disruption of the local highway network. As part of this the location of the retained cutting (which would connect into a tunnel portal and a tunnel – part of the proposed HS2 Phase 2b) was also considered.
- 2.5.31 The following three options were taken forward to a detailed appraisal where engineering and construction feasibility, cost and environmental impacts were considered:
- Option 1 (presented in the working draft EIA Report): the route of the HS2 main line would be lowered on its approach to Crewe and the retained cutting located approximately 650m south of the A500 Shavington Bypass. The A500 Shavington Bypass would need to be realigned and the existing bridge would need to be demolished and reconstructed, however, the Weston Lane overbridge would be retained;
 - Option 2: the route of the HS2 main line would approach Crewe from the south in a retained cutting located approximately 1km south of the A500 Shavington Bypass (approximately 350m further south than Option 1). The HS2 main line

would be vertically realigned to pass beneath the A500 Shavington Bypass in tunnel. The A500 Shavington Bypass and Weston Lane would not require any realignment and the bridges would be retained; and

- Option 3: the route of the HS2 main line would be horizontally realigned on its approach to Crewe and the retained cutting would be moved approximately 30m south of the A500 Shavington Bypass (approximately 620m further north than Option 1), increasing its length by approximately 950m when compared with the Proposed Scheme. The route would pass between the A500 Shavington Bypass Bridge piers, which would be retained. This option would require the realignment of Weston Lane and a new overbridge.

2.5.32 Option 2 was taken forward into the Proposed Scheme as it avoided disruption to the local highway network associated with the demolition of the A500 Shavington Bypass bridge and Weston Lane bridge, resulted in significant cost savings and presented the most favourable environmental outcome. Option 1, in comparison to Option 2, would present an increase in environmental impacts, most notably associated within the realignment of the A500 Shavington Bypass, including construction related noise and air quality impacts, visual impacts, and the removal of sensitive ecological habitats. Option 3, in comparison to Option 2, would also present an increase in environmental impacts, most notably impacts on heritage assets and amenity impacts on residents along Newcastle Road, Weston Lane, and Larch Avenue due to construction activities. Option 1 and Option 3 would be significantly more expensive to construct and require longer construction programmes than Option 2.

2.5.33 The analysis of engineering, cost and potential environmental impacts associated with all three options is set out below, with the impacts of the option selected presented first.

Option 2

2.5.34 This option would introduce visual, noise, and amenity impacts in Chorlton and along Newcastle Road, Weston Lane, Larch Avenue, and Casey Lane due to the proximity of the retained cutting in these locations. There would be an impact on historic assets in the area, most notably along the existing WCML, which includes the Historic Environment Record (HER) listed Grand Junction Railway and Basford Hall Junction. This option would result in the loss of agricultural land and holdings and the loss of ecological habitat, in particular hedgerow corridors and existing ponds, which may impact on protected species. This option has the potential to result in loss or deterioration of a spring near Basford House due to potential changes in groundwater levels. This option runs adjacent to the WCML and there is a possibility that the land may be affected by contaminant migration through shallow sand and gravel deposits.

2.5.35 Option 2 does not introduce any technical or construction complexities, risks of safety hazards, or lengthening of the construction programme.

Option 1

2.5.36 In comparison to Option 2 (the Proposed Scheme), Option 1 would result in a substantial increase in construction related traffic on the local road network and demolition waste arising from removal of the existing A500 Shavington Bypass

Bridge. There is potential for construction-related noise and air quality impacts from the construction of the off-line bridge and removal of the existing bridge. This option would introduce additional impacts on heritage assets, in particular the Grade II listed Shavington Hall, ecological habitats, and agricultural land and holdings. The presence of the realigned A500 Shavington Bypass on high embankments would lead to impacts on landscape character and visual impacts on residential properties south of the A500 Shavington Bypass between Basford and Weston, particularly residential properties along Weston Lane and Larch Avenue.

- 2.5.37 This option would introduce construction complexities associated with realignment of the A500 Shavington Bypass, which would increase the length of the construction programme and would be significantly more expensive to construct than Option 2.

Option 3

- 2.5.38 In comparison to Option 2 (the Proposed Scheme), Option 3 would introduce additional potential impacts on heritage assets, most notably the former Basford Hall and potential buried features, and amenity impacts to properties along Weston Lane, Larch Avenue, and Newcastle Road as a result of construction activity associated with the retained cutting. The requirement for a new overbridge at Weston Lane would have a detrimental impact on residential properties along Weston Lane, including the demolition of two properties. There will be more land required for construction of the Proposed Scheme due to the retained cutting ending nearer Crewe and further west. Therefore, there would be more direct impacts on agricultural land and holdings, species-rich hedgerows, veteran trees, and existing ponds, which could support protected species and habitats. This movement west, compared to the Proposed Scheme, could result in isolation of habitats and protected species during the construction phase by reducing ecological connectivity. The reduced length of route adjacent to the WCML may reduce the risk of contaminant migration, which is considered an improvement compared to the Proposed Scheme.
- 2.5.39 This option would add construction complexity due to the increase in length of the retained cutting and a new bridge at Weston Lane, which would lengthen the construction programme and result in significant additional cost.

Connection of the Proposed Scheme with the WCML at Betley Road Junction

- 2.5.40 During the design development process since the announcement of the preferred route to Crewe in November 2015, further consideration has been given to optimising existing passenger and freight services along the WCML and facilitating the connection of the HS2 main line with the WCML. In order to facilitate the connection of HS2 to the WCML south of Crewe station, modifications to the WCML would be required, including relocating the connection to Basford Hall sidings (Basford Hall Junction) at Betley Road Junction, north of Den Lane. The modifications would maintain access to the Basford Hall sidings, currently being used by freight vehicles only, so that it does not bring operational risks as a result of the HS2 connection. The sensitivity of this location, particularly the proximity of any works to properties in the locality and land required for the construction of the Proposed Scheme have been key considerations in the development of these alternatives.

2.5.41

A preliminary options appraisal was undertaken of nine options, five options were not taken forward for further consideration as they were not considered to be reasonable alternatives:

- Option 2a: This option would introduce replacement parallel crossovers at Betley Road Junction enabling movements for rail vehicles between the Basford Hall independent lines and WCML with crossover speeds of 40mph (64kph). This option would result in significant construction works to existing infrastructure and would also have a detrimental impact on the operation of the WCML due to the low speed for the crossovers at that location where WCML lines have greater line speed. As such, this option was not taken forward for further consideration;
- Option 2b: This option is a minor variation to Option 2a. The crossover speeds would all be 50mph (80kph). The impacts were deemed to be the same as Option 2a, as such, Option 2b was not taken forward for further consideration;
- Option 3a: This option would introduce replacement single crossovers at Betley Road Junction enabling movements for vehicles between the Basford Hall independent lines from the WCML on the slow lines at 75mph (120kph). However, the single crossover connecting the slow and fast lines on the WCML would have an operating speed of 40mph (64kph), which would have a detrimental impact on the operation of the WCML and on journey times. As such, Option 3a was not taken forward for further consideration;
- Option 3b: This option is a minor variation to Option 3a. A single crossover would connect the slow and fast lines on the WCML with an operating speed of 50mph (80kph) and reduced speed of 25mph (40kph) between the fast lines. The impacts were deemed to be similar to Option 3a, as such; Option 3b was not taken forward for further consideration; and
- Option 3d: This option is a minor variation to Option 3a. A single crossover would connect the slow and fast lines on the WCML with an operating speed of 75mph (120kph). A single crossover would connect the Basford Hall independent lines with an operating speed of 75mph (120kph). With this option there would not be a connection between the fast lines at Betley Road Junction, which would bring significant operational impact and risks for maintenance. As such; Option 3d was not taken forward for further consideration.

2.5.42

The following four options were taken forward to a more detailed appraisal where engineering and construction feasibility, cost and environmental impacts were considered:

- Option 1 (the option presented in the working draft EIA Report): This option would introduce replacement parallel crossovers at Betley Road Junction enabling movements for vehicles between the Basford Hall independent lines and WCML with crossover speeds of 75mph (120kph). This option would require full re-construction of the WCML over a length of approximately 1.7km, as a result, the Lower Den Farm accommodation bridge and Den Lane

overbridge would require realignment and re-construction;

- Option 3c: This option was a minor variation to Option 3e. This option would introduce replacement single crossovers enabling movements for vehicles between the Basford Hall independent lines and WCML slow lines at 75mph (120kph), movements between the WCML fast and slow lines of 60mph (97kph), and movements between the fast lines at 25mph (40kph). A single crossover would connect the Basford Hall independent lines with an operating speed of 75mph (120kph). Track modification works would be completed within the existing WCML corridor; however, this option would require approximately 550m of a realigned track north of the junction and realignment of the Lower Den Farm overbridge;
- Option 3e: This option would introduce replacement single crossovers enabling movements for vehicles between the Basford Hall independent lines from the WCML at 75mph (120kph) with a reduced speed of 25mph (40kph) between the fast lines on the WCML. Track modification works would be completed within the existing WCML corridor; however, this option would require approximately 960m of a realigned track north of the junction and realignment of the Lower Den Farm overbridge; and
- Option 4: This option would introduce replacement parallel crossovers enabling movements for vehicles between the Basford Hall independent lines and WCML slow lines at 75mph (120kph). Two single crossovers would connect the slow and fast lines on the WCML with an operating speed of 60mph (97kph), and reduced speed of 25mph (40kph) between fast lines on the WCML. Track modification works would be completed within the existing WCML corridor; however, this option would require approximately 550m of a realigned track north of the junction and realignment of the Lower Den Farm overbridge.

2.5.43 Option 3e was taken forward into the Proposed Scheme as, as on balance, it presented the most favourable environmental and operational outcome. Option 1, in comparison to Option 3e, would present an increase in environmental impacts, most notably, severance and amenity impacts for residents along Den Lane as a result of construction activities. Option 1 would also lengthen the construction programme and be significantly more expensive to construct than Option 3e. Option 3c and Option 4 were considered to be environmentally similar to Option 3; however, both options would introduce technical complexities to the operation of existing infrastructure.

2.5.44 The analysis of engineering, cost and potential environmental impacts associated with all four options is set out below, with the impacts of the option selected presented first.

Option 3e

2.5.45 This option would result in visual, noise, and amenity impacts to Lower Den Farm and some properties along Den Lane as a result of the demolition of the existing Lower Den Farm overbridge and construction of the Blakenhall Bridleway 8 accommodation overbridge. Access to Lower Den Farm would be maintained at all times. A temporary

diversion of Blakenhall Bridleway 8 would be required and would cause disruption to users during the construction period.

- 2.5.46 Option 3e does not introduce any technical or construction complexities, risks of safety hazards, or lengthening of the construction programme.

Option 1

- 2.5.47 In comparison to Option 3e (the Proposed Scheme), the construction works associated with Option 1 would be substantial. Modification and realignment works associated with the WCML would be required outside the existing WCML corridor. The realignment and reconstruction of Den Lane Bridge would generate extensive earthworks, and in turn, generate high levels of construction traffic and associated noise impacts. This would lead to severance issues for residents, businesses and road users of Den Lane. Construction activities would introduce localised effects on landscape character and potentially impact on surrounding ecological habitats, which may support protected species.

- 2.5.48 Option 1 would introduce some construction complexities with the works associated with modifications to the WCML and reconstruction of two bridges. This would significantly lengthen the construction programme and would be significantly more expensive to construct than the Proposed Scheme.

Option 3c

- 2.5.49 In comparison to Option 3e (the Proposed Scheme), Option 3c was considered to be environmentally similar. The most notable environmental impacts included visual, noise, and amenity impacts to Lower Den Farm and some properties along Den Lane as a result of the demolition of the existing Lower Den Farm accommodation bridge and construction of the Blakenhall Bridleway 8 accommodation overbridge.

- 2.5.50 Option 3c introduced technical complexities to the existing WCML and Basford Hall independent lines that would present an operational risk.

Option 4

- 2.5.51 In comparison to Option 3e (the Proposed Scheme), Option 4 was considered to be environmentally similar. The most notable environmental impacts included visual, noise, and amenity impacts to Lower Den Farm and some properties along Den Lane as a result of the demolition of the existing Lower Den Farm accommodation bridge and construction of the Blakenhall Bridleway 8 accommodation overbridge.

- 2.5.52 Option 4 introduced technical complexities to the existing WCML and Basford Hall independent lines that present a risk to existing infrastructure that powers the lines.

Grid connection from Crewe sub-station to the South Crewe auto-transformer feeder station

- 2.5.53 During the design development process since the announcement of the preferred route to Crewe in November 2015, further consideration has been given to the alignment of a power line required to provide power to operate the trains. The working draft EIA Report included two auto-transformer feeder stations located

adjacent to the route, one within the South Cheshire area, at Newcastle Road, and the other within the Fradley to Colton area (CA1).

- 2.5.54 Following continued engagement with Scottish Power and National Grid it was deemed that the power supply to an auto-transformer feeder station located in the South Cheshire area, for any option considered, would not be feasible due to constraints on capacity. The most suitable alternative identified, which has been taken forward into the Proposed Scheme, would be to upgrade the auto-transformer feeder station at Newlands Lane, located within the Fradley to Colton area (CA1), to enable it to supply power to a greater length of track. There will, therefore, be no auto-transformer feeder station located within the South Cheshire area.
- 2.5.55 Details of the options considered and the environmental impacts associated with the grid connection from Rugeley sub-station to the auto-transformer feeder station at Newlands are provided in Volume 2: Community area 1, Fradley to Colton.

Borrow pit

- 2.5.56 During the design development process since the announcement of the preferred route to Crewe in November 2015, further consideration has been given to the way in which the Proposed Scheme would acquire high quality material (usually comprising sand and gravel) to construct railway embankments. This material will be provided, in part, through excavation of cuttings and other earthworks along the route of the Proposed Scheme, where the quality is appropriate. However, at some locations along the route there is insufficient high quality material for use in railway embankment construction. The use of borrow pits close to the route of the Proposed Scheme would enable high quality material and aggregate to be extracted and processed and backfilled locally and transported largely on site haul routes, lowering HGV movements and reducing impacts on the local road network and communities. Section 6.10 of Volume 1 of this ES presents an overview of the alternatives to using borrow pits.
- 2.5.57 During the design development process a requirement was identified for a borrow pit in the section of the route covering the Whitmore Heath to Madeley (CA4) or South Cheshire area. Two options were proposed for a potential borrow pit in the area, both of which are described here. These were identified using plans showing suitable geology combined with requirements for excavated material showing where the largest shortfalls of material occurred along the route of the Proposed Scheme. Selection criteria also included mineral resource areas identified by the local minerals planning authority and avoidance, where reasonably practicable, of residential properties, environmentally sensitive receptors, major services and diversions.
- 2.5.58 The following two options were taken forward to a detailed appraisal where engineering and construction feasibility, cost and environmental impacts were considered:
- Option CA5-BP-A-1: This option includes a combination of three borrow pit locations (known as CA5-BP-A-1-a, CA5-BP-A-1-b, and CA5-BP-A-1-c); two would be located in the South Cheshire area and one in the Whitmore Heath to Madeley area (CA4). CA5-BP-A-1-a would be located west of Wrinehill,

between Randilow Farm to the south-east, Lower Den Farm to the north-west, the WCML to the north-east, and route of the Proposed Scheme to the south-west. CA5-BP-A-1-b would be located south of Wrinehill, between Randilow Farm to north-west, Wrinehill Hall to the south-east, the WCML to the north-east, and route of the Proposed Scheme to the south-west. CA5-BP-A-1-c would be located west of Madeley, overlying the route of the Proposed Scheme, north-west of the proposed Madeley tunnel portal. CA5-BP-A-1-a and CA5-A-1-b would be 5m deep, whilst CA5-BP-A-1-c would be 8m deep.

- Option CA5-BP-A-2: This option would be located in the Whitmore Heath to Madeley area (CA4), in the same location as CA5-BP-A-1-c. The location lies west of Madeley and overlies the route of the Proposed Scheme, north-west of the proposed Madeley tunnel portal. This option would be 20m deep.

2.5.59 Option CA5-BP-A-1 was taken forward into the Proposed Scheme. Whilst Option CA5-BP-A-2 would provide greater environmental benefits, when compared with Option CA5-BP-A-1, the benefits were not considered sufficient to justify the complexity and risk of hazards during construction that Option CA5-BP-A-2 presented.

2.5.60 The footprint of Option CA5-BP-A-1 was subsequently modified in order to further avoid environmental sensitivities and construction complexities, such that only one of the three initial locations (CA5-BP-A-1-a) was taken forward. The depth of CA5-BP-A-1-a would be increased to 13m. This would reduce any significant isolation effects on Randilow Farm and avoid demolition of Randilow Cottage. Any environmental risks associated with Barhill Wood and any complexities associated with its proximity to the proposed Madeley tunnel would also be removed. The boundary was modified to reduce the amount of agricultural land required, provide a greater buffer distance from Randilow Farm in order to reduce isolation and amenity effects at this property, and reduce the proximity to Betley Mere SSSI. Exclusion zones would be required in proximity to existing road and rail infrastructure.

2.5.61 The analysis of engineering, cost and potential environmental impacts associated with the first iteration of Option CA5-BP-A-1 and Option CA5-BP-A-2 is set out below, with the impacts of the option selected presented first.

Option CA5-BP-A-1

2.5.62 The first iteration of Option CA5-BP-A-1 would require land for construction of the borrow pit from the three separate locations, which would result in a significant negative impact on biodiversity, potentially impacting on environmental designations, most notably Betley Mere SSSI and ancient woodland at Barhill Wood, protected habitats, and habitats that could support protected species. This iteration would cross a number of surface water pathways and has the potential to significantly impact on a number of aquifers, springs, and licensed abstraction points. There would also be moderately significant landscape, agricultural, cultural heritage, land quality and community impacts. Significant isolation and amenity effects would be experienced at Randilow Farm and potentially the demolition of Randilow Cottage. The subsequent iteration reduces these impacts.

Option CA5-BP-A-2

- 2.5.63 In comparison to the first iteration of Option CA5-BP-A-1 (the Proposed Scheme), Option CA5-BP-A-2 would avoid any potential impacts on the Betley Mere SSSI, and the amount of land required is significantly smaller than that of the Proposed Scheme, which would avoid impacting on a number of protected habitats and species. However, with a greater cutting depth, there would likely be implications for groundwater flow and potential water quality impacts, with potential impacts on aquifers, nearby springs, and abstraction points. There would also be reduced impacts on landscape, agricultural, cultural heritage, land quality and community receptors as a result of the reduced amount of land required when compared with the Proposed Scheme.
- 2.5.64 Option CA5-BP-A-2 would be significantly more complex than the Proposed Scheme primarily due to its proximity to the proposed Madeley tunnel. A borrow pit in this location would introduce construction complexities that would significantly lengthen the construction programme and would significantly increase the requirement for transportation of materials.

Further work undertaken post appraisal

- 2.5.65 Subsequent to further analysis of construction traffic data, it was determined that a borrow pit would also be required to support construction within the Whitmore Heath to Madeley area (CA4). Discussion of this location is presented within the Volume 2: Community area 4, Whitmore Heath to Madeley.
- 2.5.66 Further work in the form of a hydrological assessment has also been undertaken to consider the likely impact on the Betley Mere SSSI arising from extraction of material from the borrow pit. If it cannot be confirmed that there is no hydrological connectivity between the proposed borrow pit and Betley Mere SSSI measures will be implemented during construction, to ensure that there will be no significant impact to the flow or quality of groundwater and surface water reaching Betley Mere. This would include the provision of a one metre vertical buffer between the base of the borrow pit excavation and groundwater levels (or alternative methods of avoidance agreed with the relevant stakeholders).

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 route announcement in November 2015, HS2 Ltd has carried out a programme of stakeholder engagement and formal consultation with a broad range of stakeholders.

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

3.2 Key stages of Phase 2a engagement and consultation

Summary of engagement

3.2.1 A summary of engagement undertaken or underway since the route announcement in November 2015 is provided in Table 8.

Table 8: Mechanisms and timeline of stakeholder engagement and consultation since the route announcement in November 2015

Date	Engagement and consultation activity and mechanisms	Stakeholders engaged/consulted
November 2015	Local authority briefings.	Local authority officers along the line of route.
November 2015 – February 2016	Consultation on schemes to assist property owners from 30 November 2015 to 25 February 2016.	National consultation with information published on the HS2 website. Direct engagement with communities and their representatives through public events and documents being made available at a range of community locations along the route.
December 2015 – September 2016	Direct engagement to develop the Proposed Scheme, the Environmental Impact Assessment (EIA) and Equality Impact Assessment (EQIA).	Local authorities, parish councils and technical and specialist stakeholders.
January 2016 – ongoing	Site visits and meetings to observe and discuss possible impacts and understand people’s concerns.	Residents, landowners, businesses, community interest groups and other directly affected stakeholders and their representatives along the route.
March 2016 – May 2016	Consultations on the draft EIA and EQIA Scope and Methodology Reports (SMR) from 8 March to 13 May 2016.	National consultation with information published on the HS2 website. Technical and specialist stakeholders, local authorities and parish councils along the line of route directly invited to participate.

Date	Engagement and consultation activity and mechanisms	Stakeholders engaged/consulted
September – November 2016	Consultations on the Working Draft EIA Report; Working Draft EQIA Report; and Design Refinements from 13 September to 7 November 2016.	National consultation with information published on the HS2 website. Direct engagement with communities and their representatives through public events and documents being made available at a range of community locations along the route.
November 2016 – ongoing	Ongoing discussions, meetings and site visits in response to issues raised during consultation and through broader stakeholder engagement.	Residents, landowners, businesses, community interest groups and other directly affected stakeholders and their representatives along the route

Property consultation

- 3.2.2 Property consultation focused on those individuals and landowners potentially directly affected by the Proposed Scheme. Consultation took place between 30 November 2015 and 25 February 2016. Its purpose was to inform the Government’s decision on whether to implement the same compensation and assistance schemes as for Phase One, taking into consideration the views of those individuals and organisations who expressed their opinions on the proposals.
- 3.2.3 Within the South Cheshire area, a property consultation event was held at Hough Village Hall on 14 January 2016.
- 3.2.4 Consultation responses were analysed, and reported on 26 May 2016 in the Government’s report entitled “HS2 Phase Two: West Midlands to Crewe Property Consultation 2015”²⁷ and the Government’s response was issued in the Decision Document HS2 Phase Two: West Midlands to Crewe Property Consultation 2015²⁸.

EIA SMR consultation

- 3.2.5 The draft EIA SMR was formally consulted on from 8 March to 13 May 2016 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. Twenty-six responses to the draft EIA SMR were received, as a result of which changes were made to the EIA SMR, which was published in September 2016. The changes between the draft EIA SMR and the publication of the EIA SMR were set out in the EIA SMR Consultation Report, also published in September 2016.
- 3.2.6 The assessment set out in this ES follows the scope and methodology in the EIA SMR and SMR Addendum (Volume 5: Appendix CT-001-001 and Appendix CT-001-002).

²⁷ UK Government: HS2 Phase 2a: HS2 Phase Two: West Midlands to Crewe Property Consultation 2015. Available online at:

<https://www.gov.uk/government/consultations/hs2-phase-two-west-midlands-to-crewe-property-consultation-2015>

²⁸ UK Government: HS2 Phase 2a: HS2 Phase Two West Midlands to Crewe property consultation 2015: government decision. Available online at:

<https://www.gov.uk/government/publications/hs2-phase-two-west-midlands-to-crewe-property-consultation-2015-government-decision>

Working draft EIA Report consultation

- 3.2.7 The working draft EIA Report was formally consulted upon between 13 September and 7 November 2016. Parallel consultations on the working draft EQIA and Design Refinements were also undertaken during this period. As part of the process of consultation, stakeholders were invited to comment on the Proposed Scheme and the working draft EIA and working draft EQIA Reports that informed it as well as the key design refinements to the Proposed Scheme, which were being considered at the time.
- 3.2.8 Four hundred and seventy-five responses to the working draft EIA Report consultation were received in total.
- 3.2.9 These responses were analysed and the following key themes and issues in the South Cheshire area were identified:
- noise and visual impacts associated with construction and operation of the Proposed Scheme on communities;
 - support for the relocation of the IMD to the Stone and Swynnerton area (CA3) (in the form of the Stone IMB-R);
 - support for the relocation of the Crewe south portal retained cutting to south of the A500 Shavington Bypass;
 - impacts on residents at Chorlton;
 - impacts on the communities and businesses, including potential isolation impacts;
 - impacts on properties on Newcastle Road; and
 - use of Den Lane and Checkley Lane during the construction period.
- 3.2.10 These consultations and wider feedback from ongoing stakeholder engagement have been considered as part of the ongoing design development of the Proposed Scheme, and the assessment and identification of mitigation opportunities for the South Cheshire area.
- 3.2.11 A Working Draft EIA Report Consultation Summary Report²⁹ has been published alongside this ES summarising how the responses to the working draft EIA Report have been taken into consideration. A separate consultation summary report has been prepared for the working draft EQIA Report³⁰.
- 3.2.12 Section 2 of this report describes the key changes made to the design in the South Cheshire area since the working draft EIA Report.

²⁹ Volume 5: Appendix CT-008-000, Working Draft Environmental Impact Assessment Report: Consultation Summary Report.

³⁰ Working Draft Equality Impact Assessment Report: Consultation Summary Report. Available online at: www.gov.uk/hs2

3.3 Engagement and consultation with stakeholder groups

Technical and specialist groups

- 3.3.1 Engagement has been undertaken with technical and specialist organisations to provide appropriate specialist input to inform the design and assessment of the Proposed Scheme. This includes engagement with statutory bodies, local councils and utility companies operating within the South Cheshire area.
- 3.3.2 Direct engagement with Cheshire East Council and Staffordshire County Council has been undertaken in order to collate local baseline information, identify and understand issues and concerns, and provide a mechanism for ongoing dialogue and discussion on the assessment and design development.
- 3.3.3 Engagement has focused on the technical areas that inform the assessment, including, landscape and visual, sound, noise and vibration and traffic and transport, amongst others topics. It has also informed the design of the Proposed Scheme, as summarised in Table 9.
- 3.3.4 Briefings were offered to specialist and technical stakeholders along the route of the Proposed Scheme during the period of consultation on the working draft EIA Report to provide information on the evolving design and assessment of the Proposed Scheme in their respective areas.
- 3.3.5 Table 9 includes engagement undertaken with technical and specialist groups and how this has informed the design and assessment of the Proposed Scheme in the South Cheshire area.

Table 9: Engagement to date with technical and specialist groups

Stakeholder	Area of focus for design and assessment	How this has informed the design and assessment of the Proposed Scheme
Statutory		
Department for Environment, Food and Rural Affairs (Defra)	Agricultural and land quality issues	Identifying local agricultural and land quality issues, including sites of particular interest such as foot and mouth burial sites.
Canal & River Trust	The landscape and visual assessment methodology with specific reference to the selection and location of representative viewpoints for the assessment and for photomontages.	Informing the selection of draft representative viewpoint and photomontage locations, with particular focus on intersections of the Proposed Scheme with Canal & River Trust estate and assets. Understanding the potential impact of the Proposed Scheme on landscape character and key recreational visual receptors at important sites in the Canal & River Trust's estate.
Environment Agency	Water and flood risk issues	Providing information on water and flood risk issues along the line of route.
Food and Environment Research Agency (FERA)	Land contamination issues	Identification of local land quality issues.
Forestry Commission	Ecology and landscape related issues	Informing understanding of methodological approach and detailed local conditions and factors to be taken into consideration in the assessment.

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Stakeholder	Area of focus for design and assessment	How this has informed the design and assessment of the Proposed Scheme
Highways England	Traffic and transport assessment	Informing the assessment of road network capacity and identification of proposed future works.
Historic England	Nationally designated heritage assets and the heritage assessment methodology	Informing the methodology for assessing setting and impacts on historic landscape at national and regional level. Identification and assessment methodology of designated and non-designated heritage assets.
Natural England	Ecology and landscape and visual related issues Agricultural land quality and land restoration issues	Providing further information regarding potential ancient woodland sites. Understanding of methodological approach and detailed local conditions and factors to be taken into consideration in the assessment.
Network Rail	Proposed Scheme design in the Crewe area	Updating HS2 Ltd on the development of potential plans for Crewe Hub.
Local authorities		
Cheshire East Council	Cultural heritage	Identifying heritage assets including listed and those of local importance, to protect these assets and their settings.
	Traffic and transport in relation to the construction of the Proposed Scheme	Understanding the local road network, its current use and levels of traffic and congestion and construction traffic routes.
	Landscape and visual effects of the Proposed Scheme	Identifying representative viewpoint and photomontages locations.
	Potential health effects of the Proposed Scheme on local communities	Understanding local demographic and determinants of health and wellbeing.
	Equality, health and community assessments	Identifying vulnerable groups within the community area.
	Land quality assessment	Identifying key sites within the local area to be included in the land quality assessment.
Utilities		
National Grid	Utilities, gas and electricity networks	Informing route-wide considerations around utilities network and factors to be considered in the design and assessment of the Proposed Scheme.
Severn Trent Water	Potential connections and proximity of the Proposed Scheme to Severn Trent Water's assets.	Understanding of local utilities and factors to consider in the design, construction and operation of the Proposed Scheme.
Other specialist stakeholders		
Central Association of Agricultural Valuers (CAAV)	Potential impacts of the Proposed Scheme on agricultural businesses.	Understanding the concerns of the agricultural industry in relation to the Proposed Scheme.

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Stakeholder	Area of focus for design and assessment	How this has informed the design and assessment of the Proposed Scheme
County Land and Business Association (CLA)	Potential impacts of the Proposed Scheme on agricultural businesses	Understanding the concerns of the agricultural industry in relation to the Proposed Scheme.
National Farmers Union (NFU)	Potential impact of the Proposed Scheme on farmers and agricultural businesses	Understanding the concerns of farmers affected by the Proposed Scheme.
North Staffordshire Bridleways Association	Potential impact of the Proposed Scheme on local bridleways.	Informing the scheme design of key bridleway routes within the area.
Royal Society for the Protection of Birds (RSPB)	Ecology and biodiversity issues	Informing the ecology survey programme, and strategic mitigation opportunities.
Cheshire Wildlife Trust	Local and regional ecology and biodiversity issues	Understanding of local wildlife assets and how to mitigate and offset any impacts to these.
Woodland Trust	The route and associated effects to local woodland habitats	Informing understanding of local woodland habitats and how to mitigate and offset impacts to these.

3.3.6 Further information about topic-specific engagement with technical and specialist groups is provided in Sections 4 to 15, where relevant.

Communities

3.3.7 Community stakeholders in the South Cheshire area include a range of local community interest groups, local facility and service providers and schools, as well as members of the public. The purpose of this engagement has been to give affected communities the opportunity to raise issues during the development of the design and assessment of the Proposed Scheme.

3.3.8 As part of the formal consultation on the working draft EIA Report, members of local communities and other interested parties were notified, provided with information and invited to engage on issues pertinent to the working draft EIA Report and the development of the Proposed Scheme design. Details of local consultation events were provided on the HS2 Ltd website, via social media, on posters at local venues, through regional advertising and direct mail-out to properties within 1km of the Proposed Scheme.

3.3.9 In the South Cheshire area, a consultation event on the working draft EIA Report, working draft EQIA Report and on key design refinements was held at Wychwood Park on 19 October 2016. HS2 Ltd staff and consultants attended the events, including engineers, environmental and property specialists, for members of the public to speak to.

3.3.10 An overview of how responses have been taken into consideration in the ES is contained in the Working Draft EIA Report Consultation Summary Report.

3.3.11 Engagement has also been undertaken with members of the community via the local parish councils and residents, as outlined in Table 10. Engagement with parish

councils and residents has been used to understand local community concerns and issues in relation to the Proposed Scheme.

3.3.12 Table 10 sets out meetings undertaken with community stakeholders in the South Cheshire area.

Table 10: Meetings held with communities and community stakeholders

Stakeholder	Area of focus	How this has informed the design and assessment of the Proposed Scheme
Weston and Basford Parish Council	To provide an update on the Proposed Scheme and discuss the working draft EIA, EQIA and Design Refinement consultation documents and understand the local conditions and factors to inform scheme design and EIA.	Understanding local conditions and factors to inform scheme design and EIA.
Hough and Chorlton Parish Council		
Hatherton and Walgherton Parish Council		
Wybunbury Parish Council		
Donnington and District Parish Council		
Mid Cheshire Footpath Society	Local footpaths and the Proposed Scheme and understand the use of local footpaths and how construction and operation of the Proposed Scheme could impact footpaths.	Understanding local conditions and factors to inform scheme design and EIA.

Directly affected individuals, landowners and businesses

3.3.13 Engagement was undertaken with land owners, farmers and growers whose operations, land and/or property will be directly affected by the Proposed Scheme whether permanently or temporarily. This included individual property and land owners, educational entities, and farmers and growers, including through the land and property consultation and ongoing dialogue.

3.3.14 Twelve visits were undertaken to farmers and growers in this area during the assessment and design development. Engagement was also carried out with key representatives of the farmers and growers' industry.

3.3.15 Key areas of focus for the engagement with landowners and their representatives were: the refinement of locations of balancing ponds, access roads and environmental mitigation; the design of access and accommodation bridges; and maintaining operational access to land and businesses.

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 South Cheshire 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 been undertaken. 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 holding³¹.
- 4.1.3 Details of published and publicly available information used in the assessment, and the results of surveys undertaken within this area, are contained in Volume 5: Appendix AG-001-005 and shown on Map Series AG-01 (Agricultural Holdings), AG-02 (Soil Associations) and AG-04 (Agricultural Land Classification) (Volume 5: Agriculture, forestry and soils Map Book).
- 4.1.4 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 can be found in the Volume 2: CA5 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), the Scope and Methodology Report (SMR)³², and the SMR Addendum³³.
- 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.

³¹ Part 3 of the HS2 Phase 2a Guide for Farmers and Growers, Available online at: www.gov.uk/hs2

³² Volume 5: Appendix CT-001-001, Environmental Impact Assessment Scope and Methodology Report.

³³ Volume 5: Appendix CT-001-002, Environmental Impact Assessment Scope and Methodology Report Addendum.

- 4.2.3 The quality of agricultural land in England and Wales is assessed according to the Agricultural Land Classification (ALC)³⁴ 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 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 land use feature, and the impacts have been calculated quantitatively. The qualitative effects on forestry land and woodland are addressed principally in Section 8, Ecology and biodiversity; and Section 11, Landscape and visual.
- 4.2.5 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, Cultural heritage; Section 8, Ecology and biodiversity; Section 11, Landscape and visual; and Section 15, Water resources and flood risk. The function of soil as a carbon store is described in Volume 3: Route-wide effects (Section 4).
- 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.
- 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 capital items demolished will not be replaced as replacement assets are not included in the Proposed Scheme and will ultimately be at the discretion of the landowner. 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 South Cheshire 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.

³⁴ 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.

Soil and land resources

Geology and soil parent materials

- 4.3.2 A full description of the geological characteristics of the South Cheshire area is provided in Section 10, Land quality and Section 15, Water resources and flood risk, and shown on Map WR-02-205 (Volume 5: Water resources and flood risk Map Book). The bedrock geology mapped by the British Geological Survey (BGS)³⁵ mostly comprises the Sidmouth Mudstone Formation, which is found north of Chorlton and also around Wrinehill and Checkley. This formation is part of the Mercia Mudstone Group and comprises structureless mudstone and siltstone. There are two halite-rich horizons present within the Sidmouth Mudstone Formation; the Northwich Halite Member found to the south of the study area, and the Wilkesley Halite Member between Blakenhall and Hough.
- 4.3.3 Superficial Glacial Till and glaciofluvial deposits are mapped throughout the study area over the bedrock units. Glacial Till comprises unsorted material ranging in size from clay to boulders (hence, it is also commonly referred to as Boulder Clay). These deposits are mapped across shallow slopes and flatter land at lower altitudes.
- 4.3.4 Glaciofluvial sands and gravels are deposited over the mudstone predominantly at slightly higher elevations and on moderate slopes, including near Wrinehill and further north on lower lying, flatter land.
- 4.3.5 To the south of Wrinehill, alluvial deposits are associated with the Checkley Brook and the River Lea. These typically comprise consolidated silty clay, but may also contain silt, sand, Peat and gravel. Superficial deposits of Alluvium and Peat are also associated with the Mere Gutter, which occupies a shallow valley east of Chorlton, and with the Basford Brook at Weston.

Topography and drainage

- 4.3.6 The main topographical feature is a largely level, low-lying plain extending throughout the area north-west of Betley. In contrast, the topography around Wrinehill in the south comprises a series of ridges with moderate to steep slopes down to the plain, draining land towards Betley Mere and Blakenhall to the east and west respectively. In the south of the study area, altitudes vary from 80m to 90m above Ordnance Datum (AOD), falling to 65m to 70m AOD at Chorlton and to 50m AOD to the south of Crewe. Drainage of the land is via the River Lea, Checkley Brook, Mere Gutter, Swill Brook and Basford Brook. There are numerous ponds present throughout the area within former marl pits, as described in Section 8, Ecology and biodiversity and Section 10, Land quality. Further details on drainage are provided in Section 15, Water resources and flood risk.
- 4.3.7 The greatest flood risk in the study area is across low-lying land, closely associated with the Checkley Brook, Mere Gutter and the Swill Brook, although normally only a narrow corridor along these watercourses is classified as Flood Zone 3, in which there is a 1 in 100 or greater annual probability of flooding. The largest areas within Flood

³⁵ British Geological Survey (2017). Geology of Britain viewer. Available online at <http://mapapps.bgs.ac.uk/geologyofbritain/home.html>.

Zone 3 are to the south of Wrinehill, at Betley Common and to the east of Shavington, with smaller areas east of Chorlton and south of Crewe. Flood Zone 2 is defined as land having between a 1 in 100 and 1 in 1,000 annual probability of flooding by a river. The largest area of land classified as Flood Zone 2 lies to the south of Crewe.

Description and distribution of soil types

- 4.3.8 The characteristics of the soils are described by the Soil Survey of England and Wales³⁶ and shown on the National Soil Map³⁷. The soils are grouped into associations of a range of soil types. They are described in more detail in Volume 5: Appendix AG-001-005 and their distribution is shown on Map AG-02-105 (Volume 5: Agriculture, forestry and soils Map Book).
- 4.3.9 There are two groups of soil associations in this study area. The presence of each group has been confirmed by detailed soil survey data obtained from published survey records and surveys undertaken for the purpose of this assessment. The first group comprises loamy sand or sandy loam topsoils over sandy loam, loamy sand or sand subsoils, developed in glaciofluvial deposits. This group includes the Blackwood, Newport 1 and Wick 1 associations. Profiles are mostly well drained, of Wetness Class³⁸ (WC) I, although the Blackwood soils can be affected by groundwater and are commonly imperfectly (WC III) or poorly (WC IV) drained. Soil surveys have confirmed that profiles characteristic of the Wick 1 and Newport 1 associations are present throughout the south, east and north of the South Cheshire area.
- 4.3.10 The second group of soils includes the Clifton and Crewe associations, which are characterised by clay loam or sandy clay loam topsoil over similar-textured subsoils. The subsoil is, however, slowly permeable and the profiles are typically poorly drained (WC IV), but can be improved to imperfectly drained (WC III) with underdrainage. Soil surveys have identified both the Clifton Association, comprising clay loam over sandy clay loam, of WC III, and the Crewe Association, with clay loam over clay subsoils, of WC IV, in the north and west of the study area.

Soil and land use interactions

Agricultural land quality

- 4.3.11 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 and the study area.
- 4.3.12 The main soil properties that affect the cropping potential and management requirements of land are texture, structure, depth, stoniness and chemical fertility.

³⁶ 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.

³⁷ Cranfield University (2001), *The National Soil Map*.

³⁸ 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.

- 4.3.13 Climate within this study 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 droughtiness³⁹ limitations of the land.
- 4.3.14 The local agro-climatic data have been interpolated from the Meteorological Office's standard 5km grid point dataset⁴⁰ for three points within the study area and are set out in Volume 5: Appendix AG-001-005. The data shows the area to have a relatively mild climate. The number of Field Capacity Days (FCD), when the soil moisture deficit⁴¹ is zero, ranges from 172 to 180 days per annum. This is higher than average for lowland England (150 days) and generally constrains agricultural cultivations and soil handling for relatively long periods over winter. Soil moisture deficits, which give an indication of the liability of soils to droughtiness in summer, are moderate to moderately small.
- 4.3.15 Site factors include gradient and microrelief, which are limiting to agricultural land quality in some places within this study area, particularly to the west of Wrinehill where the steepest slopes exceed 18 degrees, limiting land to Grade 5. Flood risk is also likely to affect agricultural land quality around the Mere Gutter, limiting land quality to Subgrade 3b. Further details are provided in Section 15, Water resources and flood risk.
- 4.3.16 The main physical limitations that result from interactions between soil, climate and site factors are soil wetness, soil droughtiness and a localised susceptibility to erosion. For soil wetness, each soil can be allocated a Wetness Class based on soil structure, evidence of waterlogging and the number of FCDs. The topsoil texture then determines its ALC grade. Soil droughtiness is determined by the soil textures and thickness of each soil horizon present, together with the crop moisture deficits.
- 4.3.17 The well drained, coarse-textured profiles of the first group of soil associations (including Blackwood, Newport 1 and Wick 1) are mostly affected by soil droughtiness, the severity of which is determined by factors such as specific soil textures and stone contents. As crop moisture deficits are moderate to moderately small, droughtiness limitations are likely to be slight, potentially downgrading land to Grade 2.
- 4.3.18 Detailed survey data at Weston Hall and in the south, east and north of the area confirms that sandy loam topsoils over loamy sand and sand subsoils of WC I are limited by soil droughtiness to mostly Grade 2, with some areas more severely limited to Subgrade 3a.
- 4.3.19 However, the Blackwood soils are affected by soil wetness and workability, and are likely to be classified as Subgrade 3a or 3b depending upon the specific site circumstances and the effects of groundwater.
- 4.3.20 The Crewe soils within the second soil type, comprising poorly drained profiles (WC IV) with clay loam or sandy clay loam topsoils are limited by soil wetness and workability

³⁹ 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.

⁴⁰ Meteorological Office (1989), *Gridpoint Meteorological data for Agricultural Land Classification of England and Wales and other Climatological Investigations*.

⁴¹ 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.

to Subgrade 3b, except where there are heavy loam topsoils, which are likely to be downgraded to Grade 4.

- 4.3.21 The detailed survey at Weston Hall identified clay loam and sandy clay loam topsoils over clay, characteristic of the Crewe association, and assessed as WC IV. The limitation is to Subgrade 3b due to soil wetness and workability. Survey data also confirms the presence of slightly better drained Clifton soils within the second soil type. In the north of the area these soils have clay loam topsoils over sandy clay loam subsoils. Where they have imperfectly drained profiles of WC III with medium loamy topsoils they are of Subgrade 3a, whilst those with heavier loamy topsoils are of Subgrade 3b.
- 4.3.22 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 the Environment, Food and Rural Affairs (Defra) mapping⁴² shows that there is a high likelihood of encountering BMV agricultural land in the locality, which makes such land a resource of low sensitivity in this study area.
- 4.3.23 The distribution of agricultural land quality in the study area is described in more detail in Volume 5: AG-001-005 and shown on Maps AG-04-115b to Map AG-04-117 (Volume 5: Agriculture, forestry and soils Map Book).

Other soil interactions

- 4.3.24 Soil fulfils a number of functions and services for society in addition to those of food and biomass production, which are central to social, economic and environmental sustainability. These are outlined in sources such as the Soil Strategy for England⁴³ and the Government's White Paper, *The Natural Choice: securing the value of nature*⁴⁴, and include:
- the storage, filtration and transformation of water, carbon and nitrogen in the biosphere;
 - the support of ecological habitats, biodiversity and gene pools;
 - support for the landscape;
 - the protection of cultural heritage;
 - the provision of raw materials; and
 - the provision of a platform for human activities, such as construction and recreation.
- 4.3.25 Forestry resources represent a potentially multifunctional source of productive timber, landscape amenity, biodiversity and carbon storage capacity. An assessment

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

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

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

of the value and sensitivity of woodland resources is reported in Section 8, Ecology and biodiversity.

- 4.3.26 The low-lying land associated with the Mere Gutter, in particular that to the north, west and south of Betley Common, and to the east of Chorlton, is likely to be at greatest risk of flooding, as set out in Section 15, Water resources and flood risk. The soils in this area function as water stores for flood attenuation, as well as providing ecological habitat.

Land use

Land use description

- 4.3.27 Agricultural land use in the South Cheshire area is predominantly pasture, although arable cropping is more common near Wrinehill to the south and in the area between Weston, Basford and Hough, to the north. The pasture found throughout the centre of the area is predominantly used to graze dairy cattle, with less intensive grassland land uses to the east of the West Coast Main Line.
- 4.3.28 Most of the fields in the northern and southern ends of the area are large and regular, reflecting their arable use. The field pattern is more irregular between Blakenhall and Hough, with small grassland fields directly south of Hough.
- 4.3.29 There is limited woodland within the study area, with the only substantial blocks of woodland being at Checkley Wood, Blakenhall Moss and Burrow Coppice. Checkley Wood is managed as part of a pheasant-shooting enterprise.
- 4.3.30 The proportion of woodland as a land use in the general locality, taken as a 4km corridor centred on the route of the Proposed Scheme, is 10%. As this is in line with the national average of 10%, woodland as a land use is assessed as a resource of medium sensitivity in this study area.
- 4.3.31 A number of environmental designations potentially influence land use within the study area. The whole area is a nitrate vulnerable zone, where statutory land management measures apply that seek to reduce nitrogen losses from agricultural sources to water.
- 4.3.32 Some agricultural land is also subject to agri-environment management prescriptions that seek to retain and enhance the landscape and biodiversity qualities and features of farmland. These are associated with the Environmental Stewardship Scheme (the Entry Level Scheme (ELS) or Higher Level Scheme (HLS)), or the Countryside Stewardship Scheme (CSS), which since 2015 is the main agri-environment scheme in England. The CSS incorporates elements of Environmental Stewardship, the English Woodlands Grant scheme and Catchment Sensitive Farming grants.
- 4.3.33 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 CSS is more focussed than Environmental Stewardship, with applications for funding being competitive and the area covered by the scheme expected to be less than that covered under Environmental Stewardship.

Holdings that have land entered into an agri-environment scheme are identified in Table 11.

Number, type and size of holdings

- 4.3.34 Table 11 sets out the main farm holdings within this study area.
- 4.3.35 Farm holdings range from small non-commercial or semi-commercial and mainly equestrian holdings to larger arable, livestock or mixed farms between 100ha and 370ha. There are four dairy units in the area, all of which are over 200ha, with herds being medium to large scale (200 to 500 milking cows). Three of these farms also undertake arable farming. Most of the solely arable farms are located in the north of the study area and are of a moderate scale. There are seven non-commercial holdings mainly used for the keeping of horses. These holdings range between 1ha and 7ha. The boundaries of the holdings are shown on Maps AG-01-115b to AG-01-117 (Volume 5: Agriculture, forestry and soils Map Book) along with the location of the main farm buildings. Field drainage is prevalent throughout the study area and critical for the dairy enterprises in particular in order to maintain high grassland productivity and extend the length of the grazing season.
- 4.3.36 In addition to the farm holdings detailed in Table 11, Checkley Wood Shoot operates across a large part of the study area, including land farmed by Grange Farm (CA5/1), Lower Den Farm (CA5/2), Ash Tree Farm (CA5/3) and Oakhanger Hall (CA5/5).
- 4.3.37 Table 11 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. The holding reference provides a unique identifier and relates to Maps AG-01-115b to AG-01-117 (Volume 5: Agriculture, forestry and soils Map Book) and Volume 5: Appendix AG-001-005.

Table 11: Summary characteristics of holdings

Holding reference/name	Holding type	Holding size (ha)	Diversification	Agri-environment scheme	Sensitivity to change
CA5/1 Grange Farm	Poultry and arable	372	Shoot	None	High
CA5/2 Lower Den Farm	Dairy, beef cattle and arable	258	Shoot, wind turbine, telephone masts	ELS and HLS	High
CA5/3 Ash Tree Farm	Dairy and arable	201	Shoot	ELS	High

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Holding reference/name	Holding type	Holding size (ha)	Diversification	Agri-environment scheme	Sensitivity to change
CA5/4* Land at Higher Den Farm	Equestrian (non-commercial)	1	Not known	None	Low
CA5/5 Oakhanger Hall	Dairy and arable	304	Shoot	ELS	High
CA5/6 1 Gonsley Farm Barns	Equestrian (non-commercial)	1.2	None	None	Low
CA5/7 2 Gonsley Farm Barns	Equestrian (non-commercial)	1.4	None	None	Low
CA5/8* Rose Hill Farm	Beef cattle and arable	52	Not known	None	Medium
CA5/9 Ellesmere Dairy Farm	Dairy and beef cattle	304	Paintball	ELS	High
CA5/10* Land west of Waybutt Lane	Equestrian (non-commercial)	7	Not known	None	Low
CA5/11* Chorlton Dairy Farmhouse	Equestrian (non-commercial)	2	Not known	None	Low
CA5/12 Jubilee Farm	Sheep, pigs, chickens and horses (non-commercial)	6	None	None	Low
CA5/13 Heath Farm	Arable	100	DIY livery, agricultural contracting, engineering workshop	None	Medium
CA5/14* Land west of Chorlton Lane	Equestrian (non-commercial)	4	Not known	None	Low
CA5/15* Chorlton Bank Farm	Grassland	7	Not known	None	Low
CA5/16* The Moss	Arable	92	Not known	None	Medium

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Holding reference/name	Holding type	Holding size (ha)	Diversification	Agri-environment scheme	Sensitivity to change
CA5/17* Rope Green Farm	Dairy and arable	28	Not known	None	Medium (affected land not part of grazing block)
CA5/18 Casey Lane Stables	Equestrian livery	6	None	None	Low
CA5/19 Brookhouse Farm	Equestrian livery	3	None	None	Low
CA5/20* Crotia Mill Farm	Beef cattle and arable	26	Not known	ELS	Medium
CA5/21* Basford Hall	Equestrian	2	Not known	None	Low
CA5/22 Larch Farm	Arable and grassland	57	Residential let	None	Medium
CA5/23* New Farm	Grassland	10	Not known	None	Medium
CA5/24* Land south of A500 Shavington Bypass	Arable	4	Not known	None	Medium

* No Farm Impact Assessment interview conducted; data estimated.

Future baseline

Construction (2020)

- 4.3.38 Volume 5: Appendix CT-004-000 provides details of the developments in the South Cheshire area that are assumed to have been implemented by 2020.
- 4.3.39 No committed developments have been identified in this study area that will materially alter the baseline conditions in 2020 for agriculture, forestry and soils.

Operation (2027)

- 4.3.40 Volume 5: Appendix CT-004-000 provides details of the developments in the South Cheshire area that are assumed to have been implemented by 2027.
- 4.3.41 No committed developments have been identified in this study area that will materially alter the baseline conditions in 2027 for agriculture, forestry and soils.

4.4 Effects arising during construction

Avoidance and mitigation measures

- 4.4.1 During the development of the design, the following measures have been incorporated to avoid or mitigate adverse impacts on agriculture, forestry or soils:
- agricultural access track provided north of Checkley Lane overbridge for use by Grange Farm (CA5/1);
 - agricultural crossing incorporated into Blakenhall Bridleway 8 accommodation overbridge to replace existing access to Lower Den Farm (CA5/2);
 - agricultural crossing incorporated into Blakenhall Bridleway 12 accommodation bridges for use by Oakhanger Hall (CA5/5); and
 - agricultural access available for Ellesmere Dairy Farm (CA5/9) via the Chorlton Road diversion.
- 4.4.2 The permanent severance of agricultural land is also mitigated by the ability of agricultural machinery to pass under the Checkley Brook viaduct.
- 4.4.3 Other design refinements to reduce the impact of the construction of the Proposed Scheme on agriculture, forestry and soil resources have included:
- rationalisation of balancing ponds to seek to locate them in least sensitive agricultural locations;
 - locally slackened or steepened slopes to improve agricultural land use;
 - rationalisation of road realignments to reduce the area of agricultural land required;
 - incorporation of agricultural tracks to gain access to severed land; and
 - rationalisation and relocation of mitigation planting to limit the area of agricultural land required and reduce impacts on holdings.
- 4.4.4 In addition, 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 will be stripped and stored. This will enable agricultural land that is required temporarily for construction to be returned to agricultural use. It will also enable soils to be returned to other uses, such as to support landscape planting and biodiversity, and to a suitable condition whereby they will be able to fulfil the identified function.
- 4.4.5 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 CoCP⁴⁵ and relate to:
- the reinstatement of agricultural land which is used temporarily during

⁴⁵ Volume 5: Appendix CT-003-000, Draft Code of Construction Practice.

construction to agriculture, where this is the agreed end use (Section 6);

- the provision of a method statement 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 will include any remediation measures necessary following the completion of works (Section 6);
- a requirement for contractors to monitor and manage flood risk and other extreme weather events, insofar as reasonably practicable, that may affect agriculture, forestry and soil resources during construction (Sections 5 and 16);
- arrangements for the maintenance of farm and field accesses affected by construction (Section 6);
- the protection and maintenance of existing land drainage and livestock water supply systems, where reasonably practicable (Sections 6 and 16);
- the protection of agricultural land adjacent to the construction site, including the provision and maintenance of appropriate stock-proof fencing (Sections 5, 6, 9 and 12);
- the adoption of measures to control the deposition of dust on adjacent agricultural crops (Section 7);
- the control of invasive and non-native species; and the prevention of the spread of weeds generally from the construction site to adjacent agricultural land (Section 9);
- the adoption of measures to prevent, insofar as reasonably practicable, the spread of soil-borne, tree, crop and animal diseases from the construction area (Sections 6 and 9); and
- liaison and advisory arrangements with affected landowners, occupiers and agents, as appropriate (Sections 5 and 6).

4.4.6 Upon completion of construction, soils replaced for agricultural, forestry or landscape uses will be monitored to identify any unsatisfactory growing conditions during the five-year aftercare period.

4.4.7 Where agricultural uses are to be resumed on land disturbed during the construction of the Proposed Scheme, the design objective is to avoid any reduction in long term capability, which would downgrade the quality of the disturbed land, through the adoption of good practice techniques in handling, storing and reinstating soils on that land. Some poorly or very poorly drained land or land with heavier textured soils (particularly the Clifton and Crewe association soils) may also require careful management, such as the timing of cultivation and livestock grazing, during the aftercare period to ensure this outcome.

Assessment of impacts and effects

4.4.8 The acquisition and use of land for the Proposed Scheme will 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 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 inaccessible severed land as part of environmental mitigation works.

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

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

Temporary effects during construction

Impacts on agricultural land

4.4.10 During the construction phase, the total area of agricultural land used within the South Cheshire area will be approximately 366ha as shown in Table 12. Of this total, it is anticipated that approximately 198ha will be restored and available for agricultural use following construction.

Table 12: Agricultural land required for the construction of the Proposed Scheme

Agricultural land quality	Area required (ha)	Percentage of agricultural land	Area to be restored (ha)
Grade 1	0	0	0
Grade 2	64.9	18	39.4
Subgrade 3a	83.2	23	36.7
BMV subtotal	148.1	41	76.1
Subgrade 3b	209.6	57	120.9
Grade 4	5.3	1	0.7
Grade 5	2.8	1	0.1
Total agricultural land	365.8	100	197.8

4.4.11 The disturbance during construction to approximately 148ha of BMV land is assessed as an impact of medium magnitude, comprising 41% of the agricultural land requirement. BMV land is assessed as a receptor of low sensitivity because of its

relative abundance in this area. The effect of the Proposed Scheme on BMV land during the construction phase is, therefore, assessed as minor adverse, which is not significant.

- 4.4.12 Following completion of construction, temporary facilities will 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. This could improve the quality of agricultural land locally, for example where droughty soils are limited by soil depth, subject to the soil resource plans to be prepared during the detailed design stage.

Nature of the soil to be disturbed

- 4.4.13 The sensitivity of the soils disturbed by construction activity reflects their textural characteristics, in the light of local rainfall conditions, as set out in the SMR. In areas of heaviest rainfall, 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 of lowest rainfall and during the driest times of the year are the least susceptible.
- 4.4.14 Successful soil handling is dependent upon movements being undertaken under appropriate weather and ground conditions using the appropriate equipment. The principles of soil handling are well established and set out in advisory material such as Defra's Code of Practice for the Sustainable Use of Soils⁴⁶. These principles will be followed throughout the construction period.
- 4.4.15 The fine loamy and seasonally waterlogged Clifton and Crewe associations are least able to remain structurally stable when moved in wet conditions or by inappropriate equipment. They are susceptible to compaction and smearing, which could affect successful reinstatement.
- 4.4.16 The disturbance of peat soils has implications for carbon emissions and biodiversity. The Proposed Scheme seeks to reduce disturbance of any deep peat soils insofar as reasonably practicable. Where disturbance cannot be avoided, the peat soils will be handled with particular care to avoid compaction when wet and wind erosion when the soils are dry. When reinstated, opportunities will be taken to use peat soils to create habitats, enhance biodiversity and build carbon reserves.
- 4.4.17 A borrow pit to be located north of Checkley Lane at Lower Den Farm (CA5/2) will be used to extract material that is suitable for engineering purposes, from beneath the topsoil and subsoil (i.e. the whole soil profile). It is anticipated that borrow pits will be restored with materials generated from construction of the Proposed Scheme, typically clay, which does not have suitable characteristics for use as construction or engineering fill. The existing soil survey data indicates that the entire agricultural soil profile (i.e. the topsoil and subsoil) is likely to be available for agricultural restoration so that agricultural soils can be returned to the same condition as their pre-excavated

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

state, as good practice techniques will be used to handle, store and reinstate soils. Given the permeable nature of the existing material beneath the agricultural soil profile, agricultural land drainage works will be required when restoring the borrow pit to achieve this condition and to ensure ongoing agricultural management of the restored land.

Impacts on holdings

- 4.4.18 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 will occur simultaneously at the start of the construction period and it is the combined effect of both that will have the most impact on the holding. In due course, some agricultural land will be restored and the impact on individual holdings will reduce.
- 4.4.19 The effects of the Proposed Scheme on individual agricultural and related interests during the construction period are summarised in Table 13. This table shows the total area of land required from a particular holding in absolute terms and as a percentage of the total area farmed. It also shows the area of land that will be returned to the holding following the construction period. The degree of impact is based on the proportion of the holding required rather than the absolute area of land.
- 4.4.20 The effects of severance during construction are judged on the ease and availability of access to severed land. With the implementation of measures in set out in the draft CoCP, these will generally be the same during and post construction. The disruptive effects, principally of construction noise and dust, are assessed according to their effects on land uses and enterprises. Impacts on residential properties on farm holdings are assessed, as required, in Section 5, Air quality; Section 6, Community; and Section 13, Sound, noise and vibration. Full details of the nature and significance of effects are set out in Volume 5: Appendix AG-001-005.

Table 13: Summary of effects on holdings during construction

Holding reference/name/ sensitivity	Total area required from holding	Construction severance	Disruptive effects	Scale of construction effect	Area to be restored
CA5/1 Grange Farm High sensitivity	46.8ha (13%) Medium	High	Low	Major adverse due to severance during construction	29.1ha (4.1ha restored borrow pit)
CA5/2 Lower Den Farm High sensitivity	90.8ha (35%) High	Medium	Medium	Major adverse due to proportion of land required for borrow pit	58.8ha (35.9ha restored borrow pit)
CA5/3 Ash Tree Farm High sensitivity	28.8ha (14%) Medium	Negligible	Low	Major/moderate due to proportion of land required	17.4ha

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Holding reference/name/ sensitivity	Total area required from holding	Construction severance	Disruptive effects	Scale of construction effect	Area to be restored
CA5/4 Land at Higher Den Farm Low sensitivity	0.4ha (41%) High	Negligible	Negligible	Moderate adverse due to proportion of land required	0ha
CA5/5 Oakhanger Hall High sensitivity	108.4ha (36%) High	High	Medium	Major adverse due to due to proportion of land required and severance during construction	50.0ha
CA5/6 1 Gonsley Farm Barns Low sensitivity	0.2ha (17%) Medium	Negligible	Medium	Minor adverse	0.1ha
CA5/7 2 Gonsley Farm Barns Low sensitivity	1.4ha (100%) High	Negligible	Negligible	Moderate adverse due to proportion of land required	0.8ha
CA5/8 Rose Hill Farm Medium sensitivity	0.7ha (1%) Negligible	Negligible	Negligible	Negligible	0ha
CA5/9 Ellesmere Dairy Farm High sensitivity	14.6ha (5%) Negligible	Negligible	Low	Moderate adverse due to disruptive during construction	3.2ha
CA5/10 Land west of Waybutt Lane Low sensitivity	6.1ha (87%) High	Negligible	Negligible	Moderate adverse due to proportion of land required	4.6ha
CA5/11 Chorlton Dairy Farmhouse Low sensitivity	1.3ha (67%) High	Negligible	Medium	Moderate adverse due to proportion of land required	0.1ha
CA5/12 Jubilee Farm Low sensitivity	4.4ha (73%) High	Negligible	Negligible	Moderate adverse due to proportion of land required	0.8ha

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Holding reference/name/ sensitivity	Total area required from holding	Construction severance	Disruptive effects	Scale of construction effect	Area to be restored
CA5/13 Heath Farm Medium sensitivity	15.9ha (16%) Medium	Negligible	Negligible	Moderate adverse due to proportion of land required	5.9ha
CA5/14 Land west of Chorlton Lane Low sensitivity	1.1ha (28%) High	Negligible	Negligible	Moderate adverse due to proportion of land required	0.2ha
CA5/15 Chorlton Bank Farm Low sensitivity	3.0ha (43%) High	Negligible	Negligible	Moderate adverse due to proportion of land required	1.6ha
CA5/16 The Moss Medium sensitivity	23.9ha (26%) High	High	Negligible	Major/moderate adverse due to the proportion of land required and severance during construction	10.6ha
CA5/17 Rope Green Farm Medium sensitivity	2.0ha (7%) Low	Negligible	Negligible	Minor adverse	0ha
CA5/18 Casey Lane Stables Low sensitivity	1.7ha (28%) High	Negligible	Negligible	Moderate adverse due to proportion of land required	0.1ha
CA5/19 Brookhouse Farm Low sensitivity	0.8ha (27%) High	Negligible	Negligible	Moderate adverse due to proportion of land required	0ha
CA5/20 Crotia Mill Farm Medium sensitivity	0.4ha (1%) Negligible	Negligible	Negligible	Negligible	0.4ha
CA5/21 Basford Hall Low sensitivity	0.7ha (35%) High	Negligible	Negligible	Moderate adverse due to proportion of land required	0.7ha

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Holding reference/name/ sensitivity	Total area required from holding	Construction severance	Disruptive effects	Scale of construction effect	Area to be restored
CA5/22 Larch Farm Medium sensitivity	3.0ha (5%) Negligible	Negligible	Negligible	Negligible	2.5ha
CA5/23 New Farm Medium sensitivity	5.9ha (59%) High	Negligible	Negligible	Major/moderate adverse due to proportion of land required	5.5ha
CA5/24 Land south of A500 Shavington Bypass Medium sensitivity	0.6ha (14%) Medium	High	Negligible	Major/Moderate adverse due to severance during construction	0.6ha

4.4.21 Overall, 24 holdings in the South Cheshire area will be affected during construction, of which 19 will experience moderate, moderate/major or major adverse effects, which are significant.

4.4.22 The temporary construction effect on the dairy units at Lower Den Farm (CA5/2) and Oakhanger Hall (CA5/5) are assessed as major adverse due to the high proportion of land required and severance. A high proportion of the land required at Lower Den Farm will be for the borrow pit north of Checkley Lane, which will be restored to agricultural use. Both holdings will also experience substantial disturbance effects on farm operations during construction, with farm access tracks and bridges being affected. The major adverse effect on Grange Farm (CA5/1) is due to the severance of land during construction.

4.4.23 Four holdings will experience major/moderate adverse effects during construction, all of which relate to land loss and severance. One of these holdings, the dairy unit at Ash Tree Farm (CA5/3), will lose part of the grazing block of land, which will have a substantial impact on the operation of the farm.

4.4.24 Most of the 12 holdings that will experience a moderate adverse temporary effect are small, low sensitivity holdings with a substantial proportion of land required.

4.4.25 Approximately 237ha of land used by Checkley Wood Shoot will be required during construction. It is expected that the temporary loss of this land will have a moderate adverse impact on the enterprise, which is significant.

Permanent effects of construction

Impacts on agricultural land

4.4.26 Following construction and restoration, the area of agricultural land that will remain permanently required will be approximately 168ha, as shown in Table 14.

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Table 14: Agricultural land required permanently

Agricultural land quality	Total area required (ha)	Percentage of agricultural land
Grade 1	0	0
Grade 2	25.4	15
Subgrade 3a	46.5	28
BMV subtotal	71.9	43
Subgrade 3b	88.8	53
Grade 4	4.6	2
Grade 5	2.7	2
Total agricultural land	168	100

4.4.27 Of this total requirement, 9.9ha (6%) will comprise newly planted woodlands for visual screening and habitat creation to mitigate environmental effects arising from the Proposed Scheme. These areas are described in Section 8, Ecology and biodiversity and Section 11, Landscape and visual.

4.4.28 An area of 0.4ha of agricultural land to the south of the River Lea, shown on CT-o6-235 (Volume 2: CA5 Map Book) will be engineered to provide replacement floodplain storage, but as this land is not BMV land, the downgrading effects on agricultural land quality will be negligible. This assessment assumes that this land will return to agricultural use.

4.4.29 The permanent requirement for approximately 72ha of BMV land within the South Cheshire area is assessed as an impact of medium magnitude, comprising 43% of the overall agricultural land requirement. BMV land in this area is a receptor of low sensitivity so the permanent effect on BMV land is assessed as minor adverse, which is not significant.

Impacts on forestry land

4.4.30 The total area of woodland required as a result of the Proposed Scheme in the South Cheshire area will be 6.4ha from seven woods, as set out in Section 8, Ecology and biodiversity, out of a total permanent land requirement (including non-agricultural land) of approximately 180ha (4%).

4.4.31 The permanent requirement for woodland is assessed as an impact of low magnitude in land use terms and, as the area of woodland is similar to the average national woodland cover (10%), the effect on forestry land is not considered to be significant in quantitative terms, and in terms of the agriculture, forestry and soils assessment. The qualitative assessment of loss of woodland is addressed in Section 8, Ecology and biodiversity.

Impacts on holdings

4.4.32 The permanent effects from the construction of the Proposed Scheme on individual agricultural and related interests are summarised in Table 15. The land required column refers to the area of land required to operate the Proposed Scheme in absolute terms and as a percentage of the overall area farmed. The scale of effect is

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based on the likely proportion of land required from the holding. The 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 loss of or damage to farm capital, such as property, buildings and structures, and the consequential effects on land uses and enterprises. Full details of the nature and scale of effects are set out in Volume 5: Appendix AG-001-005.

Table 15: Summary of permanent effects on holdings from construction

Holding reference/name/sensitivity	Land required from holding	Severance	Infrastructure	Scale of effect
CA5/1 Grange Farm High sensitivity	17.7ha (5%) Negligible	Low	Negligible	Moderate adverse due to severance
CA5/2 Lower Den Farm High sensitivity	32.0ha (12%) Medium	Low	Negligible	Major/moderate adverse due to proportion of land required
CA5/3 Ash Tree Farm High sensitivity	11.4ha (6%) Low	Negligible	Negligible	Moderate adverse due to proportion of land required
CA5/4 Land at Higher Den Farm Low sensitivity	0.4ha (41%) High	Negligible	Negligible	Moderate adverse due to proportion of land required
CA5/5 Oakhanger Hall High sensitivity	54.4ha (19%) Medium	Low	Negligible	Major/moderate adverse due to proportion of land required
CA5/6 1 Gonsley Farm Barns Low sensitivity	0.1ha (8%) Low	Negligible	Negligible	Negligible
CA5/7 2 Gonsley Farm Barns Low sensitivity	0.6ha (43%) High	Negligible	Negligible	Moderate adverse due to proportion of land required
CA5/8 Rose Hill Farm Medium sensitivity	0.7ha (1%) Negligible	Negligible	Negligible	Negligible
CA5/9 Ellesmere Dairy Farm High sensitivity	11.4ha (4%) Negligible	Negligible	Negligible	Minor adverse

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Holding reference/name/sensitivity	Land required from holding	Severance	Infrastructure	Scale of effect
CA5/10 Land west of Waybutt Lane Low sensitivity	1.5ha (22%) High	Negligible	Negligible	Moderate adverse due to proportion of land required
CA5/11 Chorlton Dairy Farmhouse Low sensitivity	1.2ha (64%) High	Negligible	Negligible	Moderate adverse due to proportion of land required
CA5/12 Jubilee Farm Low sensitivity	3.6ha (60%) High	Negligible	Negligible	Moderate adverse due to proportion of land required
CA5/13 Heath Farm Medium sensitivity	10.0ha (10%) Low	Negligible	Negligible	Minor adverse
CA5/14 Land west of Chorlton Lane Low sensitivity	0.9ha (23%) High	Negligible	Negligible	Moderate adverse due to proportion of land required
CA5/15 Chorlton Bank Farm Low sensitivity	1.4ha (20%) Medium	Negligible	Negligible	Minor adverse
CA5/16 The Moss Medium sensitivity	13.3ha (14%) Medium	Medium	Negligible	Moderate adverse due to proportion of land required and severance
CA5/17 Rope Green Farm Medium sensitivity	2.0ha (7%) Low	Negligible	Negligible	Minor adverse
CA5/18 Casey Lane Stables Low sensitivity	1.6ha (27%) High	Negligible	Negligible	Moderate adverse due to proportion of land required
CA5/19 Brookhouse Farm Low sensitivity	0.8ha (27%) High	Negligible	Negligible	Moderate adverse due to proportion of land required
CA5/20 Crotia Mill Farm Medium sensitivity	0ha (0%) Negligible	Negligible	Negligible	Negligible

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Holding reference/name/sensitivity	Land required from holding	Severance	Infrastructure	Scale of effect
CA5/21 Basford Hall Low sensitivity	0ha (0%) Negligible	Negligible	Negligible	Negligible
CA5/22 Larch Farm Medium sensitivity	0.5ha (1%) Negligible	Negligible	Negligible	Negligible
CA5/23 New Farm Medium sensitivity	0.4ha (4%) Negligible	Negligible	Negligible	Negligible
CA5/24 Land south of A500 Shavington Bypass Medium sensitivity	0ha (0%) Negligible	Negligible	Negligible	Negligible

- 4.4.33 Overall, the construction of the Proposed Scheme will affect 21 holdings in the South Cheshire area, with 13 holdings experiencing moderate, major/moderate or major adverse permanent effects, which will be significant.
- 4.4.34 Two dairy units, which are generally more susceptible to the effects of land loss than other farm holdings, will be significantly affected: Lower Den Farm (CA5/2) and Oakhanger Hall (CA5/5). The permanent effects from construction on these farms will be major/moderate adverse due to the area of land required from the two holdings, which represents nearly half of the land required for the Proposed Scheme in this area.
- 4.4.35 The remaining significant effects are assessed as moderate adverse. These arise from high land requirements from small holdings on Land at Higher Den Farm (CA5/4), 2 Gonsley Farm Barns (CA5/7), Land west of Waybutt Lane (CA5/10), Chorlton Dairy Farmhouse (CA5/11), Jubilee Farm (CA5/12), Land west of Chorlton Lane (CA5/14), Casey Lane Stables (CA5/18) and Brookhouse Farm (CA5/19). Chorlton Dairy Farmhouse (CA5/11) is unlikely to remain as a land holding.
- 4.4.36 Other moderate adverse effects arise from a medium land requirement and severance impact on a medium sensitivity farm at The Moss (CA5/16); and low land requirements, severance or infrastructure impacts on high sensitivity farms at Grange Farm (CA5/1) and Ash Tree Farm (CA5/3).
- 4.4.37 Approximately 111ha of land used by Checkley Wood Shoot will be permanently required from four holdings at Grange Farm (CA5/1), Lower Den Farm (CA5/2), Ash Tree Farm (CA5/3) and Oakhanger Hall (CA5/5). It is expected that the permanent loss of this land will have a minor adverse impact on the enterprise, which is not significant.
- 4.4.38 Although financial compensation will be available, there can be no certainty that this will 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

- 4.4.39 Other mitigation will 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.
- 4.4.40 A farm pack is being provided to all farmers and landowners that sets out baseline conditions on the farm and the assurances and obligations that HS2 Ltd will accept upon entering the land. This will 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

- 4.4.41 During construction, the total area of agricultural land required within the South Cheshire area is approximately 366ha, of which approximately 148ha is BMV land. As BMV land is prevalent in this area, this is assessed as a minor adverse residual effect, which is not significant.
- 4.4.42 Twenty-four holdings will be affected temporarily, of which 19 will experience temporary major, major/moderate or moderate adverse residual effects, which are significant.
- 4.4.43 Once the construction process is complete and land required temporarily has been restored, the residual permanent requirement for agricultural land will be 168ha of which approximately 72ha is BMV land. As BMV land is prevalent in this area, this is assessed as a minor residual adverse effect, which is not significant.
- 4.4.44 Twenty-one holdings will be affected permanently, of which 13 will experience major, major/moderate or moderate permanent effects following construction, which is significant. Of these, 12 will be likely to remain as agricultural or rural businesses and the use of compensation payments to purchase replacement land or farm buildings could reduce the effects. Due to the extent of permanent impacts, Chorlton Dairy Farmhouse (CA5/11) is unlikely to remain as a land holding.

Cumulative effects

- 4.4.45 There are no known cumulative effects arising from the construction of the Proposed Scheme as a consequence of other development projects affecting agricultural land in the locality.

4.5 Effects arising from operation

Avoidance and mitigation measures

- 4.5.1 No measures are 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 will include:

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

4.5.3 Operational airborne sound at the following sensitive livestock receptors have been included in the assessment and the results are presented in Volume 5: Appendix SV-002-005:

- Grange Farm (CA5/1); and
- Ellesmere Dairy Farm (CA5/9).

4.5.4 The predicted sound levels have been considered against the criteria defined in the SMR Addendum. Taking into consideration the noise mitigation included within the Proposed Scheme, as shown on Map Series SV-02 (Volume 5: Sound, noise and vibration Map Book), no likely significant effects from noise on livestock are identified.

4.5.5 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.

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

Other mitigation measures

4.5.7 No other mitigation measures have been identified.

Summary of likely residual significant effects

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

Cumulative effects

4.5.9 There are no known cumulative effects arising from the operation of the Proposed Scheme as a consequence of other development projects affecting agriculture, forestry or soil in the South Cheshire area.

Monitoring

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

4.5.11 On the basis of there being no significant residual operational effects, there are no area-specific requirements for monitoring agriculture, forestry and soil effects during the operation of the Proposed Scheme in the South Cheshire 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 arising from the construction and operation of the Proposed Scheme within the South Cheshire area. Oxides of nitrogen (NO_x) including nitrogen dioxide (NO₂), fine particulate matter (PM₁₀, PM_{2.5})⁴⁷ 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, borrow pits and the use of haul routes. Emissions will also arise from road traffic during construction and operation of the Proposed Scheme.
- 5.1.2 Engagement with Staffordshire County Council (SCC) and Cheshire East Council (CEC) has been undertaken. The purpose of this engagement has been to obtain relevant baseline information, which includes monitoring data in this area. Detailed reports on the air quality data and assessments for this area, are contained within Volume 5: Appendix AQ-001-105.
- 5.1.3 Maps showing the location of the key environmental features (Map Series CT-10) and the key construction (Map Series CT-05) and key operational (Map Series CT-06) features of the Proposed Scheme can be found in the Volume 2: CA5 Map Book. Air quality mapping is presented in the Volume 5: Air quality Map Book: Map AQ-01-105.
- 5.1.4 In addition, the traffic data used for the air quality assessment is set out in Background Information and Data (BID)⁴⁸, (BID-AQ-002-000: Traffic data used for the air quality assessment).

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), the Scope and Methodology Report (SMR)⁴⁹, the SMR Addendum⁵⁰ and Volume 5: Appendix AQ-001-105.
- 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 occur⁵¹:
- from construction and/or mineral extraction activities (for borrow pits);
 - from changes in the nature of traffic during construction and operation, for example increases in traffic flows during construction or where road closures

⁴⁷ PM_{2.5} and PM₁₀ describe two size fractions of airborne particles that can be inhaled and therefore are of concern for human health. The designations refer to particles of size less than 2.5 and 10 microns in diameter.

⁴⁸ HS2 Ltd (2017), High Speed Two (HS2) Phase 2a (West Midlands - Crewe), Background Information and Data, Available online at: www.gov.uk/hs2

⁴⁹ Volume 5: Appendix CT-001-001, Environmental Impact Assessment Scope and Methodology Report.

⁵⁰ Volume 5: Appendix CT-001-002, Environmental Impact Assessment Scope and Methodology Report Addendum.

⁵¹ 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 mineral dust emissions has been undertaken for sensitive receptors located within a distance of 250m from a borrow pit site. The assessment of traffic emissions has been undertaken where sensitive receptors are located up to a distance of 200m from roads screened in for further assessment.

or restrictions cause diversions and heavier traffic on adjacent roads; or

- where road alignments have changed.

5.2.3 The assessment has incorporated HS2 Ltd's policies on vehicle emissions⁵². These include the use of Euro VI heavy goods vehicles (HGVs), Euro 4 petrol and Euro 6 diesel cars and light goods vehicles (LGVs) during construction of the Proposed Scheme.

5.2.4 The assessment of construction traffic emissions has used traffic data based on an estimate of the average daily flows at the peak year during the construction period (2020-2026). The assessment assumes vehicle emission rates and background pollutant concentrations from the year 2020. This is because both pollutant emissions from vehicle exhausts and background pollutant concentrations are anticipated to reduce year by year as a result of vehicle emission controls, and so the year 2020 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 South Cheshire area are emissions from road vehicles and agricultural activities. The main roads within the area are: the M6; the A500 Newcastle Road/Shavington Bypass; the A534 Crewe Road/Nantwich Road; the A531 Newcastle Road; the A51 Nantwich Bypass/London Road; the A5020 University Way/David Whitby Way; the B5472 Weston Road; the A532 Weston Road; the B5071 Jack Mills Way/Gresty Road; and local roads serving the settlements of Shavington, Weston, Chorlton, Hough, Wybunbury and Blakelow.

5.3.2 There are 10 industrial installations (regulated by the Environment Agency) with permits for emissions to air within the area, namely Redhall Farming Ltd; ForFarmers UK Limited; 3D Waste Limited; Viridor Waste Management; Morning Foods Ltd; Joseph Heler Ltd; Ipackchem Ltd; Bentley Motors Ltd; United Phosphorus Limited; and WGR Limited. Details of their location are presented in Volume 5: Appendix AQ-001-005. 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 Defra⁵³ for the baseline year of 2016. The data is estimated for 1km grid squares for NO_x, NO₂, PM₁₀ and PM_{2.5}. Background concentrations are within the air quality standards as defined in the SMR and the SMR Addendum, for all pollutants within the South Cheshire area.

⁵² HS2 Phase 2a Information Paper E14: Air Quality

⁵³ Department for Environment, Food and Rural Affairs (Defra) (2013) Defra Background Pollutant Concentration Maps; Available online at: <http://uk-air.defra.gov.uk/data/laqm-background-maps?year=2013>

Local monitoring data

- 5.3.4 There are currently 14 diffusion tube sites located within the South Cheshire area for monitoring NO₂ concentrations. These are located around Crewe on Wistaston Road, the A534 Nantwich Road, Gresty Road, the B5076 Vernon Way, Manchester Bridge and Bradfield Road. Measured concentrations in 2015⁵⁴ exceeded the air quality standard at two of these sites, located in Nantwich. Details of the location and data measurements are presented in Map AQ-01-105 and Volume 5: Appendix AQ-001-005.

Air quality management areas

- 5.3.5 There are four air quality management areas (AQMAs) within the South Cheshire area that have been declared for exceedances of the annual mean NO₂ standard:
- the Nantwich Road AQMA, extending from the junction with Walthall Street to the junction with Pedley Street;
 - the Nantwich AQMA, encompassing the A534 Hospital Street between the junctions with London Road and Pratchitts Row;
 - the Earle Street Crewe AQMA, encompassing properties adjacent to a stretch of the A532 Earle Street; and
 - the Wistaston Road Crewe AQMA, encompassing properties adjacent to a stretch of Wistaston Road.

Receptors

- 5.3.6 Several locations have been identified in the area as sensitive receptors, which are considered to be susceptible to changes in air quality due to their proximity to dust-generating activities or traffic routes during construction or operation of the Proposed Scheme. Details of their locations are presented in Map AQ-01-105 and Volume 5: Appendix AQ-001-005.
- 5.3.7 Most of the receptors located close to the route of the Proposed Scheme are residential. Other receptors include one nursing home (Doddlespool Hall), four schools and nurseries (Betley Church of England Primary School, Shavington Primary School, Stepping Stones Nursery and Nursery School) and one medical centre on Crewe Road.
- 5.3.8 There are two statutory designated ecological sites identified close to the Proposed Scheme, namely the Black Firs and Cranberry Bog Site of Special Scientific Interest (SSSI), located adjacent to Newcastle Road, which overlies a section of the Ramsar site Midland Meres and Mosses; and the Oakhanger Moss SSSI, located adjacent to the M6, which also overlies a section of the Ramsar site Midland Meres and Mosses. There are no non-statutory designated ecological sites in this area. Further details of the ecological receptors are set out in Section 8, Ecology and biodiversity.

⁵⁴ At the time of assessment, measurements for 2015 were the latest published annual monitoring data.

Future baseline

- 5.3.9 Volume 5: Appendix CT-004-000 provides details of the developments in the South Cheshire area that are assumed to be implemented by 2020. The potential cumulative impact from committed developments on air quality in conjunction with the effects from the construction and operation of the Proposed Scheme have been considered as part of this assessment. This has been achieved by including changes in traffic predicted as a result of the committed developments within the traffic data used for the air quality assessments for construction and operation. The future air quality baselines are defined as the 'without the Proposed Scheme' scenarios at each stage.

Construction (2020)

- 5.3.10 Future background pollutant concentrations have been sourced from the Defra background maps for the first year of construction in 2020⁵⁵, which predict NO₂, PM₁₀ and PM_{2.5} levels in 2020 to be lower than in the 2016 baseline and within the relevant air quality standards.
- 5.3.11 Committed developments that have been included as future receptors in the assessment of air quality impacts during construction of the Proposed Scheme are identified in Volume 5: AQ-001-005. No additional committed developments have been identified in this area that will materially alter the baseline conditions in 2020 for air quality.

Operation (2027)

- 5.3.12 Future background pollutant concentrations have been sourced from the Defra background maps for 2027⁵⁶, which predict NO₂, PM₁₀ and PM_{2.5} levels in 2027 to be lower than in the 2016 baseline and within the relevant air quality standards.
- 5.3.13 Committed developments that have been included as future receptors in the assessment of air quality impacts during operation of the Proposed Scheme are identified in Volume 5: AQ-001-005. No additional committed developments have been identified in this area that will materially alter the baseline conditions in 2027 for air quality.

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 CoCP⁵⁷ 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.

⁵⁵ Department for Environment, Food and Rural Affairs (Defra) (2013) Defra Background Pollutant Concentration Maps; Available online at <http://uk-air.defra.gov.uk/data/laqm-background-maps?year=2013>.

⁵⁶ Department for Environment, Food and Rural Affairs (Defra) (2013) Defra Background Pollutant Concentration Maps 2027; Available online at: <http://uk-air.defra.gov.uk/data/laqm-background-maps?year=2013>

⁵⁷ Volume 5: Appendix CT-003-000, Draft Code of Construction Practice.

- 5.4.2 The assessment has assumed that the general measures detailed in Section 7 of the draft CoCP will be implemented. These include:
- contractors being required to manage dust, air pollution, odour and exhaust emissions during construction works;
 - inspection and visual monitoring, undertaken in consultation with the local authorities, to assess the effectiveness of the measures taken to control dust and air pollutant emissions;
 - cleaning (including watering) of vehicle routes and designated vehicle waiting areas to suppress dust;
 - the use of water spray systems on demolition sites to dampen down fugitive dust;
 - keeping soil stockpiles away from sensitive receptors where reasonably practicable, also taking into account the prevailing wind direction relative to sensitive receptors;
 - the use of enclosures to contain dust emitted from construction activities; and
 - soil spreading, seeding and planting of completed earthworks as soon as reasonably practicable following completion 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.
- 5.4.4 The use of borrow pits is intended to reduce the need for longer distance transport and import of materials, therefore, reducing the volume and impact of road traffic on local roads and communities.

Assessment of impacts and effects

Temporary effects

- 5.4.5 Impacts from construction of the Proposed Scheme could arise from dust-generating activities and emissions from construction traffic. As such, the assessment of construction impacts has been undertaken for dust and exposure to NO₂, PM₁₀ and PM_{2.5} concentrations.

Construction dust effects

- 5.4.6 Construction activities, such as demolition of existing buildings, earthworks, construction of new structures and trackout⁵⁸, have been assessed for their risk of having an effect on dust soiling, human health⁵⁹ and ecological sites. There are residential and ecological receptors located within 350m of these activities in the South Cheshire area.

⁵⁸ 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.

⁵⁹ Human health effects relate mainly to short-term exposure to particles of size between 2.5µm to 10µm, measured as PM₁₀.

- 5.4.7 It has been identified that there would be a negligible risk of dust and human health effects from demolition activities. For earthworks, there would be a low to medium risk of dust effects and a low risk of human health effects. For construction, there would be a low to medium risk of dust effects and a low risk of human health effects. For trackout, there would be a low to high risk of dust effects and a low risk of human health effects.
- 5.4.8 No demolition activities would affect any ecological receptors. There would be a low risk of ecological effects from other dust generating activities.
- 5.4.9 With the application of the mitigation measures contained in the draft CoCP, no significant effects are anticipated from these risks associated with the dust generating activities. The basis for this conclusion can be found in Volume 5: Appendix AQ-001-005, where the scale of dust emissions and the sensitivity of the area and receptors are fully described.

Mineral dust effects

- 5.4.10 The operation of the borrow pits during the construction of the Proposed Scheme has been assessed for the potential for effects on dust soiling, human health and ecological sites in the surrounding area. There will be one borrow pit in the South Cheshire area, located north of Checkley Lane. The borrow pit will be excavated for sands and gravels, which are classified as a soft rock in the assessment. There are residential receptors within 250m of the borrow pit. No ecological receptors are located within 250m of the borrow pit.
- 5.4.11 Assessment of the borrow pit activities has indicated that there would be moderate adverse impacts of 'disamenity'⁶⁰ dust at seven residential receptors within 250m of the borrow pit activities (one property near Checkley Lane and six properties near Den Lane). There would be slight adverse impacts at the remaining residential receptors (five properties around Fogg Cottages). Impacts to human health from borrow pit activities are not anticipated to be significant due to the low background PM10 concentrations in the area.
- 5.4.12 With the application of the mitigation measures contained in the draft CoCP, no significant effects are anticipated from the potential impacts arising from the operation of the borrow pit in this area. The basis for this conclusion can be found in Volume 5: Appendix AQ-001-005.

Construction traffic effects

- 5.4.13 Construction activity could also have the potential to affect local air quality through the additional traffic generated on local roads as a result of construction traffic routes and through changes to traffic patterns arising from temporary road diversions and realignments.
- 5.4.14 The assessment of construction traffic emissions has been undertaken for a 'without the Proposed Scheme' scenario and a 'with the Proposed Scheme' scenario. The

⁶⁰ 'Disamenity' dust refers to coarse dust particles arising from the operational of a borrow pit that can reduce amenity in the local community due to visible dust plumes and dust soiling.

traffic data for each scenario includes the additional traffic from future committed developments.

5.4.15 Construction traffic data in the study area has been screened to identify roads that required further assessment and to confirm the likely effect of the change in emissions from vehicles using those roads in the construction period. These were primarily the main roads within the study area, namely the M6, the A500 Newcastle Road/Shavington Bypass, the A531 Newcastle Road/Main Road and Den Lane near Wrinehill.

5.4.16 No significant effects are predicted at any sensitive receptors during construction of the Proposed Scheme. Concentrations of NO₂, PM₁₀ and PM_{2.5} are within the relevant air quality standards both with and without the Proposed Scheme.

5.4.17 No significant effects are anticipated at any of the ecological receptors in this area.

Permanent effects

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

5.4.19 It is assumed that dust emissions from construction of other developments in the area would be controlled by appropriate measures as set out within their respective environmental management controls and therefore no cumulative effects for air quality would be anticipated.

Other mitigation measures

5.4.20 No other mitigation measures in relation to air quality are considered necessary during construction of the Proposed Scheme in this area.

Summary of likely residual significant effects

5.4.21 No significant residual effects are anticipated for air quality in this area during construction of the Proposed Scheme.

Cumulative effects

5.4.22 The data used for the air quality assessment takes account of predicted changes in traffic as a result of committed developments in the area, including construction of Crewe Hub adjacent to the works at Crewe Station within the South Cheshire area. A qualitative assessment has been undertaken for the construction of Crewe Hub acting in conjunction with construction of the Proposed Scheme. This is reported in Section 14, Traffic and transport.

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 could arise from vehicle emissions and relate to changes in the volume, composition and distribution of road traffic and changes in road alignment. There will be no direct atmospheric emissions from the operation of trains that will cause an impact on air quality, and therefore, no assessment is required. Indirect emissions from sources such as rail and brake wear have been assumed to be negligible.
- 5.5.3 The assessment of operational traffic emissions has been undertaken for two scenarios in the operation year 2027: a 'without the Proposed Scheme' scenario and a 'with the Proposed Scheme' scenario. The traffic data for each scenario includes the additional traffic from future committed developments.
- 5.5.4 Traffic data in the South Cheshire area has been screened to identify roads that required further assessment and to confirm the likely effect of the change in emissions from vehicles using those roads in 2027. These were the proposed re-aligned or diverted roads within the South Cheshire area, namely Checkley Lane, Den Lane, Newcastle Road, Chorlton Lane and Casey Lane.
- 5.5.5 No significant effects are predicted at any sensitive receptors in the operation year. Concentrations of NO₂, PM₁₀ and PM_{2.5} are predicted to be within the relevant air quality standards both with and without the Proposed Scheme.
- 5.5.6 No significant effects are anticipated at any of the ecological receptors in this area.

Other mitigation measures

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

Summary of likely residual significant effects

- 5.5.8 No significant residual effects are anticipated for air quality in this area during operation of the Proposed Scheme.

Cumulative effects

- 5.5.9 The data used for the air quality assessment take account of predicted changes in traffic as a result of committed developments in the area, and therefore, their impacts have been included within the assessment.

Monitoring

- 5.5.10 Volume 1, Section 9 sets out the general approach to environmental monitoring during operation of the Proposed Scheme.
- 5.5.11 On the basis of there being no significant residual operational effects, there are no area specific requirements for monitoring air quality effects during the operation of the Proposed Scheme in the South Cheshire area.

6 Community

6.1 Introduction

- 6.1.1 This section of the report describes the impacts and likely significant effects on local communities resulting from the construction and operation of the Proposed Scheme within the South Cheshire area.
- 6.1.2 The assessment draws on information gathered from engagement with the users and operators of facilities including Weston and Basford Parish Council. The purpose of this engagement has been to understand how the facilities are used, to obtain relevant baseline information, inform the design development of the Proposed Scheme and to inform the assessment.
- 6.1.3 Further details of the community assessments undertaken within the South Cheshire area are contained in Volume 5: Appendix CM-001-005.
- 6.1.4 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 can be found in the Volume 2: CA5 Map Book. Community assessment maps are provided in the Map Series CM-01 in Volume 5: Community 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)⁶¹ and the SMR Addendum⁶².
- 6.2.2 The study area includes the areas of land required both temporarily and permanently for the Proposed Scheme. It also includes a wider corridor within which receptors or resources could be affected by a combination of significant residual effects drawing from the findings of other technical disciplines: noise, vibration, air quality, traffic (in relation to heavy goods vehicle (HGV)⁶³) and visual intrusion. 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. Overall, the study area is taken as the area of land that encompasses the likely significant effects of the Proposed Scheme.
- 6.2.3 Worker accommodation will be located to the south of the A500 Shavington Bypass adjacent to Basford cutting main compound. Construction worker impacts on community resources are considered at a route-wide level in Volume 3: Route-wide effects.

⁶¹ Volume 5: Appendix CT-001-001, Environmental Impact Assessment Scope and Methodology Report.

⁶² Volume 5: Appendix CT-001-002, Environmental Impact Assessment Scope and Methodology Report Addendum

⁶³ HGV effects are increases in HGV construction traffic flows identified as significant by the Traffic and Transport topic. They contribute to in-combination effects on sensitive community resources which are located adjacent to a designated construction traffic route which experiences a significant increase in HGV traffic flows or a site haul route which experiences a significant number of HGV movements.

6.3 Environmental baseline

Existing baseline

- 6.3.1 The Proposed Scheme through the South Cheshire area includes an approximately 6.6km section of the HS2 main line and two spurs approximately 6km in length. The boundary between Madeley Parish and Checkley cum Wrinehill Parish forms the southern boundary of this area.
- 6.3.2 The route will continue north towards Crewe where it will connect with the existing West Coast Main Line (WCML) via two spurs south of the A500 Shavington Bypass. Construction of the HS2 main line will continue north and provide for the future extension of the route to Manchester as part of Phase 2b. In addition, there will be associated works to the WCML to facilitate the new connection to the Proposed Scheme. There will also be works at Crewe Station to facilitate the additional services running through Crewe on the WCML as a result of the Proposed Scheme.
- 6.3.3 The South Cheshire area is predominantly rural, made up of a few small settlements with limited community facilities. In general, the majority of community facilities, such as GP surgeries, schools and community meeting places, lie within the village centres of Wrinehill, Betley, Weston and Shavington, which are outside of the study area. The area is also characterised by small clusters of dwellings and individual dwellings. Closer to Crewe, the South Cheshire area becomes more urban with typical town centre uses including a range of retail, recreation and community facilities.

Settlements

- 6.3.4 Between the settlements of Wrinehill and Blakenhall are a number of sparsely located, detached rural farm properties along Den Lane and Checkley Lane. Mill Lane End comprises 12 properties at the junction of Den Lane and Mill Lane.
- 6.3.5 Chorlton is a village approximately 6km south-east of Crewe, largely comprising a modern housing estate at Wychwood Park. To the west of Wychwood Park are a number of older residential properties, which are accessed via Chorlton Lane, a narrow no-through road.
- 6.3.6 To the north of Chorlton and east of Hough there are approximately 13 residential properties situated on Newcastle Road and eight residential properties on Casey Lane.

Open space and public rights of way

- 6.3.7 Three promoted public right of way (PRoW) routes⁶⁴ follow the route of Chorlton Footpath 7 as it crosses the WCML to the west of Chorlton. These are:
- Crewe and Nantwich Circular Walk, a long distance footpath that follows a 47km circular route around the towns of Crewe and Nantwich. The route is split into three sections through Weston, Coppenhall and Acton;
 - South Cheshire Way, a long distance footpath covering 55km from Grindley Brook near Whitchurch, to Mow Cop near Congleton. Sections of the path

⁶⁴ Promoted PRoW refers to those PRoW which are a "promoted" destination in their own right as a recreational resource.

follow the Shropshire Union Canal and the Trent and Mersey Canal. The path also connects with several other long distance paths, including the Maelor Way, the Staffordshire Way and the Sandstone and Gritstone Trails; and

- Two Saints Way, a recreated pilgrimage route of approximately 148km, which spans between Chester in Cheshire and Lichfield in Staffordshire. The route partly follows the Heart of England Way. It passes the town of Stone and crosses the Cannock Chase Area of Outstanding Natural Beauty (AONB).

Future baseline

Construction (2020)

- 6.3.8 Volume 5: Appendix CT-004-000 provides details of the developments in the South Cheshire area that are assumed to have been implemented by 2020.
- 6.3.9 The following committed developments have been identified in this area that will materially alter the baseline conditions in 2020 for community resources are set out in Table 16.

Table 16: Committed developments relevant to community

Map book Reference ⁶⁵	Planning reference	Description
CA5/12	Res.1 Housing Allocation Chorlton	Allocation for housing
CA5/15	RES.1 Housing Allocations, RES1.6 St Clements Court	Allocation for housing

- 6.3.10 These committed developments form part of the future baseline for the assessment of community effects during construction of the Proposed Scheme.

Operation (2027)

- 6.3.11 Volume 5: Appendix CT-004-000 provides details of the developments in the South Cheshire area that are assumed to have been implemented by 2027.
- 6.3.12 No additional committed developments have been identified in this area that will materially alter the baseline conditions in 2027 for community resources.

6.4 Effects arising during construction

Avoidance and mitigation measures

- 6.4.1 The following measures have been incorporated into the Proposed Scheme as part of the design development process that as a consequence of the measures avoid or reduce the environmental impacts during construction:
- the relocation of the HS2 Crewe infrastructure maintenance depot to near to Stone (in the form of an infrastructure maintenance base-rail (IMB-R)), in the Stone and Swynnerton area (CA3). As a result, the Basford West site (proposed for 370 residential properties), Mill Lane allotments and a number of residential properties will not be within the area required for the Proposed Scheme. The

⁶⁵ Volume 5 Map Book: Maps CT-13-115b to CT-13-118-R1.

relocation of the depot also means that the B5071 Jacks Mill Way and the A500 Shavington Bypass will not be affected;

- the Crewe South portal will be located 960m south of the A500 Shavington Bypass. This will avoid the need for realignment of the A500 Shavington Bypass and diversion works to other public roads and will mean the portal will be further from residential properties;
- the South Crewe auto-transformer feeder station, which was proposed to be located north of Heath Farm, has been downsized to the South Crewe mid-point auto-transformer station and relocated further south. As a result, the residential property at Heath Farm will not experience any significant loss of land or isolation effects; and
- the area required for construction of the WCML modifications south of Den Lane has been reduced and will avoid the need to realign Den Lane, thereby moving the area required for construction of the Proposed Scheme further from properties on Den Lane.

6.4.2 The following measures have been incorporated into the scheme design as part of the design development process to avoid or minimise, insofar as reasonably practicable, the environmental impacts during construction:

- provision of landscape bunds along Mill Lane and Wrinehill Road to reduce visual impacts on residential properties;
- provision of landscape bunds along Waybutt Lane, Chorlton to reduce visual impacts on residential properties;
- provision of landscape bunds adjacent to Gonsley Green Farm to reduce visual impacts on the residential property;
- provision of landscape bunds along Chorlton Lane to the west of Chorlton to reduce visual impacts on residential properties;
- provision of a landscape bund to the east of Heath Farm to reduce visual impacts on the residential property; and
- provision of landscape bunds around the Newcastle Road overbridge to reduce visual impacts on residential properties.

6.4.3 The draft Code of Construction Practice⁶⁶ (CoCP) includes a range of provisions that will help mitigate community effects associated with construction within this area, including:

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

⁶⁶ Volume 5: Appendix CT-003-000, Draft Code of Construction Practice.

(Section 5);

- maintenance of PRow during construction where reasonably practicable (Section 14);
- monitoring and management of flood risk and other extreme weather events, where reasonably practicable, that may affect community resources during construction (Section 16); and
- specific measures in relation to air quality and noise and the avoidance of HGVs operating adjacent to school during drop off and pick up periods (Section 7, 13 and 14).

Assessment of impacts and effects

Temporary effects

Residential properties

- 6.4.4 It is necessary to carry out minor utility works or minor highways works associated with the construction of the Proposed Scheme within land which 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. A full description of the affected properties is included within Volume 5: Appendix CM-001-005.
- 6.4.5 A group of residential properties on Checkley Lane to the west of Wrinehill, will be in proximity to the construction of the Proposed Scheme. The works will include the Checkley Lane overbridge, Checkley North embankment satellite compound, Checkley Lane East main compound, Checkley Lane West satellite compound, and the borrow pit north of Checkley Lane. Residents of approximately seven of the properties will experience significant adverse visual effects due to views of construction works and compounds. In addition, six of the properties will experience a significant increase in HGVs either through the use of Checkley Lane as a construction traffic route or through the presence of the site haul route adjacent to Randilow Farm. The visual and HGV effects will result in an in-combination effect on the amenity of residents at the six properties for up to one year and eight months. This will result in a major adverse effect, which is significant.
- 6.4.6 The construction of the Proposed Scheme will give rise to temporary adverse effects at Randilow Farm, located on Checkley Lane to the west of the existing WCML. The reduction in accessibility (due to road works, construction traffic routes and increases in construction traffic) and the proximity to construction activities including the Checkley Lane East main compound and a borrow pit will likely result in temporary isolation effects for this property for up to six years. As there are less than five properties affected, this is not considered significant at the community level.
- 6.4.7 Construction works associated with the demolition of the existing Blakenhall Bridleway 8 overbridge, construction of the new Blakenhall Bridleway 8 accommodation overbridge, and presence of a site haul route, will temporarily require part of the driveway of Lower Den Farm, Wrinehill for approximately three years and six months. The loss of this small area of driveway will not impact on the ability of the

residents to use their property and access will be maintained. This will result in a minor adverse effect, which is not significant.

- 6.4.8 A group of residential properties on Den Lane to the north of Wrinehill will be in proximity to the construction of the Proposed Scheme. The works will include WCML modifications, Den Lane underbridge and viaducts, Den Lane East, Den Lane West and Den Lane Welfare satellite compounds, and the borrow pit north of Checkley Lane. In total, 12 residential properties will experience significant noise effects (with five during the day as a result of construction traffic and seven from general construction works). Residents at all 12 of the properties will experience significant adverse visual effects due to views of construction works and the Blakenhall cutting satellite compound. The noise and visual effects will result in an in-combination effect on the amenity of residents at the 12 properties for up to four years and five months. This will result in a major adverse effect, which is significant.
- 6.4.9 A group of residential properties on Den Lane and Mill Lane to the east of Blakenhall, will be in proximity to the construction of the Proposed Scheme. The works will include the construction of Den Lane underbridge and viaducts and the Blakenhall Northbound Spur embankment satellite compound. These works will result in significant noise effects on 15 of the properties during the daytime due to construction works and construction traffic. Residents of all 15 of the properties will experience significant adverse visual effects due to views of construction works and compounds. The noise and visual effects will result in an in-combination effect on the amenity of residents of the 15 properties for up to two years and four months. This will result in a major adverse effect, which is significant.
- 6.4.10 A group of residential properties in Wychwood Park and Chorlton, will be in proximity to the construction of the Proposed Scheme. The works will include the Chorlton North and South embankments, Chorlton viaduct, Chorlton Lane diversion and the creation of landscape bunds along Chorlton Lane and Waybutt Lane. These works will result in significant noise effects on approximately 34 of the properties during the daytime due to general construction works. Residents of all of the properties will experience significant adverse visual effects due to views of the construction works. The noise and visual effects will result in an in-combination effect on the amenity of residents of the 34 properties for up to one year and four months. This will result in a major adverse effect, which is significant.
- 6.4.11 Two allocations for housing (RES.1 Chorlton and RES1.6 St Clement's Court) will be located in proximity to the construction of the Proposed Scheme. The works will include the Chorlton North and South embankments, Chorlton viaduct and the creation of landscape bunds along Chorlton Lane and Waybutt Lane. The properties developed closest to the route of the Proposed Scheme will experience the same noise and visual effects as described above for a group of approximately 34 residential properties in Wychwood Park and Chorlton. The significant noise and visual effects will result in an in-combination effect on the amenity of residents of these properties for up to one year and four months. This will result in a major adverse effect, which is significant.

- 6.4.12 A group of residential properties on Chorlton Lane in Chorlton will be in proximity to the construction of the Proposed Scheme. The works will include the Chorlton North and South embankments and the creation of landscape bunds along Chorlton Lane and Waybutt Lane. These works will result in significant noise effects on nine of the properties during the daytime due to general construction works and construction traffic. Residents of all nine of the properties will experience significant adverse visual effects due to views of the construction works. The significant noise and visual effects will result in an in-combination effect on the amenity of residents of the nine properties for up to three years and one month. This will result in a major adverse effect, which is significant.
- 6.4.13 A group of residential properties on Newcastle Road and Chorlton Lane to the north-west of Chorlton, will be in proximity to the construction of the Proposed Scheme. The works will include the Chorlton cutting, Chorlton cutting satellite compound, Creamery Bridge satellite compound and Newcastle Road diversion and overbridge. These works will result in significant daytime noise effects on all 12 residential properties due to construction works. All 12 residential properties will experience significant adverse visual effects due to views of the works to construct the Proposed Scheme. The noise and visual effects on 12 properties will result in an in-combination effect on the amenity of residents for up to one year. This will result in a major adverse effect, which is significant.
- 6.4.14 A group of residential properties on Casey Lane to the north-east of Hough will be in proximity to the construction of the Proposed Scheme. The works will include the Crewe South portal, Crewe South portal satellite compound, Casey Lane West satellite compound, Casey Lane closure and Newcastle Road diversion. These works will result in significant noise effects on approximately eight of the properties during the daytime due to general construction works, including construction of the Crewe South portal. All eight of the properties will experience significant adverse visual effects due to views of the construction works. The noise and visual effects will result in an in-combination effect on the amenity of residents of the eight properties for up to two years. This will result in a major adverse effect, which is significant.

Community facilities

- 6.4.15 No temporary effects on community facilities are anticipated in the South Cheshire area.

Recreational facilities

- 6.4.16 No temporary effects on recreational facilities are anticipated in the South Cheshire area.

Open space and public rights of way

- 6.4.17 No temporary effects on open space and PRoW are anticipated in the South Cheshire area.

Permanent effects

Residential properties

- 6.4.18 The upgrade and widening of the Randilow Farm access road will permanently require a small part of the driveway of Randilow Farm, Checkley Lane. The loss of this small area of driveway will not impact on the ability of the residents to use their property and access will be maintained. This will result in a minor adverse effect, which is not significant.
- 6.4.19 Works associated with the widening and realignment of Chorlton Lane will permanently require part of the outside space from two properties on Chorlton Lane, Chorlton (Dairy Farm and 2 New Cottages). The loss of these small areas of driveway will not impact on the ability of the residents to use their properties and access will be maintained. This will result in a minor adverse effect, which is not significant.

Community facilities

- 6.4.20 No permanent effects on community facilities are anticipated in the South Cheshire area.

Recreational facilities

- 6.4.21 No permanent effects on recreational facilities are anticipated in the South Cheshire area.

Open space and public rights of way

- 6.4.22 Three promoted PRoW currently follow the route of Chorlton Footpath 7 as it crosses the WCML to the west of Chorlton: Crewe and Nantwich Circular Walk, South Cheshire Way and Two Saints Way. The overbridge, which carries Chorlton Footpath 7 over the WCML will be demolished. A permanent diversion will be provided to ensure the footpath remains permanently accessible. The three promoted PRoW will be permanently diverted along the new alignment of Chorlton Footpath 7. This will result in a negligible adverse effect, which is not significant.

Other mitigation measures

- 6.4.23 No other mitigation measures are proposed.

Summary of likely residual significant effects

- 6.4.24 The construction of the Proposed Scheme will result in significant temporary in-combination effects on the following resources:

- six properties on Checkley Lane due to the combination of visual and HGV effects;
- twelve properties on Den Lane north of Wrinehill due to the combination of noise and visual effects;
- fifteen properties on Den Lane and Mill Lane End to the east of Blakenhall due to the combination of noise and visual effects;
- thirty-four properties in Wychwood Park and Chorlton due to the combination

of noise and visual effects;

- two allocations for housing (RES.1 Chorlton and RES1.6 St Clement's Court) due to the combination of noise and visual effects;
- nine properties on Chorlton Lane due to the combination of noise and visual effects;
- twelve properties on Newcastle Road and Chorlton Lane due to the combination of noise and visual; and
- eight properties on Casey Lane due to the combination of noise and visual effects.

Cumulative effects

- 6.4.25 No cumulative effects on community resources during construction of the Proposed Scheme have been identified in the South Cheshire area.

6.5 Effects arising from operation

Avoidance and mitigation measures

- 6.5.1 The following measures have been incorporated into the scheme design as part of the design development process to avoid or minimise, insofar as reasonably practicable, the environmental impacts during operation:

- provision of a noise barrier on the Blakenhall viaduct, reducing noise impacts on residential properties to the west; and
- provision of noise barriers on the Chorlton viaduct and the HS2 main line, reducing noise impacts on residential properties in Chorlton.

Assessment of impacts and effects

Residential properties

- 6.5.2 A group of residential properties on Checkley Lane to the west of Wrinehill will be in proximity to the Proposed Scheme. The operation of the Proposed Scheme will result in significant noise effects during the daytime and night-time on five of the properties due to the running of trains along the route. All five of the properties will experience significant adverse visual effects due to views of the realigned section of Checkley Lane, upper parts of the overhead line equipment and passing trains on the Checkley North embankment. The significant noise and visual effects will result in an in-combination effect on the amenity of residents at the five properties. This will result in a major adverse effect, which is significant.
- 6.5.3 A group of residential properties on Den Lane to the north of Wrinehill will be in proximity to the Proposed Scheme. The operation of the Proposed Scheme will result in significant noise effects during the daytime and night-time on six of the properties due to the running of trains along the route. All six of the properties will experience significant adverse visual effects due to views of the overhead line equipment and passing trains on the HS2 spur (northbound). The significant noise and visual effects

will result in an in-combination effect on the amenity of residents at the six properties. This will result in a major adverse effect, which is significant.

- 6.5.4 A group of residential properties on Den Lane and Mill Lane End, to the east of Blakenhall, will be in proximity to the Proposed Scheme. The operation of the Proposed Scheme will result in significant noise effects during the daytime and night-time on approximately 17 residential properties due to the running of trains along the route. All 17 of the properties will experience significant adverse visual effects due to views of Den Lane realignment, new planted landscape bunds, the South Crewe mid-point auto-transformer station, overhead line equipment and passing trains on the Chorlton South embankment and Blakenhall Northbound spur embankment. The significant noise and visual effects will result in an in-combination effect on the amenity of residents at the 17 properties. This will result in a major adverse effect, which is significant.
- 6.5.5 A group of residential properties in Wychwood Park and Chorlton will be in proximity to the Proposed Scheme. The operation of the Proposed Scheme will result in significant noise effects, during the daytime only, on 38 residential properties due to the running of trains along the route. All 38 of the properties will experience significant adverse visual effects due to views of the closed section of Chorlton Lane, noise fence barriers on the HS2 spur beyond the WCML, passing trains and overhead line equipment. The significant noise and visual effects will result in an in-combination effect on the amenity of residents at the 38 properties. This will result in a major adverse effect, which is significant.
- 6.5.6 Two housing allocations (RES.1 Chorlton and RES1.6 St Clement's Court) are located in proximity to the Proposed Scheme. The residential properties developed closest to the route of the Proposed Scheme will experience the same in-combination effect as described above for a group of approximately 38 residential properties in Wychwood Park and Chorlton. The significant noise and visual effects will result in an in-combination effect on the amenity of residents at these properties. This will result in a major adverse effect, which is significant.
- 6.5.7 A group of residential properties on Chorlton Lane in Chorlton will be in proximity to the Proposed Scheme. The operation of the Proposed Scheme will result in significant noise effects during the daytime and night-time on approximately nine residential properties due to the running of trains along the route. All nine of the properties will experience significant adverse visual effects due to views of newly planted landscape bunds, Chorlton Lane diversion, a noise fence barrier, Chorlton retaining walls, overhead line equipment and passing trains. The significant noise and visual effects will result in an in-combination effect on the amenity of residents at the nine properties. This will result in a major adverse effect, which is significant.

Community facilities

- 6.5.8 No operational effects on community facilities are anticipated in the South Cheshire area.

Recreational facilities

6.5.9 No operational effects on recreational facilities are anticipated in the South Cheshire area.

Open space and public rights of way

6.5.10 No operational effects on open space or public rights of way are anticipated in the South Cheshire area.

Other mitigation measures

6.5.11 No other mitigation measures are proposed.

Summary of likely residual significant effects

6.5.12 The operation of the Proposed Scheme will result in significant permanent in-combination effects on the following resources:

- five properties on Checkley Lane due to the combination of noise and visual effects;
- six properties on Den Lane to the north of Wrinehill due to the combination of noise and visual effects;
- seventeen properties on Den Lane and Mill Lane to the east of Blakenhall due to the combination of noise and visual effects;
- thirty-eight properties in Wychwood Park and Chorlton due to the combination of noise and visual effects;
- two allocations for housing (RES.1 Chorlton and RES1.6 St Clement's Court) due to the combination of noise and visual effects; and
- nine properties on Chorlton Lane due to the combination of noise and visual effects.

Cumulative effects

6.5.13 No cumulative effects on community resources during operation of the Proposed Scheme have been identified in the South Cheshire area.

Monitoring

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

6.5.15 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 have contributed to the in-combination assessments, are described in the relevant topic chapters.

7 Cultural heritage

7.1 Introduction

- 7.1.1 This section of the report provides a description of the current baseline for heritage assets and the likely impacts and significant effects resulting from the construction and operation of the Proposed Scheme within the South Cheshire area. Consideration is given to the extent and value (significance) of heritage assets including archaeological and palaeoenvironmental remains, historic buildings, the built environment and historic landscape.
- 7.1.2 Engagement has been undertaken with Historic England, Staffordshire County Council (SCC) and Cheshire East Council (CEC). The purpose of this engagement has been to understand the nature of heritage assets within the area, to obtain relevant baseline information and to inform the design development and assessment of the Proposed Scheme.
- 7.1.3 Throughout this section, heritage assets within the study area are identified with a unique reference code (for example, SCH001). Further detail on these heritage assets can be found in the gazetteer in Volume 5: Appendix CH-002-005. Detailed reports on cultural heritage baseline and historic landscape character within the South Cheshire area are contained in the Volume 5 Appendices. These are:
- Appendix CH-001-005 – Cultural heritage baseline report;
 - Appendix CH-002-005 – Gazetteer of heritage assets; and
 - Appendix CH-003-005 – Cultural heritage impact assessment table.
- 7.1.4 In addition, there are two route-wide cultural heritage appendices:
- Appendix CH-005-000 – Historic landscape character report; and
 - Appendix CH-006-000 – Geoarchaeological desk study report.
- 7.1.5 Maps showing the location of all designated and non-designated heritage assets can be found in Volume 5: Cultural heritage Map Book.
- 7.1.6 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: CA5 Map Book.
- 7.1.7 In addition, survey reports for the South Cheshire area, incorporating geophysical survey and remote sensing studies, are available in Background Information and Data (BID)⁶⁷, (see BID-CH-004-005: Cultural heritage survey reports).

⁶⁷ HS2 Ltd (2017), High Speed Two (HS2) Phase 2a (West Midlands - Crewe), Background Information and Data, Available online at: www.gov.uk/hs2

7.2 Scope, assumptions and limitations

- 7.2.1 The scope, key assumptions and limitations for the cultural heritage assessment are set out in full in Volume 1 (Section 8), the Scope and Methodology Report (SMR)⁶⁸, and the SMR Addendum⁶⁹.
- 7.2.2 The assessment focuses on the extent to which the Proposed Scheme will affect designated and non-designated heritage assets. Impacts on assets as a result of the Proposed Scheme will occur largely through the physical removal and alteration of heritage assets and changes to their setting.
- 7.2.3 The study area within which a detailed assessment of all assets, designated and non-designated, has been carried out is defined as the land required for the Proposed Scheme plus 500m. This is referred to in the remainder of this assessment as the 500m study area.
- 7.2.4 The setting of all designated heritage assets within the zone of theoretical visibility (ZTV) up to 2km from the land required for the Proposed Scheme has been considered. This is referred to in the remainder of this report as the 2km study area.
- 7.2.5 Impacts on the setting of heritage assets within the ZTV beyond 2km have been considered where professional judgement indicates that a significant effect may occur. No such impacts have been identified within the South Cheshire area.
- 7.2.6 The cultural heritage methodology includes the consideration of the intra-project effects of a number of topic assessments, for example, landscape and visual, ecology and biodiversity, and water resources and flood risk. Consequently, these interactions have been included in the assessment of impacts and effects.
- 7.2.7 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. Where measurements identified in the sound, noise and vibration studies⁷⁰ indicate a significant effect, this has triggered an assessment of the contribution that tranquillity makes to the significance of the heritage asset.
- 7.2.8 The baseline studies informing this assessment have been drawn from a wide and comprehensive range of information sources. These have been supported by a programme of non-intrusive survey including, extensive geophysical survey.
- 7.2.9 Heritage assets within the land required to construct the Proposed Scheme are assumed to require complete removal and the assessment has been undertaken on that basis. With respect to overhead line diversions/realignments in particular, it is likely that the majority of the heritage assets can in fact be retained, as the land is only

⁶⁸ Volume 5: Appendix CT-001-001, Environmental Impact Assessment Scope and Methodology Report.

⁶⁹ Volume 5: Appendix CT-001-002, Environmental Impact Assessment Scope and Methodology Report Addendum.

⁷⁰ Volume 5: Appendix SV-002-005, CA5 South Cheshire. Sound, noise and vibration report, Tables 15 and 16.

required to allow for raising or lowering of pylons and/or re-stringing of cables, or to provide an access route to the works.

- 7.2.10 Common features of the historic landscape such as marl pits, field boundaries and former areas of ridge and furrow are not individually considered and have not been included in the baseline, and impacts on them are not assessed individually. However, they are considered to contribute to the historic landscape character of the area and are considered within the overall assessment of impacts on historic landscape.
- 7.2.11 In undertaking the assessment, the following limitations were identified:
- although the LiDAR⁷¹ data examined covers the majority of the 500m study area, there were some areas for which data was unavailable⁷²; and
 - not all areas within the 500m study area were available for field survey (due to limited land access or site conditions) such as site reconnaissance visits and geophysical survey⁷³.
- 7.2.12 Limitations in the LiDAR data were not considered to be of a scale or significance that would have any impact on the robustness of the assessment.
- 7.2.13 Where survey data are limited, a precautionary baseline has been built up according to the guidance reported in the SMR and the SMR Addendum.

7.3 Environmental baseline

Existing baseline

- 7.3.1 Documentary baseline data was collated from a variety of sources in compiling this assessment, as set out in Volume 5: Appendix CH-001-005, including:
- Cheshire Historic Environment Record (HER)⁷⁴;
 - Cheshire Record Office collections;
 - Staffordshire HER⁷⁵;
 - Staffordshire Record Office collections;
 - material held at the William Salt Library, Stafford;
 - historic Ordnance Survey mapping; and
 - other published sources (full references are provided in Volume 5: Appendix CH-001-005).

⁷¹ Light detection and ranging (LiDAR) is a high resolution remote sensing technique to capture 3D data.

⁷² For details see the Remote Sensing Survey Report in the Background Information and Data document, BID CH-004-005.

⁷³ For details see the Geophysical Survey Report in the Background Information and Data document, BID CH-004-005.

⁷⁴ Cheshire Historic Environment Record. Available online at: <https://data.gov.uk/dataset/cheshire-historic-environment-record-local-list-of-historic-buildings-polygon>.

⁷⁵ Staffordshire Historic Environment Record. Available online at: <https://www.staffordshire.gov.uk/environment/eLand/planners-developers/HistoricEnvironment/Historic-Environment-Record/HistoricEnvironmentRecord.aspx>.

7.3.2 In addition to collating this baseline data, the following surveys were undertaken, as set out in BID CH-004-005: Cultural heritage survey reports:

- non-intrusive geophysical surveys;
- targeted fieldwalking surveys;
- detailed and systematic transcription of remote sensing data including LiDAR and aerial photographs;
- walkover and site reconnaissance of sites and buildings of potential cultural heritage significance; and
- setting assessments of all accessible designated heritage sites within 2km of the land required for the Proposed Scheme.

Designated assets

7.3.3 Grade II 19th century railway station platform buildings at Crewe constructed in 1867 (SCH052) are located wholly within the land required for the Proposed Scheme (see Volume 5: Cultural heritage Map Book: Map CH-02-208).

7.3.4 The following designated heritage assets are located partially or wholly within the 2km study area (see Volume 5: Cultural heritage Map Book: Maps CH-02-207b to CH-02-208):

- one scheduled monument: a medieval moated site⁷⁶ near Wybunbury (SCH116);
- four Grade I listed buildings: the Church of St Margaret, Betley (SCH015); Delves Hall, Doddington (SCH012); Doddington Hall (SCH012); and Crewe Hall (SCH047);
- ten Grade II* listed buildings: Betley Court (SCH015); Betley Old Hall (SCH015); Model Farm Complex, Betley (SCH015); Checkley Hall (SCH011); Hough Hall (SCH023); the Gates at Hough Hall (SCH023); Hollyhedge Farmhouse, Basford (SCH041); Former Stables at Crewe Hall (SCH047); the Church of St Michael, Crewe Green (SCH066); and the tower of the former Church of St Chad at Wybunbury (SCH110);
- one hundred and thirteen Grade II listed buildings, including large groupings at: Betley; Weston; Crewe Hall; Crewe Green; and Crewe;
- individual Grade II listed buildings lying outside settlements including:
 - Shavington Hall, a small late 19th century country house on the north side of Weston Lane, constructed in 1877 in Tudor Revival style (SCH044). The house stands within landscaped grounds and gardens. The wider setting is open, rural, agricultural land with some intrusive noise from the A500 Shavington Bypass to the north; and

⁷⁶ A platform, generally square, surrounded by a ditch marking the former site of a medieval manorial/high status residence.

- Basford Bridge cottage, a 17th century house with 19th century alterations (SCHo30). The house is two storeys comprising a timber frame with brick infill and rendered brick, and a corrugated iron roof. Its rural location on the Newcastle Road a short distance to the east of the West Coast Main Line (WCML), is an important part of its historic significance. The building is currently in a dilapidated condition.
- two Grade II registered park and gardens: Crewe Hall Park (SCHo47) and Doddington Park (SCHo12); and
- four conservation areas: Betley Conservation Area (SCHo15); Wybunbury Conservation Area (SCHo22); Weston Conservation Area (SCHo35); and Crewe Green Conservation Area (SCHo66).

Non-designated assets

- 7.3.5 All non-designated heritage assets within the 500m study area are listed in the gazetteer in Volume 5: Appendix CH-002-005 and identified on Maps CH-01-215b to CH-01-218 (Volume 5: Cultural heritage Map Book).
- 7.3.6 The following non-designated assets of moderate value lie wholly or partially within the land required for the Proposed Scheme:
- the probable site of Godewyneslegh, a deserted medieval village (DMV), and associated medieval to post-medieval agricultural landscape at Gonsley Green with fields, boundaries and hollow way⁷⁷, possible house platforms, enclosures, and remnant ridge and furrow (SCHo20); and
 - the site of Basford Hall, including a possible moat, historic farm buildings, and an associated possible DMV, north of Weston Lane and immediately west of the existing WCML (SCHo45).
- 7.3.7 The following identified non-designated assets of low value lie wholly or partially within the land required for the Proposed Scheme:
- Checkley Lane, hollow way of likely medieval origin crossing the landscape east to west from Wrinehill towards Checkley (SCHo77);
 - Den Bridge and sidings, built for the Grand Junction Railway⁷⁸ and now part of the WCML (SCHo10);
 - Den Lane, an incised country lane of likely medieval origin crossing the landscape south-east to north-west from Wrinehill towards Wybunbury (SCHo99);
 - Mill Lane, an incised country lane of likely medieval origin crossing the landscape east to west from a junction with Den Lane towards Blakenhall and Doddington (SCH100);

⁷⁷ A trackway incised into the landscape as the result of use over long periods of time.

⁷⁸ The Grand Junction Railway merged with others to form the London and North Western in 1846.

- two small Peat deposits, likely infilled kettle holes⁷⁹, located to the south-west and to the north of Higher Den farmhouse (SCHo89 and SCHo90);
- the site of Higher Hayward farmstead, located north of Den Lane, but no longer visible in the landscape (SCHo14);
- a small Peat deposit, likely an infilled kettle hole, located to the north of Gonsley Green Farm (SCHo96);
- the location of a possible moat at Chorlton (SCHo78);
- the site of a former farmstead, south of Heath Farm, including evidence of a possible enclosure or land division likely dating from the medieval or possibly Romano-British period (SCHo79);
- a railway embankment and cutting south of Casey Bridge (SCHo32), and other early railway heritage associated with the Grand Junction Railway, including Casey Bridge (SCHo33); Basford Hall Junction (SCHo37); and Basford Hall Bridge (SCHo38);
- Royal Observer Corps Monitoring Post at Shavington, off Casey Lane (SCHo34);
- the site of Crotia Mill, a watermill with medieval origins, Crotia Mill Pond, and surrounding remnant medieval to post-medieval fields (SCHo81); and
- a Railway Emergency Control Centre located at Crewe Station (SCHo85).

7.3.8

There are a number of non-designated heritage assets within the 500m study area, the setting of which may be affected by the Proposed Scheme, as follows:

- Wesleyan Methodist Chapel, Chorlton, built in red brick. The asset lies within an isolated rural setting adjacent to Chorlton Lane (SCHo26);
- the locally listed YMCA Hostel, Gresty Road, originally a late 19th century railway workers' hostel, constructed from red brick. Its relationship with the railway is the most important aspect of its setting (SCHo51);
- Enginemen's Barracks, Gresty Road, built in 1897 to accommodate train crews from the London and North Western Railway. Its relationship with the railway is the most important aspect of its setting (SCHo53);
- the locally listed Crewe Arms Hotel, built in 1880 at the same time as Crewe Station (SCHo87);
- three locally listed buildings on the corner of Nantwich and Gresty Road (SCHo54); and
- a cluster of buildings, north-west of Crewe Station, including four industrial buildings (SCHo55); the locally listed Edleston Road County Primary School

⁷⁹ A hollow created during glacial retreat when buried blocks of glacier ice separated from the main glacier melt. These can eventually fill with sediment.

(SCH073); the locally listed Imperial Hotel (SCH056); and the locally listed Temple Chambers (SCH0074).

Historic landscape

7.3.9

Analysis has been undertaken of the historic landscape character within and around the land required for the Proposed Scheme. This was based on the outputs of the SCC and CEC Historic Landscape Characterisation (HLC), geological and geographical data sources, site visits and professional judgement. For the purpose of assessment, the Proposed Scheme has been divided into a number of Historic Landscape Character Areas (HLCAs) (see Volume 5: Appendix CH-005-000). Within the South Cheshire area these are as follows:

- HLCA 17 Betley: this HLCA is primarily defined by the historic linear settlement of Betley and the surrounding farming landscape. The field network is characterised by early piecemeal enclosure. A number of meres and mosses also characterise the landscape. There has been extensive development at the northern end of the HLCA, around Chorlton, in recent years. The heritage value of this HLCA is considered to be moderate;
- HLCA 18 Hough to Checkley Brook: this HLCA is predominantly open farmland and small wooded enclosures with dispersed hamlets, farms and small settlements such as Hough, Wybunbury, and Blakenhall. The WCML (part of which was formerly the Grand Junction Railway) runs through the centre of the HCLA, and several narrow country lanes traverse the HLCA. The heritage value of this HLCA is considered to be moderate; and
- HLCA 19 Crewe Fringe: this HLCA is in proximity to Crewe, and consists of relatively open and flat farmland punctuated by the nucleated settlements of Basford, Shavington, and Weston. Important highways traverse the area, including the A500 Shavington Bypass, as well as the WCML (part of which was formerly the Grand Junction Railway), which runs through the centre of the HLCA. The heritage value of this HLCA is considered to be low.

Cultural heritage overview

7.3.10

This overview of the cultural heritage baseline is drawn from the more detailed analysis set out in the Cultural heritage baseline report (Volume 5: Appendix CH-001-005). This also contains references and a timeline setting out the chronological limits of the periods referred to below. This overview refers to heritage assets within the wider 500m study area, unless specified otherwise.

7.3.11

There is very little recorded archaeological evidence from the Palaeolithic period within the study area. This is due in large part to the climatic conditions from that period and the superficial (drift) geology and depositional processes that formed as a result. Part of the Proposed Scheme will fall within a wetland area characterised by mire deposits forming on poorly draining basins, known as meres and mosses. Examples of these are found with place names such as Betley Mere (SCH091) and Blakenhall Moss (SCH070). These usually contain depths of Peat deposits, and preservation of organic material within the Peat could be high. In addition, discrete

deposits of Peat preserved within kettle holes are located to the immediate north and south of the A500 Shavington Bypass and further south around Wychwood Park, Chorlton (SCH097 and SCH098), Blakenhall (SCH092), Wrinehill (SCH088), Higher Den Farmhouse (SCH089 and SCH090), Gonsley Green (SCH096), and within the floodplain of the Basford Brook, west of Betley (SCH093, SCH094 and SCH095). Such features have elevated geoarchaeological potential.

- 7.3.12 The earliest evidence of human occupation in Cheshire dates to the Mesolithic period, although most of the evidence for such activity is confined to the Pennine fringes in the eastern part of the county, at a considerable distance from the study area. Undated flint tool scatters have been recorded around Weston to the north of the study area. An incomplete Bronze Age copper alloy flat axe with a splayed crescent shaped blade has been found outside the study area to the west of Blakenhall.
- 7.3.13 It is during the Middle Bronze Age through to the later Iron Age that evidence for agricultural practices and land division becomes more visible in the archaeological record. However, this evidence has not been identified in the lowlands area of the Cheshire Plain. More widely, the town of Crewe and its environs are located within the territory believed to have been occupied by the Cornovii tribe during the later Iron Age. Evidence from eastern Cheshire includes Iron Age pottery of a type closely associated with the salt industry and demonstrates that salt was being traded during this period and that trackways and routes between Nantwich, Middlewich and Northwich were well established.
- 7.3.14 There is very little evidence of Roman activity in the study area although the Roman occupation has been well documented in Cheshire, often in association with salt production at sites such as Nantwich and Middlewich. There is some evidence for Roman material, coins and artefacts near Doddington to the west of the study area and Heath Farm and Weston to the north-east. There is evidence for continuing Romano-British salt production and trade in this area.
- 7.3.15 During the Anglo-Saxon period the area fell within the Kingdom of Mercia, although sites of rural occupation during this period are scarce. Documentary evidence is based mainly on place names and evidence recorded in the Domesday Book and provides evidence of the developing settlement pattern of the region. The suffix 'ton'⁸⁰, as in Shavington and Weston, suggests Saxon settlement was established by the end of the 8th century. Betley is derived from a Saxon female name, Bette, and 'ley', meaning clearing in the woods. Basford is recorded in the Domesday Survey as 'Berchesford', and prior to the Norman Conquest of 1066, it comprised three manors held individually by Owen, Erechaiin and Leofric. Blakenhall is recorded as consisting of six households, with five ploughlands and land for two plough teams. The Church of St Chad (in Wybunbury Conservation Area (SCH022)), is thought to have been important during the latter years of the Kingdom of Mercia, due to its dedication to St Chad, who was Bishop of the Mercians from AD 669.

⁸⁰ A Saxon term equivalent to a farmstead or enclosed village.

- 7.3.16 During the medieval period, the rural landscape of Cheshire would have been occupied by a series of small nucleated villages surrounded by open fields, including a three-field system near Wybunbury. Several settlements have since disappeared from the landscape, including Godewyneslegh (SCHo20). An area running north from Gonsley Green Farm to Heath Farm included field systems that may have related to the DMV, with narrow ridge and furrow and drains and boundaries observed as earthworks in 1947, but subsequently levelled and removed by modern activity. Historically, the key transport route close to the route of the Proposed Scheme followed the line of the A531 Newcastle Road, which connects Newcastle-under-Lyme with Betley and north towards what is today Crewe. During the post-medieval period, the enclosure of the landscape influenced the continuation of settlement growth. Various industries are notable during this time period, including iron works and forges, for example, at Wrinehill to the south.
- 7.3.17 The post-medieval period, and in particular the Tudor and Stuart period, saw major changes in the development of small manorial estates. Most important prior to the Industrial Revolution would have been the enclosure of the medieval open field system, with only vestiges of the former open arable fields of the county surviving by the early 19th century. Evidence of these medieval field systems can be found near Basford (SCHo45, SCHo80, and SCHo81). Commercial Peat production, which began in the late 19th century in Cheshire, and agricultural improvements, affected changes to the wetlands in the region. To the north, villages such as Weston (SCHo35) have probably remained largely unaltered in their general layout from the end of the medieval period until the late 20th and early 21st centuries.
- 7.3.18 The present town of Crewe came into being with the construction of the Grand Junction Railway's Birmingham to Warrington line in 1837. During the 20th century, a number of sites around Crewe Station, Weston and Basford were used during Second World War as cold stores, anti-aircraft batteries (SCHo72), and Prisoner of War camps.

Future baseline

Construction (2020)

- 7.3.19 Volume 5: Appendix CT-004-000 provides details of all developments in the South Cheshire area that are assumed to have been implemented by 2020.
- 7.3.20 The committed developments that materially affect the baseline conditions for heritage in this area and form part of the future baseline assessment of the effects during construction are listed in Table 17. This committed development is considered in the cumulative assessment of the construction phase of the Proposed Scheme.

Table 17: Committed developments relevant to cultural heritage

Map book reference ⁸¹	Planning reference	Description
CA5/36	15/1537N	Mixed-use development comprising up to 325 dwellings and employment uses. Associated development includes

⁸¹ Volume 5 Map Book: Maps CT-13-115b to CT-13-118-R1.

Map book reference ⁸¹	Planning reference	Description
		a local community facility, retail uses, public house/restaurant, access, open space and landscaping.

Operation (2027)

- 7.3.21 Volume 5: Appendix CT-004-000 provides details of all developments in the South Cheshire area that are assumed to have been implemented by 2027.
- 7.3.22 No committed developments have been identified in this area that will materially alter the baseline conditions in 2027 for heritage assets.

7.4 Effects arising during construction

Avoidance and mitigation measures

- 7.4.1 The design of the Proposed Scheme avoids physical impacts on any scheduled monuments, registered parks or gardens, registered battlefields or listed buildings within the South Cheshire area.
- 7.4.2 Landscape planting adjacent to Basford Bridge Cottage (SCH030), following removal of the existing Newcastle Road overbridge, will reduce noise and visual impacts on the asset.
- 7.4.3 Section 8 of the draft Code of Construction Practice⁸² (CoCP) 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

- 7.4.4 Impacts on all heritage assets described above have been assessed⁸³. However, only those leading to significant effects are described in the construction assessment set out below.

Temporary effects

- 7.4.5 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 will occur to assets both within the land required for the

⁸² Volume 5: Appendix CT-003-000, Draft Code of Construction Practice.

⁸³ These are set out in detail in the Impact Assessment Table, Volume 5: Appendix CH-003-005.

Proposed Scheme and assets in the wider study area due to the visibility of plant, cranes and equipment.

- 7.4.6 The following significant effects are expected to occur as a result of temporary impacts on designated or non-designated heritage assets due to changes to their settings.
- 7.4.7 Shavington Hall (SCHo44), an asset of moderate value, will be subject to a temporary change in its setting. The significance of the Hall's setting relates to its rural context and historic relationship with the surrounding agrarian landscape. Noise and movement from the establishment and operation of the Basford cutting main compound and temporary worker accommodation and adjacent site haul routes, a minimum of 110m to the north-east, will affect the setting of the building. This will constitute a medium adverse impact and a moderate adverse significant effect. Construction activity will take place over approximately six years and three months.
- 7.4.8 Basford Bridge Cottage (SCHo30), an asset of moderate value, will be subject to a temporary change in its setting. Demolition of the existing Newcastle Road overbridge, works associated with the closure of an adjoining section of Newcastle Road, the use of construction traffic routes, and the establishment and operation of the Chorlton cutting satellite compound and Creamery Bridge satellite compound will affect the setting of this building. This will constitute a medium adverse impact and a moderate adverse significant effect. Construction activity will take place over approximately four years and three months.
- 7.4.9 No significant temporary effects on HLCAs will result from the construction of the Proposed Scheme in the South Cheshire area.

Permanent effects

- 7.4.10 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.
- 7.4.11 The following significant effects are expected to occur as a result of permanent physical impacts on heritage assets within the land required for the Proposed Scheme.
- 7.4.12 There will be a number of non-structural changes to the Grade II 19th century railway station platform buildings at Crewe (SCHo52), an asset of moderate importance. The changes to its fabric and appearance will constitute a medium adverse impact and a moderate adverse significant effect.
- 7.4.13 The surviving earthworks and buried archaeological features in the area surrounding Gonsley Green Farm, which includes the suspected location of the DMV of Godewyneslegh (SCHo20), an asset of moderate value, will be removed during the construction of the Proposed Scheme and various works at its junction with the WCML including Crewe South cutting, Blakenhall cutting, Chorlton South embankment and Chorlton viaduct. It will also be affected by temporary construction works including the establishment and operation of the Crewe South cutting satellite compound and a large materials storage compound. This will constitute a high adverse impact and major adverse significant effect.

- 7.4.14 The existing embankment and cutting south of Casey Bridge, part of the Grand Junction Railway (SCH032), an asset of low value, will be altered by construction activities associated with a new section of WCML, the realignment of Newcastle Road and construction of the Newcastle Road overbridge. This will constitute a high adverse impact and moderate adverse significant effect.
- 7.4.15 The demolition of Casey Bridge (SCH033), an asset of low value, will constitute a high adverse impact and moderate adverse significant effect.
- 7.4.16 The site of the Royal Observer Corps Monitoring Post at Shavington (SCH034), an asset of low value, will be removed during construction activities associated with the closure and diversion of Casey Lane, the establishment and operation of Casey Lane East satellite compound and landscape planting. This will constitute a high adverse impact and moderate adverse significant effect.
- 7.4.17 The historic configuration of the Basford Hall Junction (SCH037), an asset of low value, will be altered by modifications to the WCML. This will constitute a high adverse impact and moderate adverse significant effect.
- 7.4.18 Surviving earthworks and buried archaeological features in the area of Basford Hall, including evidence associated with the possible DMV and historic farm buildings (SCH045), an asset of moderate value, will be partially removed during construction of Basford cutting, site haul routes, and landscape planting. This will constitute a high adverse impact and major adverse significant effect.
- 7.4.19 Checkley Lane (SCH077), an asset of low value, will be altered by construction of the Crewe South cutting and Checkley Lane overbridge, and the realignment of Checkley Lane. This will constitute a high adverse impact and a moderate adverse significant effect.
- 7.4.20 A possible moated site at Chorlton (SCH078), an asset of low value, will be removed by construction activities associated with the modifications to the WCML, landscape planting and habitat creation, and site haul routes. This will constitute a high adverse impact and moderate adverse significant effect.
- 7.4.21 The site of a former farmstead, south of Heath Farm (SCH079), an asset of low value, will be partially removed by construction of the Crewe South cutting, landscape bunds and habitat creation. This will constitute a high adverse impact and moderate adverse significant effect.
- 7.4.22 A kettle hole located to the south-west of Higher Den Farm (SCH089), an asset of low value, will be removed during construction of the HS2 spur (southbound) and the excavation of the borrow pit north of Checkley Lane. This will constitute a high adverse impacts and a moderate adverse significant effect.
- 7.4.23 A kettle hole near Gonsley Green (SCH096), an asset of low value, will be removed by construction of the HS2 main line and the excavation of a balancing pond. This will constitute a high adverse impact and a moderate adverse significant effect.
- 7.4.24 Den Lane (SCH099), an asset of low value, will be altered by construction of the HS2 main line, Den Lane East viaduct, Den Lane West viaduct, Den Lane Central

underbridge, and the realignment of Den Lane. This will constitute a high adverse impact and moderate adverse significant effect.

7.4.25 The following significant effects will occur as a result of the permanent impacts on designated or non-designated heritage assets as a result of changes to their settings.

7.4.26 Basford Bridge Cottage (SCH030), an asset of moderate value, will be subject to a permanent change in its setting. The removal of the existing Newcastle Road overbridge and closure of a section of Newcastle Road will sever the historic link between the building and the villages to the west of the existing WCML. However, a section of Newcastle Road will be removed immediately adjacent to the building, and the addition of landscape planting immediately to the west will improve the ability to appreciate the building by reducing visual and noise intrusion. On balance this will constitute a medium beneficial impact and a moderate beneficial significant effect.

7.4.27 No significant permanent effects on HLCAs will result from the construction of the Proposed Scheme in the South Cheshire area.

Other mitigation measures

7.4.28 Refinements to the mitigation measures incorporated into the design of the Proposed Scheme or included in the draft CoCP will be considered during detailed design to reduce further the significant effects described above. These refinements will 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.

7.4.29 A site specific management plan, in accordance with the measures within the draft CoCP, will be developed to manage the risk of structural instability to Basford Bridge Cottage (SCH030) that could potentially arise during construction works (heavy machinery and vibration) occurring adjacent to the building.

7.4.30 Milestones and/or mileposts that have to be removed during construction will be, wherever it is reasonably practicable to do so, returned to their original location before operation commences.

Summary of likely residual significant effects

7.4.31 The temporary effects of construction activity on the setting of heritage assets have been considered. However, they are largely reversible in nature and will be restricted to the duration of the construction works.

7.4.32 As no mitigation beyond that described above has been identified the residual effects are the same as those reported in the permanent and cumulative effects sections.

Cumulative effects

7.4.33 A detailed assessment has been undertaken of committed developments that have the potential to lead to cumulative effects with the Proposed Scheme.

- 7.4.34 The remnant landscape of Crotia Mill Farm (SCHo81), an asset of low value, will be partially removed by a mixed-use committed development (planning reference: 15/1537N). This will constitute a high adverse impact and moderate adverse effect.
- 7.4.35 The Network Rail maintenance access road constructed as part of the Proposed Scheme will result in further partial removal of the remnant landscape of Crotia Mill Farm, albeit a much smaller area than that which is removed by the mixed-use development. This will constitute a low adverse impact and a minor adverse effect, which is not significant.
- 7.4.36 The cumulative effect of the loss the remnant landscape of Crotia Mill Farm will result in a high adverse impact and a moderate adverse significant effect.

7.5 Effects arising from operation

Avoidance and mitigation measures

- 7.5.1 The following measures have been incorporated into the design of the Proposed Scheme, which will reduce the impacts and effects on heritage assets, as shown on the CT-o6 Map Series within the Volume 2: CA5 Map Book:
- landscape planting adjacent to Basford Bridge Cottage (SCHo30), which will reduce visual and noise effects on the building; and
 - landscape planting will increasingly reduce impacts on the setting of the assets within the area as it matures.

Assessment of impacts and effects

- 7.5.2 The assessment considers the Proposed Scheme once operational and all effects are considered to be permanent. There will be no physical impacts on buried archaeological remains or other heritage assets arising from the operation of the Proposed Scheme. Impacts on heritage assets due to changes in their settings arising from the physical presence of the Proposed Scheme are described as permanent, occurring within the construction phase, and are not repeated here, although they will endure through the operation of the Proposed Scheme. Where there is a combined effect on the setting of an asset from the presence of the constructed Proposed Scheme and its operation, this is reported in the assessment of operation.
- 7.5.3 There will be no change in significant effects from those described under permanent effects from construction as a result of the operation of the Proposed Scheme in the South Cheshire area.
- 7.5.4 No significant effects on HLCAs will result from the operation of the Proposed Scheme in the South Cheshire area.

Other mitigation measures

- 7.5.5 The Proposed Scheme includes a number of design measures to address potential impacts and significant effects. No additional operational mitigation measures beyond those included within the Proposed Scheme design have been identified. Potential opportunities for further mitigation such as planting and noise fencing have

not been identified at this stage, but will be considered as part of the detailed design process.

Summary of likely residual significant effects

- 7.5.6 No significant effects on heritage assets during operation have been identified in the South Cheshire area.

Cumulative effects

- 7.5.7 No cumulative effects on heritage assets during operation have been identified in the South Cheshire area.

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 heritage monitoring requirements during operation of the Proposed Scheme. It is assumed that all heritage assets within the land required for the Proposed Scheme will be removed during construction unless expressly excluded as a result of the mitigation process.

8 Ecology and biodiversity

8.1 Introduction

- 8.1.1 This section of the report describes the ecological baseline and identifies likely impacts and significant ecological effects that will arise from the construction and operation of the Proposed Scheme in the South Cheshire area. This includes effects upon sites recognised or designated on the basis of their importance for nature conservation.
- 8.1.2 Engagement has been undertaken with national organisations and regional and local stakeholders including: Natural England; Environment Agency; Forestry Commission; Staffordshire Wildlife Trust; Cheshire Wildlife Trust; Royal Society for the Protection of Birds; Woodland Trust; Staffordshire County Council (SCC); and Cheshire East Council (CEC). The purpose of this engagement has been to obtain relevant baseline information and inform the design development and assessment of the Proposed Scheme.
- 8.1.3 Volume 5 contains supporting information to the ecological assessment reported in this section, including:
- ecological baseline data - designated sites (see Volume 5: Appendix EC-001-000); and
 - an ecology register of local level effects, which are not reported individually in Volume 2 (see Volume 5: Appendix EC-016-005).
- 8.1.4 Map Series EC-01 showing statutory and non-statutory designated sites of relevance to the assessment in the South Cheshire area is provided in the Volume 5: Ecology and biodiversity Map Book.
- 8.1.5 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: CA5 Map Book.
- 8.1.6 In addition, ecological baseline data relating to habitats and species recorded in the South Cheshire area is set out in Background Information and Data (BID)⁸⁴ (BID-EC-002-000 to BID-EC-014-000) and accompanying Map Series EC-02 to EC-12 (BID Ecology Map Books).

8.2 Scope, assumptions and limitations

- 8.2.1 The scope, assumptions and limitations for the ecological assessment are set out in Volume 1 (Section 8), the Scope and Methodology Report (SMR)⁸⁵ and the SMR Addendum⁸⁶.

⁸⁴ HS2 Ltd (2017), High Speed Two (HS2) Phase 2a (West Midlands - Crewe), Background Information and Data, Available online at: www.gov.uk/hs2

⁸⁵ Volume 5: Appendix CT-001-001, Environmental Impact Assessment Scope and Methodology Report.

⁸⁶ Volume 5: Appendix CT-001-002, Environmental Impact Assessment Scope and Methodology Report Addendum.

- 8.2.2 Limitations associated with particular surveys are reported in BID-EC-002-000 to BID-EC-014-000.
- 8.2.3 A route-wide Water Framework Directive (WFD) compliance assessment has been undertaken in conjunction with the environmental assessment (Section 15, Water resources and flood risk). Details of the assessment are presented in Volume 5: Appendix WR-001-000.
- 8.2.4 Access was obtained to the majority of land where general habitat survey (Phase 1 habitat survey) was proposed. However, access could not be gained in time for seasonally constrained surveys at a few locations that have potential to support key ecological features. These include Burrow Coppice and Basford Hall. Further details are provided in BID-EC-002-000 to BID-EC-014-000.
- 8.2.5 Where data are limited, such as due to the absence of field surveys, a precautionary baseline has been built up according to the guidance reported in the SMR and the SMR Addendum. This constitutes a 'reasonable worst case' basis for the subsequent assessment and development of mitigation. BID-EC-002-000 to BID-EC-014-000 identifies these survey locations. Where the assessment has been based upon limited data, the ecological receptor is described as 'of up to' a specific value.
- 8.2.6 The precautionary approach to the assessment that has been adopted identifies the likely significant ecological effects of the Proposed Scheme. Unless otherwise stated, the description of effects assumes that land within the Bill limits will be subject to habitat loss resulting from development of the Proposed Scheme, with the land required for construction purposes only being reinstated following completion of construction. With respect to overhead line diversions/realignments in particular, it is likely that the majority of the habitats within the land required for the Proposed Scheme can in fact be retained, and 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.

8.3 Environmental baseline

Existing baseline

- 8.3.1 This section describes the ecological baseline relevant to the assessment: the designated sites, habitats and species recorded in this area. Further details are provided in the reports presented in Volume 5: Appendix EC-001-000 and Background Information and Data: BID-EC-002-000 to BID-EC-015-000, and maps presented in Volume 5: Map Series EC-01 and BID Ecology Map Books: Map Series EC-02 to EC-12. Statutory and non-statutory designated sites are shown on Volume 5: Map EC-01-315b-R1 to EC-01-318.
- 8.3.2 Land required for the Proposed Scheme and adjacent to it in the South Cheshire area consists mainly of agricultural land with scattered small woodlands, becoming increasingly urban towards Crewe.

Designated sites

- 8.3.3 There are two internationally important site of potential relevance to the assessment in the South Cheshire area. The Midland Meres and Mosses Phase 1 Ramsar Site, covering an area of approximately 510.9ha, 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 support numerous associated rare species of plants and invertebrates. The closest component unit of the Ramsar Site to the Proposed Scheme is Betley Mere Site of Special Scientific Interest (SSSI), which is located to the south-west of Betley, approximately 283m north-east of the land required for the Proposed Scheme.
- 8.3.4 The Midland Meres and Mosses Phase 2 Ramsar Site, covering an area of approximately 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 to the Proposed Scheme is Black Firs and Cranberry Bog SSSI, which is located approximately 1.1km east of the land required for the Proposed Scheme.
- 8.3.5 There are three nationally important SSSI of potential relevance to the assessment in the South Cheshire area. The land required for the Proposed Scheme is located within the Natural England Impact Risk Zone⁸⁷ for these SSSI. They are:
- Betley Mere SSSI, covering an area of approximately 29.4ha, is part of the Midland Mere and Mosses Phase 1 Ramsar Site. This SSSI is designated as one of the few natural standing waters in Staffordshire and occupies a shallow valley in glacial deposits, bound on three sides by extensive Peat deposits on which a wide range of vegetation types have developed. The zonation from open water with floating-leaved aquatic plants through emergent reed swamp, fen and carr to mature fen woodland, is considered to be as complete an example of a wetland hydrosere⁸⁸ as occurs in the county. This SSSI is located to the south-west of Betley, approximately 280m north-east of the land required for the Proposed Scheme;
 - Black Firs and Cranberry Bog SSSI, covering an area of approximately 12.3ha, is part of the Midland Mere and Mosses Phase 2 Ramsar Site. This SSSI is designated as an outstanding example of a schwingmoor basin mire⁸⁹, where a 'lawn' of Sphagnum moss (Cranberry Bog) has formed over a kettle hole⁹⁰ lake of glacial origin. Part of the lake remains as an open water (Black Mere). Black Firs is an acid valley alderwood on a Peat-filled depression. This SSSI is located approximately 1.1km east of the land required for the Proposed Scheme; and
 - Wybunbury Moss SSSI, covering an area of approximately 23.3ha, is

⁸⁷ 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.

⁸⁸ A hydrosere is a plant succession occurring in areas of freshwater that will, over time, ultimately become woodland.

⁸⁹ A schwingmoor is a quaking bog where the bog vegetation forms a floating mat on the surface of water or on the top of very wet Peat.

⁹⁰ A hollow created during glacial retreat when buried blocks of glacier ice separated from the main glacier melt. These can eventually fill with sediment.

designated as one of the finest examples in the country of a schwingmoor and supports an outstanding assemblage of invertebrates. This SSSI (part of which is also a National Nature Reserve) is located approximately 1.8km to the south-west of land required for the Proposed Scheme.

- 8.3.6 Whilst not a designated site, the Proposed Scheme will cross the Meres and Mosses Nature Improvement Area (NIA). This is one of 12 national NIAs set up by the government in 2012 to create joined up, resilient ecological networks at the landscape scale. The focus is to protect and improve core sites within the network and connect them by restoring wetland habitats in and around these core sites, resulting in connectivity of high quality habitats that can provide both better conditions for wildlife and enhance the capacity for species to move from one core site to another. Betley Mere SSSI (a constituent part of the Midland Meres and Mosses Phase 1 Ramsar site) falls within this NIA.
- 8.3.7 There are two Local Wildlife Sites (LWS) of potential relevance to the assessment in the South Cheshire area, which are each of county value. They are:
- Basford Brook and Mere Gutter LWS, covering an area of approximately 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 area⁹¹ for water vole. This LWS is located partially within the land required for the Proposed Scheme; and
 - Basford Brook LWS, covering an area of approximately 12.7ha, comprises marshy grassland, woodland and scrub adjacent to parts of Basford Brook. This LWS is located partially within the land required for the Proposed Scheme.
- 8.3.8 There are no Ancient Woodland Inventory (AWI) sites within 500m of the land required for the Proposed Scheme.
- 8.3.9 On the basis of the heritage review undertaken by HS2 Ltd of additional woodlands within 500m of the land required for the Proposed Scheme, no additions to the AWI are proposed in this area.

Habitats

- 8.3.10 The following habitat types which occur in the South Cheshire area that are relevant to the assessment.

Woodland

- 8.3.11 There are seven woodlands that qualify, or are likely to qualify, as lowland mixed deciduous woodland, a habitat of principal importance as listed under Section 41 of the Natural Environment and Rural Communities (NERC) Act (2006)⁹². These are:
- a broadleaved semi-natural woodland, covering an area of approximately 0.7ha, located to the north of Checkley Lane and west of Randilow Farm, which is within the land required for the construction of the Proposed Scheme.

⁹¹ National Water Vole Steering Group (2013): 'Likely Key Areas to support water vole'.

⁹² Natural Environment and Rural Communities Act 2006 (2006 CHAPTER 16). Her Majesty's Stationery Office, London.

At the top of the slope, the woodland is dominated by pedunculate oak in the canopy, with hazel dominant in the shrub layer and bramble and bluebell abundant within the field layer. The species composition of this area of woodland is characteristic of the National Vegetation Classification (NVC)⁹³ *W10c Quercus robur-Pteridium aquilinum-Rubus fruticosus* woodland *Hedera helix* sub-community. At the bottom of the slope, the woodland is dominated by crack willow and occasional alder in the canopy, with grey willow in the shrub layer. The field layer comprises abundant bramble and common nettle with occasional bittersweet. The species composition of this area of woodland is characteristic of NVC *W6b Alnus glutinosa-Urtica dioica* woodland *Salix fragilis* sub-community. The woodland is small in extent and is of district/borough value; and

- six small woodlands, located at: Lower Den Farm (approximately 0.2ha in area); Coppice Bank (approximately 0.6ha in area); Wychwood Park (approximately 1.7ha in area); Chorlton Lane (approximately 0.5ha in area); Burrow Coppice (approximately 5.4ha in area); and Basford Hall (approximately 4.1ha in area). These woodlands are partially located within the land required for the Proposed Scheme. The woodland habitats are considered to be of up to local/parish value.

Grassland

8.3.12 An area of marshy grassland, covering an area of approximately 2ha, occurs to the south-east of Heath Farm within the land required for the Proposed Scheme. The grassland may qualify as lowland meadow, a habitat of principal importance and a conservation priority of the Cheshire Biodiversity Action Plan⁹⁴ (local BAP). The grassland habitat is of up to district/borough value.

8.3.13 The majority of remaining grassland within the land required for the Proposed Scheme is improved grassland, with smaller scattered areas of species-poor semi-improved grassland. These grassland areas are of up to local/parish value.

Hedgerows

8.3.14 There are approximately 13.1km of hedgerows within the land required for the Proposed Scheme in the South Cheshire area. Hedgerow with at least 80% cover of native woody species is a habitat of principal importance. Hedgerows within the land required for the Proposed Scheme comprise approximately:

- 2.7km of native species-poor; and
- 10.4km of native species-rich; of which 1.8km are also classified as 'Important' according to the 'Wildlife and Landscape' criteria described in The Hedgerows Regulations 1997⁹⁵.

⁹³ NVC is a detailed survey and classification system that is used to compare plant communities within a range of defined community types.

⁹⁴ <http://www.cheshirewildlifetrust.org.uk/biodiversity>

⁹⁵ The Hedgerow Regulations 1997 (No. 1160). Her Majesty's Stationery Office, London.

8.3.15 Of the 13.1km of hedgerow a total of 8.4km have not been subject to survey. To accord with Phase 1 habitat descriptions un-surveyed hedgerows are mapped as native species-rich on map series EC-02, and they are included as native species-rich in the list above. This is highly precautionary, and based on ratios from the surveyed hedgerows in this area, it is likely that part of the un-surveyed hedgerow network will be species-poor.

8.3.16 As part of the precautionary assessment, it is assumed that further important hedgerows will be found within land that was not surveyed, but which will be required for the Proposed Scheme. The hedgerows within the area also function as wildlife corridors. The hedgerow network as a whole is of district/borough value.

Watercourses

8.3.17 Checkley Brook, the River Lea and four smaller watercourses will be crossed by the route of the Proposed Scheme. Checkley Brook and the River Lea may qualify as habitats of principal importance and local BAP habitats. These two watercourses and associated habitats are intrinsically important and provide corridors for wildlife dispersal, and are of up to county value. The smaller watercourses in this area are of up to district/borough value. Basford Brook, which lies to the east of the Proposed Scheme, is considered to be of county value.

Water bodies

8.3.18 There are 63 ponds located within, or partially within, the land required for the Proposed Scheme, and a further 114 ponds within 250m of the Proposed Scheme. On a precautionary basis, it is assumed that all ponds are habitats of principal importance or local BAP habitats and are of district/borough value unless surveys have shown that they are of local/parish value only.

Ancient and veteran trees

8.3.19 Ancient and veteran⁹⁶ trees with potential relevance to the assessment in the South Cheshire area have been considered.

8.3.20 On the basis of the surveys undertaken there are three veteran trees within the land required for the Proposed Scheme that are considered to be of a sufficient age and/or support features to indicate they are of veteran status. Each of the trees is considered to be of up to district/borough value. These are:

- an oak, located adjacent to Den Lane;
- an oak, located east of Gonsley Green Farm; and
- an oak, located at Basford House.

8.3.21 In addition to the above, a veteran oak tree was recorded directly adjacent to the land required for the Proposed Scheme, north of Den Lane near Coppice Bank.

⁹⁶An ancient tree is one that has passed maturity and is old, or aged, in comparison with other trees of the same species. Veteran trees are younger than ancient trees, but have features found on ancient trees such as decay in the trunk, branches and/or roots. Ancient and veteran trees are included on the Ancient Tree Inventory.

Protected and notable species

8.3.22 A summary of the likely value of protected and/or notable species of relevance to the assessment is provided in Table 18.

Table 18: Protected and notable species within the South Cheshire area

Resource/ feature	Value	Receptor	Baseline and rationale for valuation
Bats	County	Bat assemblage associated with habitats around Basford/Weston Lane	<p>Field surveys recorded non-breeding building roosts of rarer⁹⁷ species, including noctule within habitats and features present around Basford/Weston Lane.</p> <p>Three day/summer tree roosts supporting noctule, common and soprano pipistrelle bats were recorded within the land required for the Proposed Scheme. Two other tree roosts for unknown species were also recorded approximately 52m south-east and 148m south-west of the land required for the Proposed Scheme, respectively.</p> <p>Four buildings within 100m of the land required for the Proposed Scheme were recorded as supporting day/summer roosts for four species of bat, comprising: Natterer's bat, brown long-eared bat, common pipistrelle and soprano pipistrelle. An additional three buildings beyond 100m from the land required for the Proposed Scheme were also recorded as supporting day/summer roosts for brown long-eared bat and Pipistrellus species.</p> <p>Noctule are a species of principal importance⁹⁸, conservation priority of the Cheshire BAP and considered to be 'rarer' bats in England.</p> <p>Soprano pipistrelle and brown long-eared bats are both species of principal of importance and conservation priorities of the Cheshire BAP. Common pipistrelle is a conservation priority of the Cheshire BAP.</p>
	County	Bat assemblage associated with habitats around Checkley Brook and Checkley Lane	<p>Field surveys recorded low to moderate levels of activity for a diverse assemblage of rarer bat species around Checkley Brook and Checkley Lane including Myotis species, noctule, Nathusius' pipistrelle, Leisler's bat and serotine. Checkley Brook is considered to be a key commuting route for bats due to the habitats it supports.</p> <p>A summer noctule roost was detected during back-tracking field surveys along Checkley Brook, but was not able to be identified to a specific tree. One roost of unknown status was also recorded in a tree within the land required for the Proposed Scheme, north-east of Checkley Brook.</p> <p>One roost for an unknown bat species was recorded approximately 26m from the land required for the Proposed Scheme. No evidence of a maternity roost was recorded, but the presence of a rarer bat species, given foraging records in the area, cannot be discounted. Additionally, one roost of a common</p>

⁹⁷Wray, S. Wells, D. Long, E. & Mitchell-Jones, T. (2010). *Valuing Bats in Ecological Impact Assessment*, In-Practice, 23-25. Chartered Institute of Ecology and Environmental Management, Winchester.

⁹⁸ Natural Environment and Rural Communities Act 2006. Available online at: <http://www.legislation.gov.uk/ukpga/2006/16/section/41>

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			<p>pipistrelle was identified in buildings on Checkley Lane 17m north-west of the land required for the Proposed Scheme.</p> <p>Nathusius' pipistrelle is considered to be widespread, but rare in the UK. Leisler's bat is considered to be nationally scarce. Both species are conservation priorities of the local BAP.</p>
	Local/parish	Bat assemblage associated with habitats near Chorlton	<p>Field surveys recorded low to moderate activity for common pipistrelle, soprano pipistrelle and Pipistrellus species, and low levels of activity for brown long-eared bats within habitats around Chorlton, within the land required for the Proposed Scheme. This area comprises arable fields with improved grassland, ponds, trees and hedgerows with connectivity to surrounding habitat.</p> <p>Field surveys also recorded evidence of a summer roost for a Pipistrellus species in a tree and a feeding perch for brown long-eared bat within the land required for the Proposed Scheme.</p> <p>An additional five night roosts/feeding perches for brown long-eared bats were also recorded in buildings up to 20m from the land required for the Proposed Scheme.</p>
	Local/parish	Bat assemblages in trees and buildings around Basford	<p>Field surveys recorded non-breeding summer roosts for common and soprano pipistrelles in trees and buildings around Basford both within and outside of the land required for the Proposed Scheme.</p>
Amphibians	County	A meta-population ⁹⁹ (AMP5.3) of great crested newt associated with 21 ponds, west and south-west of Hough to Chorlton	<p>A meta-population of great crested newt was recorded during field surveys west and south-west of Hough to Chorlton, within the land required for the Proposed Scheme. This location is considered likely to support a medium meta-population as two ponds were confirmed as supporting great crested newt through eDNA¹⁰⁰ field surveys and suitable terrestrial habitat exists that connects the ponds. These ponds sit within a wider network of 21 ponds and are located within and up to approximately 280m from the land required for the Proposed Scheme.</p> <p>Great crested newt is an Annex 2 species, a species of principal importance, and a conservation priority of the Cheshire BAP.</p>
	County	A meta-population (AMP5.4) of great crested newt associated with 61 ponds, south of Crewe and north of the A500 Shavington Bypass	<p>A meta-population of great crested newt was recorded during field surveys near Basford Hall sidings south of Crewe and north of the A500 Shavington Bypass. This location is considered likely to support a medium meta-population of great crested newt, with 15 of the surveyed ponds supporting this species up to a medium population recorded in individual ponds. These ponds sit within a wider network of 61 ponds, which are located within and up to approximately 500m from the land required for the Proposed Scheme.</p> <p>The ponds to the east of these sidings and Basford East Development Site and potentially those south of the A500 Shavington Bypass near Basford Hall and Shavington are likely to form part of a connected population. Recently created ponds are located at Basford West Development Site.</p>

⁹⁹A metapopulation is a group of spatially separated populations which interact. Metapopulations are described in BID-EC-007-000, Ecological baseline data - amphibian and pond surveys.

¹⁰⁰Survey method to sample great crested newt environmental deoxyribonucleic acid (eDNA). Available at: <https://www.gov.uk/guidance/great-crested-newts-surveys-and-mitigation-for-development-projects#survey-methods>

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	County	A meta-population (AMP5.1) of great crested newt associated with 19 ponds, south-west of Checkley, and north and south of Checkley Lane	A meta-population of great crested newt was recorded during field surveys south-west of Checkley, and north and south of Checkley Lane. Based on field surveys undertaken to date, this location is considered likely to support a medium meta-population of great crested newt, with six of the surveyed ponds supporting this species up to a medium population recorded in individual ponds. The ponds lie within farmland and adjacent semi-natural habitats, including woodlands, are present. These ponds sit within a wider network of 19 ponds located within and up to approximately 180m from the land required for the Proposed Scheme.
	District/borough	A meta population (AMP5.2) of great crested newt associated with 23 ponds, south of Chorlton and north of Blakenhall.	A meta-population of great crested newt was recorded during field surveys south of Chorlton and north of Blakenhall. Based on field surveys, this location is considered likely to support a small meta-population of great crested newt, with one of the surveyed ponds supporting this species, with a small population size recorded. This pond sits within a wider network of 23 ponds, which are located within and up to approximately 110m from the land required for the Proposed Scheme.
	Up to county	Populations of great crested newt within un-surveyed ponds within the South Cheshire area	Ponds that have not been surveyed are assumed to support breeding populations of great crested newt of medium size class.
	Local/parish	Populations of other amphibian species including palmate newt, smooth newt, common toad and common frog within the South Cheshire area	These common amphibian species have been identified within ponds throughout the South Cheshire area during field surveys and are assumed to be present within the ponds that have not yet been surveyed. Woodland, rough grassland and hedgerow habitats are likely to be used by these species during their terrestrial phase for foraging, dispersal and shelter. Each of these species is common and widespread throughout the UK. Common toad is a species of principal importance.
Birds	County	Breeding and wintering barn owl associated with Basford Hall	Two roosting barn owls were recorded in buildings to the east of Basford Hall during field surveys, approximately 20m from the land required for the Proposed Scheme. These observations indicate the potential presence of a breeding pair. Barn owl are a conservation priority of the local BAP.
	County	Breeding birds at Checkley	Field surveys recorded a total of 41 bird species at Checkley within and adjacent to the land required for the Proposed Scheme which included six Red List species ¹⁰¹ . The species recorded are typical of farmland habitats and were present in low numbers. The recorded breeding bird assemblage included 10 species of principal importance. Farmland birds, as a group, are a conservation priority of the local BAP.
	District/borough	Wintering bird assemblage associated with habitats throughout	Field surveys recorded a total of 37 bird species in the South Cheshire area both within and adjacent to land required for the Proposed Scheme. Notable species included snipe, green sandpiper, little egret, barn owl and tree sparrow. Other records

¹⁰¹ The IUCN Red List of Threatened Species (also known as the IUCN Red List or Red Data List is the world's most comprehensive inventory of the global conservation status of biological species. Available online at: <http://www.iucnredlist.org/>

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		the South Cheshire area	were for common and widespread wintering bird species, in low numbers and typical of open countryside and woodland. The recorded breeding bird assemblage included nine Red List species and 11 species of principal importance.
Water vole	Up to county	Populations of water vole using Checkley Brook	Although no evidence of water voles was recorded during field surveys of Checkley Brook and associated water bodies, suitable habitat is present in the area, and due to connectivity with other suitable watercourses, small populations are likely to be present. Water vole is a species of principal importance and a conservation priority of the local BAP.
	Up to county	Populations of water vole using Swill Brook	Desk study records and field surveys indicate the likely presence of water vole populations in Swill Brook, associated drains and other water bodies.
Reptiles	Up to county	Population of grass snake on the golf course associated with Wychwood Park Golf Club and between the golf course and the West Coast Main Line (WCML)	Grass snakes were recorded during field surveys in this area within and adjacent to the Proposed Scheme. All common reptile species, including grass snake, are species of principal importance. Cheshire Wildlife Trust consider that sites supporting populations of grass snakes should potentially be selected as LWS conferring a county evaluation on this population.
	Up to local/parish	Potential small populations of common reptiles in the South Cheshire area	No reptiles were found (apart from grass snakes, as above) during field surveys in this area. Suitable habitat that was not surveyed was constrained to field margins, edges of woodland and scrub habitat, and isolated small patches of overgrown grassland. These habitats are within a generally intensively farmed landscape, offering limited opportunities for reptiles. It is, therefore, assumed that any other reptiles located within land required for the Proposed Scheme are present in low numbers.
White-clawed crayfish	County	White-clawed crayfish in Basford Brook	Field surveys recorded white-clawed crayfish within Basford Brook, immediately downstream from the land required for the Proposed Scheme. A short section of Basford Brook lies within the land required for the Proposed Scheme. Desk study records for white-clawed crayfish also exist within the Mere Gutter LWS. White-clawed crayfish is a species of principal importance and a conservation priority of the local BAP.
Otter	Up to district/borough	Otter population along Checkley Brook	There is a desk study record for a dead otter in the vicinity of Checkley Brook in 2014 within the land required for the Proposed Scheme. Possible evidence was recorded adjacent to a pond associated with Checkley Brook. It is assumed that otters will make use of the brook for foraging and movement. Otters are a species of principal importance and a conservation priority of the local BAP.
	Up to district/borough	Otter population along Swill Brook	Although no signs indicating use by otters were recorded during field surveys, it is assumed that they will make use of Swill Brook for foraging and movement.
Terrestrial invertebrates	District/borough	Notable species <i>Agelastica alni</i> in a woodland adjacent to	There are desk study records for the alder leaf beetle <i>Agelastica alni</i> in a deciduous woodland adjacent to Wychwood Park Golf

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		Wychwood Park Golf Club	<p>Club within the land required for the Proposed Scheme. This species is typically associated with wet woodlands.</p> <p>This is a Red Data Book species with its status described as 'insufficiently known' (RDB K).</p>
Fish	District/borough	Fish assemblage in Checkley Brook	<p>Desk study records indicate the presence of five species of fish: chub; dace; bullhead; minnow; and a species of lamprey. During other field surveys, an incidental record of bullhead was also made from within the land required for the Proposed Scheme.</p> <p>River lamprey and sea lamprey are species of principal importance. Bullhead is an Annex 2¹⁰² species.</p>
	Local/parish	Three-spined stickleback in Swill Brook, Gresty Brook and Mere Gutter	<p>During other field surveys, incidental records of three-spined stickleback were made from both within and 700m outside of the land required for the Proposed Scheme. The presence of this species is indicative of 'fair' biological water quality.</p>
Plants	District/borough	Population of ivy-leaved water-crowfoot within two ponds at Lower Den Farm	<p>Desk study records indicate the presence of this species, which is widespread within Cheshire and present in muddy margins of ponds, ditches and spring heads. It is located in ponds within the land required for the Proposed Scheme.</p> <p>Ivy-leaved water-crowfoot is a conservation priority of the local BAP.</p>
	Local/parish	Population of bluebells north-west and south-west of Coppice Bank and north of Grange Farm	<p>Field survey indicates the presence of this species within the land required for the Proposed Scheme.</p> <p>Bluebells are a conservation priority of the local BAP but are generally widely distributed.</p>
Badger	Local/parish	At least three social groups at undisclosed locations in the South Cheshire area	<p>A common and widespread species recorded during field surveys in the South Cheshire area. Field surveys revealed three main setts and other associated setts and field signs within and adjacent to the land required for the Proposed Scheme. The surveys indicate the likely presence of at least three social groups.</p>
Polecat	Up to local/parish	Potential populations using suitable habitats present in the South Cheshire area	<p>Polecat is widely distributed in Cheshire.</p> <p>Polecat potentially occurs within the South Cheshire area, and is most likely to be present within networks of farmland with hedgerows and small woods.</p> <p>Polecat is a species of principal importance and a conservation priority of the local BAP.</p>
Harvest mouse	Up to local/parish	Potential populations using suitable habitats present in the South Cheshire area	<p>Although no confirmed evidence of this species has been observed during field surveys, it is possible that populations of harvest mouse are present in hedgerows, arable land, areas of taller grassland and woodland edge habitats throughout the South Cheshire area.</p> <p>Harvest mouse is a species of principal importance and a conservation priority of the local BAP.</p>

¹⁰² Annex 2 of the EU's Habitats Directive (1992) lists priority species whose conservation requires the designation of Special Areas of Conservation.

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European hedgehog	Up to local/parish	Potential populations using suitable habitats present in the South Cheshire area	This species is widely distributed throughout the UK and is likely to be present in suitable habitats throughout the South Cheshire area including woodland, hedgerows, grassland, scrub and gardens. European hedgehog is a species of principal importance.
Brown hare	Up to local/parish	Potential populations using suitable habitats present in the South Cheshire area	There are desk study records of brown hare within the South Cheshire area both within and outside of the land required for the Proposed Scheme. Brown hare is likely to be present in areas of open arable and grassland habitats throughout this area. Brown hare is a species of principal importance and a conservation priority of the local BAP.
Hazel dormouse	Negligible	Potential populations using suitable woody habitats in the South Cheshire area	No records of dormouse within this area were obtained during the desk study records search, however, there is a single record within in the Whitmore Heath to Madeley area (CA4), to the south. Whilst surveys for hazel dormouse were not undertaken in the South Cheshire area due to lack of historical records, limited connectivity to the woodland in the Whitmore Heath to Madeley area (CA4) and the general unsuitability of the habitat network, it is considered unlikely that any populations exist within the land required for the Proposed Scheme.

Future baseline

Construction (2020)

- 8.3.23 Volume 5: Appendix CT-004-000 provides details of the developments in the South Cheshire area that are assumed to have been implemented by 2020.
- 8.3.24 No committed developments have been identified in this area that will materially alter the baseline conditions in 2020 for ecological receptors.

Operation (2027)

- 8.3.25 Volume 5: Appendix CT-004-000 provides details of the developments in the South Cheshire area that are assumed to have been implemented by 2027.
- 8.3.26 No committed developments have been identified in this area that will materially alter the baseline conditions in 2027 for ecological receptors.

8.4 Effects arising during construction

Avoidance and mitigation measures

- 8.4.1 The following measures have been included as part of the design of the Proposed Scheme (additional to the landscape planting as shown on the Map Series CT-06 along the route of the Proposed Scheme, which will be largely a mixture of woodland/scrub and grassland), and will contribute towards limiting effects on habitat and species.
- 8.4.2 The relocation of the Crewe South tunnel portal avoids impacts on Basford Brook and white-clawed crayfish potentially within it.
- 8.4.3 Approximately half of the proposed borrow pit north of Checkley Lane will be excavated into the Glaciofluvial Deposits, within the surface water catchment of

Betley Mere SSSI. There is a potential surface water connection between the borrow pit and the drains discharging to the mere. The mere is also believed to have interaction with the Glaciofluvial Deposit aquifer as both a source and sink of water. Therefore, excavation of the borrow pit within the Betley Mere catchment would have the potential to disrupt surface and groundwater flows towards the mere, without appropriate avoidance measures. The specific measures adopted to avoid the potential for impacts on Betley Mere will include¹⁰³:

- provision of a 1m vertical buffer between the base of the borrow pit excavations and the groundwater level. This will ensure that there are no significant impacts on groundwater flows;
- adherence to the measures described in the draft Code of Construction Practice¹⁰⁴ (CoCP);
- treatment and recirculation of any surface water runoff intercepted by the borrow pit into the downstream catchment at an appropriate rate and location, therefore ensuring that there will be no significant impact on the volume of water reaching the mere; and
- such reasonable ancillary measures as may be required.

8.4.4 The details of this mitigation will be agreed with the Environment Agency in consultation with Natural England to ensure that there are no significant effects on Betley Mere SSSI.

8.4.5 The assessment assumes implementation of the measures set out within the draft CoCP, which includes sensitive construction practices and the preparation of habitat management plans.

8.4.6 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;

¹⁰³ Or alternative methods agreed with the relevant stakeholders to ensure that there will be no significant impact to the flow or quality of groundwater and surface water reaching Betley Mere. If it can be confirmed that there is no hydrological connectivity between the borrow pit area and Betley Mere, these measures may not be required, subject to agreement with relevant stakeholders.

¹⁰⁴ Volume 5: Appendix CT-003-000, Draft Code of Construction Practice.

- relocation or translocation of species, soil and/or plant material, as appropriate;
- consultation with Natural England, the Environment Agency, local wildlife trusts and relevant planning authorities prior to and during construction; and
- compliance with all wildlife licensing requirements, including those for protected and invasive species and designated sites.

Assessment of impacts and effects

8.4.7 Effects arising during construction that are significant at the district/borough level or above are described below. Effects on ecological features of significance at the local/parish level are listed in Volume 5 Appendix: EC-016-005.

Designated sites

8.4.8 A HRA screening report for the Midland Meres and Mosses Phase 1 Ramsar site was carried out for the Phase Two Sustainability Statement¹⁰⁵ produced by HS2 Ltd for the consultation on a preferred scheme from the West Midlands to Manchester, Leeds and beyond, as provided in Volume 5: Appendix EC-017-001. This report concluded that the Midland Meres and Mosses Phase 1 Ramsar Site was sufficiently distant from the Proposed Scheme that there would be no significant effects. The constituent elements of the Ramsar Site considered in this assessment comprise Betley Mere SSSI and Wybunbury Moss SSSI.

8.4.9 Since the HRA screening report was prepared the design of the Proposed Scheme has continued to develop with the introduction of a borrow pit north of Checkley Lane, which will be located approximately 280m from the Betley Mere SSSI. An assessment of the impacts on the SSSI has been undertaken and on the basis of the avoidance and mitigation measures set out above it has been concluded that there will be no likely significant effects on Betley Mere SSSI, as set out in the HRA Screening Report for Midland Meres and Mosses Phase 1 Ramsar Site Addendum in Volume 5: Appendix EC-017-002.

8.4.10 The Midland Meres and Mosses Phase 2 Ramsar Site was scoped out from the HRA screening process in the Phase Two Sustainability Statement. This was on the basis that Black Firs and Cranberry Bog SSSI, which is the nearest component of the Ramsar Site, was sufficiently distant from the Proposed Scheme that there would be no significant effects. In contrast to the scheme changes considered in relation to the Phase 1 Ramsar Site above, there have been no significant changes to the Proposed Scheme that may increase the effects on the Phase 2 Ramsar Site. The Black Firs and Cranberry Bog SSSI component is approximately 1.1km from the Proposed Scheme and no construction vehicle movements will occur in the vicinity of the SSSI. On this basis no further HRA assessment has been undertaken for this site.

¹⁰⁵ HS2 (2013) *Sustainability Statement. Volume 1: Main report of the Appraisal of Sustainability.*

- 8.4.11 There will be no significant effects on the Wybunbury Moss SSSI as a result of the Proposed Scheme, given the distance from the site and that no construction vehicle movements will occur in the vicinity of the SSSI.
- 8.4.12 There will be no significant effects on the NIA as a result of the Proposed Scheme. Core sites will remain unaffected and connectivity will not be affected. Species groups associated with wetland habitats (such as amphibians and invertebrates) will not be significantly impeded during the construction process through the implementation of measures that are described in the draft CoCP.
- 8.4.13 There will be no significant effects on any other designated sites within the South Cheshire area, including Basford Brook and Mere Gutter LWS or Basford Brook LWS.

Habitats

Woodland

- 8.4.14 Construction of the Proposed Scheme, including Checkley Lane overbridge, Den Lane central underbridge, Den Lane East viaduct, Den Lane West viaduct, Blakenhall viaduct, Blakenhall Southbound spur embankment, Blakenhall Northbound spur embankment and Crewe South cutting will result in the permanent loss of approximately 6.4ha of woodland at Checkley Lane/Randilow Farm, Lower Den Farm, Coppice Bank, Wychwood Park, Chorlton Lane, Burrow Coppice and Basford Hall.
- 8.4.15 At Checkley Lane/Randilow Farm, the loss of woodland will result in a permanent adverse effect that is significant at the district/borough level. At each of the other sites, the loss of woodland will result in a permanent adverse effect that is significant at the local/parish level. However, the combined loss of woodland habitat from these areas will result in a permanent adverse effect that is significant at the district/borough level.

Grassland

- 8.4.16 Construction of Crewe South cutting and excavation of two balancing ponds to the west of the HS2 main line with access from the diverted Chorlton Lane will result in a permanent loss of approximately 2ha of marshy grassland to the south-east of Heath Farm. The loss of marshy grassland will result in a permanent adverse effect that is significant at up to district/borough level.

Hedgerows

- 8.4.17 On a precautionary basis, it is assumed that all hedgerows (approximately 13.1km) within the land required to construct the Proposed Scheme in the South Cheshire area will be permanently lost and the remaining hedgerow network fragmented. This total, however, includes some hedgerows that are likely to be retained, such as those located within land required for overhead line diversions/realignments and those located within land required for the creation of woodland and grassland habitat. The combined loss and severance of hedgerows within the land required for the Proposed Scheme will have a permanent adverse effect that is significant at district/borough level.

Watercourses

- 8.4.18 The route of the Proposed Scheme will cross the River Lea and Checkley Brook on the Checkley Brook viaduct. These watercourses will not be directly affected, and indirect adverse effects will not be significant as they will be controlled through the implementation of measures that are described in the draft CoCP. However, the Proposed Scheme will result in the permanent loss of sections of other smaller watercourses and severance of smaller unnamed watercourses where these are culverted. This habitat loss and fragmentation will result in an adverse effect that is significant at up to district/borough level.

Water bodies

- 8.4.19 On a precautionary basis, it is assumed that all 63 ponds located within the land required for the Proposed Scheme in the South Cheshire area will be permanently lost. This total, however, includes some ponds that are likely to be retained, such as those located within land required for overhead line diversions/realignments and those located within land required for the creation of woodland and grassland habitat. Where survey has not been possible, a precautionary approach to the assessment has been applied. The loss of ponds within the land required for the Proposed Scheme could lead to a permanent adverse effect on the conservation status of water bodies that will be significant, in each case, at up to district/borough level.

Ancient and veteran trees

- 8.4.20 It is assumed that three veteran trees recorded within the land required for the Proposed Scheme in the South Cheshire area will be permanently lost. Ancient and veteran trees are an irreplaceable resource and their potential loss will result in a permanent adverse effect that is significant at district/borough level in each case. Where reasonably practicable, measures will be taken to protect and retain ancient and veteran trees within and adjacent to the proposed works area to reduce the number of that will be impacted. On a precautionary basis, ancient or veteran trees are assumed to be lost as a result of:

- works associated with the Crewe South cutting and the realignment of Newcastle Road will result in the loss of two veteran oaks, one east of Gonsley Green Farm and one at Basford House respectively; and
- works associated with Crewe South cutting will result in the loss of a veteran oak adjacent to Den Lane.

Species

Bats

- 8.4.21 The removal or disturbance of habitat features that are utilised by bats during breeding, hibernation or migrating between roosts is considered to have the potential to result in adverse effects on the bat populations or assemblages during construction. However, the point at which such impacts are considered likely to result in adverse significant effects on the conservation status of the population concerned will differ depending on the status of the species concerned.

- 8.4.22 The impact of disturbance on bat populations will generally be localised and limited to the period of construction. Bats utilising retained habitats may be subject to irregular and localised disturbance from lighting, noise and movement during the construction period where works in autumn, winter and spring may be carried out for short periods after dusk or prior to dawn. These impacts would only temporarily deter bats from using foraging and commuting habitats and the implementation measures that are described in the draft CoCP will reduce potential disturbance affects to a level that is not significant.
- 8.4.23 Establishment of the Basford cutting main compound to the south of the A500 Shavington Bypass will result in the loss of three day/summer roosts comprising noctule, common and soprano pipistrelles associated with habitats present around Basford/Weston Lane as well as the removal of trees that were recorded as having potential to support roosting bats. Construction will also result in the removal and fragmentation of foraging and commuting habitat, which includes hedgerows with mature trees and water bodies. The direct loss of roosts and the loss and fragmentation of foraging and commuting habitat will result in a permanent adverse effect on the assemblage of bats in the Basford/Weston Lane area, which will be significant at the county level.
- 8.4.24 Construction of the Checkley Brook viaduct is likely to disturb the summer noctule roost recorded along Checkley Brook associated with the bat assemblage near Checkley Brook and Checkley Lane, which could potentially make it unsuitable for continued use during this period. Construction will also result in the removal and fragmentation of foraging and commuting habitat, notably the loss of woodland at Randilow Farm, as well as hedgerows with mature trees and water bodies in this area. The disturbance to the roost and the loss and fragmentation of foraging and commuting habitat will result in a permanent adverse effect on the assemblage of bats around the Checkley Brook and Checkley Lane area, which will be significant at the county level.
- 8.4.25 Loss of other suitable habitats within the land required for the Proposed Scheme may require some bats to travel further, and expend more energy during day to day foraging and movement throughout their home range for the duration of construction. However, such effects alone are for all species considered unlikely to result in sufficient disturbance of the populations or assemblages concerned to result in a permanent adverse effect on their conservation status.

Amphibians

- 8.4.26 A meta-population of great-crested newts (AMP 5.3) has been identified across a network of 21 ponds, west and south-west of Hough to Chorlton. Construction of the Crewe South cutting and the HS2 spurs will result in the loss of nine ponds, none of which are confirmed as supporting great crested newts, as well as grassland and hedgerows that offer terrestrial habitat opportunities for foraging, dispersal and shelter. This will result in a permanent adverse effect on the great crested newt metapopulation in the Hough/Chorlton area, which will be significant at the county level.

- 8.4.27 A metapopulation of great-crested newts (AMP 5.1) has been identified across a network of 19 ponds on land to the south-west of Checkley. Construction of the Checkley Brook viaduct, Checkley Lane overbridge and HS2 spurs will result in loss of 12 ponds, six of which are confirmed as supporting great crested newts, as well as grassland and hedgerows that offer terrestrial habitat opportunities for foraging, dispersal and shelter. This will result in a permanent adverse effect on the great-crested newt population to the south-west of Checkley, which will be significant at the county level.
- 8.4.28 A metapopulation of great-crested newts (AMP 5.2) has been identified across a network of 23 ponds in the area to the south of Chorlton and north of Blakenhall. Construction of the Den Lane Central underbridge, Den Lane East viaduct, Den Lane West viaduct, HS2 spurs and HS2 main line, and excavation of balancing ponds, will result in the loss of 15 ponds, one of which is confirmed as supporting great crested newts, as well as grassland and hedgerows that offer terrestrial habitat opportunities for foraging, dispersal and shelter. This will result in a permanent adverse effect on the great crested newt metapopulation south of Chorlton and north of Blakenhall, which will be significant at the district/borough level.
- 8.4.29 Of the 63 ponds within the land required for the Proposed Scheme within the South Cheshire area, 11 ponds have been assessed as unsuitable for great crested newts, 15 have been accessible for presence/absence survey, and of these, nine have been confirmed as supporting great crested newts. In the absence of survey information, the remaining 37 ponds are assumed to support populations of great crested newts. This is highly precautionary and it is likely that a proportion of the un-surveyed ponds do not support great crested newt populations. The loss of any ponds supporting great crested newts would result in a permanent adverse effect on amphibian populations that will be, in each case, significant at up to county level.

Reptiles

- 8.4.30 Construction of the WCML modifications and Chorlton retaining wall 5 and associated noise/landscape bunds will result in the permanent loss of small area of habitat, which supports a population of grass snake on the golf course associated with Wychwood Park Golf Club and between the golf course and the WCML. The loss of habitat suitable for this species will result in a permanent adverse effect on the grass snake population, which will be significant at up to county level.

Vascular plants

- 8.4.31 Construction of the Den Lane Central underbridge, Den Lane East viaduct, Den Lane West viaduct, Blakenhall Southbound spur embankment and the Crewe South cutting will result in the loss of ponds at Lower Den Farm, which support ivy-leaved water-crowfoot. The loss of these ponds will result in a permanent adverse effect on the population of ivy-leaved water-crowfoot, which will be significant at the district/borough level.

Other mitigation measures

8.4.32 This section describes other mitigation measures designed to reduce or compensate for significant ecological effects. These include habitat creation and habitat enhancement.

Habitats

Woodland

8.4.33 The Proposed Scheme will result in the loss of approximately 0.7ha of lowland mixed deciduous woodland to the north of Checkley Lane and west of Randilow Farm, which is significant at the district/borough level.

8.4.34 There is a further loss and fragmentation of approximately 5.7ha of lowland mixed deciduous woodland at Lower Den Farm, Coppice Bank, Wychwood Park, Chorlton Lane, Burrow Coppice and Basford Hall, each of which is of significant at the local/parish level. These losses are further reported within the register of local/parish effects (Volume 5: Appendix EC-016-005). The combined loss and fragmentation of woodland habitats from these woodlands is significant at the district/borough level.

8.4.35 In accordance with the Ecological Principles of Mitigation in the SMR Addendum, a route-wide, integrated strategic approach has been developed to compensate for loss of woodland. The woodland habitat creation in this area is required to fulfil the objective of no net loss as far as possible in the local area as well as to ensure that the populations of protected and notable species including bats are maintained. With these objectives in mind, where reasonably practicable, the locations of woodland habitat creation have been selected so as to increase the size of existing higher quality habitat and to increase connectivity.

8.4.36 Within the South Cheshire area, approximately 9.9ha of woodland habitat creation will be undertaken at the following locations:

- approximately 0.8ha north-east of Checkley Lane accommodation overbridge. In particular, this will partially compensate for the loss of approximately 0.7ha of lowland mixed deciduous woodland at Checkley Lane/Randilow Farm;
- approximately 0.1ha south-east of Blakenhall Bridleway 8 accommodation overbridge;
- approximately 3.3ha south of Chorlton Lane;
- approximately 0.6ha west of Chorlton Lane;
- approximately 2.5ha to the north-west of Newcastle Road;
- approximately 0.1ha to the north-east of Newcastle Road;
- approximately 2.3ha to the south of Weston Lane; and
- approximately 0.2ha to the north-west of Larch Avenue.

8.4.37 The target habitat type for woodland planting is lowland mixed deciduous woodland, a habitat of principal importance. The new areas of woodland habitat will connect and

help maintain the integrity of remaining areas of woodland. A temporary adverse effect is expected until these woodland areas have become established, after which the effect will be reduced to a level that is not significant.

- 8.4.38 In addition, there will be further areas of landscape planting of native broadleaved woodland, which will also contribute to habitat creation.

Grassland

- 8.4.39 The Proposed Scheme will result in the loss of approximately 2ha of marshy grassland to the south-east of Heath Farm, which is significant at the district/borough level.

- 8.4.40 In accordance with the Ecological Principles of Mitigation in the SMR Addendum, a route-wide, integrated strategic approach has been developed to compensate for loss of grassland. The grassland habitat creation in this area is required to fulfil the objective of no net loss as far as possible in the local area as well as to ensure that the populations of protected and notable species including great crested newts and barn owls are maintained. With these objectives in mind, where reasonably practicable, the locations of grassland habitat creation have been selected so as to increase the size of existing higher quality habitat and to increase connectivity.

- 8.4.41 Within the South Cheshire area, grassland habitat creation will be undertaken at locations including approximately 3.5ha of species-rich grassland, which will be created to the west of Chorlton Lane. In particular this will compensate for losses of 2ha of marshy grassland to the south-east of Heath Farm.

- 8.4.42 The target habitat type for grassland habitat creation is lowland meadow or floodplain grazing marsh habitat of principal importance, depending on location. A temporary adverse effect upon grassland habitats within the South Cheshire area is expected until grassland creation areas have become established, after which these measures will reduce the cumulative effect on grassland to a level that is not significant.

Hedgerows

- 8.4.43 New hedgerows will be planted as replacement for those lost as a result of the Proposed Scheme. Approximately 17km of new hedgerows will be planted and the species composition will be characteristic of the surrounding area. This represents a net gain in hedgerow of approximately 3.9km after mitigation, which when mature represents a residual beneficial effect that is significant at the district/borough level. In addition, opportunities will be sought to retain or replace hedgerows within the land required for the Proposed Scheme for temporary works only. Reinstatement of existing hedgerows within the land required for temporary works would provide approximately 10.2km of hedgerow in addition to the mitigation described.

Watercourses

- 8.4.44 Where smaller watercourses are diverted, the channel will be naturalised where possible with a profile to promote the establishment of marginal vegetation and pools. Once the vegetation has developed the adverse effect on these watercourses will be reduced to a level that is not significant.

Water bodies

- 8.4.45 At least one pond will be created for every pond lost within the Proposed Scheme. New ponds will be established in accordance with the Ecological Principles of Mitigation in the SMR Addendum. Once established, it is anticipated that any adverse effect on pond habitats will be reduced to a level that is not significant.

Ancient and veteran trees

- 8.4.46 Where practicable, measures will be taken to protect the three impacted veteran trees. Where loss is unavoidable, the trees will be soft felled and sections placed within retained habitats to provide a continued deadwood resource. Ancient and veteran trees are irreplaceable and the loss of these trees represents a residual adverse effect that is significant at the district/borough level.

Species

Bats

- 8.4.47 To replace roosts that will be lost to construction, artificial roosting provision will be provided across the Proposed Scheme in accordance with the Ecological Principles of Mitigation within the SMR Addendum. The habitat creation measures detailed above for mitigation of habitat loss, including creation of areas of grassland, hedgerows, new ponds, and semi-natural woodland, will compensate for those bat foraging habitats lost within the land required for the Proposed Scheme as detailed below.
- 8.4.48 The loss of confirmed and potential roosts associated with the bat assemblage in the Basford/Weston Lane area will be addressed through the provision of alternative compensatory roosts within woodland planting to the north of and parallel to Weston Lane and south-east of Basford Hall. The creation of areas of grassland, water bodies and woodland, as detailed above, as foraging and commuting features will address the areas lost. The creation of new hedgerows will also improve connectivity between habitats either side of the route of the Proposed Scheme helping to maintain bat dispersal corridors. Following the implementation of the measures the adverse effects on the bat assemblage in the Basford/Weston Lane area will be reduced to a level that is not significant.
- 8.4.49 The disturbance of the noctule roost and loss and fragmentation of habitats associated with the bat assemblage near Checkley Brook and Checkley Lane will be addressed by the creation of wetland and woodland habitat in areas to the north of Checkley Brook, north and south of Den Lane, west of Chorlton, and areas around Newcastle Road overbridge. Once established, the planting will channel bats under the Checkley Brook viaduct ensuring connectivity is maintained beneath the route of the Proposed Scheme. Alternative compensatory roosts will also be provided in these areas. Following implementation of these measures the adverse effects on the bat assemblage associated with habitats present near Checkley Brook and Checkley Lane will be reduced to a level that is not significant.

Amphibians

- 8.4.50 Provision of ponds, species-rich neutral grassland and broadleaved woodland will be designed to compensate for the loss of breeding sites, foraging habitat and places of

shelter used by great crested newts and other amphibian species. Compensation will be provided within the ecological compensation areas at Checkley Lane, Wrinehill Road/Den Lane and Casey Lane. Ponds, grassland and woodland will be established in accordance with the Ecological Principles of Mitigation within the SMR Addendum. Following implementation of these measures the adverse effect on the amphibian populations in the South Cheshire area will be reduced to a level that is not significant. HS2 Ltd will continue to survey ponds for great-crested newt populations, where it is confirmed that populations are absent then pond and terrestrial habitat provision will be re-assessed.

Reptiles

- 8.4.51 The loss of a small area of habitat used by grass snake population on the golf course, associated with Wychwood Park Golf Club, and between the golf course and the WCML will be addressed through the provision of ponds and grassland within an ecological compensation area between Waybutt Lane and the WCML, in proximity to the area of habitat lost. This will compensate for the loss of breeding sites, foraging habitat and places of shelter used by grass snakes. The ponds and grassland will be established in accordance with the Ecological Principles of Mitigation within the SMR Addendum. Following implementation of these measures the adverse effect on the grass snake population on the golf course, associated with Wychwood Park Golf Club, and between the golf course and the WCML will be reduced to a level that is not significant.

Vascular plants

- 8.4.52 The loss of ponds at Lower Den Farm that support ivy-leaved water-crowfoot will be compensated through the provision of ponds within the ecological compensation areas at Checkley Lane and Wrinehill Road/Den Lane. Ponds will be established in accordance with the Ecological Principles of Mitigation within the SMR Addendum with consideration given to the translocation of this species to the new ponds from Lower Den Farm where appropriate. Following implementation of these measures, the adverse effect on the ivy-leaved water-crowfoot population near Lower Den Farm will be reduced to a level that is not significant.

Badger

- 8.4.53 Although there will be no significant effects on badger populations in this area, mitigation measures to address the potential disturbance of badgers will be provided in accordance with the Principles of Ecological Mitigation within the SMR Addendum. This will include the provision of badger proof fencing and replacement setts where necessary.

Summary of likely residual significant effects

- 8.4.54 This section describes anticipated significant residual ecological effects during construction, taking into account the mitigation and compensation proposed.
- 8.4.55 The assumed loss of three veteran trees is a permanent adverse residual effect that is significant at the district/borough level, in each case.

- 8.4.56 There will be a net gain in hedgerow of approximately 3.9km after mitigation, which when mature represents a residual beneficial effect that is significant at the district/borough level.

Cumulative effects

- 8.4.57 No cumulative effects on ecological receptors have been identified in the South Cheshire area.

8.5 Effects arising from operation

Avoidance and mitigation measures

- 8.5.1 Within this section of the Proposed Scheme the following elements of the design will avoid or reduce impacts on features of ecological value during operation:

- Checkley Brook viaduct will provide ecological connectivity under the route of the Proposed Scheme to adjacent habitats. Ecological connectivity beneath the route of the Proposed Scheme will be maintained for a length of 180m of viaduct in the South Cheshire area. This will reduce habitat fragmentation, allowing free passage of wildlife at these locations;
- four overbridges and one underbridge will maintain farm access and/or public access on footpaths or bridleways across the route. These bridges may assist in maintaining ecological connectivity to adjacent semi-natural habitats, by facilitating the passage of some species of wildlife across the route; and
- where the route of the Proposed Scheme crosses a watercourse a culvert or dry tunnel will be provided to allow passage of for mammal such as otter and water vole.

Assessment of impacts and effects

- 8.5.2 Significant effects arising during operation at the district/ borough level or above are described below. Significant effects on ecological features at the local/parish level are listed in Volume 5 Appendix: EC-016-005.

Species

Bats

- 8.5.3 The operation of the Proposed Scheme has the potential to result in a variety of impacts on bat populations including those as a result of collision with passing trains, turbulence and noise. The point at which such impacts are considered to result in a significant adverse effect on the conservation status of the population concerned will differ between species. As a consequence, the following assessment of operational impacts takes into account the differing character and nature of the bat populations and/or assemblages concerned in determining the likely effects of the Proposed Scheme on each of these receptors.
- 8.5.4 Due to the large areas over which bats forage it is likely that any loss of, or displacement from, suitable foraging habitat in the vicinity of the Proposed Scheme will in itself amount to only a small proportion of the wider available resource. However, the impact of any such disturbance or displacement could be greatly

increased if bats are hampered in moving between breeding sites, hibernation sites and other roosts that they commonly utilise.

- 8.5.5 Noise, vibration and lighting associated with passing trains have the potential to disturb bat species foraging and commuting within habitats close to the Proposed Scheme. Understanding of the impact of noise on bats caused by passing trains is limited. Research suggests that gleaning bats, such as brown long-eared, will have reduced foraging success within areas where there is persistent noise from busy roads¹⁰⁶. However, noise generated from passing trains will be regular but temporary and as such will differ from that resulting from a busy road.
- 8.5.6 Where the route of the Proposed Scheme bisects, or is located in proximity to existing features known to be utilised regularly by foraging or commuting bats, there is an increased risk that bats could be killed or injured as a result of collisions with passing trains or associated turbulence. The significance of any such effect will be dependent on both the flight height range of the species and the vertical alignment of the Proposed Scheme (i.e. whether the railway is in cutting, at grade or on embankment) at the point the impact occurs.
- 8.5.7 The Checkley Brook viaduct and Chorlton Footpath 7 overbridge will ensure dispersal opportunities for bats are retained. Vegetation will be established either side of Chorlton Footpath 7 overbridge, to provide suitable commuting routes prior to the removal of existing habitats and construction of features such as at the Crewe South cutting and Chorlton cutting.
- 8.5.8 Although it is possible that there may be infrequent incidental mortality of individual bats, due to the avoidance measures described above and the availability of alternative foraging and commuting habitat on either side of the Proposed Scheme, this is unlikely to result in a significant adverse effect on the conservation status of the bat assemblages present in the South Cheshire area.

Birds

- 8.5.9 The majority of bird species that are known to be present in the area are not considered to be particularly vulnerable to collision with trains. However, barn owls hunt low over the rough grassland habitats that are associated with railway embankments and are slow moving, and therefore, subject to likely collision with high speed trains. One pair of barn owls breeding in the vicinity of the Proposed Scheme will be affected, at Basford Hall. Research undertaken by the British Trust for Ornithology on behalf of HS2 Ltd suggests that there may be effects on barn owls up to 3km away¹⁰⁷. This means that the more barn owls are likely to be affected than those in the vicinity of the Proposed Scheme identified above. This would result in a permanent residual adverse effect that will be significant at the county level.

¹⁰⁶ Schaub, A., Ostwald, J. & Simeers, B.M. (2008). Foraging bats avoid noise. *Journal of Experimental Biology*, **211**, 3174-3180.

¹⁰⁷ Pringle, H., Siriwardena, G. & Toms, M. (2016). *Research Report 692: Informing best practice for mitigation and enhancement measures for Barn Owls*. British Trust for Ornithology, Thetford.

Other mitigation measures

- 8.5.10 HS2 Ltd will seek to identify opportunities to provide barn owl nesting boxes and enhance barn owl habitat at least 3km from the Proposed Scheme in consultation with local landowners. A barn owl action plan will be prepared to identify the measures that can be implemented to help offset the effects. As the availability of nesting sites is a limiting factor for this species the implementation of these measures would be likely to increase numbers of barn owls within the wider landscape and thus offset the adverse effect.

Summary of likely residual significant effects

- 8.5.11 The mitigation, compensation and enhancement measures described above are likely to reduce the residual ecological effects during operation to a level that is not significant, except for barn owl. Train strike is likely to result in the loss of barn owls that nest within 3km of the route resulting in a residual significant effect at the county level. However, provided the proposed mitigation measures for barn owl are implemented through liaison with landowners, the residual effect on barn owl would be reduced to a level that is not significant.

Cumulative effects

- 8.5.12 No cumulative effects on ecological receptors have been identified in the South Cheshire area.

Monitoring

- 8.5.13 Volume 1, Section 9 sets out the general approach to environmental monitoring during operation of the Proposed Scheme.
- 8.5.14 There are no area-specific requirements for monitoring ecology and biodiversity effects or mitigation during the operation of the Proposed Scheme in the South Cheshire area.

9 Health

9.1 Introduction

- 9.1.1 This section identifies the communities within the South Cheshire area that will be subject to impacts associated with the Proposed Scheme and reports changes that are considered to be potentially important for the health and wellbeing of people within these communities.
- 9.1.2 Engagement with key public health bodies has been undertaken to inform the health assessment process. The assessment draws on health-related information and views expressed in consultation responses from Staffordshire County Council (SCC), Cheshire East Council (CEC) and Crewe Town Council as well as the local parish councils of Weston and Basford, Hough and Chorlton, and Wybunbury.
- 9.1.3 This section deals specifically with impacts at a local level within the South Cheshire area. Health effects across the Proposed Scheme as a whole are assessed in Section 8 of Volume 3: Route-wide effects.
- 9.1.4 Further details of the health assessment, including the application of assessment criteria supporting the conclusions presented in this section are contained in Volume 5: Appendix HE-001-005, Health assessment matrix.
- 9.1.5 Maps showing the location of the key environmental features (Map Series CT-10), construction features (Map Series CT-05), and key operational features (Map Series CT-06) of the Proposed Scheme can be found in the Volume 2: CA5 Map Book.
- 9.1.6 In addition, the community health profile for the South Cheshire area is set out in Background Information and Data (BID)¹⁰⁸ (BID-HE-002-005).

9.2 Scope, assumptions and limitations

- 9.2.1 The scope, assumptions and limitations for the health assessment are set out in Volume 1 and the Scope and Methodology Report (SMR)¹⁰⁹.
- 9.2.2 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'¹¹⁰. 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.
- 9.2.3 The assessment has considered the impacts of the Proposed Scheme on a range of environmental and socio-economic 'health determinants', which will result in adverse

¹⁰⁸ HS2 Ltd (2017), High Speed Two (HS2) Phase 2a (West Midlands - Crewe), Background Information and Data, Available online at: www.gov.uk/hs2

¹⁰⁹ Volume 5: Appendix CT-001-000, Environmental Impact Assessment Scope and Methodology Report.

¹¹⁰ World Health Organization, 1948: Constitution of the World Health Organization Basic Documents, 45th edition supplement. Available online at: www.who.int/governance/eb/who_constitution_en.pdf

or beneficial effects on health and wellbeing. This process is documented in the health assessment matrices in Volume 5: Appendix HE-001-003. Based on this a professional judgement has been made to identify those effects on population health and wellbeing that are sufficiently important to report within the health assessment sections found in this report and Volume 3: Route-wide assessment.

9.2.4 The health determinant impacts of relevance within the South Cheshire area are:

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

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

9.2.6 The health assessment methodology is based, in part, on a review of published evidence showing how impacts on health determinants are linked to health 'outcomes' (i.e. effects) in a large enough population. 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.

9.2.7 There is no established or widely recognised framework for assessing the 'significance' of 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. However, this does not provide a definitive basis for drawing conclusions as to whether a health effect is likely to be 'significant'.

9.2.8 The assessment process has involved a review of the impacts of the Proposed Scheme on the above health determinants, as documented in the health assessment matrices in Volume 5: Appendix HE-001-005. Based on this, a professional judgement has been made to identify those impacts on population health and wellbeing that are sufficiently important to report within the health assessment sections found in the Volume 2: Community area reports and Volume 3: Route-wide assessment.

9.3 Environmental baseline

Existing baseline

Demographic and health profile of the South Cheshire area

- 9.3.1 The South Cheshire area covers an approximately 6.6km section of the HS2 main line and two spurs approximately 6km in length, predominantly within the local authority area of CEC. The southern extent of the South Cheshire area is predominantly rural in character, with agriculture being the main land use, interspersed with small villages and scattered dwellings and farmsteads. The main residential areas are Wrinehill, Chorlton, Hough, Basford and Weston.
- 9.3.2 The northern extent of the South Cheshire area becomes mostly urban towards Crewe, which is a large town of approximately 84,000 residents, with a range of services and community facilities. The Proposed Scheme will cross the A500 Newcastle Road/Shavington Bypass and several local roads linking the rural communities to services and facilities in the larger settlements.
- 9.3.3 The wards¹¹¹ in southern section of the South Cheshire area have a relatively small population, with population densities of between one and nine persons per hectare. In the northern section of the area, close to Crewe, the wards have population densities ranging from 17 to 50 persons per hectare. Data provided by the Office of National Statistics¹¹² and the Association of Public Health Observatories (APHO)¹¹³ show that the population across the three wards in the southern section of the South Cheshire area, Wybunbury, Shavington and Haslington, are, by comparison with national averages, in good health and experience low levels of deprivation. In contrast, two wards in the northern section of the South Cheshire area, Crewe South and Crewe East, have higher levels of deprivation and a lower standard of health when compared with national figures.
- 9.3.4 The population in the southern section of the area is considered to be generally more resilient than the national average with regard to changes in the relevant health determinants, and with relatively few vulnerabilities. One vulnerability in this population is a slightly higher than average proportion of older people (the 65 – 84 years category) across the southern section of the area. In contrast, Crewe South and Crewe East have up to 40% of their population in the lowest social grade category¹¹⁴ and fall into the 10% most deprived wards nationally for health and disability deprivation. Crewe East has a relatively high proportion of households that have one or more people with a long-term health problem or disability.
- 9.3.5 The available data permit a profile to be made of the whole population in the South Cheshire area and provide detail down to ward level. The description of the whole

¹¹¹ Electoral wards are the spatial units used to elect local government councillors. National Census data are published at ward level.

¹¹² The Office of National Statistics (ONS) provides spatial data on levels of deprivation, using indicators of: 'multiple deprivation', 'employment', 'education', 'barriers to housing and social services', 'crime' and 'living environment'. These data are based on the 2011 census and available by Lower Super Output area.

¹¹³ Public Health Observatories (PHOs) are part of Public Health England. They produce information, data and intelligence on people's health and health care for practitioners, commissioners, policy makers and the wider community. <http://www.apho.org.uk>

¹¹⁴ Approximated Social Grade has six categories A, B, C1, C2, D and E. It is a socio-economic classification produced by the ONS (UK Office for National Statistics) using algorithms developed by the MRS Census & Geodemographic Group.

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. Detailed community profile data are presented in Background Information and Data: BID-HE-002-005, Community area health profile

- 9.3.6 The South Cheshire area contains a number of community resources whose users may be impacted by the Proposed Scheme. These are described in detail in the health assessment matrix in Volume 5: Appendix HE-001-005.
- 9.3.7 For the purpose of the health assessment the South Cheshire area is divided into communities as described below.

Description of communities in the South Cheshire area

Blakenhall and surrounds

- 9.3.8 This area comprises the rural community between Checkley Brook and Gonsley Green Farm, to the north of Den Lane. The hamlet of Checkley lies approximately 1km to the west along Checkley Lane, and the village of Wrinehill is located approximately 1km to the east, beyond the West Coast Main Line (WCML). The hamlet of Blakenhall lies to the west of the route of the Proposed Scheme along Mill Lane. Residential properties close to the route of the Proposed Scheme in this area comprise mainly sparsely located detached farms, as well as five properties at Higher Den Farm, and 12 houses on the junction of Mill Lane and Den Lane.

Chorlton, Hough and surrounds

- 9.3.9 This area extends from Chorlton to the A500 Shavington Bypass on the urban fringe of Crewe. Chorlton village, on the outskirts of Crewe, lies approximately 200m east of the Proposed Scheme. It comprises approximately 420 residential properties, most of which are within a modern housing development. A hotel and golf course lie at Wychwood Park to the east. The Proposed Scheme will pass close to villages on the southern edge of Crewe including: Hough, approximately 500m to the west, off Newcastle Road; Weston, approximately 500m to the east off Weston Lane; and Basford, immediately west of the Proposed Scheme on Weston Lane. The Proposed Scheme will pass close to individual properties and groups of properties on Chorlton Lane, Newcastle Road, Casey Lane and Weston Lane.

Future baseline

- 9.3.10 A future baseline profile of the South Cheshire area has been established to forecast the changing demographics characteristics and potential health needs of local communities. The population in Cheshire East, which includes the South Cheshire community area, is expected to grow by approximately 1% between 2010 and 2030¹¹⁵. These changes in population include a 12% reduction in people aged 16-64 and a 92% increase in people aged 85 and over. The number of residents aged 65 and over living with dementia in Cheshire East is predicted to rise from 5,402 in 2014 to 6,710 by

¹¹⁵ Cheshire East Council, Population Projections and Forecasts, 2013. <https://moderngov.cheshireeast.gov.uk/documents/521757/2013-02-08%20-SHLAAv3-%20Appendix-Backgroundpaper.pdf>.

2020¹¹⁶. A detailed review of future baseline data is presented in Volume 5: Appendix HE-002-005.

Construction (2020)

- 9.3.11 Volume 5: Appendix CT-004-000 provides details of committed developments in the South Cheshire area that are assumed to have been implemented by 2020.
- 9.3.12 The committed developments that materially affect the baseline conditions in this area and form part of the future baseline assessment of the effects during construction are listed in Table 19.

Table 19: Committed developments relevant to health

Map book reference ¹¹⁷	Planning reference	Description
CA5/36	15/1537N	Mixed-use development comprising up to 325 dwellings and employment uses. Associated development includes a local community facility, retail uses, public house/restaurant, access, open space and landscaping.
CA5/37	13/0336N	Up to 370 dwellings with associated development including of offices, a local centre comprising food and non-food retail, restaurant/public house, hotel, car showroom. Ancillary works include access, a pumping station, substation, earthworks, open space and landscaping.
CA5/23	14/3267N	Up to 53 dwellings including access.
CA5/35	14/4025N	Up to 490 dwellings and associated development including a primary school, pumping station, substation, open space, ecological mitigation, landscaping, access and parking.
CA5/49	Policy S.12.4, Gresty Road, Crewe, The P Way Site	Allocation for 80 dwellings, employment and appropriate uses.
CA5/12	Res 1 Housing Allocations, Chorlton	Allocation for housing.
CA5/15	Res 1 Housing Allocations, Res1.6 St Clements Court	Allocation for housing.
CA5/32	E3.1 Basford West	Allocation for a regional warehouse and distribution park.
CA5/34	E3.2 Basford East	Allocation for major industrial business and development uses.

Operation (2027)

- 9.3.13 Volume 5: Appendix CT-004-000 provides details of committed developments in the South Cheshire area that are assumed to have been implemented by 2027.

¹¹⁶ Cheshire East Council; Cheshire East Dementia care strategy, 2014.

http://www.cheshireeast.gov.uk/council_and_democracy/council_information/media_hub/media_releases/previous_media_releases/media_releases_august_2014/dementia_care_strategy.aspx.

¹¹⁷ Volume 5 Map Book: Maps CT-13-115b to CT-13-118-R1.

- 9.3.14 No further committed developments have been identified in this area that will alter the baseline conditions in 2027 for health receptors.

9.4 Effects arising during construction

Avoidance and mitigation measures

- 9.4.1 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. Adverse impacts on health determinants have been reduced, insofar as reasonably practicable, through mitigation measures incorporated into the design of the Proposed Scheme to reduce adverse effects on people.
- 9.4.2 The mitigation measures incorporated into the design of the Proposed Scheme in the South Cheshire area include:
- the relocation of the HS2 Crewe infrastructure maintenance depot to near to Stone (in the form of an infrastructure maintenance base-rail (IMB-R)), in the Stone and Swynnerton area (CA3). As a result, the Basford West site (proposed for 370 residential properties), Mill Lane allotments and a number of residential properties will not be within the area required for the Proposed Scheme. The relocation of the depot also means that the B5071 Jacks Mill Way and the A500 Shavington Bypass will not be affected;
 - the Crewe South portal will be located 960m south of the A500 Shavington Bypass. This will avoid the need for realignment of the A500 Shavington Bypass and diversion works to other public roads and will mean the portal will be further from residential properties;
 - the South Crewe auto-transformer feeder station, which was proposed to be located north of Heath Farm, has been downsized to the South Crewe mid-point auto-transformer station and relocated further south;
 - maintaining accesses across the route of the Proposed Scheme, including: at Den Lane (via the Den Lane Central underbridge); at Blakenhall (via the Blakenhall Bridleway 12 Central accommodation underbridge, the Blakenhall Bridleway 8 accommodation overbridge, the Blakenhall Bridleway 12 West accommodation overbridge and the Blakenhall Bridleway East accommodation overbridge); at Checkley Lane (via the Checkley Lane overbridge); at Chorlton (via the Chorlton Footpath 7 overbridge); and at Newcastle Road (via the Newcastle Road overbridge);
 - temporary diversions of roads and PRow to maintain access during construction and, insofar as reasonably practicable, to maintain the PRow network; and
 - earthworks to soften viaduct abutments, and landscape earthworks, with planting to integrate the Proposed Scheme into the surrounding landscapes at Den Lane, Blakenhall, Newcastle Road, Checkley Brook, Checkley Lane, Grange Farm, between the HS2 spur (northbound) and HS2 main line, and at Casey Lane.

- 9.4.3 HS2 Ltd will require its contractors to comply with the environmental management regime for the Proposed Scheme, including the Code of Construction Practice (CoCP), which provides a generic basis for route-wide construction environmental management.
- 9.4.4 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.
- 9.4.5 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, to provide appropriate information and to be the first point of contact to resolve community issues. The nominated undertaker will take reasonable steps to engage with the community, particularly focusing on those who may be affected by construction impacts, including local residents, businesses, landowners and community resources, and the specific needs of protected groups (as defined in the Equality Act 2010).

Assessment of impacts and effects

Neighbourhood quality

- 9.4.6 The term 'neighbourhood quality' is used in this assessment to describe a combination of factors that have the potential to affect residents' feelings about their local environment. If these factors are altered to a sufficient degree, there would be effects on mental health and wellbeing. The Proposed Scheme will affect the quality of neighbourhoods through environmental changes resulting from the presence of construction sites, construction activities and construction traffic on local roads. This section assesses how changes to neighbourhood quality may influence people's level of satisfaction with their local environment and perceptions about issues such as personal safety and security.
- 9.4.7 A review of published research evidence linking neighbourhood quality with health and wellbeing can be found in Volume 5: Appendix HE-003-000. The evidence linking the individual aspects of neighbourhood quality with health outcomes ranges from moderate to strong. The environmental effects of the Proposed Scheme related to this section are assessed in Section 5, Air quality, Section 11, Landscape and visual, Section 13, Sound, noise and vibration and Section 14, Traffic and transport.
- 9.4.8 The assessment of neighbourhood quality is guided by the findings from other assessments, but does not rely on significance thresholds used in these assessments since these do not relate specifically to health; rather it assesses qualitatively how the Proposed Scheme is likely to alter local amenity and perceptions about neighbourhood quality, and consequently may affect health and wellbeing.
- 9.4.9 A review of the pathways through which the construction of the Proposed Scheme may impact on neighbourhood quality, and the potential for health effects, is documented in Volume 5: Appendix HE-001-005. As the air quality assessment shows that, following mitigation, impacts on air quality (including dust) resulting from the construction and operation of the Proposed Scheme will be very small and are not

expected to affect health and wellbeing adversely, air quality impacts are not considered to contribute to any impacts on neighbourhood quality in this area.

- 9.4.10 This assessment has, therefore, considered temporary and, where applicable, permanent impacts including:
- noise emissions, affecting local amenity;
 - visual impacts affecting residents' satisfaction with their living environment and 'sense of place'; and
 - construction traffic on local roads, causing dissatisfaction with the local environment and concerns about safety.
- 9.4.11 The construction of the Proposed Scheme will have temporary and permanent impacts on neighbourhood quality in areas close to construction sites, including Checkley Lane, Blakenhall, Chorlton, Newcastle Road, Casey Lane and Basford. 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.
- 9.4.12 The construction of Checkley Brook viaduct, Checkley North embankment and Crewe South cutting, including construction compounds, stockpiles and traffic on site haul routes, will be visible from detached farm properties on Checkley Lane. Further north, the construction of Crewe South cutting, WCML modifications and Den Lane East viaduct and Den Lane West viaduct will be visible from several farms and groups of cottages on Den Lane and Mill Lane. Construction traffic will run on site haul routes to the east of the WCML and either side of the HS2 main line. HGVs will temporarily use Den Lane and Checkley Lane, passing through the village of Checkley, causing disturbance and potential concerns about road safety on these routes. Noise from construction activities and traffic will be noticeable throughout these areas. Residents living in these rural communities are likely to experience these features of the Proposed Scheme as changing the quality of their neighbourhood and to regard that change as adverse, in terms of diminishing the amenity of the area and reducing the sense of its rural character and tranquillity.
- 9.4.13 At Chorlton, the construction of the Crewe South cutting, new section of the WCML, Chorlton viaduct, Chorlton retaining walls, and the movement of construction traffic along site haul routes will be visible from Freshwater Drive, Waybutt Lane and Chorlton Lane, and from rear gardens on Hampstead Drive and Freshwater Drive. Noise from construction activities and construction traffic will be noticeable across western parts of Chorlton, including Freshwater Drive, Hampstead Drive and streets to the west of Wychwood Park. Construction will take place in proximity to a group of nine residential properties on Chorlton Lane, to the west of the Proposed Scheme. The Proposed Scheme will sever these properties from the main residential area of Chorlton, and a new access road will link these properties to Newcastle Road. HGVs will be present on the northern section of Chorlton Lane, and along the new access road serving isolated properties at the end of Chorlton Lane; these will affect visual amenity and may also cause concerns about road safety. Residents living in Chorlton

are likely to experience these features of the Proposed Scheme as changing the quality of their neighbourhood and to regard that change as adverse. For the community west of the Proposed Scheme on Chorlton Lane, these impacts are likely to be seen as diminishing neighbourhood quality in terms of damaging the amenity of the area and reducing the sense of its rural character and tranquillity.

- 9.4.14 Further north, between Hough and Weston, construction works will include the Newcastle Road realignment and overbridge, Casey Lane diversion, Crewe South portal satellite compound and Crewe South portal retained cutting. Works will take place adjacent to approximately 12 houses on Newcastle Road and Chorlton Lane, and eight houses on Casey Lane. HGVs will be present on Casey Lane and on Newcastle Road, either side of the Proposed Scheme, as far as the junction with Casey Lane. Residents living in these areas are likely to experience these features of the Proposed Scheme as changing the quality of their neighbourhood and to regard that change as adverse, in terms of damaging the amenity of the area and giving rise to concerns about road safety on routes used by HGVs.
- 9.4.15 To the east of Basford, construction of the Basford cutting and movement of traffic along the site haul routes will be visible from Basford Hall and Larch Farm. Construction noise will be noticeable in this area. Further west, in Basford, the Basford cutting main compound, batching plant and transfer nodes will be visible from the rear gardens of properties along Weston Lane and Larch Avenue. Residents living in Basford are likely to experience these features of the Proposed Scheme as changing the quality of their neighbourhood and to regard that change as adverse.

Access to green space and physical activity

- 9.4.16 There is moderate evidence to show that access to green space contributes to good mental health. There is also moderate evidence that environmental factors such as access to high quality green space, safety and amenity, can influence participation in physical activity. Physical activity is strongly linked to health outcomes. A review of published research evidence linking access to green space, recreation and physical activity with health and wellbeing can be found in Volume 5: Appendix HE-003-000.
- 9.4.17 A review of the pathways through which the construction of the Proposed Scheme may impact on levels of access to green space and physical activity, and the potential for health effects, is documented in Volume 5: Appendix HE-001-005. This has identified the following impacts:
- impacts on PRow, including temporary closures, diversions and loss of amenity, which may deter the use of these routes by walkers, cyclists and equestrians; and
 - the presence of construction traffic, including HGVs, on the local road network, which may deter their use by walkers, cyclists and equestrians; and
 - direct impacts on public open space including temporary loss of open space and amenity impacts.
- 9.4.18 Effects on PRow in the Checkley Lane area will include the diversion of Checkley cum Wrinehill Footpath 8 to run under the Checkley Brook viaduct, closure of Checkley

cum Wrinehill Footpath 15 and diversion of Blakenhall Footpath 17, with a diversion to run alongside the Proposed Scheme, reconnecting with the footpath network via Checkley Lane. Further north, the Proposed Scheme will intersect several rural PRow between Waybutt Lane and Wrinehill Road/Den Lane. Chorlton Footpath 3, Blakenhall Footpaths 7 and 11 and Blakenhall Bridleway 12 will be partially stopped up and diverted. These PRow will cross the Proposed Scheme via the Blakenhall Bridleway 12 East, West and Central accommodation underbridges. A new PRow, the Blakenhall New Bridleway, will be approximately 1.3km in length and connect Blakenhall Bridleway 12 with Blakenhall Bridleway 8, following the new section of the WCML. North of Chorlton, a number of footpaths will be diverted via the Chorlton Footpath 7 overbridge across the Proposed Scheme and WCML. Three promoted recreational routes, which follow the route of Chorlton Footpath 7, will be affected during construction. These are the Crewe and Nantwich Circular Walk, South Cheshire Way and Two Saints Way.

- 9.4.19 The presence of the construction works is likely to affect the openness, amenity and recreational value of these footpath networks, which may deter their use, reducing levels of physical activity and access to green space, and the health and wellbeing benefits associated with this.
- 9.4.20 Construction traffic will mainly utilise the site haul routes along the Proposed Scheme alignment. However, some construction traffic, including HGVs, will be present on local roads within the South Cheshire area during the setting up of construction sites. Section 14, Traffic and transport has identified the potential for construction traffic to obstruct or deter pedestrians, cyclists and equestrians at 10 locations on nine roads in the vicinity of the Proposed Scheme in this area.
- 9.4.21 The presence of HGVs is likely to deter some non-motorised users from using the affected routes. In the case of recreational users, it is considered that alternative routes will be available. However, for those using these routes for active travel to work or to access shops and services, there is a possibility that people will instead choose to travel by car, temporarily reducing levels of physical activity and associated health and wellbeing benefits.

Social capital

- 9.4.22 The connections between the 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.¹¹⁸

- 9.4.23 A review of published research evidence linking social capital with health and wellbeing can be found in Volume 5: Appendix HE-003-000. There is moderate evidence for a link between social capital and health and wellbeing outcomes. A decrease in social capital has the potential to reduce the beneficial health effects that are gained through social contact and support. 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.
- 9.4.24 A review of the pathways through which the construction of the Proposed Scheme may impact on levels of social capital, and the potential for health effects, is documented in Volume 5: Appendix HE-001-005. This has identified temporary and permanent impacts including:
- changes in community connectivity resulting from PRoW and road diversions and/or changes to journey times; and
 - impacts associated with the presence of the construction workforce.
- 9.4.25 Chorlton Lane will be permanently closed to the north of the existing WCML, isolating nine properties from the rest of Chorlton village. A new access road will be created running northwards to Newcastle Road and Hough. The severance of this group of older properties from the more recent development area in Chorlton village is likely to result in the loss of social capital, which has the potential to adversely affect wellbeing.
- 9.4.26 The villages in the southern parts of the South Cheshire area support small, well-established communities. Feedback from community consultation indicates that people's levels of trust in their communities and community cohesion are strong. The assessment has identified potential health effects associated with the introduction of a temporary construction workforce into these communities. Further north, where the population density, diversity and turnover increases, the impact of the construction workforce is likely to be lower. Temporary accommodation for an estimated 240 workers will be provided at Basford cutting main compound for approximately five years and six months. During the day, the workforce will be present on construction sites and compounds throughout the South Cheshire area. The presence of construction workers is likely to be noticeable, with construction vehicles using local roads to access compounds during site setup, and workers using facilities within local villages such as Wrinehill, Hough, Shavington and Weston.
- 9.4.27 It is well understood that the introduction of a temporary construction workforce into communities, which have the characteristics identified above, has the potential to alter people's perceptions about their communities and reduce levels of trust. Such a reduction in social capital has the potential to affect wellbeing adversely, and may

¹¹⁸ 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

influence behaviours that are beneficial to wellbeing such as the use of community facilities.

9.4.28 The draft CoCP¹¹⁹ 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.

9.4.29 There is also a potential for the presence of the temporary workforce to have a beneficial effect on local communities through increased use of local services and opportunities for social interaction.

Other mitigation measures

9.4.30 HS2 Ltd will engage with local authorities and community representatives in the development of the Community Engagement Framework with the aim of fostering positive relationships between local communities and the temporary construction workforce.

Cumulative effects

9.4.31 No cumulative effects have been identified.

9.5 Effects arising from operation

Avoidance and mitigation measures

9.5.1 Adverse impacts on health determinants have been 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 South Cheshire area are described in Section 2 and include measures to integrate the Proposed Scheme into the landscape and to providing visual and noise screening, including noise fence barriers and bunds to provide acoustic screening at Den Lane, Chorlton and Lane End Farm.

Assessment of impacts and effects

9.5.2 This section assesses the health effects of the operation of the Proposed Scheme on the health and wellbeing of communities. Permanent construction impacts on health determinants resulting from the construction of the Proposed Scheme are assessed as permanent construction impacts in Section 9.4.

Neighbourhood quality

9.5.3 Noise and visual impacts from passing trains will result in permanent operational impacts on neighbourhood quality in the communities in proximity to the Proposed Scheme, including Checkley Lane, Blakenhall and Chorlton (Chorlton Lane and Wychwood Park). These operational impacts will be experienced alongside

¹¹⁹ Volume 5: CT-003-000, Draft Code of Construction Practice.

permanent construction impacts, including the presence of the railway infrastructure within the local landscape. Impacts on neighbourhood quality have the potential to affect the wellbeing of residents adversely, 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.

- 9.5.4 The presence of trains running on Checkley Brook viaduct, Checkley North embankment and Crewe South cutting will be visible in addition to the existing WCML. Near Blakenhall, the Crewe South cutting, HS2 spurs and Den Lane viaducts, will be visible from several farms and groups cottages on Den Lane and Mill Lane. Train noise will be noticeable at rural properties close to the Proposed Scheme in these areas. Residents of these properties are likely to experience these features of the Proposed Scheme as changing the quality of their neighbourhoods, and to regard these changes as adverse, in terms of reducing the sense of rural character and tranquillity.
- 9.5.5 The presence of trains running in Chorlton cutting adjacent to the group of nine properties on Chorlton Lane will affect the character and setting of this area. Landscape planting will shorten views and noise from passing trains will impact on outdoor amenity. The new access road, with new planting and balancing ponds, will change the character of the approach to these properties. Residents of these properties are likely to experience these features of the Proposed Scheme as changing the quality of their neighbourhood, and to regard these changes as adverse, in terms of reducing the sense of rural character and tranquillity.
- 9.5.6 Further north, trains will be visible from properties on Newcastle Road and Casey Lane. Residents in this area may experience some changes in the quality of their neighbourhood, and may perceive these as adverse or neutral.

Other mitigation measures

- 9.5.7 No further mitigation measures are proposed.

Cumulative effects

- 9.5.8 No cumulative health effects have been identified.

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 specific monitoring of health effects during the operation of the Proposed Scheme is proposed.

10 Land quality

10.1 Introduction

- 10.1.1 This section of the report presents the baseline conditions along the route of the Proposed Scheme in the South Cheshire area in relation to land quality, and reports the likely impacts and significant effects 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, from a scientific, historical, mineral exploitation or mineral resources point of view including geological sites of special scientific interest (SSSI), local geological sites (LGS), areas of salt resources and areas of designated mineral resources. Consideration is also given to petroleum (gas) prospects and licensing. Mitigation measures are presented and any residual significant effects are summarised.
- 10.1.2 Engagement has been undertaken with the British Geological Survey (BGS), Staffordshire County Council (SCC), Cheshire East Council (CEC), the Environment Agency, the Food and Environment Research Agency and the Animal and Plant Health Agency. The purpose of this engagement has been to discuss the Proposed Scheme and potential effects, and obtain relevant baseline information.
- 10.1.3 Details of baseline information, conceptual site models (CSM) and risk assessments are outlined in Volume 5: Appendix LQ-001-005 and presented in Maps LQ-01-115b to LQ-01-118 (Volume 5: Land quality Map Book).
- 10.1.4 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 can be found in the Volume 2: CA5 Map Book.
- 10.1.5 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), the Scope and Methodology Report (SMR)¹²⁰, and Volume 5: Appendix LQ-001-005.
- 10.2.2 In accordance with the SMR, a risk based approach has been 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 the Proposed Scheme plus a 250m buffer from the edge of proposed construction activities. In the case of groundwater data, this is increased to 1km.

¹²⁰ Volume 5: Appendix CT-001-001, Environmental Impact Assessment Scope and Methodology Report.

- 10.2.3 The majority of new and diverted utilities will be laid in the boundaries of existing highways within normal road construction layers and natural soils below. These have been considered in the context of the 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 minerals identified in published mineral plans and existing planning or licensed areas. Any inference of the presence of minerals provided by geological maps/reports is excluded (except where these are covered by the Mineral Local Plan (MLP)).
- 10.2.8 The geo-conservation assessment is based upon local geological trust records.

10.3 Environmental baseline

Existing baseline

- 10.3.1 Baseline data has been collected from a range of sources including Ordnance Survey mapping, the BGS, Coal Authority, CEC, Public Health England, the Environment Agency, Natural England and Food and Environment Research Agency records, as well as web sources such as local geological trusts.
- 10.3.2 Unless otherwise stated, all features described in this section are presented in Maps LQ-01-115b to LQ-01-118 (Volume 5: Land quality Map Book).

Geology

- 10.3.3 This section describes the underlying ground conditions within the South Cheshire area. Recent changes in lithostratigraphic classifications by the BGS have been incorporated where appropriate¹²¹.
- 10.3.4 Table 20 provides a summary of the superficial and bedrock units underlying the Proposed Scheme in the South Cheshire area.

Table 20: Summary of the superficial and bedrock units underlying the Proposed Scheme in the South Cheshire area

Geology	Distribution	Formation description	Aquifer classification
Superficial			
Alluvium	Narrow bands associated with Gresty Brook and Basford Brook in the north of the study area and Checkley Brook in the south of the study area.	Deposits of clay, silt, sand and gravel of fluvial origin.	Secondary A
River Terrace Deposits	Narrow bands associated with main surface water features.	Sand and gravel	Secondary A
Peat	Several pockets to the east, west and south of the study area.	Peat	Unproductive aquifer
Glaciofluvial Deposits	Provides surface cover in the northernmost part of the study area, with sporadic subcrops in the south.	Sand and gravel	Secondary A
Glacial Till	Covers the entire study area at the near surface or at shallow depth below the deposits listed above.	Clays with sand and gravel component	Unproductive aquifer
Bedrock			
Mercia Mudstone Group, Sidmouth Mudstone Formation, Wilkesley Halite Member	Subcrops within the central part of the study area.	Halite with mudstone partings.	Unproductive aquifer
Mercia Mudstone Group, Sidmouth Mudstone Formation – mudstone	Present in the north and south of study area.	Red mottled grey/ green mudstone and siltstone.	Secondary B
Mercia Mudstone Group, Sidmouth Mudstone Formation. Northwich Halite Member	Small area crossed by the route of the Proposed Scheme near Checkley Lane.	Halite stone and mudstone.	Unproductive aquifer

Made ground

- 10.3.5 Made ground is a term used to denote man-made deposits such as landfill, 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

¹²¹ British Geological Survey, (2014), *Lithostratigraphy of the Sherwood Sandstone. Research Report RR/14/01*. Available online at: <http://www.bgs.ac.uk/downloads/start.cfm?id=2904>

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

10.3.6 Areas where made ground has been specifically identified include the following:

- an area of land covered by made ground extends from the southern boundary of the South Cheshire area to a point approximately 200m south-east of where Checkley Lane crosses the WCML;
- an area of land approximately 310m by 220m in area, located south of Den Lane Bridge and immediately to the west of the existing WCML; and
- much of the route of the Proposed Scheme between Basford and Crewe.

10.3.7 No known farm burial or pyre sites associated with the 2001 outbreak of foot and mouth disease have been identified within the South Cheshire study area. In all cases, records do not provide an exact location for any burial or pyre sites. Older unrecorded sites may be present from the 1967 outbreak.

Superficial geology

10.3.8 Superficial glacial deposits from several glacial phases are present beneath all of the study area. Post-glacial sediments include Alluvium, River Terrace Deposits and Peat.

10.3.9 Glacial sand and gravel deposits are reported to underlie most of the area of the Proposed Scheme between the southern end of the South Cheshire area and Den Lane.

10.3.10 The area of the Proposed Scheme between Den Lane and Gonsley Green Farm is predominantly underlain by Glacial Till, a poorly sorted glacial deposit comprising particle sizes from clay to boulders.

10.3.11 In the area of the Proposed Scheme between Gonsley Green Farm and Hough Common, and to the east of the WCML, the superficial deposits comprise mainly glacial sands and gravels, with till present to the west of the WCML. Between Hough Common and Basford Hall the Proposed Scheme is predominantly underlain by glaciofluvial sand and gravel deposits.

10.3.12 In the area of the Proposed Scheme north of Basford Hall, Glacial Till is the dominant superficial geological deposit.

10.3.13 Peat is indicated to be present, approximately 160m south-west of Moss House in the vicinity of Betley Mere and Mere Gutter, and between a point approximately 200m north-east of Half Moon Farm and the route of the Proposed Scheme.

10.3.14 Alluvium and River Terrace Deposits are indicated along the line of Checkley Brook, Swill Brook, Gresty Brook, and Valley Brook.

Bedrock geology

10.3.15 The Sidmouth Mudstone Formation, part of the Mercia Mudstone Group, extends from the southern part of the study area to Crewe. This geological unit comprises predominantly weak, red-brown silty mudstone. Halite rich layers are present within

this geological unit. Intensely fractured strata, referred to as breccias, produced by the dissolution of salt around the time of deposition, are also common throughout the formation. More recent salt dissolution, including that from brine pumping, gives rise to dissolution hollows and collapse breccias. Gypsum/anhydrite also occurs throughout the formation as nodules and veins¹²².

10.3.16 Two halite-rich horizons are present within the Sidmouth Mudstone Formation:

- the Wilkesley Halite Member underlies the route of the Proposed Scheme between Blakenhall and a point approximately 700m south of Basford. This unit comprises halite of variable purity with thin mudstone layers¹²³; and
- the Northwich Halite Member, comprising halite with thin mudstone layers¹²⁴, underlies the route of the Proposed Scheme in the vicinity of Randilow Farm, approximately 1km south-west of Wrinehill.

Radon

10.3.17 Radon is radioactive gas formed by the radioactive decay of naturally occurring uranium in rocks and soils. The South Cheshire area is not identified as an area of elevated radon potential as defined on Public Health England's UK Radon online maps¹²⁵.

Groundwater

10.3.18 Three categories of aquifer have been identified within the South Cheshire area, as defined by the Environment Agency:

- glaciofluvial deposits, Alluvium, and River Terrace Deposits are classified as Secondary A aquifers; and
- the Mercia Mudstone Group, which is classified as a Secondary B aquifer, except in the areas where the Wilkesley Halite Member and the Northwich Halite Member outcrop.
- Peat, Glacial Till, the Wilkesley Halite Member, and the Northwich Halite Member are designated as Unproductive aquifers.

10.3.19 The Environment Agency reports that there are two licensed groundwater abstractions in the study area, located at The Grange. The abstractions are from the superficial deposits and the water from both abstractions is used for general farming and domestic supply.

10.3.20 There are no published groundwater source protection zones (SPZ)¹²⁶ in the study area. It should be noted, however, that all abstractions that are used directly or indirectly for human consumption are by default provided with SPZ. In such cases the

¹²² British Geological Survey; *The BGS Lexicon of Named Rock Units*. Available online at: <http://www.bgs.ac.uk/lexicon/lexicon.cfm?pub=SIM>

¹²³ British Geological Survey; *The BGS Lexicon of Named Rock Units*. Available online at: <http://www.bgs.ac.uk/lexicon/lexicon.cfm?pub=WHT>

¹²⁴ British Geological Survey; *The BGS Lexicon of Named Rock Units*. Available online at: <http://www.bgs.ac.uk/lexicon/lexicon.cfm?pub=NWHF>

¹²⁵ Public Health England; *UK maps of radon*. Available online at: www.ukradon.org/information/ukmaps

¹²⁶ A groundwater SPZ is a defined area within which groundwater is extracted for potable water supply. The area is defined by the Environment Agency on the basis of the length of time taken for groundwater to migrate to the potable source.

abstraction point qualifies for a default 10m radius SPZ₁ and 250m radius SPZ₂. There is no default SPZ₃ for total catchment with respect to this type of abstraction.

- 10.3.21 According to CEC records, there are no private groundwater abstractions that do not require a permit registered within the study area.
- 10.3.22 Further details on the groundwater in the South Cheshire area can be found in Section 15, Water resources and flood risk.

Surface water

- 10.3.23 Checkley Brook and the River Lea join approximately 700m south-east of The Grange Farm, on the border of the Whitmore Heath to Madeley area (CA₄) and South Cheshire area and flow to the west and north-west.
- 10.3.24 Gresty Brook and tributaries flow to the east of and parallel to the WCML. These watercourses cross into the study area in a number of locations, including in the vicinity of Betley Common, West Heath, Chorlton and Weston. Gresty Brook is currently culverted beneath the WCML. Downstream of the existing Gresty Brook Culvert, in the northern part of the existing Basford Hall Sidings, the brook continues to flow westwards through the more built-up area of Wistaston.
- 10.3.25 Swill Brook flows through the study area, originating approximately 1km north of Half Moon Farm and flowing northwards, before turning to the north-west some 240m south of Weston Lane. Valley Brook flows through the study area just north of Crewe Station, flowing in a westerly direction.
- 10.3.26 Two unnamed watercourses, originating in the vicinity of the WCML, flow westwards along the line of the A500 Newcastle Road/Shavington Bypass. One watercourse is located to the north and the other to the south of this road.
- 10.3.27 There are numerous ponds of varying sizes and a number of drains and minor watercourses within the study area.
- 10.3.28 Betley Mere SSSI, part of the Midland Meres and Mosses Phase 1 Ramsar site, is located approximately 280m (at its closest point) to the north-east of the route of the Proposed Scheme, approximately 30m to the east of the study area for land quality in the vicinity of Den Lane Bridge. However, drainage channels that flow into Betley Mere are present within the study area, and the SSSI is potentially vulnerable to discharges into surface water. For this reason, the site has been included in this assessment. A separate but related assessment of the Betley Mere SSSI is provided in Section 8, Ecology and biodiversity and Section 15, Water resources and flood risk.
- 10.3.29 There are three licenced surface water abstraction points in the study area:
- Checkley Brook adjacent to Grange Farm;
 - Mere Gutter, in the vicinity of Weston Hall Estate, for agricultural purposes; and
 - Valley Brook at Crewe and Alsager College.

- 10.3.30 Further information on surface water in the South Cheshire area is provided in Section 15, Water resources and flood risk.

Current and historical land use

- 10.3.31 Within the study area, current potentially contaminative land uses include engineering works, light industrial units, evidence of fuel/storage tanks, existing railways (including the WCML), active and closed petrol filling stations, landfills and the activity of several farms.
- 10.3.32 The southern part of the study area comprises rural and agricultural settlements, with associated housing, agricultural buildings, pits and ponds. The pits in this area are commonly referred to as sand pits, reflecting the underlying glacial deposits. Many pits have become ponds following discontinuation of use.
- 10.3.33 The northern part of the study area largely comprises of the Crewe conurbation, with significant railway related land use.
- 10.3.34 There is evidence of some potential land contamination in the South Cheshire area around Gonsley Green Farm and south of Basford Hall, arising from light industry, infilled brickfield clay extraction pits and landfill sites.
- 10.3.35 There are two former and one operational petrol filling stations in the study area. The former sites are located near the corner of Cobbs Lane and Newcastle Road in Hough, and between Hewett Street and the A534 Nantwich Road, near Crewe Station. The operational site is located on the western side of Macon Way, at the junction with the Nantwich Road, Crewe.
- 10.3.36 The WCML runs through the study area and becomes closer to the route of the Proposed Scheme as the route continues north. The WCML features engineered cuttings and embankments as well as bridges for road crossings. The area immediately south of Crewe has more extensive rail infrastructure, including tracks, engine sheds, sidings, shunting yards, train refuelling facilities and goods loops. A number of tanks are also evident in historical mapping. This area has also experienced increased commercial and industrial activity, and in more recent years has undergone residential development around the southern edge of Crewe. These activities have required numerous earthworks, such as those associated with the A500 Shavington Bypass.
- 10.3.37 Operational and historical rail maintenance and refuelling facilities in the Crewe area include the following:
- an operational train maintenance facility and associated refuelling facilities approximately 1.3km south-east of the Nantwich Road entrance to Crewe Station;
 - an operational train refuelling island located in the southern part of Basford Hall sidings;
 - an operational electric traction maintenance depot located in the southern part of Basford Hall sidings;

- the former Crewe Diesel Depot, located approximately 500m south-east of the Nantwich Road entrance to Crewe Station;
- an operational rail engineering works located approximately 500m south-east of the Nantwich Road entrance to Crewe Station; and
- a waste receiving station (for operational train waste) located approximately 200m north of the Nantwich Road entrance to Crewe Station.

- 10.3.38 The area in the vicinity of the A532 Weston Road in Crewe has been subject to historical and continuing industrial use. Of particular note is a former iron and steel works between the A532 Weston Road and the WCML, to the south-east of Cowley Road. Current land use in this area is predominantly light commercial and engineering works.
- 10.3.39 The earliest historical mapping available shows the land being used predominantly for rural and agricultural purposes in the south of the study area, with an increasing amount of development northwards, towards Crewe.
- 10.3.40 Historical land uses identified within the study area with the potential to have caused contamination comprise six historical landfills recorded by the Environment Agency and/or CEC and several additional small infilled extraction pits and ponds, which may have been filled with a variety of waste materials. There are no records of infilling at these smaller pits and quarries within the study area.
- 10.3.41 The six historical landfill sites that have been identified are detailed in Table 21. The potential for landfill gases to be present in the vicinity of Casey Bridge is indicated in records obtained from the National Hazard Directory.

Table 21: Landfill sites located within the study area

Name and area reference ²²⁷	Location	Description
Historical landfill adjacent to Den Lane (former Betley Ash Quarry) 5-29	Located off Den Lane, Blakenhall, immediately adjacent to the existing WCML. Volume 5: Map LQ-01-116	A local authority recorded landfill site. The type of material deposited is not known. Records indicate that there is a revoked local authority authorisation at the site for the undertaking of quarry processes, including crushing of bricks, tiles and concrete for roadstone.
Brickfield refuse tip 5-45	Located approximately 580m north-east of Manor Farm and directly intersected by the Proposed Scheme. Volume 5: Map LQ-01-116	An historical area of clay extraction for brickmaking and a subsequent brickfield tip.
Historical landfill at Gonsley Green Farm 5-55	Gonsley Green Farm, Blakenhall, Nantwich Volume 5: Map LQ-01-116	Environment Agency records state that the landfill received industrial waste including farm waste. Information from the Environment Agency also indicates that the landfill was in use pre-1948. No further information with regard to the waste input and licence issue and surrender dates is available.

²²⁷ The area reference is the unique identifying number for the site, shown on the Volume 5: Land quality Map Book

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Name and area reference ¹²⁷	Location	Description
Historical landfill site 160m south-west of Weston Hall 5-101	Located approximately 160m south-west of Weston Hall, Weston, Crewe, Cheshire Volume 5: Map LQ-01-117	Environment Agency records indicate that the landfill was licenced to accept inert waste from February 1986. The first input of waste was in December 1986 and the last input was in May 1987, at the time of the licence surrender.
Historical landfill at Yew Tree Farm 5-116	Weston, Crewe, Cheshire Volume 5: Map LQ-01-117	Environment Agency records state that the landfill was licenced to accept industrial and household waste. The first input of waste was in January 1960 and the last input was in March 1972.
British Railways Tip 5-239	Tommy's Lane, Crewe Volume 5: Map LQ-01-118	The dates of operation and types of material deposited are not known.

10.3.42 Contaminants commonly associated with landfill sites could include metals, semi-metals, asbestos, organic and inorganic compounds. Landfill sites and infilled pits could also give rise to landfill gases such as methane or carbon dioxide and leachate.

Other regulatory data

10.3.43 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 (IPC) and integrated pollution prevention and control licences (IPPC)). Notable data identified during the review are presented below. There were no major incidents, four significant and 20 minor incidents reported over a 10 year period between 1991 and 2001.

10.3.44 There is one significant pollution incident recorded, which occurred on 6 May 2001, causing a significant impact to water and involved the release of sewage materials at Basford Brook, to the west of Mere Road, Weston.

10.3.45 There are three further significant and 20 minor pollution incidents to water reported by the Environment Agency. The significant incidents related to one release of oils, one release of rubble/litter or solids and one release of an unknown pollutant.

10.3.46 Two obsolete fuel station entries were found in the records, these were registered as Hough Garage on Cobbs Lane, Hough and Nantwich Road Service Station, Crewe. One operational fuel station was found in the records, registered to Crewe Arms Express on Nantwich Road, Crewe.

10.3.47 The following Environment Agency licenced waste management sites are within the study area:

- an inert and excavation waste transfer station located at Basford Hall Sidings, approximately 1km south of Crewe station; and
- a scrapyards located at Old Cattle Market, Gresty Road, Crewe. The records indicate that the operator of this site also previously had a licence for a metal recycling operation located in the vicinity of Dario Gradi Drive, Crewe.

10.3.48 The following sites hold Local Authority Pollution Prevention and Controls permits within the study area:

- a vehicle re-spraying business located on Herald Drive, Macon Way, Crewe; and
- Crewe Arms Express on Nantwich Road, Crewe.

10.3.49 A poultry production unit at The Grange holds an IPPC permit.

10.3.50 It should be noted that whilst there is a current IPPC permit for the former iron and steel works, these works have now been demolished and land redeveloped. Therefore, the permit is not relevant for the current use of the land.

10.3.51 There are seven discharge consents recorded within the study area, five of which discharge to surface water and two to groundwater.

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

Mining/mineral resources

10.3.53 CEC is responsible for the overall mineral and waste local plans for the county. The Cheshire Replacement Minerals Local Plan, adopted in 1999, provides planning advice on where mineral development can take place¹²⁸. This document covers the Cheshire East and Cheshire West and Chester Council areas. Minerals extracted from within areas covered by the Plan include clay, Peat, salt, sandstone, construction sand and silica sand. Spatial data relating to the above document is presented on the CEC website¹²⁹. These data indicate that there is an area of search for sand and gravel located approximately 50m to the east of Waybutt Lane, Chorlton. This area of search appears to overlap the study area to the east of the Proposed Scheme by more than 200m in places.

10.3.54 Based on the current Replacement Minerals Local Plan (1999), the route of the Proposed Scheme does not cross any mineral safeguarding areas (MSA).

10.3.55 CEC is in the process of undertaking a review of this Plan and has identified a proposed MSA for sand and gravel encompassing much of the route of the Proposed Scheme from the southern end of the study area to the A500 Shavington Bypass, together with an area along Valley Brook in Crewe. The entire route of the Proposed Scheme within the South Cheshire area is also identified as a proposed MSA for salt¹³⁰.

10.3.56 Based on the data presented on the CEC website, there are no current mineral extraction operations within the study area¹³⁰.

10.3.57 Data provided on the UK Oil and Gas Authority website¹³¹ indicates the following:

- the portion of the South Cheshire area from Chorlton village northwards is covered by petroleum Block SJ75. Data provided on the UK Oil and Gas

¹²⁸ Cheshire East Council (1999); Replacement Minerals Local Plan; Available online at:

http://cheshireeast.gov.uk/planning/spatial_planning/saved_and_other_policies/cheshire_minerals_local_plan/cheshire_minerals_local_plan.aspx

¹²⁹ Cheshire East Council Minerals Local Plan; Available online at: <http://maps.cheshire.gov.uk/ce/localplan/minerals/>

¹³⁰ Cheshire East Council (2015); Minerals Sites and Areas Assessment, Appendix 3. Available online at:

http://cheshireeast.gov.uk/planning/spatial_planning/research_and_evidence/aggregate_resources.aspx.

¹³¹ Oil and Gas Authority; Onshore Oil and Gas Authority. Available online at: <https://ogauthority.maps.arcgis.com/apps/webappviewer/index.html>.

Authority website indicates that Block SJ75 has been awarded to Ineos Upstream Limited under Petroleum Exploration and Production Licence reference PEDL293;

- an onshore conventional oil and gas borehole, drilled for Hamilton Oil Company Ltd, located approximately 160m north of the point where Den Lane crosses the WCML. The borehole was drilled in 1992, and was subsequently plugged and abandoned¹³²; and
- the entire South Cheshire study area is located within the Bowland Shale Gas Study Area. The data also indicates that north of Den Lane; the remainder of the South Cheshire area is located within the Bowland Shale Prospective Area¹³³.

10.3.58 The current CEC Replacement Minerals Local Plan indicates there is no active coalbed methane extraction in the study area. There also is no reference to coal mining in this study area.

10.3.59 Mineral extraction, in the form of one borrow pit north of Checkley Lane, will be required as part of the works for the Proposed Scheme in the South Cheshire area. The borrow pit is required to meet the shortfall of granular fill required to construct the Proposed Scheme and is to be located in proximity to the route of the Proposed Scheme to obtain sands and gravels of an appropriate quality (see Volume 1, Section 6).

10.3.60 The borrow pit in the South Cheshire area falls within the River Terrace Deposits, which may be designated as an MSA in the future and will be located north of Checkley Lane and south of Wrinehill.

10.3.61 The borrow pit will be operational during the construction phase of the Proposed Scheme. The estimated duration of use of the borrow pits is four years, which includes excavating and backfilling.

10.3.62 The borrow pit site has been derived from geotechnical desk study of mineral resources. Prior to construction of the Proposed Scheme, HS2 Ltd will undertake detailed ground investigations to help confirm the depth of granular deposits suitable for construction material, which will inform the surface area and depth of extraction required within the borrow pit site.

Geo-conservation resources

10.3.63 No geological SSSI or LGS have been identified within the study area. Therefore, no assessment of geo-conservation resources has been carried out.

¹³² Hamilton Oil Company Ltd (1992); Composite log for Blakenhall-1. Available online at:

<http://ukogL.org.uk/map/php/images.php?subfolder=wells/compositeLogHeader&filename=145-clh.jpg>

¹³³ Department of Energy and Climate Change (2013); *The Carboniferous Bowland Shale gas study: geology and resource estimation*. Available online at: https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/226874/BGS_DECC_BowlandShaleGasReport_MAIN_REPORT.pdf

Receptors

10.3.64 The sensitive receptors that have been identified within the South Cheshire area are summarised in Table 22. A definition of receptor sensitivity is given in the SMR.

Table 22: Summary of sensitive receptors

Issue	Receptor type	Receptor description	Receptor sensitivity
Land contamination	People	Residents at existing properties, schools and study centres	High
		Workers and visitors at nearby facilities	Moderate
		Public using PROW	Low
	Groundwater	Secondary A aquifer	Moderate
		Secondary B aquifer	Low to moderate
		Unproductive strata	Low
	Surface waters	River Lea, Checkley Brook, Gresty Brook and tributaries	Moderate
		Swill Brook	Moderate
		Valley Brook	Moderate
		Ponds and drains	Low to moderate
	Ecology	Betley Mere ¹³⁴ and associated drains within study area	High
	Built environment	Underground structures and buried services.	Low
		Buildings and property	Low to high
Impacts on mining/mineral and petroleum sites (severance and sterilisation of sites)	Mining/mineral sites	Proposed sand and gravel MSAs	Medium
		Proposed salt MSAs	Medium
	Petroleum, oil and gas exploration licensing (including oil, gas and unconventional gas).	Blocks Under Offer in the 14 th Onshore Round	Low
		Bowland Shale Gas study area	Low
		Shale Prospective Area	Low

Future baseline

Construction (2020)

10.3.65 Volume 5: Appendix CT-004-000 provides details of committed developments in the South Cheshire area that are assumed to have been implemented by 2020

¹³⁴ Betley Mere, a SSSI and part of a Ramsar site, is located approximately 30m outside of the study area. Drainage channels that flow into Betley Mere are present within the study area.

10.3.66 The committed developments that materially affect the baseline conditions for land quality in this area and form part of the future baseline assessment of the effects during construction are listed in Table 23.

Table 23: Committed developments relevant to land quality

Map book reference ¹³⁵	Planning reference	Description
CA5/6	10/4029N	Agricultural workers dwelling
CA5/37	13/0336N	Up to 370 dwellings with associated development including of offices, a local centre comprising food and non-food retail, restaurant/public house, hotel, car showroom. Ancillary works include access, a pumping station, substation, earthworks, open space and landscaping.
CA5/35	14/4025N	Up to 490 dwellings and associated development including a primary school, pumping station, substation, open space, ecological mitigation, landscaping, access and parking.
CA5/24	14/0256N	Barn conversion into two dwellings with office facilities.

Operation (2027)

10.3.67 Volume 5: Appendix CT-004-000 provides details of committed developments in the South Cheshire area that are assumed to have been implemented by 2027.

10.3.68 No further committed developments have been identified in this area that will alter the baseline conditions in 2027 for land quality receptors.

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 Practice¹³⁶ (CoCP). The draft CoCP sets out the measures and standards of work that will 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 will 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, 13 and 15);
- methods to control spillage and prevent contamination of adjacent areas (Section 5);
- the management of human exposure for both construction workers and people living and working nearby (Section 11);

¹³⁵ Volume 5 Map Book: Maps CT-13-115b to CT-13-118-R1.

¹³⁶ Volume 5: Appendix CT-001-003, Draft Code of Construction Practice.

- methods for the storage and handling of excavated materials (both contaminated and uncontaminated) (Sections 7 and 15);
- management of any unexpected contamination found during construction (Section 11);
- a post-remediation permit to work system (Section 11);
- storage requirements for hazardous substances such as oil (Section 16);
- traffic management to ensure that there is a network of designated site haul routes to reduce compaction/degradation of soils (Section 7);
- methods to monitor and manage flood risk and other extreme weather events, where reasonably practicable, that may affect land quality during construction (Section 5 and 16);
- methods to manage discovery of unknown animal burial pits (Section 6); and
- the excavation and restoration of borrow pits (Section 6, 7 and 12).

10.4.3 The draft CoCP requires that prior to and during construction, a programme of further detailed investigations, which may include both desk based and site based work, takes place in order to confirm the full extent of areas of contamination. It also requires a risk assessment to be undertaken to determine what, if any, site specific remediation measures are required to allow the Proposed Scheme to be constructed safely and to prevent harmful future migration of contaminants. The investigation and assessment of potentially contaminated sites will be undertaken in accordance with Environment Agency CLR11¹³⁷ and British Standards BS10175¹³⁸ and BS8576¹³⁹.

10.4.4 Where significant contamination is encountered, a remedial options appraisal will be undertaken to define the most appropriate remediation techniques. Where appropriate, this appraisal will 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 UK¹⁴⁰. The preferred option will then be developed into a remediation strategy.

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

Assessment of impacts and effects

10.4.6 Construction of the Proposed Scheme in this area will require earthworks, utility diversions, deep foundations, a borrow pit (involving temporary dewatering) and

¹³⁷ Environment Agency, (2004), *CLR11 Model Procedures for the Management of Land Contamination*.

¹³⁸ British Standard, (2011), *BS10175+A1:2013 Investigation of Potentially Contaminated Sites*.

¹³⁹ British Standard, (2013) *BS8576 Guidance on investigations for ground gas – Permanent gases and Volatile Organic Compounds (VOCs)*.

¹⁴⁰ Sustainable Remediation Forum UK, (2010), *A Framework for Assessing the Sustainability of Soil and Groundwater Remediation*.

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: CA5 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 more detailed risk assessments are historical or current landfills, railway infrastructure, a former brickfield, a former petrol station and a former iron and steel works. All areas assessed are shown on Maps LQ-01-115b to LQ-01-118 (Volume 5: Land quality Map Book) and those considered as potentially posing a risk to the Proposed Scheme are labelled with a reference number.
- 10.4.8 CSMs have been produced for those areas taken to detailed risk assessments. The following factors determine the need for detailed risk assessments:
- whether the site is located on or off the route of the Proposed Scheme or associated off line works;
 - the vertical profile of the route of the Proposed Scheme;
 - the presence of underlying sensitive groundwater aquifers (Secondary A or Secondary B) 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 24. A more detailed assessment of baseline risk is provided in Volume 5: Appendix LQ-001-005. The potential baseline risks presented are those before any mitigation is applied. The assessed baseline risk is based on the information available 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.

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Table 24: Summary of baseline CSM for sites which may pose a contaminative risk for the Proposed Scheme

Area reference ¹⁴¹	Area name	Human health risk	Groundwater risk	Surface water risk	Buildings risk	Ecology risk
5-29	Historical landfill adjacent to Den Lane (former Betley Ash Quarry) Volume 5: Map LQ-01-116	Low to moderate	Moderate	Low	Low to moderate /low	Low
5-45 5-48	Brickfield refuse tip and brickfield Volume 5: Map LQ-01-116	Low to moderate/low	Very low	Low	Low to moderate /low	Low
5-55	Historical landfill at Gonsley Green Farm Volume 5: Map LQ-01-116	Low to moderate/low	Very low	Very low	Moderate /low	Not present
5-65 5-110	Railway infrastructure (WCML and Basford sidings) Volume 5: Maps LQ-01-116 and LQ-01-117	Low to moderate/low	Moderate/low	Low	Very low	Low
5-94 5-234	Former petrol filling station (Hough Garage) and operational petrol filling station (Crewe Arms Express) Volume 5: Maps LQ-01-117 and Map LQ-01-118	Low to moderate/low Low to moderate	Moderate Moderate	Low Low	Moderate /low to moderate Moderate /low to moderate	Not present Not present
5-101	Historical landfill site 160m south-west of Weston Hall Volume 5: Map LQ-01-117	Low to moderate/low	High	Moderate	Moderate /low to moderate	Not present
5-116	Historical landfill at Yew Tree Farm Volume 5: Map LQ-01-117	Moderate/low	High	Moderate	Moderate /low to moderate	Not present

¹⁴¹ Each potentially contaminated site is allocated a unique reference number (See Volume 5: Appendix LQ-001-005 and Land quality Map Book).

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Area reference ¹⁴¹	Area name	Human health risk	Groundwater risk	Surface water risk	Buildings risk	Ecology risk
5-107, 5-166, 5-168, 5-201, 5-207, 5-210, 5-213, 5-220, 5-222, 5-223, 5-249, 5-250, 5-255	Evidence of fuel storage in Basford and Crewe areas Volume 5: Maps LQ-01-117 and LQ-01-118	Low to moderate/low	Moderate/low	Moderate	Low to moderate /low	Not present
5-177, 5-243, 5-244, 5-248, 5-252	Railway infrastructure/ engineering facilities and other engineering facilities in Crewe/Basford area Volume 5: Maps LQ-01-117 and LQ-01-118	Low to moderate/low	Moderate	Moderate	Low	Not present
5-178, 5-182, 5-186, 5-203, 5-204, 5-205, 5-208, 5-245, 5-253	Railway infrastructure/ engineering facilities and other engineering facilities in Crewe/Basford area Volume 5: Map LQ-01-118	Low to moderate/low	Moderate/low	Moderate	Low	Not present
5-202 5-209	Former iron and steel works Volume 5: Map LQ-01-118	Low to moderate/low	Low	Very low	Very low to moderate /low	Not present
5-227	Former petrol filling station (Nantwich Road) Volume 5: Map LQ-01-118	Low to moderate/low	Moderate/low	Very low	Moderate /low to moderate	Not present
5-239	British Railways Tip Volume 5: Map LQ-01-118	Low to moderate/low	Moderate	Moderate	Moderate /low to moderate	Not present
5-246	Train refuelling island, Crewe Volume 5: Map LQ-01-117	Low to moderate/low	Moderate	Moderate	Low to moderate /low	Not present

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.

- 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 will 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 will result in a negative effect, and conversely, an improvement will result in a positive effect. The assessment assumes that contamination will be controlled through the general measures in the draft CoCP.
- 10.4.14 All of the sites set out in Table 24 have been assessed for the change in impact associated with construction of the Proposed Scheme. The assessment has shown that whilst there are a number of minor adverse and beneficial effects at the construction stage, none of these would be regarded as significant in line with the methodology set out in the SMR. The details of the full assessment are presented in Volume 5: Appendix LQ-001-005.
- 10.4.15 In the event that unexpected contamination is encountered during the construction of the Proposed Scheme in this area, this will be remediated, as described in the draft CoCP, resulting in an overall beneficial effect.
- 10.4.16 Construction compounds located in the South Cheshire area will 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.

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 Table 25 provides the summary of the permanent (post-construction) effects obtained from a comparison of the baseline and post-construction impacts and whether these are significant. The details of these comparisons are presented in Volume 5: Appendix LQ 001-005.
- 10.4.19 The magnitude of the permanent effects and their significance have been determined by assessing the change in risk between the main baseline risk and the main post-construction risk. Therefore, where there is no change between the main baseline risk and the main post-construction risk, the permanent effect significance is deemed to be negligible even if the risk is assessed to remain as high. This will 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 of the Proposed Scheme. As noted above, a worsening will result in negative effects and an improvement will result in positive effects.

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Table 25: Summary of permanent (post-construction) effects

Name and area reference ¹⁴²	Receptor	Main baseline risk	Main post-construction risk	Post-construction effect
Historical landfill adjacent to Den lane (former Betley Ash Quarry) 5-29 Volume 5: Map LQ-01-116	Groundwater	Moderate	Low	Moderate beneficial (significant)
Historical landfill site 160m south-west of Weston Hall 5-101 Volume 5: Map LQ-01-117	Groundwater	High	Moderate/low	Moderate beneficial (significant)
Historical landfill at Yew Tree Farm 5-116 Volume 5: Map LQ-01-117	Groundwater	High	Moderate/low	Moderate beneficial (significant)
	Surface water	Moderate	Low	Moderate beneficial (significant)

10.4.20 Where remediation is carried out for sites within land required for the construction of the Proposed Scheme, there would be significant beneficial effects. Significant beneficial effects may occur at the historical landfill adjacent to Den Lane (former Betley Ash Quarry), at the historical landfill site south-west of Weston Hall.

10.4.21 The historical landfill adjacent to Den Lane (former Betley Ash Quarry) and the historical landfill site south-west of Weston Hall lie within the area required for construction of the Proposed Scheme. This may require remediation works, which would be expected to reduce the risks to groundwater quality, resulting in significant beneficial effects. Remediation is not expected at the landfill at Yew Tree Farm as it falls outside the land required for the Proposed Scheme.

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

Mining/mineral resources

10.4.23 Construction of the Proposed Scheme has the potential to affect existing mineral resources, proposed areas of mineral exploitation and/or petroleum/gas reserves. This could occur by sterilisation of the resource through direct excavation during construction of the Proposed Scheme or through temporary and/or permanent

¹⁴² Each potentially contaminated site is allocated a unique reference number.

severance¹⁴³ or isolation that may occur during the construction of the Proposed Scheme, possibly continuing through to its operation.

- 10.4.24 There are no MSAs designated in the South Cheshire area at present, but the Proposed Scheme will cross areas which may be designated at some stage in the future.

Temporary effects

- 10.4.25 The majority of effects on mining, mineral and hydrocarbon sites will be permanent and are discussed below.
- 10.4.26 Temporary effects may occur during initial excavation of the borrow pit if areas of potentially contaminated land have been identified during future ground investigation work. Three small areas of potentially contaminated land have been identified in the borrow pit within the South Cheshire area. Two of these sites were former quarries/pits, which have subsequently been infilled. The other is an infilled pond. For all sites, the quality of the infill material is unknown. There is potential for contamination to exist in the infill material. However, due to the relatively small size of these sites (all less than 0.5ha) and the need to remove the infill material from site to access the mineral, the effect of such work is assessed to be minor, and therefore, not significant.
- 10.4.27 Temporary adverse effects may occur where construction compounds are proposed on areas of sand and gravel. In such cases, there may be a temporary sterilisation of the resource during construction works. However, this is not considered to represent a significant effect, and the resource will not be lost permanently.
- 10.4.28 The temporary effects on the hydrological regimes, as a result of the borrow pit extraction, are uncertain at this stage. The need for secondary aquifer dewatering is assumed as a worst case, which may lead to localised and temporary disturbance of groundwater flow directions. Further details regarding the temporary groundwater effects are given in Section 15, Water resources and flood risk.

Permanent effects

- 10.4.29 The majority of effects on mining and mineral sites will be permanent.
- 10.4.30 Section 2.3 of this report sets out the details of the borrow pit in the South Cheshire area. The thickness of the available mineral resource is uncertain, however, the estimated depth of extraction has been derived from geotechnical desk study of mineral resources.
- 10.4.31 Excavation will be carried out in zones, until each zone is depleted. The exact size and number of zones will be assessed during detailed design.
- 10.4.32 Backfill material will arrive at the borrow pit location as soon as it becomes available. The borrow pit will be backfilled with natural, clean excavated material from other areas of the Proposed Scheme, and capped off with the previously excavated topsoil

¹⁴³ 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.

and subsoil. Generally, backfill will be placed and compacted in even layers where needed to mitigate differential settlement across the site.

- 10.4.33 The backfill for the borrow pit will be predominantly cohesive material (e.g. silt and clay), and will include material derived from the Mercia Mudstone Group and the Glacial Till. The Mercia Mudstone Group contains evaporite minerals, mainly halite (sodium chloride) and gypsum (hydrous calcium sulphate). These minerals can cause changes in groundwater quality when dissolution occurs. However, if present in relatively small quantities, and surrounded by low permeability compacted clays and mudstones, the potential for dissolution is small, and the potential effect on groundwater quality is not considered significant. If substantial horizons of halite are encountered in excavations, this will not be used for backfill in borrow pits.
- 10.4.34 The borrow pit site is currently in agricultural use. It is proposed to restore the land back to the current land use, post-excavation.
- 10.4.35 Use of borrow pits is assessed as having a minor beneficial effect, which is not significant, as it avoids depletion of local permitted reserves. It should be noted that extraction from below the structural footprint of the route of the Proposed Scheme will not occur, as the permanent railway will require good founding conditions. A plan will 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 effective management of minerals within the affected location of the MSA.
- 10.4.36 The effects of construction of the Proposed Scheme on the sand and gravel areas will be permanent where they underlie the permanent works, with a strip of mineral becoming sterilised. However, as a proportion of the total MSA, this strip is less than 1% of the total, and the effect on the MSA is considered to be minor, and therefore, not significant.
- 10.4.37 The route of the Proposed Scheme will cross a Petroleum Exploration and Production Licence area. It is unlikely that construction of the Proposed Scheme will place a constraint on future exploitation of potential sources of shale gas or other forms of hydrocarbon resource.
- 10.4.38 Table 26 reports the assessment of permanent effects from construction on the mining and mineral resources identified.

Table 26: Summary of effects for mining, mineral resources and oil and gas resources

Site name	Status	Description	Sensitivity / value	Magnitude of impact	Effect and significance (Y/N)
Block SJ75	Licensed	DECC onshore petroleum licensing blocks (as defined by DECC)	Low	Minor	Negligible (N)
Bowland Shale Gas Study Area.	Gas Study Area	Shale gas study area (as defined by DECC)	Low	Minor	Negligible (N)

Site name	Status	Description	Sensitivity / value	Magnitude of impact	Effect and significance (Y/N)
Shale Prospective Area	Shale Prospective Area	Prospective areas for shale gas / oil (as identified in BGS resource studies)	Low	Minor	Negligible (N)
Superficial sand and gravel	Proposed MSA	Proposed MSA for sand and gravel extraction, defined by CEC ¹⁴⁴	Medium	Minor	Negligible (N)
Borrow pit	Possible future MSA	Area identified for use on Proposed Scheme	Medium	Positive	Minor beneficial (N)

10.4.39 There will be negligible effects on for onshore petroleum licensing blocks, shale gas / oil exploration and sand and gravel extraction. There will be one minor beneficial effect in terms of the borrow pit in the possible future MSA associated with avoiding depletion of local permitted reserves.

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 will be developed at the detailed design stage if required. These measures will ensure that risks to people, the environment and property from contaminants in the ground below the Proposed Scheme will be controlled such that they will not be significant. For example, measures might include excavation and treatment of contaminated soils or controls to manage movement of landfill gas and leachate, if required.

Summary of likely residual significant effects

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

Cumulative effects

10.4.43 No significant cumulative temporary or permanent effects during construction with regard to land contamination, mineral resources, petroleum resources or geo-conservation sites are anticipated.

¹⁴⁴ Cheshire East Council. The Cheshire Replacement Minerals Local Plan adopted in 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

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

Assessment of impacts and effects

- 10.5.3 The Proposed Scheme within this area includes the South Crewe mid-point auto-transformer station, which will be located to the north of Gonsley Green Farm and the Wrinehill package substation, which will be located to the south of Checkley Lane. A mid-point auto-transformer station can, in principle, be a source of contamination through accidental discharge or leaks of coolant. However, in common with other modern substations, 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, any 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 those implemented during construction of the Proposed Scheme.

Summary of likely residual significant effects

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

Cumulative effects

- 10.5.7 No cumulative effects on ecological receptors have been identified in the South Cheshire area.

Monitoring

- 10.5.8 Volume 1, Section 9 sets out the general approach to environmental monitoring during operation of the Proposed Scheme.
- 10.5.9 Requirements for monitoring will 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) 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 within the South Cheshire 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 and vehicles on roads, but also the presence of the new permanent infrastructure associated with the Proposed Scheme.
- 11.1.3 Engagement has been undertaken with Staffordshire County Council (SCC), Cheshire East Council (CEC) and Natural England. The purpose of this engagement has been to discuss the assessment methodology, the extent of the landscape and visual study area, the distribution of visual receptor viewpoints and the location of verifiable photomontages.
- 11.1.4 Further details on the landscape and visual assessment, including engagement, baseline information and assessment findings, are presented in the Volume 5: Landscape and visual Map Book and Volume 5: Appendix LV-001-005, which comprises the following:
- Part 1 Engagement with technical stakeholders;
 - Part 2 Landscape character assessment;
 - Part 3 Visual assessment; and
 - Part 4 Assessment matrices.
- 11.1.5 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: CA5 Map Book.
- 11.1.6 The Volume 2: CA5 Map Book also includes Map Series LV-03 (Construction phase viewpoints), Map Series LV-04 (Operation phase viewpoints) and and Map Series LV-01 (Verifiable photomontages), showing viewpoints that will be significantly affected.
- 11.1.7 A separate, but related, assessment of effects on historic landscape character and the setting of heritage assets is reported in Section 7, Cultural heritage.

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), the Scope and Methodology Report¹⁴⁵ (SMR) and the SMR Addendum¹⁴⁶.
- 11.2.2 Winter surveys for the landscape and visual assessment were undertaken from January to March 2016 and February 2017 to inform the assessment. Summer field surveys, including photographic studies of landscape character areas (LCA) and visual assessment of viewpoints, were undertaken from July to September 2016. During the baseline survey, there were some areas that were inaccessible (such as private land, commercial premises and residential buildings). In these instances, professional judgement has been used to approximate the likely views from these locations.
- 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 SMR Addendum, and are an indication of the theoretical visibility of the Proposed Scheme. In some locations, extensive vegetation cover will mean the actual visibility is substantially less than that shown in the ZTV, and professional judgement on site visits 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. Overhead line equipment is described and taken into account in the assessment of effects on LCAs and visual receptors.
- 11.2.5 Landscape and visual receptors within approximately 500m of the Proposed Scheme have been assessed as part of the study area. Long distance views of up to 1km have been considered at settlement edges in Wrinehill, Checkley, Blakenhall, Betley, Betley Common, Chorlton, Hough, Shavington, Basford and Weston.
- 11.2.6 Professional judgements on landscape value, susceptibility and sensitivity are summarised in the baseline descriptions in the proformas in Volume 5: Appendix LV-001-005, Part 2.

11.3 Environmental baseline

Existing baseline

Landscape baseline

- 11.3.1 The study area extends from Madeley in the south, to the north of Crewe Station. Modifications to the existing West Coast Main Line (WCML) and works at Crewe

¹⁴⁵ Volume 5: Appendix CT-001-001, Environmental Impact Assessment Scope and Methodology Report.

¹⁴⁶ Volume 5: Appendix CT-001-002, Environmental Impact Assessment Scope and Methodology Report Addendum.

Station also form part of the Proposed Scheme in the South Cheshire area. No local landscape designations have been identified.

- 11.3.2 Most of the study area comprises a mix of pastoral and arable farmland. The landform is more rolling and smaller scale in the southern part of the study area, but becomes more gently undulating and larger scale north of Chorlton Lane. Fields within the southern part of the study area are typically bounded by a robust network of field hedges, interspersed with hedgerow trees, groups of trees and single mature trees. Small mixed species woodlands are found throughout the area and include pockets of ancient woodland at Checkley Wood, Robin Knights Rough, Shaw's Rough and Stockings Cote.
- 11.3.3 A short stretch of the tree-lined Checkley Brook flows through the southern part of the study area within a secluded and relatively tranquil landscape near Checkley Lane at Wrinehill. North of Chorlton, Basford Brook runs via a narrow, meandering valley, flowing through a belt of linear woodland, with a diverse mix of tree and shrub species. The Crewe and Nantwich Circular Walk, the South Cheshire Way and the Two Saints Way, which run along Chorlton Footpath 7, are all regionally promoted long distance trails.
- 11.3.4 The northern part of the study area has an increasingly urban fringe quality due to its proximity and inclusion of part of the built up area of Crewe, with field enlargement and loss of hedgerows. The A500 Newcastle Road/Shavington Bypass is a dominant landscape feature to the north of the study area. Much of the landscape within the study area is interspersed with small, often historic villages, as well as a scattering of isolated dwellings and farmsteads.
- 11.3.5 Due to its location on the edge of Crewe, the northern part of the study area has recently seen significant road development, including the A500 Shavington Bypass, the A5020 David Whitby Way and the B5071 Jack Mills Way. Other notable linear transport corridors in the study area are Weston Lane and Newcastle Road as well as the WCML. Basford Hall sidings lie to the north of the A500 Shavington Bypass and west of the existing WCML within the Crewe urban area. The tall lighting columns associated with the sidings are visible across much of the northern part of the South Cheshire area.
- 11.3.6 The LCAs have been determined as part of an integrated process of environmental characterisation, informed by the outcome from other topics including the historic landscape character and ecological assessments. Use has been made of published landscape character assessments, historic landscape characterisation (HLC) 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 Areas¹⁴⁷, the Staffordshire

¹⁴⁷ 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>

Landscape Guidelines¹⁴⁸ and the Cheshire Landscape Character Assessment¹⁴⁹. More detail on the approach to the landscape characterisation is set out in the SMR Addendum.

- 11.3.7 For the purposes of this assessment, the study area for South Cheshire has been subdivided into 12 LCAs. Full descriptions are contained within Volume 5: Appendix LV-001-005, Part 2.

Visual baseline

- 11.3.8 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 locations maps (see Volume 2: CA5 Map Book, Map Series LV-03 and LV-04). They are described and assessed in full in the proformas in Volume 5: Appendix LV-001-005, Part 3. 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: Recreational¹⁵⁰, 4: Transport, 5: Hotels/healthcare (none within this area) and 6: Employment (none within this area).
- 11.3.9 No protected views have been identified within the study area. Residential visual receptors within the South Cheshire area are typically located within and around the villages and hamlets. These include Wrinehill, Checkley, Betley, Blakenhall, Chorlton, Hough, Shavington and Weston and Basford. Residential receptors are also found at many dispersed properties and farmsteads.
- 11.3.10 Views from settlement edges are typically filtered and framed by intervening field boundary vegetation, which allied to low lying and gently undulating or rolling landform, partially restricts open views.
- 11.3.11 A range of recreational visual receptors are located at the Wychwood Park Golf Club, Border Fisheries and the extensive public rights of way (PRoW) network. The PRoW include footpaths, bridleways, national and regional cycleways and walks along the regionally promoted South Cheshire Way, the Two Saints Way and the Crewe and Nantwich Circular Walk long distance routes.
- 11.3.12 Views from recreational receptors on elevated positions, for example from the edge of Wychwood Park Golf Club, are longer range and more panoramic. Views from the network of PRoW are variable depending on the local landscape. In many locations, they are restricted or filtered by landform or by hedgerow and woodland cover.
- 11.3.13 Key transport visual receptors within the South Cheshire area are located along Checkley Lane, Den Lane, Chorlton Lane, Newcastle Road, Casey Lane and Weston Lane. These roads pass through undulating or gently rolling rural farmland comprising

¹⁴⁸ Staffordshire County Council, Development Services Department (2000), *Planning for Landscape Change*. Available online at: <https://www.staffordshire.gov.uk/environment/eLand/planners-developers/landscape/NaturalEnvironmentLandscapeCharacterTypes.aspx>

¹⁴⁹ Cheshire East Council (2008), *Cheshire Landscape Character Assessment*. Available online at: www.cheshireeast.gov.uk/.../heritage.../landscape/landscape_character_assessment.asp

¹⁵⁰ 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.

pastures and arable fields. Hedgerow and field trees, together with variations in landform, provide a degree of visual filtering and framing of views.

Future baseline

Construction (2020)

- 11.3.14 Volume 5: Appendix CT-004-000 provides details of the developments in the South Cheshire area that are assumed to have been implemented by 2020.
- 11.3.15 No committed developments have been identified in this area that will materially alter the baseline conditions in 2020 for landscape and visual receptors.

Operation (2027)

- 11.3.16 Volume 5: Appendix CT-004-000 provides details of the developments in the South Cheshire area that are assumed to have been implemented by 2027.
- 11.3.17 No committed developments have been identified in this area that will materially alter the baseline conditions in 2027 for landscape and visual receptors.

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 will be visible in many locations and will have the potential to give rise to significant temporary effects that cannot practicably be mitigated. Such effects are temporary and will vary over the construction period depending on the intensity and scale of the works at the time. The assessment of landscape and visual effects has been based on the activities occurring during the peak construction phase, which is defined as the period during which the main construction works will take place, including the establishment of compounds, main earthworks and structure works.

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. The peak civil engineering stage in this area will be undertaken between the start of 2021 and the end of 2024. 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.

- 11.4.2 Section 2.2 sets out the 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

- 11.4.3 Measures that have been incorporated into Sections 12 and 14 of the draft Code of Construction Practice¹⁵¹ (CoCP) to avoid or reduce landscape and visual effects, where reasonably practicable, during construction include the following:

¹⁵¹ Volume 5: Appendix CT-003-000, Draft Code of Construction Practice.

- avoidance of unnecessary tree and vegetation removal, and protection of existing trees in accordance with BS 5837: Trees in relation to design, demolition and construction¹⁵²;
- 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.

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

Assessment of temporary impacts and effects

11.4.5 The most apparent changes to the landscape and to the views experienced during construction will relate to: the presence of construction plant; the excavation of cuttings; erection of viaducts; construction of embankments; soils and material storage and stockpiling; the removal of existing landscape elements, including trees and hedgerows; and the closure and diversion of existing roads, lanes and PRoW. Other key changes include the construction of overbridges and underbridges, excavation and restoration of the borrow pit north of Checkley Lane, property demolitions, and the presence of compounds and transfer nodes.

Landscape assessment

11.4.6 The following five LCAs in Table 27 will be significantly affected during construction. Full details of effects are described in Volume 5: Appendix LV-001-005 Part 2.

Table 27: Construction phase significant landscape effects

Madeley Valley	Medium-high susceptibility and medium-high sensitivity
This LCA lies primarily within the Whitmore Heath and Madeley area (CA4), but a small part of the LCA is crossed by the Proposed Scheme in the South Cheshire area. The assessment of effects on this landscape is included in Volume 2: Community area 4, Whitmore Heath to Madeley (CA4), Section 11, Landscape and visual.	
Betley Ancient Clay Farmlands	Medium-high susceptibility and medium-high sensitivity
This landscape will be affected by the complex and extensive construction activity associated with the Checkley North embankment, HS2 spurs, new section of WCML, embankments and cuttings, realignment of Checkley Lane and Den Lane, Den Lane East and West viaducts (and associated cranes), landscape bunds, and a borrow pit north of Checkley Lane. The nature and scale of the works will completely alter the local landscape, with removal of trees and hedgerows, loss of the mainly small-scale pattern and large-scale changes to the local landform. The presence of site haul routes, satellite compounds, construction plant and material stockpiles will further alter the character of the farmland.	
Construction of the Proposed Scheme will result in a medium magnitude of change and moderate adverse effect on this LCA, which is significant.	

¹⁵² BS 5837:2012 Trees in relation to design, demolition and construction – Recommendations, 2012, British Standard.

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The Grange Lower Farms and Woods	Low-medium susceptibility and low-medium sensitivity
<p>This landscape will be impacted by construction activity associated with the HS2 spurs plus excavation and working of part of the borrow pit north of Checkley Lane. The landscape will also be indirectly affected by construction of the Checkley Lane realignment and Checkley Lane overbridge. Although few trees and hedgerows will have to be removed, the large scale changes to the local landform and introduction of uncharacteristic features such as material stockpiles will substantially alter the eastern side of this LCA. Noise and movement associated with the works will introduce disturbance and reduce tranquillity across much of this landscape.</p> <p>Construction of the Proposed Scheme will result in a high magnitude of change and major adverse effect on this LCA, which is significant.</p>	
Blakenhall Lower Farms and Woods	Medium susceptibility and medium sensitivity
<p>There will be direct impacts along the eastern side of this large LCA due to the construction works associated with the new section of WCML, retaining walls, embankments and cuttings, Blakenhall viaduct and Chorlton viaduct (and associated views of cranes), diversion of Chorlton Lane, the South Crewe mid-point auto-transformer station, and modifications to the WCML. The nature and scale of the works will completely alter the rural landscape in proximity to the Proposed Scheme, which adjoins the residential area of Wychwood Park, with removal of trees and hedgerows, loss of field pattern and large scale changes to the local landform. The presence of site haul routes, satellite compounds, construction plant and material stockpiles will further alter the character of the rural landscape. Overall the construction works in this LCA are complex and will be readily perceptible and prominent within the landscape.</p> <p>Construction of the Proposed Scheme will result in a high magnitude of change and major adverse effect on this LCA, which is significant.</p>	
Shavington/Crewe Outer Fringe Lower Farms and Woods	Low-medium susceptibility and low-medium sensitivity
<p>This large LCA will be bisected by the Proposed Scheme. The landscape will be impacted by construction of the HS2 spurs, Crewe South cutting, Crewe South portal, Newcastle Road realignment and Newcastle Road overbridge, diversion of Casey Lane and modifications to the WCML. The presence of two satellite compounds, material stockpiles and movement of construction vehicles will also introduce considerable disturbance into the rural landscape. Although relatively few trees and hedgerows will have to be removed, around the proposed Newcastle Road overbridge there will be considerable alterations to the existing relatively flat landform to build the road embankments.</p> <p>Construction of the Proposed Scheme will result in a high magnitude of change and moderate adverse effect on this LCA, which is significant.</p>	

Visual assessment

Introduction

- 11.4.7 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, will be in leaf. Where residential receptors will experience significant effects at night-time arising from additional lighting, these are also presented in this section. Visual receptors who will experience non-significant effects are reported in Volume 5: Appendix LV-001-005.
- 11.4.8 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 will be lower than those reported.
- 11.4.9 The landscape and visual assessment has identified locations where continuous night working and/or overnight working during construction will result in significant effects

on residential receptors (summarised in Table 28 and described in detail in Volume 5: Appendix LV-001-005, Part 3).

- 11.4.10 Additional lighting will not give rise to significant effects due to the nature of the construction programme, except at the Basford cutting main compound and temporary workers accommodation site; where night-time working will be required for periods of time.
- 11.4.11 Table 28 describes the construction phase significant visual effects. These are described in detail in Volume 5: Appendix LV-001-005 and shown in Map Series LV-03 in the Volume 2: CA5 Map Book.

Table 28: Construction phase significant visual effects

View north-east from farmland north of Checkley Brook

(VP 024.03.001)

Users of Checkley cum Wrinehill Footpath 8 will have close range views of the construction activity associated with the Checkley North embankment and Checkley Brook viaduct, the Checkley Lane realignment, the Checkley Lane overbridge and associated earthworks. The presence of the Checkley Lane West satellite compound, construction equipment and movement of construction vehicles will also impact on views. The works associated with Checkley Brook viaduct will be prominent and cranes for construction of the viaduct will be visible on the skyline. Views across gently rolling open farmland will be replaced by a major construction site with extensive earth formation and movement of materials, as well as alterations to the local landform. A large material stockpile will also be located adjacent to the viewpoint.

Construction of the Proposed Scheme will result in a **high magnitude of visual change and major adverse effect**, which is significant.

View east from farmland east of Turncocks Lane

(VP 024.02.019)

Residents and users of Checkley cum Wrinehill Footpath 4 will have close range views of construction activity associated with the Checkley Brook viaduct and Checkley North embankment, the Checkley Lane realignment and Checkley Lane overbridge and associated earthworks. The presence of the Checkley Lane West satellite compound and Checkley North embankment satellite compound/ Checkley Lane East main compound will also impact on views. Works associated with Checkley Brook viaduct including skyline views of static tower cranes will also be visible. These works and the presence of construction equipment, material stockpiles, and movement of construction vehicles will result in new features that form prominent, incongruous elements in the current views across the rolling well-wooded farmland, interrupting the characteristic hedgerow field boundaries.

Construction of the Proposed Scheme will result in a **high magnitude of visual change and major adverse effect**, which is significant.

View north-east from Checkley Lane and Turncocks Lane

(VP 024.02.010)

Residents and users of Checkley cum Wrinehill Footpaths 4 and 16 will have foreground views of construction activity associated with the HS2 spurs, Checkley North embankment satellite compound/ Checkley Lane East main compound, the Checkley Lane realignment, and Checkley Lane overbridge and associated earthworks, as well as the presence of the Checkley Lane West satellite compound and the Checkley North embankment satellite compound. These works, and the presence of construction equipment, material stockpiles and movement of construction vehicles will result in new features that form prominent, incongruous elements in the current views across the rolling well-wooded farmland, interrupting the characteristic hedgerow field boundaries and small blocks of woodland.

Construction of the Proposed Scheme will result in a **high magnitude of visual change and major adverse effect**, which is significant.

View south-west from Checkley Farm near Randilow Farm

(VP 024.02.008)

Residents and users of Checkley Lane will have close range southerly views of construction activity associated with the Checkley Lane realignment and Checkley Lane overbridge and medium range westerly views of construction of the HS2 main line, HS2 spurs and associated earthworks, although these views will be partially screened and filtered by intervening trees. The Checkley North embankment satellite compound/ Checkley Lane East main compound will also be visible in the middle ground of views to the south. These works, associated earthworks, material stockpiles and the presence of construction equipment and movement of construction vehicles will result in incongruous new features in the rural views across open arable fields and well-treed pastures. Loss of mature vegetation alongside Checkley Lane will also impact on views.

Construction of the Proposed Scheme will result in a **medium magnitude of visual change and moderate adverse effect**, which is significant.

Views from farmland near The Grange

(VPs 024.02.009, VP 024.03.011 and VP 024.03.013)

Residents and users of Blakenhall Footpaths 4 and 17 will have medium range to distant views of the construction activity associated with the HS2 spurs, the realigned Checkley Lane and Checkley Lane overbridge, and associated earthworks. These works, which will include the presence of material stockpiles, construction equipment and movement of construction vehicles, will form incongruous features within views across the large-scale open arable farmland. The presence of some linear material stockpiles will be a further uncharacteristic feature of the view but will serve to screen some of the construction works. Residents at Checkley Brook Farm will have some distant views of the works, particularly from their upper floor windows. Footpath users will have more extensive views of the works, although in places these will be partially obstructed and filtered by the gently rolling landform, scattered field and hedgerow trees and by the Grange Farm complex. Although the construction activity in this area is extensive, only a small part of the view will be affected, which will reduce the magnitude of visual change.

Construction of the Proposed Scheme will result in a **medium magnitude of visual change and moderate adverse effect**, which is significant.

Views north-east from residences along Mill Lane and Blakenhall Footpath 4

(VP 025.02.003)

Residents and users of the footpath will have close to medium range views across the roadside hedgerows towards the construction of the HS2 spurs, the Den Lane diversion and Den Lane viaducts (East and West) and alterations to the Scottish Power Energy Networks 132kV overhead line. These works, together with the Blakenhall Northbound Spur embankment satellite compound, associated earthworks, material stockpiles and the presence of construction equipment and movement of construction vehicles will introduce some prominent and incongruous features into the rural landscape. Easterly views over the large-scale arable farmland will be substantially altered. Residents along Mill Lane will have ground and upper floor views of the works, although these will be partially filtered by garden vegetation and by the scattered field and hedgerow trees. Footpath users will have views of the works above the roadside hedgerows, although these will be partially filtered by the intervening trees.

Construction of the Proposed Scheme will result in a **high magnitude of visual change and major adverse effect**, which is significant.

View south-west from Den Lane near Higher Den Farm

(VP 025.02.001)

Residents, users of Blakenhall Bridleway 8 and Blakenhall Footpath 9 and Den Lane will be surrounded on all sides by construction works associated with the HS2 spurs, modification works to the WCML, Blakenhall Southbound spur embankment, the Den Lane diversion and Den Lane viaducts (East and West), and associated earthworks. These works, the presence of construction equipment and movement of construction vehicles will introduce prominent, incongruous elements in the views across the medium-scale pastoral landscape, interrupting the already patchy hedgerow field boundary pattern and reducing scenic quality. Excavation and working of the borrow pit north of Checkley Lane and west of a large unnamed mere, will occupy much of the mid-ground and distant view to the south. The scale and proximity of the works in this location will completely alter the current rural outlook from both the ground and upper floors of Higher Den farm as well as from the footpath and bridleway, with little intervening vegetation to provide any screening.

Construction of the Proposed Scheme will result in a **high magnitude of visual change and major adverse effect**, which is significant.

View south-west from WCML overbridge

(VP 025.02.007)

Residents and users of Blakenhall Bridleway 8 will have close range views of construction activity associated with the modifications to the WCML, construction of the realigned section of the bridleway on the Blakenhall Bridleway 8 accommodation overbridge and associated earthworks. The existing overbridge (on which this viewpoint is located) will be demolished. The presence of the Blakenhall cutting satellite compound, material stockpiles, construction equipment and movement of construction vehicles will result in new features that form prominent, incongruous elements in close range views from the farm. In addition, there will be some distant views of construction of the Den Lane East viaduct and the Blakenhall Southbound spur embankment to the south-west. Together with some mature tree loss in front of the farm, these elements will introduce a substantial alteration to the outlook from this viewpoint.

Construction of the Proposed Scheme will result in a **high magnitude of visual change and major adverse effect**, which is significant.

View north-east from farmland near Heath Farm

(VP 026.02.012)

Residents and users of Chorlton Footpath 8 will have close to medium range views towards construction works associated with the Crewe South cutting, HS2 spurs, new section of the WCML, Chorlton Lane diversion and Chorlton Footpath 7 overbridge, two balancing ponds, associated earthworks and landscape bunds. The presence of the Heath Farm satellite compound, material stockpiles, construction equipment and movement of construction vehicles will completely change the current rural outlook across open farmland in which the WCML currently has a relatively unobtrusive presence. Users of the nearby South Cheshire Way and Two Saints Way will have wide ranging views of the works, although these will be partially screened and filtered by the row of poplar trees. The earth formation and haulage vehicle movement associated with the landscape bunds along the diverted section of Chorlton Lane will be particularly prominent.

Construction of the Proposed Scheme will result in a **high magnitude of visual change and major adverse effect**, which is significant.

View east from the junction of Mill Lane and Den Lane

(VP 025.02.006)

Residents and users of the lanes will have extensive views of construction works, associated with the Blakenhall Northbound Spur embankment, realigned section of Den Lane and the Den Lane West viaduct, associated earthworks, planted landscape bunds and alterations to the Scottish Power Energy Networks 132kV overhead line. The Blakenhall Northbound Spur embankment satellite compound will also be visible in close range views from the ground and particularly upper floor of the residential properties. These works, the presence of material stockpiles, construction equipment and movement of construction vehicles will introduce prominent, incongruous elements in the view across gently rising arable fields with scattered mature trees.

Construction of the Proposed Scheme will result in a **high magnitude of visual change and major adverse effect**, which is significant.

View north-east from Gonsley Green Farm

(VP 025.02.013)

Residents and users of Blakenhall Footpath 7 and Blakenhall Bridleway 12 will have extensive views of construction works associated with the HS2 spurs, Crewe South cutting, Chorlton South embankment and the South Crewe mid-point auto-transformer station, engineering earthworks and landscape bunds. The Crewe South cutting satellite compound will also be visible in the mid-ground. These works, the presence of material stockpiles, construction equipment and movement of construction vehicles will be prominent and incongruous elements in the views across the arable fields and pastures, foreshortening views and interrupting the characteristic hedgerow/ post and rail field boundaries and small blocks of woodland and the rural, relatively open visual character. A distinctive copse of trees to the east of the farm will be removed and pond to the rear, which is a focal point in views from the house, will be reduced in size. The scale and proximity of the works in this location will completely alter the current rural outlook from both the ground and upper floors of the farm, as there is little intervening vegetation to provide any screening.

Construction of the Proposed Scheme will result in a **high magnitude of visual change and major adverse effect**, which is significant.

View south-west from next to Waybutt Lane

(VP 026.02.002)

Residents and users of Chorlton Footpath 3 and Waybutt Lane on the edge of Wychwood Park will have close range views of the construction of various elements of the Proposed Scheme including, the HS2 spurs, a new section of the WCML, the Chorlton viaduct (and associated cranes) and Chorlton Lane diversion, retaining walls, embankments and cuttings, landscape bunds, balancing ponds and associated earthworks. Views will also be affected by the presence of material stockpiles. The construction activity and movement of construction vehicles will substantially change the current outlook, which despite proximity to the WCML, is rural in character. Residents on the edge of Wychwood Park will have views of the works from the ground and upper floors. The earth formation and haulage vehicle movements associated with the landscape bunds along Waybutt Lane and Chorlton Lane, and works to close Chorlton Lane, will be particularly prominent in views from the edge of Wychwood Park.

Construction of the Proposed Scheme will result in a **high magnitude of visual change and major adverse effect**, which is significant.

Views east from Chorlton Lane

(VP 026.02.004)

Residents along Chorlton Lane and users of the road will have foreground views of construction of the new section of WCML, Chorlton cutting, Chorlton Lane diversion, other embankments and cuttings, retaining walls, associated earthworks and landscape bunds. The presence of construction vehicles, material stockpiles and movement of construction vehicles will be further uncharacteristic features of the view. Works to divert Chorlton Lane, which currently crosses the WCML via an underbridge, will be prominent in close range views. This construction activity will result in a loss of existing trees and hedgerows within a landscape, which despite proximity to the WCML, is currently rural in outlook. Residents on Chorlton Lane will have ground and particularly upper floor views of the works, with little intervening vegetation to provide screening.

Construction of the Proposed Scheme will result in a **high magnitude of visual change and major adverse effect**, which is significant.

View south-west from Waybutt Lane and Chorlton Lane junction

(VP 026.02.006)

Residents and users of Chorlton Footpath 10, Wychwood Park Golf Course, Chorlton Lane and Waybutt Lane will have close range views towards the extensive and complex construction works associated with the Proposed Scheme, including the HS2 spurs (northbound and southbound), the new section of the WCML, the Chorlton North embankment, Chorlton Lane diversion, Chorlton retaining walls, other embankments and cuttings, noise barriers, associated earthworks and landscape bunds. These works, and the presence of construction equipment, material stockpiles and movement of construction vehicles will substantially change the current outlook, which despite proximity to the WCML, is currently rural in character. Residential receptors on the edge of Wychwood Park will have views of the works from the ground and upper floors. The works associated with the landscape bunds along Waybutt Lane and Chorlton Lane, and works to close Chorlton Lane, will be particularly prominent in views from Bridge Cottage and the edge of Wychwood Park.

Construction of the Proposed Scheme will result in a **medium magnitude of visual change and moderate adverse effect**, which is significant.

View west from the South Cheshire Way/ Two Saints Way

(VP 026.03.13)

Users of Chorlton Footpath 7 and Chorlton Footpath 9 (South Cheshire Way) and the Two Saints Way and transport receptors on Chorlton Lane will have close range views of the HS2 spurs (northbound and southbound), new section of WCML, Chorlton Footpath 7 overbridge, modifications to the WCML, Crewe South cutting, Chorlton Lane diversion and associated earthworks. The existing brick-built Chorlton Footpath 7 overbridge will be demolished and the South Cheshire Way/Two Saints Way diverted. The two existing ponds will be infilled. These works, and the presence of construction equipment, and movement of construction vehicles will intensify the effects of the WCML and completely change the mid-ground view beyond. The construction activity will result in new features that form prominent, incongruous elements in the views across the medium/large-scale farmland, interrupting the characteristic hedgerow field boundaries and the rural, relatively open visual character.

Construction of the Proposed Scheme will result in a **high magnitude of visual change and major adverse effect**, which is significant.

Views east from farmland south of Heath Farm

(VPs 026.02.011)

Residents and users of Chorlton Footpath 7 and the South Cheshire Way/Two Saints Way will have close to medium range views towards construction works associated with the Crewe South cutting, HS2 spurs, new section of the WCML, Chorlton Lane diversion and Chorlton Footpath 7 overbridge, two balancing ponds and landscape bunds. The existing Chorlton Footpath 7 overbridge will be demolished and the South Cheshire Way/Two Saints Way will be diverted at this point. The presence of Heath Farm satellite compound, material stockpiles, construction equipment and movement of construction vehicles will completely change the current rural outlook across open farmland in which the WCML currently has a relatively unobtrusive presence. Users of the nearby South Cheshire Way and Two Saints Way will have wide ranging views of the works. Views will be dominated by the construction activity, particularly the construction of the new balancing ponds, and extensive habitat creation areas, as well as the Chorlton Lane diversion works. Some views of the construction works will be filtered by the line of mature poplar trees along the access track to Heath Farm, but views will be mainly open.

Construction of the Proposed Scheme will result in a **high magnitude of visual change and major adverse effect**, which is significant.

View west from Basford Footpath 6

(VP 026.03.020)

Users of Basford Footpath 6 (South Cheshire Way/ Two Saints Way) and Newcastle Road will have close range and slightly elevated views of construction activity associated with the realigned Newcastle Road, and mid-range views towards the construction of the Casey Lane diversion. The Chorlton cutting satellite compound and Creamery Bridge satellite compound will be visible in the mid-ground. In the distance, there will be views of construction activity associated with the Newcastle Road overbridge, Crewe South portal retained cutting, a new section of WCML and associated earthworks. These works, the presence of material stockpiles, construction equipment and movement of construction vehicles will foreshorten views and introduce new incongruous elements in the views across the open arable farmland. The scale and proximity of the works in this location, will alter the current rural outlook.

Construction of the Proposed Scheme will result in a **high magnitude of visual change and major adverse effect**, which is significant.

View west and north from Newcastle Road near Basford Cottage and Basford Footpath 4

(VP 026.02.21)

Residents and users of the footpath will have close range views of construction works, associated with the Crewe South portal retained cutting, HS2 spurs, modifications to the WCML, a new section of WCML and the realigned Newcastle Road and Newcastle Road overbridge. The Chorlton cutting satellite compound and Creamery Bridge satellite compound will also be visible. These works, material stockpiles and the presence of construction equipment and movement of construction vehicles will substantially change the outlook from this viewpoint, which apart from the existing outdoor storage yard and industrial units, is mostly rural in character. Demolition of the existing Newcastle Road overbridge and embankments and removal of a section of carriageway will further contribute to the complete change in outlook that will be experienced in this location.

Construction of the Proposed Scheme will result in a **high magnitude of visual change and major adverse effect**, which is significant.

View east from residences along Newcastle Road near Hough

(VP 026.02.022)

Residents and users of Newcastle Road will have close range views of construction activities associated with the Crewe South portal retained cutting, HS2 spurs, modifications to the WCML, a new section of WCML, the realigned Newcastle Road and Newcastle Road overbridge, associated earthworks and landscape bunds. The Crewe South portal satellite compound will also be visible to the rear of the properties. The current outlook across arable fields will be replaced by large scale construction activity, although there will be some filtering of views by the garden vegetation, particularly to the rear. These works, presence of construction equipment and movement of construction vehicles will introduce prominent, incongruous elements in the views across the arable farmland. This will interrupt the characteristic hedgerow field boundaries, small blocks of woodland and the rural, relatively open visual character.

Construction of the Proposed Scheme will result in a **high magnitude of visual change and major adverse effect**, which is significant.

Views east along Newcastle Road on the edge of Hough

(VP 026.02.028)

Residents and users of Regional Cycle Network Route 70 and users of Newcastle Road and Back Lane will have close range views of the construction works associated with the realigned Newcastle Road, Newcastle Road overbridge and associated earthworks. The current outlook across arable fields will be replaced by large scale construction activity, largely to the north of the road. From the upper floors of the properties, residents will also have views of the Crewe South portal satellite compound and more extensive views of construction of the Newcastle Road overbridge. These works, presence of construction equipment and movement of construction vehicles will introduce prominent, incongruous elements in the views across the arable landscape, interrupting the characteristic hedgerow field boundaries and the rural, relatively open visual character.

Construction of the Proposed Scheme will result in a **high magnitude of visual change and major adverse effect**, which is significant.

View north-east from farmland close to Casey Lane

(VP 027.02.004)

Residents and users of Basford Footpath 10 and Casey Lane will have close to medium range views of construction activity associated with the Crewe South portal retained cutting, HS2 spurs, a new section of WCML, the realigned Newcastle Road and Newcastle Road overbridge, and associated earthworks. The Crewe South portal satellite compound will also be visible to the front of the properties. The current outlook across arable fields will be replaced by large scale construction activity, although there will be some filtering of views by garden vegetation. These works, the presence of construction equipment and movement of construction vehicles will introduce prominent, incongruous elements in the views across the arable landscape, interrupting the characteristic hedgerow field boundaries and the rural, relatively open visual character.

Construction of the Proposed Scheme will result in a **high magnitude of visual change and major adverse effect**, which is significant.

View north-east from farmland east of Back Lane

(VP 027.02.002)

Residents and users of Basford Footpath 10 will have close to medium range views of the Crewe South portal satellite compound and construction of a balancing pond and associated access track, which will help screen mid-ground views of construction activity associated with modifications to the WCML, new section of WCML and the Crewe South portal retained cutting beyond. There may also be distant views of the realigned section of Newcastle Road. Residents at Sutch Farm will have extensive ground floor and upper floor views of the works. Most of the works will be at grade, which will require less change to the local landform, but the presence of materials stockpiles, construction equipment and movement of construction vehicles will result in new incongruous features in the views across the open arable farmland. Part of the satellite compound will be screened by the properties on Casey Lane, but generally it will be prominent in views.

Construction of the Proposed Scheme will result in a **medium magnitude of visual change and moderate adverse effect**, which is significant.

View west from farmland east of Casey Lane

(VP 027.03.019)

Users of Basford Footpath 3 will have close to medium range views of the construction works associated with the diverted section of Casey Lane and a balancing pond and associated access track. A small woodland block will be removed. These works, together with the presence of the Casey Lane East satellite compound (on the site of the former woodland) and a large materials stockpile will screen most views of the construction activity associated with the modifications to the WCML, the new section of WCML and the Crewe South portal beyond. Users of the footpath will also have distant southerly views towards the realigned section of Newcastle Road. Most of the works will be at grade, which will require less change to the local landform, but the material stockpiles and the presence of construction equipment and movement of construction vehicles will result in new incongruous features in the views across the open arable farmland.

Construction of the Proposed Scheme will result in a **medium magnitude of visual change and moderate adverse effect**, which is significant.

View east from Weston Lane near Basford Hall

(VP 027.02.013)

Residents and users of Weston Lane will have close range views towards the construction activity associated with the modifications to the WCML and realignment of the WCML to Basford Hall sidings, new section of WCML, additional WCML railway systems equipment and associated access track. The Basford Hall southbound satellite compound and a large materials stockpile will be visible on the opposite side of the road and the southern roadside hedgerow will be removed. These new incongruous features will interrupt views and change the character of the otherwise rural outlook from Basford Hall and Larch Farm, although ground floor views will continue to be partially screened by the tall hedgerows on the north side of the road.

Construction of the Proposed Scheme will result in a **high magnitude of visual change and major adverse effect**, which is significant.

View south-east from junction of Casey Lane and Weston Lane

(VP 027.02.014)

Residents and users of Regional Cycle Route 70 and Basford Footpath 1, Casey Lane and Weston Lane will have close range views of the construction works associated with the diverted section of Casey Lane and mid-range views of the Casey Lane East satellite compound. Views will be more extensive from the upper floor of Dairy House Farm. These works, loss of hedgerows and trees along the south side of Weston Lane and along Casey Lane (between Casey Lane and the WCML), associated earthworks, and the presence of construction equipment and movement of construction vehicles will introduce prominent and incongruous elements in the views across the arable farmland, interrupting the characteristic hedgerow field boundaries and the rural, relatively open visual character. Views will, however, be partially screened and filtered by intervening mature trees in front of Dairy House and along the north side of Weston Lane.

Construction of the Proposed Scheme will result in a **medium magnitude of visual change and moderate adverse effect**, which is significant.

View north from farmland near Larch Avenue

(VP 027.02.012)

Residents and users of Basford Footpath 11 will have oblique close to mid-range views towards the Basford cutting transfer nodes and batching plant. However, the viewpoint is also representative of views from properties along Larch Avenue. From here, residents will also experience more extensive, close and mid-range views towards the Basford cutting main compound and temporary workers accommodation, in addition to the transfer nodes and batching plant. These elements of the Proposed Scheme will occupy much of the large arable field close to the A500 Shavington Bypass. The loss of mature trees and hedgerows will substantially alter the current outlook from the properties, which despite proximity to major road and rail lines, retains a largely rural character and with partly intact field pattern. Movement of construction vehicles will intensify the effects of traffic movements on the A500 Shavington Bypass.

Construction of the Proposed Scheme will result in a **high magnitude of visual change and major adverse effect**, which is significant.

Construction (at night)

At night, the lighting associated with the Basford cutting main compound and temporary workers accommodation will be visible in mid-range views and will intensify the existing light spill from the A500 Shavington Bypass and urban area of Crewe. The extent of the new lighting will introduce a **medium magnitude of visual change and moderate adverse effect**, which is significant.

View north from farmland next to Weston Lane

(VP 027.02.010)

Residents and users of Weston Lane will have mid-range views of the Basford cutting main compound and temporary workers accommodation. These elements of the Proposed Scheme will occupy two large arable fields close to the A500 Shavington Bypass, resulting in loss of mature trees and hedgerows and substantially altering the mid-ground view. There will, however, be some screening and filtering of views by hedgerows and mature trees along the intervening field boundary. Overall, however, the construction activity associated with the main compound will be very prominent and will change the outlook from the rear of these properties.

Construction of the Proposed Scheme will result in a **high magnitude of visual change and major adverse effect**, which is significant.

Construction (at night)

At night, the lighting associated with the Basford cutting main compound and temporary workers accommodation will be visible in mid-range views and will intensify the existing light spill from the A500 Shavington Bypass and urban area of Crewe. The extent of the new lighting will introduce a **medium magnitude of visual change and moderate adverse effects** on these residents, which is significant.

Other mitigation measures

- 11.4.12 To 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 will 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

- 11.4.13 The temporary residual significant effects during construction remain as described above. These effects will be temporary and reversible in nature lasting only for the duration of the construction works. These residual effects will generally arise from the widespread presence of construction activity and construction plant within the landscape and viewed from surrounding residential receptors, and users of PRow and main roads within the study area.
- 11.4.14 The following significant landscape effects will remain after implementation of construction phase mitigation:
- major adverse significant effects in relation to two LCAs;
 - moderate adverse significant effects in relation to two LCAs;
 - major adverse significant effects at 18 residential viewpoint locations;
 - major adverse significant effects at three recreational viewpoint locations;
 - moderate adverse significant effects at five residential viewpoint locations;
 - moderate adverse significant effects at three recreational viewpoint locations;
 - and
 - moderate adverse significant night-time effects at two residential viewpoint locations.

Cumulative effects

- 11.4.15 No significant cumulative temporary or permanent effects during construction are anticipated.

11.5 Permanent effects arising during 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. Permanent changes within the landscape and views caused by the construction are assessed in this section.

Avoidance and mitigation measures

- 11.5.2 The operational assessment of impacts and effects is based on year 1 (2027), year 15 (2042) and year 60 (2087) of the Proposed Scheme. A process of iterative design and assessment has been employed to avoid or reduce adverse effects during the operation of the Proposed Scheme. Measures that will be incorporated into the design of the Proposed Scheme include:

- design of earthworks (such as the earthworks associated with the Checkley North embankment, Crewe South cutting, Blakenhall Northbound Spur embankment and cutting, Blakenhall Southbound Spur embankment, Chorlton embankment (North and South), Blakenhall cutting, Chorlton cutting and Basford cutting) to tie the engineering earthworks for embankments and cuttings into their wider landscape context and to mitigate views of structures and overhead line equipment from sensitive receptors where reasonably practicable. The design of earthworks will have regard to their relationship to surrounding land uses and management, such as agriculture;
- compensatory woodland planting, using the same species composition and planting types, to provide enhanced landscape and green infrastructure connectivity, as well as connectivity of historic designed landscape features where reasonably practicable. Areas where more extensive mitigation planting will be introduced include around prominent structures, such as the Checkley Lane overbridge, Den Lane Central underbridge, Den Lane East viaduct, Den Lane West viaduct, the new section of the WCML, along the Proposed Scheme and WCML (west of Chorlton), around the Newcastle Road overbridge and around the diverted section of Casey Lane;
- hedgerow replacement and restoration in areas of loss to restore habitat connectivity and landscape pattern where reasonably practicable and to integrate the Proposed Scheme mitigation into the wider landscape character; and
- replacement of field ponds and wetland habitats with new wetlands, ecological ponds and biodiversity wetland features.

Assessment of impacts and effects

- 11.5.3 The likely effects on landscape and visual receptors during operation of the Proposed Scheme relate to the presence of new structures and elements in the landscape

including viaducts, embankments, overbridges, underbridges, road and PRoW realignments and diversions. Other aspects include the presence of overhead line equipment, noise fence barriers, and the presence of the South Crewe mid-point auto-transformer station. Landscape bunds and new planting will also influence how the Proposed Scheme affects landscape and visual receptors.

Landscape assessment

- 11.5.4 The four LCAs set out in Table 29 will be significantly affected during operation. Full details of effects are described in Volume 5: Appendix LV-001-005, Part 2.

Table 29: Operational phase significant landscape effects

Madeley Valley	Medium-high susceptibility and medium-high sensitivity
The Madeley Valley LCA lies primarily within the Whitmore Heath to Madeley area (CA4), but a small part of the LCA will be crossed by the Proposed Scheme in the South Cheshire area. Assessment of effects on the Madeley Valley LCA during operation of the Proposed Scheme is included in the Volume 2: Community area 4, Whitmore Heath to Madeley, Section 11, Landscape and visual.	
The Grange Lower Farms and Woods	Low-medium susceptibility and low-medium sensitivity
Year 1:	
The landscape will be directly impacted by the presence of the HS2 spurs and associated cuttings as they start to diverge from the HS2 main line north of Grange Farm. The LCA will also be indirectly impacted by the presence of the Checkley Lane diversion and Checkley Lane overbridge. This is a large scale landscape, which to a degree can absorb the scale of the new infrastructure, although views of the overhead line equipment and noise disturbance caused by passing trains will reduce the perception of tranquillity and seclusion experienced in this landscape. New linear belts of scrub and woodland along the west side of the HS2 spur (northbound) and around the Checkley Lane overbridge will in time help to reduce these effects.	
Operation of the Proposed Scheme will give rise to a medium magnitude of change and moderate adverse effect on the LCA, which is significant.	
Year 15 and year 60:	
Operation of the Proposed Scheme in year 15 will reduce to non-significant and remain so in year 60 as the mitigation planting matures and helps to screen and integrate the HS2 spur embankments and cuttings, as well as Checkley Lane overbridge embankments, as reported in Volume 5: Appendix LV-001-004.	
Blakenhall Lower Farms and Woods	Medium susceptibility and medium sensitivity
Year 1:	
This is a large LCA with a pattern and scale of land cover that can absorb the scale of the new infrastructure. As a result the magnitude of change on the landscape of this LCA as a whole will be medium. Close to the Proposed Scheme, however, the effects will be higher, due to the complexity of the new infrastructure and presence of uncharacteristic features such as retaining walls and the Blakenhall and Chorlton viaducts. The Proposed Scheme will locally intensify the effects of the WCML in terms of reduction in tranquillity and scenic quality as they will both run in proximity through the LCA, although the presence of landscape bunds and noise fence barriers will help contain some of the effects.	
An area of farmland between the WCML and the Proposed Scheme will be encircled by rail infrastructure, which in addition to the reduction in scenic quality, will increase the sense of severance and reduce the perception of tranquillity and seclusion through visual intrusion and intermittent noise disturbance from passing trains. The slopes of the Blakenhall Northbound spur embankment and Chorlton South embankment will be partially planted to help integrate them within the wider landform.	
Operation of the Proposed Scheme in year 1 will result in a medium magnitude of change and moderate adverse effect on the LCA, which is significant.	

Year 15 and year 60:

Operation of the Proposed Scheme in year 15 will reduce to non-significant and remain so in year 60 as the extensive mitigation planting around the HS2/WCML corridor matures and the new structures, earthworks and landscape bunds become more integrated within the landscape, as reported in Volume 5: Appendix LV-001-004.

Shavington/Crewe Outer Fringe Lower Farms and Woods	Low-medium susceptibility and low-medium sensitivity
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Year 1:

The central part of this LCA will be directly affected by the presence of the Crewe South portal, Crewe South cutting, Newcastle Road realignment and Newcastle Road overbridge, and diversion of Casey Lane. In year 1, the Newcastle Road overbridge and associated embankments will be a very apparent landscape feature, which will substantially change the character of the local landscape in terms of both landform and pattern of land cover, with severance of the historic hedgerow field pattern and interruption of landscape scale across the valley. The diversion of Casey Lane will have a similar but less marked impact on the character of the landscape east of the WCML near Basford Brook. The Crewe South portal retained cutting will be less visible in the wider landscape, but will nevertheless will alter the local landform.

The intactness and scenic quality of the farmland has been affected by views of new settlement and electricity pylons as well as by 20th century agricultural intensification. The scale and prominence of the new infrastructure will intensify these effects in terms of further reduction in scenic quality and tranquillity, and increased perception of severance. To mitigate this, extensive planting is proposed around the Newcastle Road overbridge, along the diverted section of Casey Lane and around the HS2/WCML corridor.

Operation of the Proposed Scheme in year 1 will result in a **medium magnitude of change and moderate adverse effect** on the LCA, which is significant.

Year 15 and year 60:

Operation of the Proposed Scheme in year 15 will reduce to non-significant and remain so in year 60 as the extensive mitigation planting around the Crewe South portal retained cutting, Crewe south cutting, landscape bund and Newcastle Road overbridge matures and results in a new wooded landscape around the Proposed Scheme. Although the local landscape character will change from open farmland to woodland, it will still be rural in context as reported in Volume 5: Appendix LV-001-005.

Visual assessment

Introduction

- 11.5.5 The following section describes the likely significant effects on visual receptors during operation year 1, year 15 and year 60. 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, will be in leaf. Winter and summer scenarios are, therefore, considered for year 1 and summer scenarios for year 15 and year 60, to capture worst case and best case. Likely significant effects on residential receptors from additional lighting at night-time are also identified. Non-significantly affected visual receptors are reported in Volume 5: Appendix LV-001-005.
- 11.5.6 Where a viewpoint represents multiple types of receptor, the assessment is based on the most sensitive receptor. Effects on other receptor types with a lower sensitivity will be lower than those reported.
- 11.5.7 The assessment has not identified any locations within this study area where additional lighting in operation of the Proposed Scheme will result in significant visual effects at night.

- 11.5.8 The assessment has identified locations where the operation of the Proposed Scheme will result in significant effects (summarised in Table 30 and described in detail in the relevant proformas in Volume 5: Appendix LV-001-005, Part 3).

Table 30 : Operational phase significant visual effects

<p>View north and east from farmland north of Checkley Brook (VP 024.03.001)</p> <hr/> <p>Year 1 winter and summer:</p> <p>Users of Checkley cum Wrinehill Footpath 4 will have close range views of the overhead line equipment and passing trains on the Checkley North embankment. The embankment slopes will be slackened and the lower sections planted, but they will still dominate most of the field of view and create an incongruous new skyline feature. Combined with the loss of existing landscape features, including some trees and hedgerows, the current rural outlook across large undulating pastures will be completely altered. This is an open view with little intervening vegetation to provide additional screening of the Checkley North embankment in summer.</p> <p>Operation of the Proposed Scheme in year 1 will result in a high magnitude of visual change and major adverse effect, which is significant.</p> <p>Year 15:</p> <p>The Proposed Scheme will become less noticeable in the view by year 15 as the mitigation planting on the lower slopes of the Checkley North embankment matures and helps to both screen and filter views, and integrate the new landform within its wider visual context.</p> <p>Operation of the Proposed Scheme in year 15 will reduce to a medium magnitude of visual change and moderate adverse effect, which is significant.</p> <p>Year 60:</p> <p>The mitigation planting will be mature and the embankment will be better integrated within its visual context but, due to its scale, the Checkley North embankment will remain prominent in the view.</p> <p>Operation of the Proposed Scheme in year 60 will remain a medium magnitude of visual change and moderate adverse effect, which is significant.</p> <hr/> <p>Views east from farmland east of Turncocks Lane (VP 024.02.019)</p> <hr/> <p>Year 1 winter and summer:</p> <p>Residents and users of Checkley cum Wrinehill Footpath 4 will have close to medium range views of upper parts of the overhead line equipment and passing trains on the Checkley North embankment and Checkley Brook viaduct. The embankment slopes will be slackened and the lower sections planted but they will still be prominent and will foreshorten views across the rolling fields. There will also be views of the Checkley Lane overbridge and associated road embankments. Some of the longer views, however, will be screened by the intervening landform. This is an open view, with little intervening vegetation to provide summer screening.</p> <p>Operation of the Proposed Scheme in year 1 will result in a medium magnitude of visual change and moderate adverse effect, which is significant.</p> <p>Year 15 and year 60:</p> <p>Operation of the Proposed Scheme in year 15 will reduce to non-significant and remain so in year 60 as the mitigation planting along the lower slopes of the Checkley North embankment matures and helps screen views and integrate the embankment and Checkley Brook viaduct within the wider visual context as reported in Volume 5: Appendix LV-001-005.</p> <hr/> <p>Views north-east from Checkley Lane and Turncocks Lane (VP 024.02.010)</p> <hr/> <p>Year 1 winter and summer:</p> <hr/>

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Residents and users of Checkley cum Wrinehill Footpaths 4 and 16, Checkley Lane and Turncocks Lane will have close to medium range views of upper parts of the overhead line equipment and passing trains on the Checkley North embankment. The embankment slopes will be slackened, but will still be prominent and will foreshorten views across the rolling fields. There will also be views of the Checkley Lane overbridge and associated road embankments. Additionally, residents at the bungalow on Checkley Lane close to the viewpoint will have close range views of the Checkley Lane diversion. Existing hedgerows and trees present in the view will be removed. Some of the longer views, however, will be screened by the intervening landform. As most of the foreground vegetation will have been removed, there will be no additional screening or filtering of views in summer.

Operation of the Proposed Scheme in year 1 will result in a **medium magnitude of visual change and moderate adverse effect**, which is significant.

Year 15 and year 60:

Operation of the Proposed Scheme in year 15 will reduce to non-significant and remain so year 60 as the roadside mitigation planting and extensive planting around the Checkley North embankment and Checkley Lane overbridge matures and helps screen views and integrate the structures into the wider visual context as reported in Volume 5: Appendix LV-001-005.

View south-west from Checkley Lane near Randilow Farm

(VP 024.02.008)

Year 1 winter and summer:

Residents and road users will have close range views of passing vehicles on the Checkley Lane overbridge and mid-range views of the overhead line equipment on the Checkley North embankment. The realigned section of Checkley Lane will lie further from the viewpoint than at present, but the outlook, particularly to the south, will be quite different to that presently experienced, with a new road passing through what is currently an open arable field. As most of the foreground vegetation will have been removed, there will be no additional screening or filtering of views in summer.

Operation of the Proposed Scheme in year 1 will result in a **medium magnitude of visual change and moderate adverse effect**, which is significant.

Year 15 and year 60:

Operation of the Proposed Scheme in year 15 will reduce to non-significant and remain so in year 60 as the mitigation planting around the Checkley Lane overbridge matures and helps screen views and integrate the overbridge and the realigned section of Checkley Lane within the wider visual context as reported in Volume 5: Appendix LV-001-005.

The view of the Proposed Scheme from viewpoint 024.02.008 during year 15 operation (summer) is illustrated on the photomontage shown in figure LV-01-660 (Volume 5: Appendix LV-001-005).

Views north-east from residences along Mill Lane and Blakenhall Footpath 4

(VP 025.02.003)

Year 1 winter and summer:

Residents and users of Blakenhall Footpath 4 will have close to medium range views across the roadside hedgerows of the overhead line equipment and passing trains on the HS2 spur (northbound), as well as trains on the Den Lane West viaduct. Upper storey views from the properties will be more extensive. The new features in the view, combined with changes to the landform and loss of existing landscape features, including hedgerows, trees and field boundaries, will change the outlook from this viewpoint. Views will, however, be partially obscured and filtered by the intervening hedgerows and scattered field and hedgerow trees, particularly in summer.

Operation of the Proposed Scheme in year 1 will result in a **medium magnitude of visual change and moderate adverse effect**, which is significant.

Year 15 and year 60:

Operation of the Proposed Scheme in year 15 will reduce to non-significant and remain so in year 60 as the extensive mitigation planting around the various elements of the Proposed Scheme described above matures and helps to screen views of the overhead line equipment and passing trains on the HS2 spur (northbound) as reported in Volume 5: Appendix LV-001-005.

View south-west from Den Lane near Higher Den Farm

(VP 025.02.001)

Year 1 winter and summer:

Residents and users of Blakenhall Bridleway 9 and Blakenhall Footpath 9 and Den Lane will have views of the overhead line equipment and passing trains on the Blakenhall Southbound spur embankment. There will also be views of the realigned Den Lane and trains on the Den Lane East viaduct. Upper storey views from Higher Den Farm, which occupies a more elevated situation than the viewpoint, will be more extensive. The slopes of the Blakenhall Southbound Spur embankment will be slackened and partially planted to help integrate it within the surrounding landscape, but it will still be a prominent, incongruous feature with loss of landscape features including trees, hedgerows and field boundaries. There will also be views of the restored borrow pit landscape (including newly reinstated hedgerows). The Proposed Scheme will include the formation of new balancing ponds with associated access tracks, two of which will be visible from the farm. The extensive new mitigation planting will not provide any screening or landscape integration at this stage and there is little intervening vegetation to provide additional screening or filtering of views in summer.

Operation of the Proposed Scheme in year 1 will result in a **high magnitude of visual change and major adverse effect**, which is significant.

Year 15 and year 60:

Operation of the Proposed Scheme in year 15 will reduce to non-significant and remain so in year 60 as the extensive mitigation planting around and between the various elements of the Proposed Scheme described above (including on the lower slopes of the Blakenhall Southbound spur embankment), matures and helps to both filter views and integrate the Blakenhall Southbound spur embankment and road embankments within the wider visual context. The outlook will change from relatively open fields to woodland, but it will remain rural in context as reported in Volume 5: Appendix LV-001-005.

The view of the Proposed Scheme from viewpoint 025.02.001 during year 15 operation (summer) is illustrated on the photomontage shown in figure LV-01-661 (Volume 5: Appendix LV-001-005).

View south-west from WCML overbridge

(VP 025.02.007)

Year 1 winter and summer:

Residents at Lower Den Farm and users of the Blakenhall Bridleway 8 will have close range views of the realigned section of Blakenhall Bridleway 8 and Blakenhall Bridleway 8 accommodation overbridge and associated bridge embankments. The existing access track will be realigned and the existing overbridge removed. The most noticeable changes will be the tree losses and interruption and foreshortening of views across an open arable field in front of the farm by the grassed embankments of the new overbridge. Existing vegetation along the WCML will mostly screen views of Den Lane East viaduct to the south. In summer, foreground vegetation in full leaf will help filter some views of the Blakenhall Bridleway 8 accommodation overbridge.

Operation of the Proposed Scheme in year 1 will result in a **medium magnitude of visual change and moderate adverse effect**, which is significant.

Year 15 and year 60:

Operation of the Proposed Scheme in year 15 will reduce to non-significant and remain so in year 60 as the mitigation planting around the Blakenhall Bridleway 8 accommodation overbridge matures and helps screen views and integrate the overbridge within the wider visual context as reported in Volume 5: Appendix LV-001-005.

View north-east from farmland near Heath Farm

(VP 026.02.012)

Year 1:

Residents and users of Chorlton Footpath 8 will have close to medium range views of the diverted section of Chorlton Lane, the Chorlton Footpath 7 overbridge, newly planted landscape bunds and the balancing ponds. There may also be distant views to the north of the Newcastle Road overbridge. It is unlikely that the overhead line equipment of the Proposed Scheme will be visible due to the location of the line in cutting as it approaches the Crewe South portal retained cutting. Views will also continue to be filtered by the mature line of columnar poplar trees along the access track to Heath Farm and obstructed by the farm buildings. Mitigation planting will not provide any screening or

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landscape integration at this stage and the bunds and road diversion will be very apparent. The presence of these new features in the view will change the current rural outlook across arable fields.

Operation of the Proposed Scheme in year 1 will result in a **medium magnitude of visual change and moderate adverse effect**, which is significant.

The view of the Proposed Scheme from viewpoint 026.02.012 during year 1 operation (summer) is illustrated on the photomontage shown in figure LV-01-565 (Volume 5: Appendix LV-001-005).

Year 15 and year 60:

Operation of the Proposed Scheme in year 15 will reduce to non-significant and remain so in year 60 as the mitigation planting on the landscape bunds matures and helps to screen and integrate the elements of the Proposed Scheme described above within the wider visual context as reported in Volume 5: Appendix LV-001-005.

View east from the junction of Mill Lane and Den Lane

(VP 025.02.006)

Year 1 winter and summer:

Residents and users of the Den Lane and Mill Lane will have ground and upper floor close range views of the overhead line equipment and passing trains on the Blakenhall Northbound spur embankment. The lower parts of the embankment will be screened by the landscape bunds, but the upper parts will be prominent, and will interrupt views across well-treed farmland from the front of the properties and fundamentally change the skyline character. Although the slopes of the embankment will be slackened to help integrate them within the surrounding landscape, the Proposed Scheme will alter key characteristics of the view with loss of trees, hedgerows and field boundaries, and substantial changes to the gently rising landform. Views across the open farmland will be foreshortened. The realigned Den Lane and raised pylon overhead line will create further visual effects. In summer, views will be more filtered by the foreground hedgerows in full leaf, but the landscape bunds and Blakenhall Northbound spur embankment beyond will remain prominent.

Operation of the Proposed Scheme in year 1 will result in a **high magnitude of visual change and major adverse effect**, which is significant.

Year 15:

The Proposed Scheme will become less prominent within the view by year 15, as the extensive maturing mitigation planting helps to filter views and integrate the embankment and landscape bunds within the wider visual context. The outlook will change from relatively open arable fields and pastures to developing woodland, but it will remain rural in context. Views of passing trains and the overhead line equipment will be screened by the maturing vegetation. Due to the scale and proximity of the Blakenhall Northbound spur embankment, a sense of severance and foreshortening of views will remain.

Operation of the Proposed Scheme in year 15 will result in a **medium magnitude of visual change and moderate adverse effect**, which is significant.

Year 60:

Although the Blakenhall Northbound spur embankment will not be visible, there will be an ongoing sense of severance and foreshortening of views.

Operation of the Proposed Scheme in year 60 will result in a **medium magnitude of visual change and moderate adverse effect**, which is significant.

View north-east from Gonsley Green Farm

(VP 025.02.013)

Year 1 winter and summer:

Residents and users of the diverted section of Blakenhall Bridleway 12 will have close range views of newly planted landscape bunds, the South Crewe mid-point auto-transformer station and access track. Above and beyond the landscape bunds the overhead line equipment and passing trains on the Chorlton South embankment will extend across most of the view to the east. Whilst the lower parts of the embankment will be screened by the landscape bunds, the upper parts will be apparent. South of the bunds the Blakenhall viaduct will also be visible. Blakenhall Bridleway 12 will be diverted and the existing WCML overbridge demolished. The new features in the view, combined with changes to the landform and loss of existing landscape features, including hedgerows and mature trees, will intensify the effects of the WCML and change the current rural outlook across arable fields and pastures towards Chorlton and Wychwood Park. The pond to the rear of the Gonsley Green Farm will be reduced in size and the northern end of the landscape bund will impinge on views from the house and define new skyline views. In summer, views of the elements of the Proposed Scheme described above will remain largely unchanged due to the limited existing intervening vegetation to provide additional summer screening.

Operation of the Proposed Scheme in year 1 will result in a **high magnitude of visual change and major adverse effect**, which is significant.

The view of the Proposed Scheme from viewpoint 025.02.013 during year 1 operation (summer) is illustrated on the photomontage shown in figure LV-01-563 (Volume 5: Appendix LV-001-005).

Year 15:

The Proposed Scheme will become less prominent within the view by year 15, as the extensive mitigation planting continues to mature, helping to filter views and integrate the embankment and landscape bunds within the wider visual context. The outlook will change from relatively open fields to developing woodland, but it will remain rural in context. Views of passing trains and the overhead line equipment will be screened by the maturing vegetation. Due to the proximity of the wooded Chorlton south embankment, a sense of severance will remain, with loss of distant views.

Operation of the Proposed Scheme in year 60 will reduce to a **medium magnitude of visual change and moderate adverse effect**, which is significant.

Year 60:

Although the Chorlton South embankment will not be visible, there will be an ongoing sense of severance and loss of distant views.

Operation of the Proposed Scheme in year 60 will remain a **medium magnitude of visual change and moderate adverse effect**, which is significant.

View west from Chorlton Footpath 3 next to Waybutt Lane

(VP 026.02.002)

Year 1 winter and summer:

Residents in Wychwood Park and users of Chorlton Footpath 3 and Waybutt Lane will have close range views of the landscape bunds, which will screen most views of the Proposed Scheme beyond. Between the bunds, there will be views of the noise fence barriers on the Chorlton viaduct beyond the WCML, with the tops of passing trains and the overhead line equipment visible above. A section of Chorlton Footpath 3 will be diverted and the existing WCML overbridge removed. The mitigation planting will provide minimal screening or landscape integration at this stage, and the artificial landform of the bunds will be prominent in the view. There is little other intervening vegetation to provide additional screening or filtering of views in summer.

Operation of the Proposed Scheme in year 1 will result in a **high magnitude of visual change and major adverse effect**, which is significant.

Year 15 and year 60:

Effects will reduce to non-significant by year 15 and remain so in year 60 as mitigation planting on top of bunds matures and helps to screen views. Although the outlook will have changed from open fields to woodland, this is still a rural context as reported in Volume 5: Appendix LV-001-005.

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The view of the Proposed Scheme from viewpoint 026.02.002 during year 15 operation (summer) is illustrated on the photomontage shown in figure LV-01-662 (Volume 5: Appendix LV-001-005).

Views east from Chorlton Lane

(VP 026.02.004)

Year 1 winter and summer:

Residents and users of Chorlton Lane will have close range views of the newly planted landscape bunds and Chorlton Lane diversion. The Chorlton Lane underbridge will be closed. Noise fence barriers and the upper parts of the overhead line equipment of the Proposed Scheme will be prominent features. Beyond and slightly above this, the Chorlton retaining walls, overhead line equipment, and passing trains associated with the new section of the WCML will be prominent. The presence of these new features will completely change the outlook from this viewpoint and interrupt views to Wychwood Park. The removal of the existing vegetation along Chorlton Lane will create open views. Therefore, there will be little vegetation to provide additional screening and filtering of views in summer.

Operation of the Proposed Scheme in year 1 will result in a **high magnitude of visual change and major adverse effect**, which is significant.

Year 15:

By the summer of year 15, the large areas of maturing mitigation planting around Chorlton Lane will help to screen and filter views of the Proposed Scheme and the WCML beyond it, and additionally to integrate the new features within their landscape context. Although the outlook will have changed from open fields to developing woodland, the Proposed Scheme will create severance in the foreground of views.

Operation of the Proposed Scheme in year 15 will result in a **medium magnitude of visual change and moderate adverse effect**, which is significant.

Year 60:

Effects will reduce to non-significant by year 60 as the mitigation planting matures and helps to screen and integrate the Proposed Scheme and new section of WCML within the wider visual context as reported in Volume 5: Appendix LV-001-005.

View west from the junction of Chorlton Lane and Waybutt Lane near Chorlton Footpath 10

(VP 026.02.006)

Year 1 winter and summer:

Residents, users of Chorlton Footpath 10, Wychwood Park Golf Course, Waybutt Lane and Chorlton Lane will have close range views of the closed section of Chorlton Lane and the landscape bunds, which will screen most views of the Proposed Scheme beyond. Between the bunds there will be views of the noise fence barriers on the HS2 spurs (northbound and southbound) beyond the WCML, with the tops of passing trains and the overhead line equipment visible above. The loss of vegetation on the existing bunds (in order to raise the height of the bund) will be very apparent. Mitigation planting will not provide any screening or landscape integration at this stage and the artificial landform of the bunds will be noticeable in the view. The overhead line equipment of the Proposed Scheme will intensify that of the WCML. In summer, the foreground hedgerows in full leaf will help to screen views from Chorlton Lane and Waybutt Lane, but residential receptors on the edge of Wychwood Park will have views over the hedgerows towards the WCML.

Operation of the Proposed Scheme in year 1 will result in a **high magnitude of visual change and major adverse effect**, which is significant.

Year 15 and 60:

Operation of the Proposed Scheme in year 15 will reduce to non-significant and remain so in year 60 as the mitigation planting matures and helps to both screen views and integrate the new landscape bunds within their landscape context. Although the outlook will change from open fields to woodland, it will still be rural in context as reported in Volume 5: Appendix LV-001-005.

The view of the Proposed Scheme from viewpoint 026.02.006 during year 15 operation (summer) is illustrated on the photomontage shown in figure LV-01-662 (Volume 5: Appendix LV-001-005).

Views south-east from farmland south of Heath Farm

(VPs 026.02.011)

Year 1 winter and summer:

Residents and users of Chorlton Footpath 7 and South Cheshire Way/ Two Saints Way will have close to medium range views of the diverted section of Chorlton Lane, the Chorlton Footpath 7 overbridge and new landscape bunds. There may also be distant views to the north of the Newcastle Road overbridge. It is unlikely that the overhead line equipment of the Proposed Scheme will be visible as the line will be in cutting on approach to the Crewe South portal. The overhead line equipment of the new section of WCML and HS2 spur will intensify views of the existing WCML. Mitigation planting will not provide any screening or landscape integration at this stage and the bunds and road realignment will be prominent. The presence of these new features in the view will change the current rural outlook across arable fields and pastures towards the WCML. The loss of the existing foreground hedgerow means that there will be no additional screening or filtering of views in summer.

Operation of the Proposed Scheme in year 1 will result in a **medium magnitude of visual change and moderate adverse effect**, which is significant.

Year 15 and 60:

Operation of the Proposed Scheme in year 15 will reduce to non-significant and remain so in year 60 as the woodland mitigation planting next to the balancing pond and planting on the landscape bunds matures and helps to both screen and filter views of the overhead line equipment of the new section of WCML and HS2 spurs and integrate them within the wider visual context as reported in Volume 5: Appendix LV-001-005.

View west from farmland near Newcastle Road and Basford Brook

(VP 026.03.020)

Year 1 winter and summer:

Users of Basford Footpath 6 (South Cheshire Way/Two Saints Way) and Newcastle Road will have close range views towards the realigned section of Newcastle Road and mid-range views towards the diverted section of Casey Lane. The Newcastle Road overbridge and the overhead line equipment associated with the new section of WCML will be distantly visible against a backdrop of trees. Together these elements of the Proposed Scheme will introduce some incongruous new features in the views across the large-scale gently undulating and open arable farmland. There are few trees or shrubs to provide additional screening in the summer.

Operation of the Proposed Scheme in year 1 will result in a **medium magnitude of visual change and moderate adverse effect**, which is significant.

Year 15 and 60:

Operation of the Proposed Scheme in year 15 will reduce to non-significant and remain so in year 60 as the roadside hedgerow and hedgerow trees along the realigned section of Newcastle Road and diverted section of Casey Lane mature and help screen views and integrate these roads within the wider visual context as reported in Volume 5: Appendix LV-001-005.

View west from Newcastle Road

(VP 026.02.021)

Year 1 winter and summer:

Residents and users of Basford Footpath 4 will have foreground views of the closed section of the Newcastle Road. The existing overbridge will be demolished, the road embankments removed and the area planted. The southernmost properties in the cluster will have westerly views of the overhead line equipment of the HS2 spurs, which will intensify views of the WCML. The residents at Chorlton Bank Farm will have open mid-range views of the realigned section of the Newcastle Road to the north and the Newcastle Road overbridge to the north-west. The new section of road will interrupt mid-range skyline views across the gently rolling farmland towards woodland along Basford Brook, although views of passing traffic on the current road alignment will be substantially reduced. In summer, views from residential properties to the south of the closed section of the Newcastle Road will be more screened and filtered by foreground trees in full leaf, but there is little vegetation to provide screening from Chorlton Bank Farm.

Operation of the Proposed Scheme in year 1 will result in a **high magnitude of visual change and major adverse effect**, which is significant.

Year 15 and 60:

Operation of the Proposed Scheme in year 15 will reduce to non-significant and remain so in year 60 as the mitigation planting on the closed section of Newcastle Road matures and helps to screen views and integrate the road within the wider visual context. In time this will improve the setting of the Basford Cottage listed building and the outlook for residential receptors to the south of the road as reported in Volume 5: Appendix LV-001-005.

View east along the Newcastle Road near Hough

(VP 026.02.022)

Year 1 winter and summer:

Residents and users of the current road alignment will have their view along the road substantially altered as the existing overbridge will be demolished, the road embankments removed and the area planted. In time this will improve the setting of the outlook from the properties, particularly since views of passing traffic will be substantially reduced. To the rear of the properties, however, there will be close range views towards the realigned section of Newcastle Road as it rises up to the Newcastle Road overbridge. A landscape bund will screen views of passing traffic on the new road and mature trees along the rear garden boundary of the properties will also help screen views of the road embankments. Overall, however, the outlook will change from open fields to a prominent road embankment. In summer, garden vegetation in full leaf will provide additional screening and filtering of views.

Operation of the Proposed Scheme in year 1 will result in a **high magnitude of visual change and major adverse effect**, which is significant.

Year 15 and 60:

Operation of the Proposed Scheme in year 15 will reduce to non-significant and remain so in year 60 as the extensive mitigation planting around the realigned section of Newcastle Road, along the road embankments and between the properties and the Crewe South portal retained cutting (including on the new landscape bunds) matures and helps to screen views and integrate the road, its associated embankments and the upper parts of the Crewe South portal retained cutting within the wider visual context. The outlook to the rear and east of the properties will be one of woodland rather than open views across arable farmland, but it will still be rural in character as reported in Volume 5: Appendix LV-001-005.

Views west at south Cheshire Way/Two Saints Way

(VP 026.03.013)

Year 1 winter and summer:

Users of Chorlton Footpath 7 (South Cheshire Way) and the Two Saints Way and Chorlton Lane will have close range views of the additional overhead line equipment and passing trains, which will intensify views of the WCML. From the new Chorlton Footpath 7 overbridge, recreational receptors on the South Cheshire Way/Two Saints Way will have views of a substantially widened rail corridor, although these views will be temporary and transient.

Operation of the Proposed Scheme in year 1 will result in a **medium magnitude of visual change and moderate adverse effect**, which is significant.

Year 15 and 60:

Operation of the Proposed Scheme in year 15 will reduce to non-significant and remain so in year 60 as the mitigation planting along the far side of the Proposed Scheme matures and forms a wooded backdrop to the rail infrastructure thereby helping to integrate it into the wider visual context as reported in Volume 5: Appendix LV-001-005.

Views west along Newcastle Road on the edge of Hough

(VP 026.02.028)

Year 1 winter and summer:

Residents and users of Regional Cycle Network Route 70 and Newcastle Road on the current road alignment will have close range views of the new section of Newcastle Road as it diverts away from the current alignment through arable fields. The current outlook will be substantially altered with views across the open fields replaced by a new road, a small balancing pond and areas of landscape planting and grassland habitat creation. A benefit of the Proposed Scheme is that traffic movements along the current road alignment will be substantially reduced, which will improve

the setting of these properties. In summer, garden vegetation in full leaf will provide additional screening and filtering of views.

Operation of the Proposed Scheme in year 1 will result in a **medium magnitude of visual change and moderate adverse effect**, which is significant.

Year 15 and 60:

Operation of the Proposed Scheme in year 15 will reduce to non-significant and remain so in year 60 as the roadside mitigation planting and woodland/scrub planting around the junction between the old and new sections of Newcastle Road matures and helps to screen views as reported in Volume 5: Appendix LV-001-005.

The view of the Proposed Scheme from viewpoint 026.02.028 during year 15 operation (summer) is illustrated on the photomontage shown in figure LV-01-649 (Volume 5: Appendix LV-001-005).

View north-east from farmland close to Casey Lane

(VP 027.02.004)

Year 1 winter and summer:

Residents and users of Basford Footpath 10 will have close to medium range views of the landscape bunds around the top of the Crewe South portal retained cutting and a new balancing pond and associated access track. They will also have more distant views of the realigned section of Newcastle Road, and the Newcastle Road overbridge beyond Casey Lane, but these new features will only give rise to a slight change in the background view. Views from the upper floors of the properties will be more extensive. At this early stage, the mitigation planting will not provide any screening or landscape integration and the new landforms will appear as uncharacteristic features in the view. In summer, garden vegetation in full leaf and trees along Casey Lane will provide additional screening and filtering of views.

Operation of the Proposed Scheme in year 1 will result in a **high magnitude of visual change and major adverse effect**, which is significant.

Year 15 and 60:

Operation of the Proposed Scheme in year 15 will reduce to non-significant and remain so in year 60 as the mitigation planting around the balancing pond and along the landscape bunds and Newcastle Road embankment matures and helps integrate these features within the wider visual context. The outlook will change from open farmland to woodland but it will still be rural in context as reported in Volume 5: Appendix LV-001-005.

View west from farmland east of Casey Lane

(VP 027.03.019)

Year 1 winter and summer:

Users of the Basford Footpath 3 will have their outlook across open fields replaced by a new road with areas of tree and shrub planting and grassland habitat creation. The new road will be an incongruous feature within the rural landscape. In the distance there will also be mid-range views of the realigned section of Newcastle Road. The new section of Casey Lane will interrupt longer views across the arable farmland. This is an open view with little intervening vegetation to provide screening or filtering of views in summer.

Operation of the Proposed Scheme in year 1 will result in a **medium magnitude of visual change and moderate adverse effect**, which is significant.

Year 15 and 60:

Operation of the Proposed Scheme in year 15 will reduce to non-significant and remain so in year 60 as the mitigation planting along the Casey Lane diversion matures and helps to screen and views and integrate the road within the wider visual context. The planting either side of Basford Footpath 3 will obstruct most views out from the path. The outlook will change from relatively open fields to developing woodland, but it will remain rural in context as reported in Volume 5: Appendix LV-001-005.

View north from farmland near Larch Avenue

(VP 027.02.012)

Year 1 winter and summer:

Residents and users of Basford Footpath 3 are highly unlikely to have any views of the Proposed Scheme during operation. Their outlook will have changed considerably, however, due to the removal of vegetation during construction. The existing viaduct and embankments supporting the A500 Shavington Bypass will be more visible and upper floors of the properties along Larch Avenue will have views of passing traffic. This is an open view with little intervening vegetation to provide screening or filtering of views in summer.

Operation of the Proposed Scheme in year 1 will result in a **medium magnitude of visual change and moderate adverse effect**, which is significant.

Year 15 and 60:

Operation of the Proposed Scheme in year 15 will reduce to non-significant and remain so in year 60 as the mitigation planting (replacement of trees and hedgerows), will help to screen and filter views of the A500 Shavington Bypass embankment and viaduct as reported in Volume 5: Appendix LV-001-005.

Other mitigation measures

- 11.5.9 The permanent effects of the Proposed Scheme on landscape and visual receptors have been reduced through incorporation of the measures described in this section. Effects in year 1 of operation may be further reduced by establishing planting early in the construction programme. This would provide additional screening and greater integration of the Proposed Scheme into the landscape. However, no other mitigation measures are considered practicable due to the high visibility of elements of the Proposed Scheme and the sensitivity of the surrounding receptors.

Summary of likely residual significant effects

- 11.5.10 In many cases, significant effects will reduce over time as the proposed mitigation planting matures and reaches its designed intention. However, the following likely residual significant effects will remain following year 15 of operation:
- moderate adverse effect on one LCA;
 - moderate adverse visual effects at three residential viewpoint locations; and
 - moderate adverse visual effect at one recreational viewpoint location.

Cumulative effects

- 11.5.11 No cumulative effects during operation on landscape and visual receptors have been identified in the South Cheshire area.

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 South Cheshire area.

12 Socio-economics

12.1 Introduction

- 12.1.1 This section reports on the environmental baseline, likely economic and employment impacts as well as significant effects during construction and operation of the Proposed Scheme within the South Cheshire area. The assessment considers existing businesses, community organisations, local employment and local economies, including planned growth and development.
- 12.1.2 Engagement with Staffordshire County Council (SCC) and 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.
- 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 can be found in the Volume 2: CA5 Map Book.
- 12.1.5 In addition, business and labour market data is presented in Background Information and Data (BID)¹⁵³, (BID-SE-001-000: Business and labour market data).

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)¹⁵⁴.

12.3 Environmental baseline

Existing baseline

Study area description

- 12.3.1 The following provides a brief overview in terms of employment, economic structure, labour market, and business premises availability within the South Cheshire area.
- 12.3.2 The South Cheshire area lies predominantly within the administrative area of CEC within the North West region of England and the Cheshire and Warrington Local Enterprise Partnership (LEP) area¹⁵⁵, with a small part of the study area falling in the administrative area of SCC.

¹⁵³ HS2 Ltd (2017), High Speed Two (HS2) Phase 2a (West Midlands - Crewe), Background Information and Data, Available online at: www.gov.uk/hs2

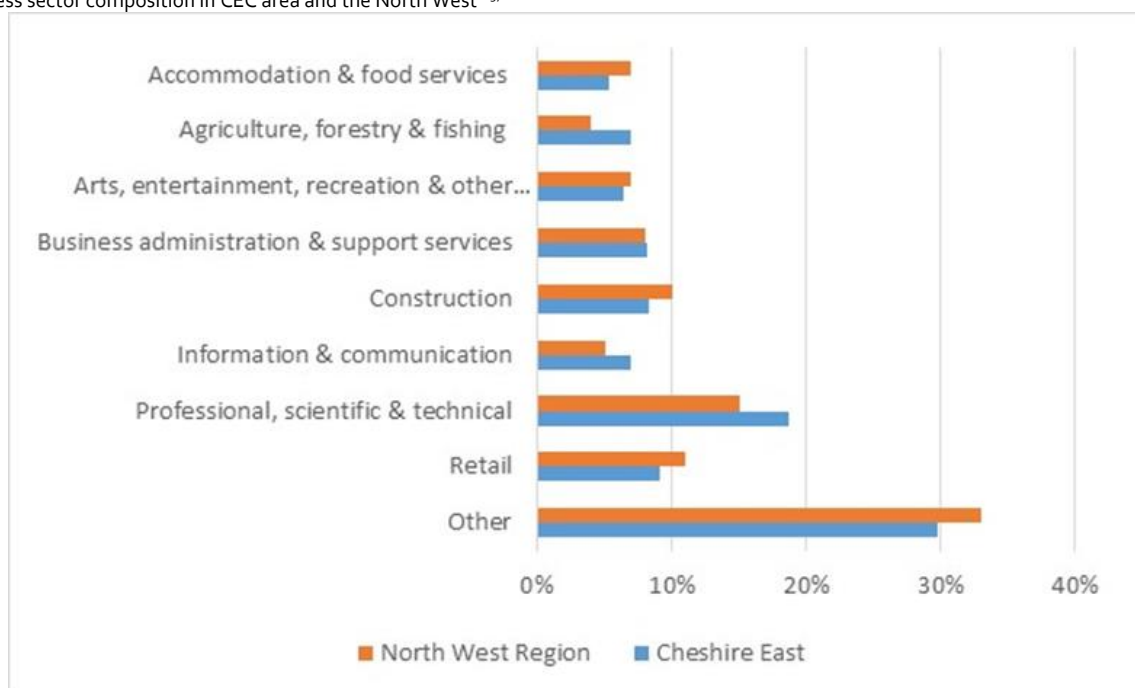
¹⁵⁴ Volume 5: Appendix CT-001-001, Environmental Impact Assessment Scope and Methodology Report.

¹⁵⁵ Cheshire and Warrington Local Enterprise Partnership, (2016), *European Structural and Investment Funds Strategy 2014-2020*.

Business and labour market

12.3.3 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 (19%), with retail the second largest (9%) followed jointly by construction and business administration and support services (8% each). This is shown in Figure 9. For comparison within the North West region, the largest sectors were professional, scientific and technical (15%), followed by retail (11%) and construction (10%)¹⁵⁶.

Figure 9: Business sector composition in CEC area and the North West ¹⁵⁷



12.3.4 In 2015¹⁵⁸, approximately 189,000 people worked in the CEC area. According to the Office for National Statistics Business Register and Employment Survey 2015, the top five sectors in terms of share of employment in CEC were: health (13%); professional, scientific and technical (12%); manufacturing (11%); retail (10%) and accommodation and food services (8%). These compare with the top five sectors for the North West region, which were: health (14%); retail (11%); manufacturing (10%); business administration and support services (9%) and education (9%). This is shown in Figure 10¹⁵⁹.

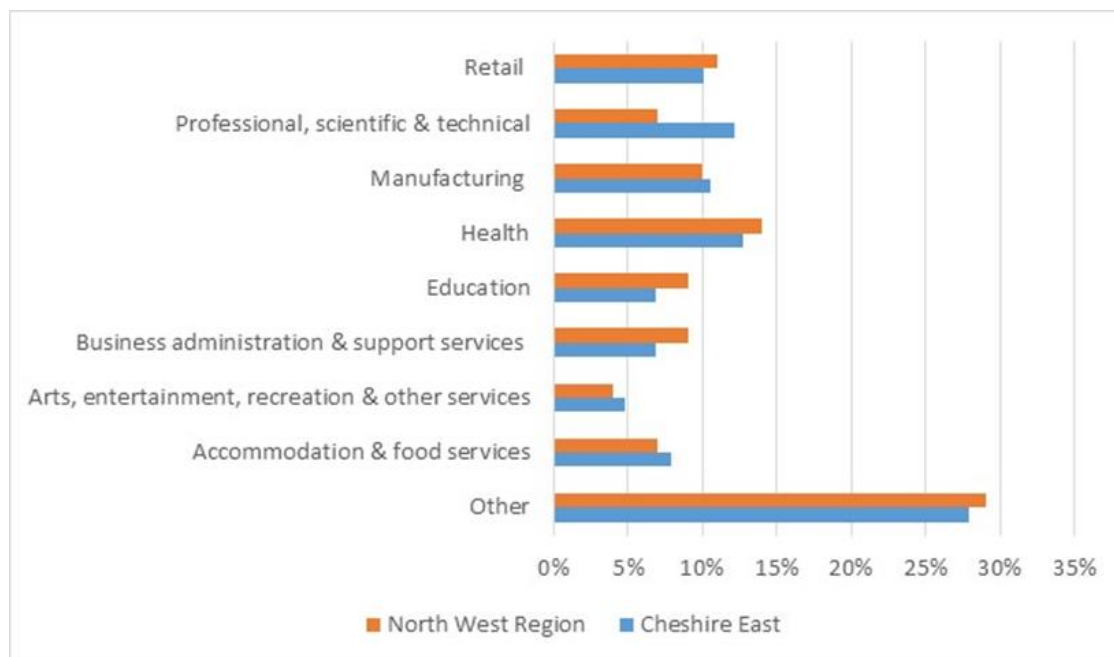
¹⁵⁶ Office for National Statistics; (2015); UK Business Count – Local Units; <http://www.nomisweb.co.uk>.

¹⁵⁷ "Other" includes: wholesale; health; manufacturing; property; transport and storage (including postal); financial and insurance; motor trades; education; public administration and defence; mining, quarrying and utilities.

¹⁵⁸ Office for National Statistics; (2015); Business Register and Employment Survey; <http://www.nomisweb.co.uk>

¹⁵⁹ Office for National Statistics; (2015); Business Register and Employment Survey; <http://www.nomisweb.co.uk>

Figure 10: Employment by industrial sector in the CEC area and the North West ¹⁶⁰



12.3.5 According to the Annual Population Survey (2016)¹⁶¹, the employment rate¹⁶² within the CEC area was 76% (172,100 people), which was higher than that recorded for both the North West (72%) and England (74%). In 2016, unemployment¹⁶³ in the CEC area was 4%, which was lower than the North West region (5%) and England (5%).

12.3.6 According to the Annual Population Survey (2015)¹⁶⁴, 39% of CEC residents aged 16-64 were qualified to National Vocational Qualification Level 4 (NVQ4) and above, compared to 34% in the North West and 38% in England, while 6% of residents had no qualifications, which was lower than that recorded both for North West (10%) and England (8%).

Property

12.3.7 A review of employment land in 2012¹⁶⁵ identified a need for 15.4ha per year to 2030 for general business land in the CEC area. The importance of developing a range of employment sites to support growth has been highlighted in the LEP Strategic Economic Plan.¹⁶⁶

¹⁶⁰ 'Other' includes construction; wholesale; transport and storage (inc postal); information and communication; financial and insurance; motor trades; public administration and defence; property; mining, quarrying and utilities; agriculture, forestry and fishing.

¹⁶¹ Annual Population Survey, (2016), NOMIS, <http://www.nomisweb.co.uk>.

¹⁶² 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'.

¹⁶³ Refers to people without a job who were available to start work in the two weeks following their interview and who had either looked for work in the four weeks prior to interview or were waiting to start a job they had already obtained. As the unemployed form a small percentage of the population, the APS unemployed estimates within local authorities are based on very small samples so for many areas would be unreliable. To overcome this ONS has developed a statistical model that provides better estimates of total unemployed for unitary authorities and local authority districts (unemployment estimates for counties are direct survey estimates), NOMIS.

¹⁶⁴ Annual Population Survey, (2016), NOMIS, <http://www.nomisweb.co.uk>.

¹⁶⁵ Arup (2012), Cheshire East Employment Land Review, Based on upper range (includes 30% flexibility factors) covering 2009-2030.

¹⁶⁶ Cheshire and Warrington LEP, Strategic Economic Plan and Growth Plan for Cheshire and Warrington (Draft as at 25 March 2014), <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 April 2017 has been assessed as 19% based on marketed space against known stock¹⁶⁷.

Future baseline

Construction (2020)

- 12.3.9 Volume 5: Appendix CT-004-000 provides details of the developments in the South Cheshire area that are assumed to have been implemented by 2020.
- 12.3.10 Implementation of all outstanding development consents and land allocations that can be built could result in approximately 11,900 additional jobs by 2020. The existing composition and numbers of employers, employees and economic sectors in the area is likely to change over time in ways that cannot be accurately forecast. These are considered in the cumulative assessment of the construction phase of the Proposed Scheme.

Operation (2027)

- 12.3.11 Volume 5: Appendix CT-004-000 provides details of the developments in the South Cheshire area that are assumed to have been implemented by 2027.
- 12.3.12 No additional committed developments have been identified in this area that will materially alter the baseline conditions in 2027 for business receptors.

12.4 Effects arising during construction

Avoidance and mitigation measures

- 12.4.1 The draft Code of Construction Practice¹⁶⁸ (CoCP) includes a range of provisions that will help mitigate socio-economic effects associated with construction within this area, including:
- reducing nuisance through sensitive layout of construction sites (Section 5);
 - consulting businesses located close to hoardings on the design, materials used and construction of the hoarding, to reduce impacts on access to and visibility of their premises (Section 12);
 - applying best practicable means (BPM) during construction works to reduce noise (including vibration) at sensitive receptors (including local businesses), 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

¹⁶⁷ 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).

¹⁶⁸ Volume 5: Appendix CT-003-000, Draft Code of Construction Practice.

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 a business's operations. Any resulting effects on employment are reported at a route-wide level (see Volume 3, Route-wide effects); and
- potential employment opportunities arising from construction in the local area (including in adjacent community areas).

Temporary effects

In-combination effects

12.4.3 No non-agricultural¹⁶⁹ businesses have been identified within the South Cheshire area that are expected to experience significant in-combination effects as a result of the Proposed Scheme.

Isolation

12.4.4 No non-agricultural businesses have been identified within the South Cheshire area that are expected to experience significant isolation effects as a result of the Proposed Scheme.

Construction employment

12.4.5 Three main compounds sites (Checkley Lane East, Basford cutting and Motorail Terminal) and 19 satellite construction compounds will be located in the South Cheshire area. These sites could result in the creation of up to 3,150 person years of construction employment opportunities¹⁷⁰, broadly equivalent to 310 full-time permanent jobs¹⁷¹, which depending on skill levels required and the skills of local people, are potentially accessible to residents in the locality and to others living further afield. The impact of the direct construction employment created by the Proposed Scheme has been considered as part of the route-wide assessment (see Volume 3, Route-wide effects).

12.4.6 Direct construction employment could also lead to opportunities for local businesses to supply the project or to benefit from expenditure of construction workers. The impact of the indirect construction employment creation has been considered as part of the route-wide assessment (see Volume 3, Route-wide effects).

¹⁶⁹ Possible employment loss in agricultural businesses as a result of the Proposed Scheme is being estimated at the route-wide level.

¹⁷⁰ 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.

¹⁷¹ Based on the convention that 10 employment years is equivalent to one full time equivalent job.

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

Permanent effects

Businesses

12.4.8 Businesses directly affected, comprising those that lie within land required for the Proposed Scheme, are reported in groups, where possible, to form defined resources based on their location and operational characteristics. A group could contain either one or a number of businesses reflecting the fact that a building may have more than one occupier or that similar businesses and resources are clustered together.

12.4.9 The following committed developments in

12.4.10 Table 31 include land affected by the Proposed Scheme. However, the layout/nature of the intended employment creating activities associated with these committed developments, and the areas of land on which they are proposed, makes it possible to accommodate the works in the land required by the Proposed Scheme without extinguishing these developments.

Table 31: Committed developments relevant to socio-economics

Map book reference ¹⁷²	Planning reference	Description
CA5/36	15/1537N	Mixed-use development comprising up to 325 dwellings and employment uses. Associated development includes a local community facility, retail uses, public house/restaurant, access, open space and landscaping.
CA5/24	14/0256N	Barn conversion into two dwellings with office facilities.
CA5/18	15/4224N	Industrial unit and erection of acoustic treatment to boundaries.
CA5/19	16/1987N	Industrial building.

12.4.11 No significant direct effects on non-agricultural employment have been identified within the area. The Proposed Scheme is not anticipated to result in the displacement or possible loss of jobs within this area.

Other mitigation measures

12.4.12 The assessment has concluded that there will be no significant adverse socio-economic effects arising during construction in relation to businesses directly affected by the Proposed Scheme.

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 is committed to working with its suppliers to build a skilled workforce that promotes further economic growth across the UK.

¹⁷² Volume 5: Appendix CT-004-000, Committed Developments

Summary of likely residual significant effects

- 12.4.14 There are no significant effects identified in the assessment that will arise during construction.

Cumulative effects

- 12.4.15 No significant cumulative temporary or permanent effects during construction are anticipated.

12.5 Effects arising from operation

Avoidance and mitigation measures

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

Assessment of impacts and effects

Resources with direct effects

- 12.5.2 There are no resources considered likely to experience significant direct socio-economic effects during the operation of the Proposed Scheme.

In-combination effects

- 12.5.3 No businesses have been identified within the area that are expected to experience significant in-combination effects as a result of the Proposed Scheme.

Operational employment

- 12.5.4 Direct operational employment created by the Proposed Scheme could lead to indirect employment opportunities for local businesses in terms of potentially supplying the Proposed Scheme or benefiting from expenditure of directly employed workers on goods and services.
- 12.5.5 The impact of operational employment creation has been assessed and reported at a route-wide level in Volume 3, Route-wide effects.

Other mitigation measures

- 12.5.6 No further mitigation measures have been identified for socio-economic receptors.

Summary of likely residual significant effects

- 12.5.7 There are no significant effects identified in the assessment that will arise during operation.

Cumulative effects

- 12.5.8 No cumulative socio-economic effects have been identified in the South Cheshire area during operation.

Monitoring

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

- 12.5.10 On the basis of there being no significant residual operational effects, there are no area-specific requirements for monitoring socio-economic effects during the operation of the Proposed Scheme in the South Cheshire area.

13 Sound, noise and vibration

13.1 Introduction

13.1.1 This section reports the assessment of the likely noise and vibration significant effects arising from the construction and operation of the Proposed Scheme within the South Cheshire area on:

- people, primarily where they live ('residential receptors') in terms of individual dwellings and on a wider community basis, including any shared community open areas¹⁷³; and
- community facilities such as schools, hospitals, places of worship, and also commercial properties, such as offices and hotels, collectively described as 'non-residential receptors' and 'quiet areas'¹⁷⁴.

13.1.2 Engagement with Cheshire East Council (CEC) and Staffordshire County Council (SCC) has been undertaken with respect to the sound, noise and vibration assessment. The purpose of this engagement has been to obtain relevant information regarding residential and non-residential resources and existing baseline sound levels, and to discuss the development of the mitigation to be included in the Proposed Scheme. CEC and SCC officers were also invited to attend and witness the baseline sound measurements being undertaken within this area.

13.1.3 More detailed information regarding the sound, noise and vibration assessment for the South Cheshire area is available in the relevant appendices in Volume 5:

- sound, noise and vibration, route-wide assumptions and methodology (Appendix SV-001-000); and
- sound, noise and vibration baseline, construction and operational assessment (Appendix SV-002-005).

13.1.4 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 can be found in the Volume 2: CA5 Map Book. Mapping to support the sound, noise and vibration assessment is presented in Map Series SV-05 (Volume 2: CA5 Map Book) and Map Series SV-01, SV-02, SV-03 and SV-04 (Volume 5: Sound, noise and vibration Map Book).

13.1.5 The assessment of likely significant effects from noise and vibration on agricultural, community, heritage, ecological and health receptors and the assessment of tranquillity are presented in Section 4, Agriculture, forestry and soils; Section 6,

¹⁷³ 'Shared community open areas' are those that the National 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.

¹⁷⁴ Quiet areas are defined in the Environmental Impact Assessment Scope and Methodology Report as either Quiet Areas as identified under the Environmental Noise Regulations or are resources which are prized for providing tranquillity.

Community; Section 7, Cultural heritage; Section 8, Ecology and biodiversity; Section 9, Health; and Section 11, Landscape and visual of this report respectively.

13.2 Scope, assumptions and limitations

- 13.2.1 The approaches to assessing sound, noise and vibration and appropriate mitigation are outlined in Volume 1 (Section 8), the Scope and Methodology Report¹⁷⁵ (SMR), and the SMR Addendum¹⁷⁶.
- 13.2.2 In this assessment 'sound' is used to describe the acoustic conditions that people experience as a part of their everyday lives. The assessment considers how those conditions may change through time and how sound levels and the acoustic character of an area is likely to be modified through the introduction of the Proposed Scheme. 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.

13.3 Environmental baseline

Existing baseline

- 13.3.1 The South Cheshire area is characterised as predominantly rural, becoming more urbanised towards Crewe. The main roads in the area are the A500 Newcastle Road/Shavington Bypass, the A531 Newcastle Road, the A534 Crewe Road/Nantwich Road, and the A532 Weston Road. There are a number of local roads serving the settlements of Shavington, Weston, Chorlton, Hough, Wybunbury, and Blakelow. The West Coast Main Line (WCML) between Stafford and Crewe runs adjacent to the route of the Proposed Scheme for the majority of this area. Sound from the WCML and from local and distant roads dominates the sound environment for most residential locations within this area.
- 13.3.2 Sound levels close to the WCML are high during the day, with little reduction at night due to the night-time freight movements on this existing rail route. The daytime and night-time sound levels are lower at greater distances from the WCML and local roads. Further information on the existing baseline, including baseline sound levels and baseline monitoring results, is provided for the South Cheshire area in Volume 5: Appendix SV-002-005.
- 13.3.3 It is likely that the majority of receptors adjacent to the line of route are not currently subject to appreciable vibration¹⁷⁷. The predicted vibration levels at all receptors as a result of the Proposed Scheme has, therefore, been assessed using specific

¹⁷⁵ Volume 5: Appendix CT-001-001, Environmental Impact Assessment Scope and Methodology Report.

¹⁷⁶ Volume 5: Appendix CT-001-002, Environmental Impact Assessment Scope and Methodology Report Addendum.

¹⁷⁷ Further information is available in Volume 5: Appendix SV-001-000 Sound, noise and vibration methodology, assumptions and assessment report and Volume 5: Appendix CT-001-001, Environmental Impact Assessment Scope and Methodology Report.

thresholds, below which receptors will not be affected by vibration. Further information is provided in Volume 1 (Section 8).

Future baseline

- 13.3.4 Without the Proposed Scheme, existing sound levels in this area are likely to increase slowly over time. This is primarily due to road traffic growth, which may be as a result of local or national trends or due to specific committed developments. Changes in car technology may offset some of the expected sound level increases due to traffic growth on low speed roads. On higher speed roads, tyre sound dominates¹⁷⁸ and hence the expected growth in traffic is likely to continue to increase ambient sound levels.
- 13.3.5 Volume 5: Appendix CT-004-000 provides details of the developments in the South Cheshire area that are assumed to have been implemented by 2020 and 2027. Committed developments involving sound or vibration sensitive uses within the relevant study area have been included within the assessment and are reported for the South Cheshire area in Volume 5: Appendix SV-002-005. Where applicable, sound, noise or vibration significant effects on these committed developments are discussed in the following sections.

Construction (2020)

- 13.3.6 The assessment of noise from construction activities assumes a future baseline year of 2020, which represents the period immediately prior to the start of the construction period. As a reasonable worst case, it has been assumed that no change in baseline sound levels will occur between the existing baseline year of 2016 and the future baseline year of 2020.

Operation (2027)

- 13.3.7 The operational assessment is based upon the predicted change in sound levels that result from the operation of the Proposed Scheme. The assessment initially considered a worst case (that would over-estimate the change in levels) by assuming that sound levels would not change from the existing baseline year of 2016. Where significant effects were identified on this basis, the effects have been assessed using a baseline year of 2027 to coincide with the proposed start of passenger services. The future baseline is the sound environment that would exist in 2027 without the Proposed Scheme This is presented in Table 14 and Table 15 in Volume 5: Appendix SV-002-005.

¹⁷⁸ Tyre noise typically becomes the dominant sound source for steady road traffic.

13.4 Effects arising during construction

Local assumptions and limitations

Local assumptions

- 13.4.1 The construction arrangements that form the basis of the assessment are presented in Section 2.3 of this report and in Volume 1 (Section 8).
- 13.4.2 During certain construction processes, there may be the need to operate fixed construction plant such as generators¹⁷⁹ and water pumps for reasons of safety or engineering practicability on a continuous basis. This equipment will be sited, or locally screened to control sound to neighbouring residential premises.
- 13.4.3 The following activities have been assumed to be undertaken during the evening and night-time for reasons of safety, engineering practicability or to reduce the impact on existing transport: works in proximity to the WCML, including demolition of bridge structures, pile cap construction and installation of beams and concreting.
- 13.4.4 It is assumed there will also be some night-time working during road and rail possession periods and it is expected that the noise effects from these works will be limited in duration and are, therefore, not considered to be significant. Any noise effects arising from these short-term construction activities will be controlled and reduced by the management processes set out in the draft Code of Construction Practice¹⁸⁰ (CoCP).
- 13.4.5 The assessment takes account of people's perception of noise throughout the day. More stringent criteria are applied during evening and night-time periods, when people are more sensitive to noise, compared to the busier and more active daytime period.
- 13.4.6 Piling and vibratory compaction is likely to result in short-term¹⁸¹ appreciable ground-borne vibration at a small number of dwellings, situated very close to these activities. These receptors will also be exposed to appreciable noise from the construction of the Proposed Scheme. The significance of the identified vibration effects has been assessed in combination with the airborne noise effects also identified at these receptors. The assessment is presented in Volume 5: Appendix SV-002-005.

Local limitations

- 13.4.7 There are a number of locations in this area where the land or property owners did not permit baseline sound level monitoring to be undertaken at their premises. However, sufficient baseline sound level information has been obtained at neighbouring representative locations to undertake the assessment. Further information is provided in Appendix SV-002-005 (Volume 5).

¹⁷⁹ As required by the CoCP. The use of diesel or petrol-powered generators will be reduced by using mains electricity or battery-powered equipment where reasonably practicable.

¹⁸⁰ Volume 5: Appendix CT-003-000, Draft Code of Construction Practice.

¹⁸¹ Typically less than 1 month.

Avoidance and mitigation measures

- 13.4.8 The assessment assumes the implementation of the principles and management processes set out in Section 13 of the draft CoCP (Section 13), which are:
- best practicable means (BPM) as defined by the Control of Pollution Act 1974 (CoPA) and Environmental Protection Act 1990 (EPA), which will be applied during construction activities to minimise noise (including vibration) at neighbouring residential properties;
 - 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; 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 will be offered in accordance with the HS2 noise insulation and temporary re-housing policy.
 - 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, 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 will undertake and report such monitoring as is necessary to assure and demonstrate compliance with all noise and vibration commitments. Monitoring data will be provided regularly to, and be reviewed by, the nominated undertaker and made available to the local authorities; and
 - contractors will be required to comply with the terms of the CoCP and appropriate action will be taken by the nominated undertaker as required to ensure compliance.
- 13.4.9 In addition to this mitigation, to avoid or reduce likely community significant effects, taller screening¹⁸², as described in the draft CoCP, has been assumed at Blakenhall Northbound spur cutting, Chorlton north embankment and Basford cutting worksites.
- 13.4.10 Noise insulation will be offered for qualifying buildings as defined in the draft CoCP. Noise insulation or where appropriate temporary re-housing will avoid residents being significantly affected by levels of construction noise inside their dwellings. The

¹⁸² As described in the draft CoCP, provided by solid temporary hoarding, temporary stockpiles, screening close to activities or other means to provide equivalent noise reductions.

assessment reported in this section provides an estimate of the buildings that are likely to qualify for noise insulation. None are predicted to qualify for temporary rehousing.

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

Assessment of impacts and effects

Residential receptors: direct effects – individual dwellings

- 13.4.12 Taking account of the avoidance and mitigation measures set out in the previous paragraphs, the following six residential properties are forecast to experience noise above the eligibility criteria as defined in the HS2 noise insulation and temporary rehousing policy¹⁸³. These residential dwellings are indicated on Map Series SV-03 (Volume 5: Sound, noise and vibration Map Book):

- 1 - 2 Gonsley Farm Barns, Blakenhall, Nantwich (assessment location ref.: 15072);
- Gonsley Green Farm, Blakenhall, Nantwich (assessment location ref.: 15072);
- Dairy Farm, Chorlton Lane, Chorlton, Crewe (assessment location ref.: 15102); and
- 1 - 2 New Cottages, Chorlton Lane, Chorlton, Crewe (assessment location ref.: 15102).

- 13.4.13 For daytime construction, the trigger level for eligibility for noise insulation is 75dB¹⁸⁴ measured outside.

- 13.4.14 The mitigation measures, including noise insulation for the six residential properties, will reduce noise inside all dwellings such that it does not reach a level where it will significantly affect residents.

Residential receptors: direct effects – communities

- 13.4.15 The avoidance and mitigation measures to be implemented during construction in this area will avoid airborne construction noise adverse effects on the majority of receptors and communities. Residual temporary noise or vibration effects are identified later in this section. With regard to noise outside dwellings, the assessment of temporary effects takes account of construction noise relative to existing sound levels.

- 13.4.16 In locations with lower existing sound levels¹⁸⁵, construction noise effects are likely to be caused by changes to noise levels outside dwellings. These may be considered by

¹⁸³ Further information is provided in HS2 Information Paper E13, Control of construction noise and vibration.

¹⁸⁴ $L_{pAeq, 0800-1800}$ measured at the façade.

¹⁸⁵ Further information is presented in Volume 5: Appendix SV-001-000, Sound, noise and vibration methodology, assumptions and assessment report.

the local community as an effect on the acoustic character of the area and hence be perceived as a change in the quality of life for that community. These effects are considered to be significant when assessed on a community basis taking account of the local context.

13.4.17 The temporary adverse effects on the residential areas identified in Table 32, including shared open areas, are considered to be significant on a community basis.

Table 32: Direct adverse effects on residential communities and shared open areas during construction that are considered to be significant on a community basis

Significant effect number ¹⁸⁶	Type of significant effect	Time of day	Location	Cause (construction activities)	Assumed approximate duration of impact ¹⁸⁷
CSV05-Co1	Construction noise	Daytime	Wrinehill: Approximately 10 dwellings in the vicinity of Higher Den House, Den Lane, Wrinehill	Demolitions, earthworks and movement of vehicles on the site haul routes. The typical and highest monthly noise levels are approximately 65dB and 70dB ¹⁸⁸ .	Up to 1 year and 7 months
CSV05-Co2	Construction noise	Daytime	Mill Lane End: Approximately 15 dwellings on Mill Lane and Den Lane.	Site establishment, earthworks and movement of vehicles on the site haul routes. The typical and highest monthly noise levels are approximately 65-70dB and 75dB ¹⁸⁹ .	Up to 2 years and 4 months
CSV05-Co3	Construction noise	Daytime	Lane End Farm, Chorlton: Approximately 20 dwellings in the vicinity of Lane End Farm, Chorlton Lane.	Earthworks, works to the WCML and movement of vehicles on the site haul routes. The typical and highest monthly noise levels are approximately 65-70dB and 80dB ¹⁹⁰ .	Up to 3 years and 1 month
CSV05-Co4	Construction noise	Daytime	Wychwood Park / Chorlton: Approximately 35 dwellings on Freshwater Drive, St Clements Court, Henley Road and Chiltern Close.	Earthworks, road works and movement of vehicles on the site haul routes. The typical and highest monthly noise levels are approximately 65dB and 70dB ¹⁹¹ .	Up to 1 year and 4 months
CSV05-Co5	Construction noise	Daytime	Basford: Approximately 25 dwellings on Casey	Demolitions, earthworks and movement of vehicles on the site haul routes. The typical and	Up to 2 years and 2 months

¹⁸⁶ Volume 5: Appendix SV-002-005 CA5 Sound, noise and vibration report.

¹⁸⁷ At the closest properties in the community.

¹⁸⁸ Equivalent continuous sound level at the facade, $L_{pAeq, 0700-1900}$.

¹⁸⁹ Equivalent continuous sound level at the facade, $L_{pAeq, 0700-1900}$.

¹⁹⁰ Equivalent continuous sound level at the facade, $L_{pAeq, 0700-1900}$.

¹⁹¹ Equivalent continuous sound level at the facade, $L_{pAeq, 0700-1900}$.

Significant effect number ¹⁸⁶	Type of significant effect	Time of day	Location	Cause (construction activities)	Assumed approximate duration of impact ¹⁸⁷
			Lane and Newcastle Road	highest monthly noise levels are approximately 65dB and 70dB ¹⁹² .	

13.4.18 Track laying, power system and signalling installation works are unlikely to result in significant construction noise effects, given the short duration close to any communities and, where included in the Proposed Scheme, the presence of the permanent noise fence barriers.

Residential receptors: indirect effects

13.4.19 Construction traffic is likely to cause adverse noise effects on occupants of residential dwellings adjacent to Checkley Lane, between the route of the Proposed Scheme and the A51 London Road, Bridgemere. However, considering that the effect occurs in the peak month only, a likely significant construction traffic noise effect has not been identified.

13.4.20 Construction traffic is likely to cause adverse noise effects on residential receptors along Den Lane between the route of the Proposed Scheme and Wrinehill. Approximately 35 dwellings located immediately adjacent to the road are forecast to experience a change in road traffic noise levels of around 8dB L_{pAeq, 0700-2300} during the peak months (further information on traffic is provided in Section 14, Traffic and transport). This is considered to be a likely significant effect on a community basis at the residential dwellings on this route, denoted as CSV05-Co6 in Volume 5: Appendix SV-002-005. This temporary adverse effect represents a change in the acoustic character of the area, which may be perceived as a change in the quality of life for that community.

Non-residential receptors: direct effects

13.4.21 The assessment has identified airborne sound levels greater than the relevant impact screening criteria at Wesleyan Methodist Chapel, Chorlton Lane, Chorlton (assessment location ref.: 15101) as shown on Map Series SV-03 (Volume 5: Sound, noise and vibration Map Book), in the South Cheshire area. An assessment has been undertaken to determine if this impact would result in a significant effect using the significance criteria set out in Annex A of Volume 5: Appendix SV-001-000.

13.4.22 Wesleyan Methodist Chapel, Chorlton is located to the north-east of the Proposed Scheme. The church is a brick construction and the majority of the windows are single glazed. Currently, the church only holds routine services on Sundays (at 10:30 on the first Sunday of the month and 18:30 on other Sundays), which is outside of the anticipated construction work times for the nearby sites, and therefore, a likely significant construction noise effect is not identified at the Wesleyan Methodist Chapel, Chorlton.

¹⁹² Equivalent continuous sound level at the facade, L_{pAeq, 0700-1900}.

Non-residential receptors: indirect effects

- 13.4.23 The assessment of construction noise and vibration indicates that significant indirect effects on residential receptors are unlikely to occur in this area.

Summary of likely residual significant effects

- 13.4.24 The proposed avoidance and mitigation measures will reduce noise inside all dwellings from the construction activities such that residents will not be significantly affected¹⁹³.

- 13.4.25 The measures will also reduce the construction noise effects on acoustic character in the majority of residential communities. Despite these measures, the effects on the acoustic character in the following local residential community areas are considered to be significant:

- Wrinehill;
- Mill Lane End, Mill Lane and Den Lane, Blakenhall;
- Lane End Farm, Chorlton;
- Wychwood Park, Chorlton; and
- Casey Lane / Newcastle Road, Basford.

- 13.4.26 Construction traffic on Den Lane is likely to cause significant noise effects on adjacent residential dwellings.

- 13.4.27 HS2 Ltd will continue to seek reasonably practicable measures to further reduce or avoid these significant effects. In doing so HS2 Ltd will continue to engage with stakeholders to fully understand the receptors, their use and the benefit of the measures.

Cumulative effects

- 13.4.28 The assessment above has considered the potential cumulative construction noise effects of the Proposed Scheme and other committed developments¹⁹⁴. In the South Cheshire area, it is not anticipated that there will be any developments of sufficient scale built at the same time as the Proposed Scheme and accordingly, construction noise or vibration from the Proposed Scheme is unlikely to result in any significant cumulative noise effects.

- 13.4.29 A qualitative assessment has been undertaken for the construction of Crewe Hub acting in conjunction with construction of the Proposed Scheme in relation to construction traffic. This is reported in Section 14, Traffic and transport.

¹⁹³ Volume 5: Appendix SV-001-000.

¹⁹⁴ Volume 5: Appendix CT-004-000, Committed Developments.

13.5 Effects arising from operation

Local assumptions and limitations

Local assumptions

- 13.5.1 The effects of noise and vibration from the operation of the Proposed Scheme have been assessed based upon the highest likely train flows, considering the service pattern for Monday to Saturday including Phase One and Phase Two services. The expected passenger service frequency for Phase 2a, with both Phase One and Phase Two services operational, are described in Volume 1 (Section 4).
- 13.5.2 Passenger services will start at or after 05:00 from the terminal stations and in this area, with Phase One and Phase Two in operation, will progressively increase to 12 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 24:00. Further information is presented in Volume 1 (Section 4).

Avoidance and mitigation measures

- 13.5.3 The development of the Proposed Scheme has sought to keep the route as low as is reasonably practicable and away from main communities.

Airborne noise

- 13.5.4 HS2 trains will be quieter than the relevant current European Union specifications, in line with the assumptions made for the HS2 Phase One ES. This will include reduction of aerodynamic noise from the pantograph that otherwise would occur above 186mph (300kph) with current pantograph designs, drawing on proven technology in use in East Asia. Overall these measures will reduce noise emissions by approximately 3dB at 225mph (360kph) compared to a current European high speed train. The track will be specified to reduce noise, as will the maintenance regime. Further information is provided in Volume 5: Appendix SV-001-000.
- 13.5.5 The Proposed Scheme incorporates noise mitigation in the form of 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.
- 13.5.6 In the South Cheshire area, noise barriers have been incorporated into the Proposed Scheme to avoid or reduce adverse effects due to airborne noise at the following communities:
- Blakenhall;
 - Weston; and
 - Chorlton.

- 13.5.7 The location and height of these noise barriers are shown on Map Series SV-05 (Volume 2: CA5 Map Book).
- 13.5.8 In practice, barriers may differ from this general assumption while maintaining the required acoustic performance. For example, where noise barriers are in the form of landscape earthworks, they need to be higher above rail level to achieve similar noise attenuation to a noise fence barrier because the crest of the earthwork will be further than 5m from the outer rail.
- 13.5.9 Noise effects will be reduced in other locations along the Proposed Scheme by landscape earthworks provided to avoid or reduce significant visual effects and engineering structures, such as cuttings and safety fences on viaducts (where noise barriers are not required). The location of the landscape earthworks is shown on Map Series SV-05 (Volume 2: CA5 Map Book).
- 13.5.10 Significant noise effects from the operational static sources such as line-side equipment will be avoided through their design and the specification of noise emission requirements. Further information is presented in Volume 5: Appendix SV-001-000.
- 13.5.11 Noise insulation measures will be offered for qualifying buildings as defined in the Noise Insulation (Railways and Other Guided Transport Systems) Regulations 1996¹⁹⁵ (the Regulations). The assessment reported in this section provides an estimate of the buildings that are likely to qualify under the Regulations based upon the currently available information. Qualification for noise insulation under the Regulations will be formally identified and noise insulation offered at the time the Proposed Scheme becomes operational. Where noise insulation is required, as well as improvements to noise insulation of windows facing the railway, ventilation will be provided so that windows can be kept closed to protect internal sound levels.
- 13.5.12 Noise insulation will avoid any residual significant effects on health and quality of life arising inside dwellings taking into account mitigation incorporated into the design of the Proposed Scheme.
- 13.5.13 Where the noise from the operation of the Proposed Scheme measured outside a dwelling exceeds the Interim Target defined by the World Health Organization's (WHO) Night Noise Guidelines for Europe¹⁹⁶, residents are considered to be significantly affected by the resulting noise inside their dwelling. The Interim Target is a lower level of noise exposure than the trigger threshold for night noise in the Regulations, i.e. 55dB equivalent continuous level, $L_{pAeq,23:00-07:00}$ measured without reflection from the front of buildings. The effect on people at night due to the maximum sound level as each train passes has also been assessed¹⁹⁷. In line with these criteria, where night-time noise levels for the use of new or additional railways or

¹⁹⁵ Her Majesty's Stationery Office (1996), *The Noise Insulation (Railways and Other Guided Transport Systems) Regulations*, London.

¹⁹⁶ World Health Organization (2010), *Night time Noise Guidelines for Europe*.

¹⁹⁷ During the night (2300-0700) a significant effect is also identified where the Proposed Scheme results in a maximum sound level at the façade of a building at or above: 85dB L_{pAFmax} (where the number of train pass-bys exceeding this value is less than or equal to 20); or 80dB L_{pAFmax} (where the number of train pass-bys exceeding this value is greater than 20).

altered roads authorised by the Bill are predicted following the methodology set out in the Regulations to exceed 55dB¹⁹⁸, or the maximum noise level as a train passes exceeds the relevant criteria, noise insulation will be offered for these additional buildings.

- 13.5.14 In the case of PRow, they are by their nature transitory routes, with users not staying in any one location for long periods. Train sound from the Proposed Scheme will be intermittent and its level will vary as the PRow moves closer to and further from the Proposed Scheme. No significant noise effects have, therefore, been identified for users of PRow within the South Cheshire area.

Ground-borne noise and vibration

- 13.5.15 Significant ground-borne noise or vibration effects will be avoided or reduced through the design of the track and track-bed.

Assessment of impacts and effects

Residential receptors: direct effects – individual dwellings

- 13.5.16 Taking account of the avoidance and mitigation measures incorporated into the Proposed Scheme, the assessment has identified three residential dwellings, close to the Proposed Scheme, where noise levels are predicted to exceed the daytime trigger threshold set in the Regulations¹⁹⁹. It is, therefore, estimated that these buildings are likely to qualify for noise insulation under the Regulations. These dwellings are indicated on Map Series SV-04 (Volume 5: Sound, noise and vibration Map Book):

- Dairy Farm, Chorlton Lane, Chorlton, Crewe (assessment location ref.: 15102); and
- 1 - 2 New Cottages, Chorlton Lane, Chorlton, Crewe (assessment location ref.: 15102).

- 13.5.17 The assessment has identified three additional residential buildings close to the Proposed Scheme where the daytime forecast noise level does not exceed the threshold set in the Regulations but the predicted night-time noise level exceeds the World Health Organization's Interim Target of 55dB¹⁹⁸, or the maximum noise level as a train passes exceeds the relevant criteria¹⁹⁶. It is anticipated that these buildings will also be offered noise insulation as described in the avoidance and mitigation measures section. These buildings are indicated on Map Series SV-04 in Volume 5: Sound, noise and vibration Map Book:

- 1 - 2 Gonsley Farm Barns, Blakenhall, Nantwich (assessment location ref.: 15072); and
- Gonsley Green Farm, Blakenhall, Nantwich (assessment location ref.: 15072).

¹⁹⁸ Equivalent continuous level, $L_{pAeq,23:00-07:00}$ measured without reflection from the front of buildings.

¹⁹⁹ Equivalent to a daytime the free-field level of 65 dB $L_{pAeq,0700-2300}$, and a night-time free-field level of 60 dB $L_{pAeq,2300-0700}$

- 13.5.18 The mitigation measures, set out in the previous section, including noise insulation, will reduce noise inside all dwellings such that it will not reach a level where it will significantly affect residents.

Residential receptors: direct effects – communities

- 13.5.19 The proposed mitigation measures in the South Cheshire area will avoid or reduce airborne noise adverse effects on the majority of receptors, and in the following communities:
- Checkley;
 - Wrinehill;
 - Blakenhall;
 - Weston; and
 - Chorlton.
- 13.5.20 Taking account of the envisaged mitigation, Map Series SV-05 in Volume 2: CA5 Map Book shows the long term 40dB²⁰⁰ night-time sound level contour from the operation of trains on the Proposed Scheme. The extent of the 40dB night-time sound level contour is equivalent to, or slightly larger than, the 50dB daytime contour²⁰¹. In general, below these levels adverse effects are not expected.
- 13.5.21 Above 40dB during the night and 50dB during the day the community effect of noise is dependent on the baseline sound levels in that area and the change in sound level (magnitude of effect) brought about by the Proposed Scheme. The airborne noise impacts and effects forecast for the operation of the Proposed Scheme are presented on Map Series SV-05 in Volume 2: CA5 Map Book. The changes in noise levels shown on these maps are likely to affect the acoustic character of the area such that taking account of the local context²⁰², this may be significant when assessed on a community basis²⁰³.
- 13.5.22 Approximately 10 isolated properties within the area have been identified as being subject to a likely adverse noise effect; these effects are likely to be received as an effect on the acoustic character of the area. However, as the affected properties are spatially remote from larger defined residential areas, are subject to smaller magnitudes of noise effect, or are small in number, the effects are not considered to be significant on a community basis.
- 13.5.23 In this study area, the direct adverse effects on the acoustic character of the areas of the residential communities identified in Table 33 are considered to be significant on a community basis.

²⁰⁰ Defined as the equivalent continuous sound level from 23:00 to 07:00 or $L_{pAeq,night}$.

²⁰¹ With the train flows described in the assumptions section of this CA Report, the daytime sound level (defined as the equivalent continuous sound level from 07:00 to 23:00 or $L_{pAeq,day}$) from the Proposed Scheme would be approximately 10dB higher than the night-time sound level. The 40dB contour therefore indicates the distance from the Proposed Scheme at which the daytime sound level would be 50dB.

²⁰² Further information is provided in Volume 5: Appendices SV-001-000 and SV-002-005.

²⁰³ Further information is contained in Volume 1.

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Table 33: Direct adverse effects on residential communities and shared open areas during operations that are considered significant on a community basis

Significant effect number (See Map series SV-05)	Source of significant effect	Time of day	Location and details
OSV05-C01	Airborne noise increase from new train services	Daytime and night-time	Checkley Approximately five dwellings in the vicinity of Checkley Lane. Forecast increases in sound from the Proposed Scheme are likely to cause a major adverse effect on the acoustic character of the area around the properties. The effect on the acoustic character of residential areas that are located further from the Proposed Scheme would be moderate adverse. There are no shared open spaces identified as being affected in this community.
OSV05-C02	Airborne noise increase from new train services	Daytime and night-time	Wrinehill Approximately 10 dwellings in the vicinity of Higher Den House, Den Lane. Forecast increases in sound from the Proposed Scheme are likely to cause a major adverse effect on the acoustic character of the area around the properties. The effect on the acoustic character of residential areas that are located further from the Proposed Scheme would be moderate adverse. There are no shared open spaces identified as being affected in this community.
OSV05-C03	Airborne noise increase from new train services	Daytime and night-time	Mill Lane End Approximately 15 dwellings on Mill Lane and Den Lane. Forecast increases in sound from the Proposed Scheme are likely to cause a major adverse effect on the acoustic character of the area around the properties. The effect on the acoustic character of residential areas that are located further from the Proposed Scheme would be moderate adverse. There are no shared open spaces identified as being affected in this community.
OSV05-C04	Airborne noise increase from new train services	Daytime and night-time	Lane End Farm, Chorlton Approximately 10 dwellings, in the vicinity of Land End Farm, Chorlton Lane. Forecast increases in sound from the Proposed Scheme are likely to cause a major adverse effect on the acoustic character of the area around the closest properties. There are no shared open spaces identified as being affected in this community.
OSV05-C05	Airborne noise increase from new train services	Daytime only	Wychwood Park / Chorlton Approximately 45 dwellings in the vicinity of Chiltern Close, Freshwater Drive, Henley Road and St Clements Court. Forecast increases in sound from the Proposed Scheme are likely to cause a minor adverse effect on the acoustic character of the area around the closest properties during the daytime only. The effect on the acoustic character of residential areas that are located further from the Proposed Scheme would be negligible. There are no shared open spaces identified as being affected in this community.

Residential receptors: indirect effects

13.5.24 The assessment of operational noise and vibration indicates that significant indirect effects on residential receptors are unlikely to occur in this area.

Non-residential receptors: direct effects

- 13.5.25 The assessment of operational noise and vibration indicates that significant direct effects on non-residential receptors are unlikely to occur in this area.

Non-residential receptors: indirect effects

- 13.5.26 The assessment of operational noise and vibration indicates that significant indirect effects on non-residential receptors are unlikely to occur in this area.

Summary of likely residual significant effects

- 13.5.27 At individual properties, the mitigation measures, including noise insulation, will reduce noise inside all dwellings such that it will not reach a level where it will significantly affect residents, and therefore, no likely residual significant effects are identified.
- 13.5.28 At a community level, the envisaged mitigation, including landscape earthworks and noise mitigations, described in this section, and presented in Map Series SV-05 (Volume 2: CA5 Map Book), will substantially reduce the potential airborne sound impacts and noise effects that would otherwise arise from the Proposed Scheme. The potential significant adverse airborne noise effects due to increased noise levels around the following communities have been identified:
- Checkley: occupants of residential properties in the vicinity of Checkley Lane, identified by OSV05-Co1 on Map SV-05-155b;
 - Wrinehill: occupants of residential properties in the vicinity of Higher Den House, Den Lane identified by OSV05-Co2 on Map SV-05-116;
 - Mill Lane End: occupants of residential properties in the vicinity of Mill Lane and Den Lane, identified by OSV05-Co3 on Map SV-05-116;
 - Lane End Farm, Chorlton: occupants of residential properties in the vicinity of Land End Farm, Chorlton Lane, identified by OSV05-Co4 on Map SV-05-116/117; and
 - Wychwood Park/Chorlton: occupants of residential properties in the vicinity of Chiltern Close, Freshwater Drive, Henley Road and St Clements Court, identified by OSV05-Co5 on Map SV-05-116/117.
- 13.5.29 The assessment of operational noise and vibration indicates that significant direct effects on non-residential receptor are unlikely to occur in this area.
- 13.5.30 HS2 Ltd will continue to seek reasonably practicable measures to further reduce or avoid these significant effects. In doing so HS2 Ltd will continue to engage with stakeholders to fully understand the receptors, their use and the benefit of the measures.
- Cumulative effects**
- 13.5.31 It is not anticipated that there will be any significant cumulative noise effects during operation of the Proposed Scheme.

Monitoring

- 13.5.32 Volume 1 (Section 9) sets out the general approach to environmental monitoring during operation of the Proposed Scheme.
- 13.5.33 Operational noise and vibration monitoring will 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.
- 13.5.34 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 will be shared with the relevant local authorities at appropriate intervals.

14 Traffic and transport

14.1 Introduction

- 14.1.1 This section describes the likely impacts on all forms of transport and the consequential significant effects on transport users arising from the construction and operation of the Proposed Scheme through the South Cheshire area. The effects on traffic and transport are assessed quantitatively, based on existing baseline traffic conditions and future scenarios.
- 14.1.2 Engagement with Highways England, Cheshire East Council (CEC) and Staffordshire County Council (SCC) has been undertaken. An important focus of this engagement has been to obtain relevant baseline information.
- 14.1.3 A detailed report on traffic and transport impacts and surveys undertaken within the South Cheshire area is contained in Volume 5: Appendix TR-001-000: Transport Assessment.
- 14.1.4 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 can be found in the Volume 2: CA5 Map Book.
- 14.1.5 Maps showing traffic and transport significant effects during construction (Map Series TR-03) and operation (Map Series TR-04) and construction traffic routes to compounds (Map Series TR-08) can be found in Volume 5: Traffic and transport Map Book.
- 14.1.6 In addition, further traffic survey data is set out in Background Information and Data (BID)²⁰⁴, (see BID-TR-001-000: Traffic assessment baseline data).

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), the Scope and Methodology Report (SMR)²⁰⁵ and the SMR Addendum²⁰⁶.
- 14.2.2 The study area for traffic and transport includes all roads affected by the Proposed Scheme including: the M6; the A500 Newcastle Road/Shavington Bypass; the A534 Crewe Road/Nantwich Road; the A531 Newcastle Road; the A51 Nantwich Bypass; the A51 London Road; the A5020 University Way/David Whitby Way; the B5472 Weston Road; the A532 Weston Road; the B5071 Jack Mills Way/Gresty Road; and local roads serving the settlements of Shavington, Weston, Chorlton, Hough, Wybunbury and Blakelow.
- 14.2.3 The baseline forecast traffic flows for the future years of assessment have been derived using the Department for Transport's (DfT) traffic forecasting tool, Trip End

²⁰⁴ HS2 Ltd (2017), High Speed Two (HS2) Phase 2a (West Midlands - Crewe), Background Information and Data, Available online at: www.gov.uk/hs2

²⁰⁵ Volume 5: Appendix CT-001-001, Environmental Impact Assessment Scope and Methodology Report.

²⁰⁶ Volume 5: Appendix CT-001-002, Environmental Impact Assessment Scope and Methodology Report Addendum.

Model Presentation Program (TEMPro), relevant traffic models (Highways England M6 J13-J15 Smart Motorways Project (SMP) Strategic Model) and model data provided by CEC from the Crewe SATURN Model. The assessment covers the average weekday morning (08:00-09:00) and evening (17:00-18:00) peak periods.

- 14.2.4 Since it is not possible to forecast how services may change in the future, it has been assumed that bus services for the future years of assessment will be the same as those currently operating.
- 14.2.5 Forecast future year traffic flows with and without the Proposed Scheme have been based on an approach that does not take account of wider effects such as redistribution and reassignment of traffic. It is unlikely that these wider changes would affect the conclusions drawn in this section.
- 14.2.6 The construction assessment includes a combined assessment of the construction traffic that could arise as a result of the overlap in construction programme between the Proposed Scheme and the proposed Crewe Hub. At this time, the Crewe Hub proposal is at an early stage of development and there is insufficient information on which to base a robust assessment of in-combination construction effects. Nevertheless, the combined construction impacts of the Proposed Scheme and the Crewe Hub proposal have been considered.
- 14.2.7 The operational analysis at Crewe Station includes an assessment of the incremental impact of Phase 2a services compared to a baseline assuming HS2 Phase One is already in operation and also the combined impacts of HS2 Phase One and Phase 2a services.

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, CEC and SCC (including provision of information on public transport, public right of way (PRoW) and accident data) and desktop analysis.

Surveys

- 14.3.2 Traffic surveys, comprising automatic traffic counts, junction turning counts and queue surveys, of roads crossing the route of the Proposed Scheme or potentially affected by the Proposed Scheme were undertaken in: November and December 2015; February, March, July and November 2016; and March and April 2017. This data has been supplemented by existing traffic data from other sources where available, including from Highways England, CEC and SCC. Assessment of the data indicates that the peak hours in the area are 08:00 – 09:00 and 17:00 – 18:00.
- 14.3.3 PRoW surveys were undertaken in May, June, July and November 2016 and April 2017 to establish their nature and usage by non-motorised users (pedestrians, cyclists and equestrians). The surveys included all PRoW and roads that will 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 surveys were undertaken during the weekend,

when usage is expected to be highest, but some were undertaken on a weekday where routes may be influenced by commuting or other localised uses.

Highway network

- 14.3.4 The M6 is the only strategic road that runs through the South Cheshire area. The M6 runs along a north to south alignment to the east of Crewe. The main access to the motorway network in this area is at junction 16 of the M6. The Proposed Scheme will not intersect the M6 in this area.
- 14.3.5 There are five primary 'A' roads in the South Cheshire area, these are: the A500 Newcastle Road/Shavington Bypass, which provides an east to west connection through the area and links Nantwich to the south of Crewe and the M6 at Junction 16; the A532 Weston Road, which passes through Crewe Town Centre; the A5020 David Whitby Way/University Way, which passes around the eastern boundary of Crewe; the A534 Crewe Road/Nantwich Road, which connects Crewe with Nantwich and Sandbach; and the A531 Newcastle Road, which connects Crewe with the settlements of Chorlton, Betley, Wrinehill and Madeley Heath. The strategic and primary road network, particularly around Crewe, can get busy at peak times and delays can be experienced.
- 14.3.6 The main local roads that will be affected by the Proposed Scheme are: the A5020 University Way/David Whitby Way, which traverses the eastern boundary of Crewe and connects the A534 Crewe Road/Nantwich Road with the A500 Newcastle Road/Shavington Bypass; the A51 Nantwich Bypass, which connects a number of primary 'A' roads to the west of Crewe; and the B5071 Jack Mills Way/ Gresty Road, which connects the A500 Shavington Bypass with central parts of Crewe.
- 14.3.7 Other local roads that will be affected by the Proposed Scheme include: a section of Crewe Road, parallel to the B5071 Jack Mills Way; Checkley Lane; Den Lane; Chorlton Lane; Casey Lane; and Newcastle Road. The local road network in this area generally operates well although some localised delays can be experienced, particularly at peak times in the built-up area around Crewe.
- 14.3.8 Relevant accident data for the road network subject to assessment has been obtained from CEC. Data for the three year period (2011 to 2014²⁰⁷) has been assessed and any identified clusters have been examined. Five accident clusters were identified within the Crewe area: at the A500 Meremoor roundabout; the A51 Nantwich Road roundabout; the A530 Middlewich Road/Colleys Lane junction; the A532 Earle Street roundabout; and the A5019 Mill Street/A5078 Oak Street junction. The majority of accident related casualties were minor in severity with seven serious injury accidents and no fatal accidents at these junctions.
- 14.3.9 The Proposed Scheme will cross eight roads and roadside footways within the South Cheshire area, these are: Checkley Lane; Den Lane; Chorlton Lane; Newcastle Road; Casey Lane; Weston Lane; the A500 Newcastle Road/Shavington Bypass; and the A534 Nantwich Road.

²⁰⁷ Represents the last full year of data available at the time of undertaking the assessment.

Parking and loading

- 14.3.10 There are approximately 780 car parking spaces at Crewe Station located in two parking areas off Pedley Street and the A532 Weston Road. Additionally, public car parking is available in privately operated car parks around the station area. The station also includes provision for drop-off and taxi facilities on the A534 Nantwich Road, short stay parking on Pedley Street and a taxi waiting area off the A532 Weston Road. There are no designated parking or loading spaces identified in the area to the south of the A500 Newcastle Road/Shavington Bypass that are expected to be impacted by the Proposed Scheme.

Public transport network

- 14.3.11 Bus services in the South Cheshire area operate out of Crewe town centre, which acts as a central hub for local bus services. There are bus stops located on the A534 Nantwich Road and the A532 Weston Road, which provide access for users of Crewe Station. There are no bus routes that cross the route of the Proposed Scheme in the South Cheshire area, although services use parallel routes to access areas including Shavington, Weston, Basford, Hough and Wrinehill.
- 14.3.12 There are bus stops located to serve the main built-up areas. Where bus stops are expected to be affected by either the construction or operation of the Proposed Scheme, these are referred to in the relevant assessment sections.
- 14.3.13 National and local rail services are accessible at Crewe Station, which is a major rail interchange. At Crewe Station, the West Coast Main Line (WCML) connects with the Crewe to Derby Line, the Crewe to Manchester Line and the North Wales Coast Line. These connections provide access to major destinations, including London, Liverpool, Manchester, Birmingham, Cardiff and Glasgow.

Non-motorised users

- 14.3.14 There are pedestrian footways throughout Crewe town centre and adjacent to many of the roads in the smaller settlements of Shavington, Weston, Chorlton and Betley. 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.
- 14.3.15 The Proposed Scheme will cross the existing route of 14 PRoW including one bridleway in the South Cheshire area. A further 10 PRoW in the area will be affected either temporarily or permanently due to, for example, temporary diversion of PRoW during construction and permanent upgrades for maintenance access to the Proposed Scheme. Additionally, Madeley Footpath 7 in the adjoining Whitmore Heath to Madeley area (CA4) partially passes through this area. Any change to Madeley Footpath 7 is reported in Volume 2: Community area 4, Whitmore Heath to Madeley. The surveys undertaken to inform the assessment showed that there were fewer than 10 people a day recorded on most of the PRoW in the area. The route with the greatest usage was Basford Footpath 4 with 53 users observed during the survey day.

- 14.3.16 In the South Cheshire area, there is a network of advisory cycle routes²⁰⁸ connecting Crewe with some of the smaller surrounding settlements. There are cycle routes along: Macon Way; the A534 Crewe Road; the A534 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

- 14.3.17 There are no navigable waterways situated within the South Cheshire area. Consequently, this topic is not considered further in this assessment.

Air transport

- 14.3.18 There is no relevant air transport in the South Cheshire area. Consequently, this topic is not considered further in this assessment.

Future baseline

- 14.3.19 The future baseline traffic volumes have been calculated by applying growth factors derived from TEMPro for the future years of 2023, 2027 and 2041. These represent the construction assessment year (2023), the year of opening (2027) and future assessment year (2041). Growth factors from TEMPro have been checked to ensure that committed developments and growth forecasts from the M6 J13-15 SMP Strategic Model are appropriately reflected. Future baseline traffic volumes for the Crewe area have been provided by CEC, from the Crewe SATURN model, for the future years of 2023, 2027 and 2041. The Crewe SATURN model contains up to date assumptions regarding committed development and on this basis no further committed sites were identified for inclusion within the model area.
- 14.3.20 Committed transport schemes are also included in the future baseline. In this area, of relevance are Basford West Spine Road (known as the B5071 Jack Mills Way) and Crewe Green Link Road (known as the A5020 David Whitby Way), both of which are now complete.

Construction (2023)

- 14.3.21 Construction of the Proposed Scheme is expected to commence in 2020 with construction activity continuing to 2027 (although activity in 2027 will be limited to testing and commissioning). Construction activities have been assessed against 2023 baseline traffic flows, irrespective of when they occur during the construction period. The year 2023 has been adopted as a common base year and the impact of individual or overlapping activities are considered against this single year. The year 2023 broadly represents the likely peak period during construction of the Proposed Scheme and is therefore considered to be reasonably representative.
- 14.3.22 Future baseline traffic volumes in the peak hours are forecast to grow by an average of 14% by 2023 compared to the baseline year of 2016.

²⁰⁸ Advisory cycle routes are locally promoted routes for use by cyclists that do not generally have any formal cycle infrastructure provision, such as cycle lanes.

14.3.23 A sensitivity analysis has been carried out for the Proposed Scheme and the proposed Crewe Hub for the year 2023 and is considered under the assessment of construction.

Operation (2027 and 2041)

14.3.24 Future baseline traffic volumes in the peak hours are forecast to grow by an average of 13% by 2027 compared to the baseline year of 2016. The forecast growth in the assessment area is lower to 2027 than 2023 as a result of the transport network improvements included in the Crewe SATURN model.

14.3.25 Future baseline traffic volumes in the peak hours are forecast to grow by an average of 22% by 2041 compared to the baseline line year of 2016.

14.3.26 The main assessment for operation includes the predicted traffic associated with the operation of HS2 Phase One as part of the future baseline. The assessment also considers the combined impacts of the Proposed Scheme and HS2 Phase One compared to a future baseline without either.

14.4 Effects arising during construction

Avoidance and mitigation measures

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

- new highways (roads and PRow) will 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 will be maintained or locally diverted during construction to limit the need for diversions of traffic onto alternative routes;
- traffic management measures will be implemented to limit any disruption;
- road closures will be restricted to overnight and weekends, insofar as reasonably practicable;
- temporary alternative routes for PRow will be provided during construction, insofar as reasonably practicable, where either the existing or final proposed route is not available;
- insofar as reasonably practicable, site haul routes will 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;
- HGVs will be routed, insofar as reasonably practicable, along the strategic and/or primary road network;
- insofar as reasonably practicable, the use of the local road network will 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;

- a temporary railhead will be provided near to Stone in the Stone and Swynnerton area (CA3) to allow construction materials, including excavated materials, and equipment to be transported by the existing rail network. The temporary railhead will include direct access to and from the M6, which will reduce HGV movements on the local road network;
- the reuse of excavated material, insofar as reasonably practicable, along the route of the Proposed Scheme;
- borrow pits in the Fradley to Colton area (CA1), Whitmore Heath to Madeley area (CA4) and South Cheshire area will limit the volume of construction traffic on the road network;
- highway measures including junction improvements, passing places and carriageway widening will be provided, as required, to manage the safe passing of construction vehicles on construction HGV routes. These are considered in this assessment and Volume 4: Off-route effects;
- 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

- 14.4.2 The following section considers the impacts on traffic and transport and the likely consequential significant effects resulting from construction of the Proposed Scheme.

Key construction transport issues

- 14.4.3 The traffic and transport impacts during the construction period within the South Cheshire area will include:
- road closures and associated realignments and diversions;
 - alternative routes for PRoW; and
 - construction vehicle movements to and from the various worksites.
- 14.4.4 The construction assessment has also considered any impacts in the South Cheshire area that arise from construction of the Proposed Scheme in the adjoining community areas.
- 14.4.5 Construction vehicle movements required to construct the Proposed Scheme will include the delivery of plant and materials, movement of excavated materials and site worker trips. Works will include utilities diversions, earthworks, underpass, viaduct, bridge, and highway construction.
- 14.4.6 Details of construction compounds are provided in Section 2.3. The locations of the compounds and the associated access routes are shown in Map Series TR-o8 (Volume 5: Traffic and transport Map Book). Table 34 provides a summary of this along with the

transport activity at each compound. For each compound the peak month of activity is the month within which HGV traffic is at its highest for that compound. The busy period is the period during which HGV traffic serving that compound will be greater than 50% of the HGV traffic in the peak month. The average daily combined two-way vehicle trips for the busy period is the lower end of the range shown in Table 34. The average daily combined two-way vehicle trips for the peak month is the upper end of the range shown in Table 34.

Table 34: Typical vehicle trip generation for construction sites in the South Cheshire area

Compound type	Location	Access to / from compound to main road network	Indicative start/set up date	Estimated duration of use (years)	Estimated duration of busy period (months)	Average daily combined two-way vehicle trips during busy period and within peak month of activity	
						Cars/LGV	HGV
Main and satellite	Checkley Lane East main compound (including Checkley North embankment satellite compound)	Checkley Lane for site set-up and servicing, followed by site haul route thereafter to the A53 Newcastle Road	October 2020	Civil engineering 4 years and 3 months	4	32-44	49-77
			January 2025	1 year and 9 months	8	42-82	16-34
Satellite	Checkley Lane West satellite compound	Accessed via Checkley Lane to the east and west and then via the site permanent maintenance roads constructed to the east and west of the HS2 main line	January 2025	1 year and 3 months	8	26-58	19-34
Satellite	Den Lane Welfare satellite compound	Den Lane to the A51 London Road and site haul route to Newcastle Road	January 2025	6 months	3	99-224	up to 10

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Compound type	Location	Access to / from compound to main road network	Indicative start/set up date	Estimated duration of use (years)	Estimated duration of busy period (months)	Average daily combined two-way vehicle trips during busy period and within peak month of activity	
						Cars/ LGV	HGV
Satellite	Den Lane East satellite compound	Den Lane to the A51 London Road and site haul route to Newcastle Road	January 2024	2 years and 3 months	7	18-18	up to 10
Satellite	Den Lane West satellite compound	Den Lane to the A51 London Road and site haul route to Newcastle Road	January 2024	2 years and 3 months 2 years and 3 months	4	38-224	up to 10
Satellite	Blakenhall Northbound spur embankment satellite compound	Den Lane and then via the site haul routes constructed to the west of the HS2 main line	October 2020	4 years and 3 months	4	136-187	126-182
Satellite	Blakenhall cutting satellite compound	Chorlton Lane or Den Lane and then via the site haul route	October 2020	3 years	1	56-77	101-101
Satellite	Delta Junction satellite compound	Accessed via Den Lane and then the site haul route	January 2025	1 year and 3 months	11	14-18	up to 10
Satellite	Crewe South cutting satellite compound	Accessed via the diverted Chorlton Lane to Newcastle Road, the A531 Newcastle Road and the A500 Newcastle Road	October 2020	Civil engineering 4 years and 3 months	11	128-176	146-199
			July 2024	Rail systems 1 year and 6 months	10	57-84	up to 10

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Compound type	Location	Access to / from compound to main road network	Indicative start/set up date	Estimated duration of use (years)	Estimated duration of busy period (months)	Average daily combined two-way vehicle trips during busy period and within peak month of activity	
						Cars/ LGV	HGV
Satellite	Waybutt Lane satellite compound	Den Lane or Chorlton Lane to Newcastle Road, the A531 Newcastle Road and the A500 Newcastle Road and site haul routes	January 2025	1 year	9	58-84	up to 10
Satellite	Swill Brook satellite compound	Accessed via the diverted Chorlton Lane to Newcastle Road, the A531 Newcastle Road and the A500 Newcastle Road and site haul routes	April 2026	6 months	3	18-30	up to 10
Satellite	Heath Farm satellite compound	Accessed via the diverted Chorlton Lane to Newcastle Road, the A531 Newcastle Road and the A500 Newcastle Road and site haul routes	July 2025	9 months	6	29-32	28-32

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Compound type	Location	Access to / from compound to main road network	Indicative start/set up date	Estimated duration of use (years)	Estimated duration of busy period (months)	Average daily combined two-way vehicle trips during busy period and within peak month of activity	
						Cars/ LGV	HGV
Satellite	Chorlton cutting satellite compound	Newcastle Road to Newcastle Road, the A531 Newcastle Road and the A500 Newcastle Road and site haul routes	October 2020	4 years and 3 months	5	32-44	59-89
Satellite	Creamery Bridge satellite compound	Newcastle Road to the A531 Newcastle Road and the A500 Newcastle Road and site haul routes	January 2024	2 years 9 months	1	23-114	up to 10
Satellite	Crewe South portal satellite compound	Newcastle Road to the A531 Newcastle Road and the A500 Newcastle Road	October 2020	Civil engineering 4 years 3 months	16	24-33	54-86
			January 2024	Rail systems 2 years and 9 months (12 month overlap with civils)	4	23-114	up to 10
Satellite	Casey Lane East satellite compound	Accessed via Weston Lane or Newcastle Road to the A531 Newcastle Road and the A500 Newcastle Road and site haul routes	January 2024	2 years	13	18-18	up to 10

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Compound type	Location	Access to / from compound to main road network	Indicative start/set up date	Estimated duration of use (years)	Estimated duration of busy period (months)	Average daily combined two-way vehicle trips during busy period and within peak month of activity	
						Cars/LGV	HGV
Satellite	Basford Hall Southbound satellite compound	Accessed via Weston Lane or Casey Lane to Newcastle Road, the A531 Newcastle Road and the A500 Newcastle Road and site haul routes	January 2024	2 years and 9 months	9	34-124	up to 10
Main	Basford cutting main compound	A500 Shavington Bypass	October 2020	6 years and 3 months Civils is 3 years, with 3 years 3 months for worker accommodation and continued use as a main compound	4	400-550	88-93
Transfer node	Transfer node associated with Basford cutting main compound	A500 Shavington Bypass	October 2020	4 years and 3 months	12	N/A	615-930
Satellite	Crewe South Crossovers satellite compound	A500 Shavington Bypass	January 2024	2 years	4	37-134	3-12
Main	Motorail Terminal main compound	A500 Shavington Bypass	October 2020	2 years and 9 months	3	130-130	11-25
Satellite	Alexandra Stadium satellite compound (existing Network Rail land)	A500 Shavington Bypass	October 2020	2 years and 9 months	33	34-34	up to 10

14.4.7 Information on the indicative construction programme is provided in Section 2.3 and the construction methodology is summarised in Volume 1 (Section 6). This illustrates how the phasing of activities at different compounds will generally be staggered and

that construction activities at individual compounds may not occur over the whole duration presented in Table 34.

- 14.4.8 Where construction routes serve more than one construction compound, the combined vehicle movements during the busiest period for each section of each route have been assessed.

Highway network

Strategic and local road network traffic

- 14.4.9 Temporary road or lane closures and associated diversions will be required in a number of locations including: Checkley Lane; Den Lane; Newcastle Road; and Casey Lane. In most cases, these works will be restricted to short-term overnight and/or weekend closures, and are not, therefore, considered significant. Where works are of a longer duration and/or have a significant effect, these are addressed below.
- 14.4.10 Chorlton Lane and Casey Lane will be stopped-up permanently at the point where they cross the route of the Proposed Scheme and WCML and the impact of these closures have been assessed within the operational assessment.
- 14.4.11 Where site haul routes, created adjacent to the route of the Proposed Scheme, cross the existing road network, traffic control measures will be implemented and could include the provision of temporary signals or roundabouts, which will be removed upon completion of the works. Short-term lane restrictions will be required in some locations to implement access points for construction vehicles. These traffic control measures are not likely to have a significant effect on traffic flows and delays for vehicle occupants.
- 14.4.12 Construction of the Proposed Scheme is forecast to result in changes in daily traffic flows due to the movement of excavated or fill material and construction vehicles accessing construction compounds and also temporary road closures and diversions.
- 14.4.13 These changes in traffic flow will lead to increases in delays to vehicle users and congestion²⁰⁹, which are significant, at the following junctions:
- A500 Shavington Bypass/B5472 Weston Road/A531 Newcastle Road roundabout – major adverse effect;
 - A500 Shavington Bypass/A5020 David Whitby Way roundabout – major adverse effect; and
 - A500 Shavington Bypass/B5071 Jack Mills Way roundabout – major adverse effect.
- 14.4.14 Junction assessments have been undertaken against the peak month flows and include robust assumptions on the level of construction traffic in the peak hours. The

²⁰⁹ In assessing significant effects of traffic changes on congestion and delays, a major adverse effect occurs where traffic flows on a road link will be beyond or very close to capacity with the Proposed Scheme and the increases in traffic due to the Proposed Scheme will be such as to substantially increase queues and delays on a routine basis at peak times. A moderate adverse effect will occur when traffic flows on a road link will be approaching or at capacity with the Proposed Scheme and modest increases in traffic will increase the frequency of queues and more substantial delays. A minor adverse effect occurs when traffic flows on a road link are not generally exceeding capacity with the Proposed Scheme but the increase in flows will result in occasional queues and delays or small increases in existing delays.

temporary effects identified are considered to be the reasonable worst case and HS2 Ltd will continue to work with the relevant highway authorities to manage the impacts at these locations.

14.4.15 Construction of the Proposed Scheme will result in substantial increases in traffic flows (i.e. more than 30% for HGV or all vehicles) in some locations, which can lead to traffic-related severance²¹⁰ for non-motorised users from increases in either all traffic (including Proposed Scheme worker trips, LGV and HGV traffic) or HGV traffic. The effect reported below for each road is the most significant traffic-related severance effect for non-motorised users:

- A500 Shavington Bypass between the A51 London Road and the M6 – moderate adverse effect as a result of an increase in all traffic;
- A51 London Road between Checkley Lane and the B5071 Wybunbury Road – major adverse effect as a result of an increase in HGV traffic;
- A51 London Road between the B5071 Wybunbury Road and the A500 Shavington Bypass – moderate adverse effect as a result of an increase in HGV traffic;
- A531 Newcastle Road between the A531 Weston roundabout and the A500 Meremoor roundabout – moderate adverse effect as a result of an increase in HGV traffic;
- Checkley Lane between the A51 London Road and the Proposed Scheme – moderate adverse effect as a result of an increase in all traffic;
- Den Lane between Wrinehill Road and the WCML – major adverse effect as a result of an increase in all traffic;
- Casey Lane between Newcastle Road and the Proposed Scheme – major adverse effect as a result of an increase in HGV traffic;
- Chorlton Lane between Waybutt Lane and Newcastle Road – minor adverse effect as a result of an increase in all traffic;
- Wybunbury Road between the A51 London Road and Wrinehill Road – major adverse effect as a result of an increase in HGV traffic; and
- Wrinehill Road between Bridge Street and Den Lane – moderate adverse effect as a result of an increase in all traffic.

14.4.16 Utilities works have been assessed in detail where they are major and where the traffic and transport impacts from the works separately, or in combination with other works, will be greater than other construction activities arising within the area. Minor utilities works are expected to result in only localised traffic and pedestrian diversions, which will be of short-term duration. No additional significant effects from these minor

²¹⁰ In the context of this Traffic and transport section, severance is used to relate to a change in ease of access for non-motorised users due to, for example, a change in travel distance or travel time or a change in traffic levels on a route that makes it harder for non-motorised users to cross. A reference to severance does not imply a route is closed to access.

utilities works are expected. Similarly, other minor works will involve a low level of use of local roads. Such use is not expected to give rise to significant construction traffic impacts.

Accidents and safety

- 14.4.17 The effect of the Proposed Scheme on accident and safety risks will not be significant. At one junction, the A500 Shavington Bypass/B5472 Weston Road/A531 Newcastle Road roundabout (Meremoor roundabout) where there are existing highway safety issues, there will be an increase in traffic flow and congestion, but the overall change in traffic flow will not be sufficient to raise additional safety concerns.
- 14.4.18 There are no further locations where there are both accident clusters and substantial increases in traffic during construction.

Parking and loading

- 14.4.19 No significant effects on parking or loading have been identified during construction in the South Cheshire area.

Public transport network

- 14.4.20 The temporary diversions, realignments and lane closures required during construction of the Proposed Scheme will not result in any adverse significant effects upon the operation of existing bus services or stops.
- 14.4.21 The construction of the Proposed Scheme, in particular modifications and connections to the WCML, is expected to require a number of rail possessions over a period of up to five years in this area including 64 possessions of either 27 or 54 hours, two possessions up to 100 hours, and two blockades. The works includes utility diversions, bridge demolitions, construction of cuttings, and connection of the HS2 spurs to the WCML. Disruption to rail users will be reduced by limiting possessions, where reasonably practicable, to existing maintenance periods. The two blockades will affect users of the WCML and will be managed through a combination of some diversions and replacement bus services which will reduce the disruption to the travelling public.
- 14.4.22 The construction of the Proposed Scheme is also expected to require possessions and two longer partial blockades of the independent (freight) lines to the west of Crewe Station. However this will not directly affect the travelling public. HS2 Ltd will work with Network Rail and the freight operating companies to ensure that the impact of these works on freight operations is limited.
- 14.4.23 HS2 Ltd will work with Network Rail and the train operating companies to ensure that any need for additional possessions can be reduced with good planning and communication (including appropriate advance notice). As the majority of possessions are likely to be short term in nature, the effect on delay to rail passengers and freight services will not be significant.

Non-motorised users

- 14.4.24 The construction works associated with the Proposed Scheme will require the temporary closure or diversion/realignment of PRow and roads. In most cases, these

will be of a short duration and/or distance and therefore will not have a significant severance effect on users.

14.4.25 However, there will be temporary adverse effects, which are significant, on non-motorised users during construction as a result of severance from increased travel distance and/or hindrances such as substantial changes in levels for non-motorised users due to temporary PRow and road realignments or diversions at:

- Checkley cum Wrinehill Footpath 5 – minor adverse effect from increase in distance of up to 350m;
- Checkley cum Wrinehill Footpath 15 – moderate adverse effect from increase in distance of up to 950m;
- Blakenhall Footpath 7 – minor adverse effect from increase in distance of up to 450m;
- Blakenhall Footpath 11 – minor adverse effect from increase in distance of up to 450m;
- Blakenhall Footpath 17 – moderate adverse effect from increase in distance of up to 950m;
- Chorlton Footpath 8 – minor adverse effect from increase in distance of up to 200m; and
- Basford Footpath 5 – minor adverse effect from increase in distance of up to 400m.

14.4.26 With the exception of Checkley cum Wrinehill Footpath 15 and Blakenhall Footpath 17, the changes in travel distance on the PRow realignments or diversion will be less than 500m.

Permanent effects

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

Other mitigation measures

14.4.28 The implementation of the CoCP in combination with the construction workforce travel plan will mitigate the transport-related effects during construction of the Proposed Scheme.

Summary of likely residual significant effects

14.4.29 The most intensive peak periods of construction for the Proposed Scheme will cause increases in traffic that will from time to time cause significant adverse effects through additional congestion and/or increased delays for road users at: the A500 Shavington Bypass/B5472 Weston Road/A531 Newcastle Road roundabout (major adverse); the A500 Shavington Bypass/A5020 David Whitby Way roundabout (major

adverse); and the A500 Shavington Bypass/B5071 Jack Mills Way roundabout (major adverse).

- 14.4.30 During the construction period there will be increases in traffic which will increase traffic-related severance for non-motorised users at: the A500 Shavington Bypass between the A51 London Road and the M6 (moderate adverse); the A51 London Road between Checkley Lane and the B5071 Wybunbury Road (major adverse); the A51 London Road between the B5071 Wybunbury Road and the A500 Shavington Bypass (moderate adverse); the A531 Newcastle Road between the A531 Weston roundabout and the A500 Meremoor roundabout (moderate adverse); Checkley Lane between the A51 London Road and the Proposed Scheme (moderate adverse); Den Lane between Wrinehill Road and the WCML (major adverse); Casey Lane between Newcastle Road and the Proposed Scheme (major adverse); Chorlton Lane between Waybutt Lane and Newcastle Road (minor adverse); Wybunbury Road between the A51 London Road and Wrinehill Road (major adverse); and Wrinehill Road between Bridge Street and Den Lane (moderate adverse).
- 14.4.31 There will be temporary adverse significant effects due to increased travel distance during construction on non-motorised users of: Checkley cum Wrinehill Footpath 5 (minor adverse); Checkley cum Wrinehill Footpath 15 (moderate adverse); Blakenhall Footpath 7 (minor adverse); Blakenhall Footpath 11 (minor adverse); Blakenhall Footpath 17 (moderate adverse); Chorlton Footpath 8 (minor adverse); and Basford Footpath 5 (minor adverse).

Cumulative effects

- 14.4.32 The assessment includes the cumulative effects of planned and committed development during construction by taking this into account within the background traffic growth.
- 14.4.33 The assessment also takes into account Proposed Scheme construction traffic and transport impacts of works to construct the Proposed Scheme being undertaken in neighbouring community areas.

Crewe Hub

- 14.4.34 As the aspiration for Crewe Hub is that it is operational in line with the year of opening (2027) of the Proposed Scheme, there is the potential for construction activity associated with the Proposed Scheme and the Crewe Hub proposal to overlap. At this time, the Crewe Hub proposal is at an early stage of development and there is insufficient information on which to base a robust assessment of in-combination construction effects. Nevertheless, the combined construction impacts of the Proposed Scheme and the Crewe Hub proposal have been assessed in the event that the latter proceeds at the same time as the Proposed Scheme.
- 14.4.35 Construction works for the Proposed Scheme will predominantly impact to the south of Crewe and along the A500 corridor from M6 Junction 16. There is some limited access required to Crewe Station for the Proposed Scheme works to the station, including a new island platform, and traffic associated with these works will be routed from the M6 Junction 16 along the A500 Newcastle Road, the B5472 Weston Road, the A532 Weston Road and the A534 Nantwich Road. These are the only roads along

which it is considered there would be an interface during construction of the Proposed Scheme and the Crewe Hub proposal. It should be noted that construction traffic relating to the Crewe Hub proposal is likely to use other roads, in addition to those identified above and the impacts on these will need to be considered as part of the environmental impact assessment associated with the Crewe Hub proposal.

- 14.4.36 The potential construction traffic associated with the Crewe Hub proposal has been derived by considering other major station redevelopment schemes, in particular Glasgow Central. Based on the information available, the following assumptions are adopted for the cumulative assessment of the Proposed Scheme with the Crewe Hub proposal:
- the peak in construction activity for the Crewe Hub proposal is likely to be during demolitions at Crewe Station and has been based on the rate for Glasgow Central, which was 59 HGVs (118 HGV two-way trips) per day. In addition, a further 50 car/LGV two-way trips per day are included for workers; and
 - Crewe Hub has the potential for construction access from the rail network as well as multiple vehicle routes. To provide a reasonable worst case assumption, 50% of the vehicle trips are assumed to access the station area using the same routes as the Proposed Scheme construction traffic, which equates to 59 HGV movements and 25 car movements a day, combined with the Proposed Scheme peak month flows on the above roads only.
- 14.4.37 Based on these assumptions, the construction of the proposed Crewe Hub is not expected to result in any different significant effects than those assessed for the Proposed Scheme with regard to traffic congestion or traffic related severance for non-motorised users. As a consequence, there will be no new or different significant effects on air quality, community, health or sound, noise and vibration as a result of construction traffic associated with the Crewe Hub proposals in combination with the Proposed Scheme.
- 14.4.38 Any overlap in rail possessions requirements is uncertain at this stage as the proposed Crewe Hub is at an early stage in development. Nevertheless, any cumulative rail possessions will be planned to seek to minimise disruption to users, and therefore, the effect on delay to passenger and freight services is not expected to be significant.

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 will avoid or reduce impacts on transport users:
- reinstatement of most roads on or close to their existing alignments;
 - the provision of a new platform at Crewe Station to reduce the impact on existing services; 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.

Key operation transport issues

- 14.5.3 There will be increased demand at the existing Crewe Station as a consequence of the Proposed Scheme. However, apart from this, the operation and maintenance of the Proposed Scheme will generate a limited number of vehicular trips and the effect will not be significant.
- 14.5.4 The operational effects therefore relate to localised impacts around Crewe Station and the road closures and the permanent diversion and realignment of roads and PRoW.

Highway network

Strategic and local road network traffic

Operation (2027)

- 14.5.5 The Proposed Scheme will require the permanent widening, diversion or realignment of: Checkley Lane; Den Lane; Newcastle Road; and Casey Lane. The permanent diversions or realignments will increase travel distance for vehicle occupants. The diversions or realignments will be less than 1km in length and will not result in any significant effects with regard to increased journey times for vehicle occupants.
- 14.5.6 The diversion arising from stopping-up of the Chorlton Lane underbridge will result in an increase in travel distance of up to 4km for vehicle users from east of Chorlton travelling to the west of the Proposed Scheme and, although the number of users of this route is low (fewer than 100 vehicles per day), there will be a minor adverse traffic delay effect, which is significant, due to increased journey times for vehicle occupants.
- 14.5.7 The operation of the Proposed Scheme HS2 services will add 2.1% daily rail passengers boarding, alighting or interchanging at Crewe Station. This will result in a maximum increase of 0.5% in total peak hour traffic and this increase will not result in any significant effects.
- 14.5.8 When combined with HS2 Phase One (which will add an additional 4.8% of daily passengers), there will be a combined total increase of daily rail passengers of 6.9%. As a result of the increased patronage of the Proposed Scheme and HS2 Phase One combined there will be an increase in traffic at the following locations:
- A534 Crewe Road/A532 Weston Road roundabout junction;
 - A534 Nantwich Road/Mill Street signal junction; and
 - A534 Nantwich Road/Gresty Road signal junction.
- 14.5.9 In combination with HS2 Phase One, there will be an increase of a maximum of 1.8% in total peak hour traffic using these junctions and this will result in minor adverse congestion effects, which are significant. This is however unchanged from the effects of HS2 Phase One alone. It should be noted that while congestion is expected to

increase, the overall change in queues is expected to be limited due to the relatively small increase in trips.

Operation (2041)

14.5.10 In 2041, the operation of the Proposed Scheme HS2 services will add 1.9% daily rail passengers boarding, alighting or interchanging at Crewe Station and a maximum of 0.7% in total peak hour traffic. This increase will not result in any significant effects.

14.5.11 When combined with HS2 Phase One (which will add 4.7% of daily passengers), there will be a combined total increase of daily rail passengers of 6.6% and a maximum of 2.8% in total peak hour traffic (no more than 14 additional queuing vehicles in the peak hour at any of the assessed junctions) and this will result in minor adverse congestion effects, which are significant, at:

- A534 Crewe Road/A532 Weston Road roundabout junction;
- A534 Nantwich Road/Mill Street signal junction; and
- A534 Nantwich Road/Gresty Road signal junction.

14.5.12 This is however unchanged from the effects of HS2 Phase One alone.

Accidents and safety

14.5.13 The effect on accident and safety risk will not be significant as there are no locations in the South Cheshire area where there are substantial forecast increases in traffic due to the operation of the Proposed Scheme.

Parking and loading

14.5.14 The Proposed Scheme will add up to 2.1% in demand for car parking, drop-off and taxis at Crewe Station. This increase in demand is assessed as not significant. When taken in combination with HS2 Phase One, the increase in demand is up to 6.9% and this will result in a minor adverse effect, which is significant, on parking and drop-off facilities. This is unchanged from HS2 Phase One.

Public transport network

14.5.15 The Proposed Scheme will provide improved journey times on HS2 services and build on the already significant beneficial effects of HS2 Phase One which were reported in the HS2 Phase One Environmental Statement (ES). The Proposed Scheme is assumed to have the same service pattern as HS2 Phase One, but provide additional benefits from further journey time savings with an additional 13 minute journey time saving for passengers between Crewe and London.

14.5.16 The Proposed Scheme will also relieve pressure on bottlenecks, improve reliability and performance, and create extra capacity on the WCML and at stations between Handsacre and immediately south of Crewe. In particular, any released capacity could be used to run additional freight services to Basford Hall yard, a major freight interchange immediately south of Crewe.

14.5.17 The Proposed Scheme includes a new island platform at Crewe Station. The relocation of conventional rail services to the island platform will facilitate HS2 services stopping

at Crewe whilst maintaining existing services on the conventional railway. The improved rail services at Crewe will provide benefits to users at the station, although interchange distances between platforms will increase for some passengers using the new platform. Overall, the Proposed Scheme will provide benefits for users of Crewe Station, although these are not assessed as being significant.

- 14.5.18 The permanent diversion or realignment of highways will increase travel distances for bus passengers. However, as all of the diversions or realignments will be less than 1km in length there will be no significant effects on public transport users within the South Cheshire area.

Non-motorised users

- 14.5.19 The Proposed Scheme will require the permanent stopping-up of a number of PRoW in the South Cheshire area. Users will be required to use alternative PRoW and there will be adverse effects, which are significant, on non-motorised users as a result of severance from increased travel distance. The following PRoW will be affected:
- Checkley cum Wrinehill Footpath 15 – moderate adverse effect from increase in distance of up to 650m;
 - Chorlton Footpath 11 – minor adverse effect from increase in distance of up to 250m; and
 - Chorlton Footpath 12 will also be permanently stopped up, however, this will not result in an adverse effect as there is no change in travel distance via alternative routes.
- 14.5.20 The Proposed Scheme includes the creation of a new bridleway, Blakenhall New Bridleway. The new bridleway will begin at the realigned Blakenhall Bridleway 8, along the western side of a new spur from the WCML, and end where it connects to the realigned Blakenhall Bridleway 12. The new bridleway will add up to 500m to the bridleway network and is assessed as a minor beneficial severance effect on non-motorised users, which is significant.
- 14.5.21 The Proposed Scheme includes the extension of Chorlton Bridleway 2 broadly following the alignment of Waybutt Lane. The extension will add up to 1.1km to the bridleway network and is assessed as a moderate beneficial severance effect on non-motorised users, which is significant.
- 14.5.22 There will be permanent widening, realignment, diversion or extension of 22 PRoW and five roads in the South Cheshire area that will have an impact on travel distances or introduce hindrances such as substantial changes in levels for non-motorised users.
- 14.5.23 There will be adverse effects, which are significant, on non-motorised users of nine of these PRoW and roads as a result of severance from increased travel distance and/or hindrances. These are:
- Checkley cum Wrinehill Footpath 5 – minor adverse effect from increase in distance of up to 150m;
 - Checkley cum Wrinehill Footpath 8 – minor adverse effect from increase in

distance of up to 400m;

- Blakenhall Footpath 7 – minor adverse effect from diversion via an underbridge;
- Blakenhall Bridleway 12 – moderate adverse effect from increase in distance of up to 650m and diversion via an overbridge;
- Blakenhall Footpath 17 – moderate adverse effect from increase in distance of up to 700m;
- Chorlton Footpath 3 – moderate adverse effect from increase in distance of up to 800m and diversion via an overbridge;
- Basford Footpath 4 – minor adverse effect from diversion via new road crossing;
- Den Lane – minor adverse effect from increase in distance of up to 200m and diversion via an underbridge; and
- Newcastle Road – minor adverse effect from increase in distance of up to 150m.

14.5.24 With the exception of Blakenhall Bridleway 12, Blakenhall Footpath 17 and Chorlton Footpath 3, the changes in travel distance on the PRow and road realignments or diversion are less than 500m.

14.5.25 The stopping-up of Casey Lane will require the permanent diversion of Regional Route 70 cycle route, which will be diverted via Back Lane and Weston Lane and this will increase travel distance for cycle users by up to 700m. However, a shorter diversion of 450m will be available for pedestrians via Newcastle Road and the new Casey Lane diversion. The stopping-up will result in a minor adverse effect, which is significant, on the non-motorised users as a result of severance.

14.5.26 Due to stopping-up of the existing Chorlton Lane underbridge, there will be a moderate adverse effect, which is significant, as a result of severance on non-motorised users of Chorlton Lane wishing to travel through the existing underbridge and beyond the WCML. Cyclists and equestrian users will be diverted via Newcastle Road, resulting in an increase in travel distance of up to 4km. A shorter diversion of 1.7km will be available to pedestrians, using Chorlton Footpaths 13 and 9, Chorlton Footpath 7 overbridge, and on access roads to the west of the Proposed Scheme.

Other mitigation measures

14.5.27 No further mitigation measures are considered necessary during operation of the Proposed Scheme based on the outcome of this assessment.

Summary of likely residual significant effects

14.5.28 The Proposed Scheme will provide improved journey times on HS2 services and build on the already significant beneficial effects of HS2 Phase One. The Proposed Scheme will also relieve pressure on bottlenecks, improve reliability and performance, and create extra capacity on the WCML and at stations between Handsacre and

immediately south of Crewe. The Proposed Scheme includes a new island platform at Crewe Station that will facilitate HS2 services stopping at Crewe whilst maintaining existing services on the conventional railway although interchange distances between platforms will increase for some passengers using the new platform. Overall, the Proposed Scheme will provide benefits for users of Crewe Station although these are not assessed as being significant.

- 14.5.29 The Proposed Scheme will increase daily rail passengers boarding, alighting or interchanging at Crewe Station by 2.1%. Taking the impacts of the Proposed Scheme in isolation, this increase will not result in any significant adverse effects.
- 14.5.30 When combined with HS2 Phase One, there will be a combined total increase of daily rail passengers of 6.9%, which will result in a minor adverse effect on traffic congestion at: the A534 Crewe Road/A532 Weston Road roundabout junction; the A534 Nantwich Road/Mill Street signal junction; and the A534 Nantwich Road/Gresty Road signal junction. This will also result in a minor adverse effect on parking and drop-off facilities at Crewe Station. These effects are unchanged from those for HS2 Phase One alone.
- 14.5.31 There will be a minor adverse traffic delay effect due to increased journey times for vehicle occupants as a result of the stopping-up of the Chorlton Lane underbridge.
- 14.5.32 There will be a moderate adverse severance effect due to increased travel distance and/or additional hindrances to travel on non-motorised users of: Checkley cum Wrinehill Footpath 15; Blakenhall Bridleway 12; Blakenhall Footpath 17; Chorlton Footpath 3; and Chorlton Lane.
- 14.5.33 There will be minor adverse severance effects on non-motorised users of: Chorlton Footpath 11; Checkley cum Wrinehill Footpath 5; Checkley cum Wrinehill Footpath 8; Blakenhall Footpath 7; Basford Footpath 4; Den Lane; Newcastle Road; and Casey Lane.
- 14.5.34 The creation of Blakenhall New Bridleway will add up to 500m to the bridleway network, which is a minor beneficial severance effect for non-motorised users.
- 14.5.35 The extension of Chorlton Bridleway 2 will add up to 1.1km to the bridleway network, which is a moderate beneficial severance effect for non-motorised users.

Cumulative effects

- 14.5.36 The assessment includes cumulative effects of planned and committed development during operation, by taking into account background traffic growth in the future baseline.
- 14.5.37 The operational analysis includes an assessment of the incremental impact of the Proposed Scheme services assuming HS2 Phase One is in the baseline and also the combined impacts of the Proposed Scheme and HS2 Phase One services.
- 14.5.38 No assessment of the operational impact of Crewe Hub has been undertaken.

Monitoring

- 14.5.39 Volume 1, Section 9 sets out the general approach to environmental monitoring during operation of the Proposed Scheme.
- 14.5.40 Operational and maintenance traffic will be very limited and there are no stations on the route of the Proposed Scheme. Crewe Station has its own Station Travel Plan and the associated monitoring is the responsibility of the station operator. Consequently, no specific monitoring requirements are considered necessary for this topic during operation of the Proposed Scheme.

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 South Cheshire area. The likely impacts and significant effects of the Proposed Scheme's construction and operation on surface water and groundwater bodies and their associated water resources are assessed. The likely impacts and significant effects of the Proposed Scheme on flood risk and land drainage are also considered.
- 15.1.2 Engagement has been undertaken with the Environment Agency, Natural England, Cheshire East Council (CEC), which is the Lead Local Flood Authority (LLFA), Staffordshire County Council (SCC) and United Utilities (the local water and sewerage undertaker). The purpose of this engagement has been to obtain relevant baseline information and to discuss issues and potential effects.
- 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: CA5 Map Book.
- 15.1.4 Map Series WR-01, WR-02, WR-03, WR-05 and WR-06, showing details of the water features referred to in this section, are contained in the Volume 5: Water resources and flood risk assessment Map Book.
- 15.1.5 Detailed information on the water resources and flood risk issues specific to this area are contained in the Volume 5 appendices. These comprise:
- Appendix WR-003-005 – Water resources assessment; and
 - Appendix WR-004-005 – Flood risk assessment.
- 15.1.6 Volume 5 also includes a detailed route-wide, stand-alone Water Framework Directive (WFD) compliance assessment (Appendix WR-001-000) and a draft route-wide water resources and flood risk operation and maintenance manual (Appendix WR-002-000).
- 15.1.7 In addition, detailed hydraulic modelling reports are included in Background Information and Data (BID)²¹¹ (BID-WR-004-010 - Hydraulic modelling report - Checkley Brook).
- 15.1.8 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;
 - compliance with the statutory requirements of the WFD; and
 - route-wide flood risk issues related to application of the Sequential Test and

²¹¹ HS2 Ltd (2017), High Speed Two (HS2) Phase 2a (West Midlands - Crewe), Background Information and Data, Available online at: www.gov.uk/hs2

Exception Test in the National Planning Policy Framework (NPPF).

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), the Scope and Methodology Report (SMR)²¹² and the SMR Addendum²¹³.
- 15.2.2 Unless indicated otherwise, the spatial scope of the assessment 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 detailed in Section 2.2 of this report. The study area has been extended to cover Betley Mere Site of Special Scientific Interest (SSSI) (a Ramsar Site), which is located approximately 280m north-east of the route of the Proposed Scheme. This SSSI is designated as one of the few natural standing waters in Staffordshire.
- 15.2.3 The assessment is based on desk study information, including information provided 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 modelling has been undertaken of watercourses and key structures within flood risk areas. This includes modelling of the River Lea and Checkley 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 The assessment is based on existing available water quality information provided by the Environment Agency.
- 15.2.8 Impacts on biological receptors such as aquatic fauna and flora, which are referred to in the Volume 5: Appendix WR-001-000, WFD compliance assessment, are assessed in Section 8, Ecology and biodiversity.

15.3 Environmental baseline

Existing baseline - Water resources and WFD

Surface water

- 15.3.1 Water bodies in the southern part of the study area (River Lea and Checkley Brook) fall within the Staffordshire Trent Valley Catchment of the Humber river basin district (RBD). Those to the north (Mere Gutter, Gresty Brook, Valley Brook, River Weaver, Flash Brook, Small Brook and River Wheelock) fall within the Wistaston Brook Catchment of the North West RBD.

²¹² Volume 5: Appendix CT-001-001, Environmental Impact Assessment Scope and Methodology Report.

²¹³ Volume 5: Appendix CT-001-002, Environmental Impact Assessment Scope and Methodology Report Addendum.

- 15.3.2 The river basin management plans identify the chemical and ecological condition of surface water bodies, and the quantitative and chemical status of groundwater bodies within these two RBDs.
- 15.3.3 The statutory objective of the WFD is to prevent deterioration of all water bodies at good or high status and to prevent water bodies at less than good status from deteriorating further.
- 15.3.4 Specialist field surveys have been undertaken, where access has been available. This has included the majority of surface water bodies within the study area. Receptor values have been adjusted to reflect the outputs from these surveys, in 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 crossed by the Proposed Scheme within this study area, including their location, current overall WFD status and future overall status objectives, is provided in Table 35. Valley Brook is crossed by existing rail infrastructure to the north of Crewe Station, however, the Proposed Scheme will not involve works to, nor new structures directly associated with, this watercourse and as such it is not included in Table 35. Table 35 also identifies the receptor values attributed to each individual watercourse based on the methodologies set out in the SMR, the SMR Addendum and as applied in the WFD compliance assessment (Volume 5: Appendix WR-001-000).

Table 35: Key surface water bodies and their WFD status

Water body name and identification number ²¹⁴	Current WFD status ²¹⁵	WFD status objective	Watercourse classification	Crossing location (National Grid Reference) ²¹⁶	Receptor value
Checkley Brook – Upper GB112068055230	Good	Good by 2015	Main river	Checkley Brook (SJ74955 45967)	Very high
River Lea GB112068055200	Bad	Good by 2027	Main river	Checkley Brook (SJ74955 45967)	Very high
Wistaston Brook (incorporating Mere Gutter and Gresty Brook) GB112068055280	Bad	Good by 2027	Main river tributaries:		
			Minor ditch	Blakenhall south (SJ73942 47226)	Low
			Minor ditch	Blakenhall spur (SJ73840 47197)	Low
			Minor ditch	Blakenhall (SJ73803 47447)	Low

²¹⁴ The Environment Agency has attributed each surface water and groundwater body a unique water body identification (ID) number.

²¹⁵ See Volume 5: Appendix WR-003-000, WFD report for definitions of WFD status.

²¹⁶ This is the location where the Proposed Scheme will cross the watercourse.

			Minor ditch	Wrinehill Road (SJ73219 48102)	Low
			Minor ditch	Gonsley (SJ73326 48323)	Low
			Minor ditch	Half Moon (SJ72954 49240)	Low
			Minor ditch	Unnamed WCML culvert (SJ73642 48434)	Low
			Minor ditch	Unnamed WCML culvert (SJ73586 48495)	Low
			Minor ditch	Unnamed WCML culvert (SJ73138 49251)	Low
			Minor ditch	Unnamed WCML culvert	Low

Abstractions and permitted discharges (surface water)

- 15.3.6 There are three licensed surface water abstractions in the study area: from Mere Gutter, at Weston Hall Estate; from Checkley Brook at The Grange; and from Valley Brook at Crewe and Alsager College. These have all been assessed as high value receptors.
- 15.3.7 Records of unlicensed private water abstractions, which comprise those for quantities less than 20m³ per day, have been obtained from the local authorities. This data indicates that there are no registered private unlicensed surface water abstractions within the study area. As there is no obligation to register private water supplies, unregistered private groundwater supplies may also be present. Private water supplies are assessed as high value receptors unless details obtained from the owner indicate otherwise.
- 15.3.8 There are nine surface water discharge consents within the study area, two of which are within the area of land required for the Proposed Scheme. These have been assessed as being receptors of low value.

Groundwater

- 15.3.9 The location of abstractions, geological formations and indicative groundwater levels, where available, are shown in Map Series WR-02 in Volume 5: Water resources and flood risk Map Book.
- 15.3.10 The geology of the study area is described in Section 10, Land quality, and the superficial and bedrock hydrogeology is summarised in Table 36. Unless stated otherwise, the geological groups listed will all be crossed by the Proposed Scheme. Table 36 also identifies the receptor values attributed to each groundwater receptor

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based on the methodologies set out in the SMR, the SMR Addendum and as applied in the WFD compliance assessment (Volume 5: Appendix WR-001-000).

Table 36: Summary of geology and hydrogeology in the study area

Geology ²¹⁷	Distribution	Formation description	Aquifer classification	WFD body (ID) and current overall status	WFD status objective	Receptor value
Superficial deposits						
Alluvium	Narrow bands associated with Gresty and Basford brooks in the north and Checkley Brook in south	Deposits of clay, silt, sand and gravel of fluvial origin	Secondary A	Weaver and Dane Sand and Gravel Aquifers (GB41202G991700), poor	Good by 2027	Moderate
River Terrace Deposits	Narrow bands associated with main surface water features	Sand and gravel	Secondary A	Weaver and Dane Sand and Gravel Aquifers (GB41202G991700), poor	Good by 2027	Moderate
Peat	Not crossed by the route of the Proposed Scheme. Several pockets to the east and west in the southern part of the study area	Peat	Unproductive strata	Not assessed by the Environment Agency	Not assessed by the Environment Agency	Low

²¹⁷ 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, when the Group/Formation/Member classification was adopted by the British Geological Survey, replacing the earlier classification adopted by the pioneer geological surveyors in the 19th century. While some traditional names have been retained by this process, many new names have 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

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Geology ²¹⁷	Distribution	Formation description	Aquifer classification	WFD body (ID) and current overall status	WFD status objective	Receptor value
Glaciofluvial Deposits	Provides surface cover in the northernmost part of the route, with sporadic subcrops in the south	Sand and gravel of Devensian age	Secondary A	Weaver and Dane Quaternary Sand and Gravel Aquifers (GB41202G991700), poor	Good by 2027	Moderate
Glacial Till	Covers the entire study area at the near surface or at shallow depth below the deposits listed above	Devensian clays with sand and gravel component	Unproductive strata	Not assessed by the Environment Agency	Not assessed by the Environment Agency	Low

Bedrock

Mercia Mudstone Group, Sidmouth Mudstone Formation, Wilkesley Halite Member	Found below superficial deposits within the central part of the study area	Halite with mudstone partings	Unproductive Strata	Not assessed by the Environment Agency	Not assessed by the Environment Agency	Low
Mercia Mudstone Group, Sidmouth Mudstone Formation - mudstone	Present in the north and south of study area	Red mottled grey/ green mudstone and siltstone	Secondary B	Not assessed by the Environment Agency	Not assessed by the Environment Agency	Moderate

Geology ²¹⁷	Distribution	Formation description	Aquifer classification	WFD body (ID) and current overall status	WFD status objective	Receptor value
Mercia Mudstone Group, Sidmouth Mudstone Formation. Northwich Halite Member	Small area crossed by the route of the Proposed Scheme near Checkley Lane	Halite stone and mudstone	Unproductive	Not assessed by the Environment Agency	Not assessed by the Environment Agency	Low

Superficial deposit aquifers

15.3.11 The basis of the receptor values attributed to the superficial deposit aquifers present within the study area, as shown in Table 36, is outlined briefly as follows:

- Alluvium, River Terrace Deposits and Glaciofluvial Deposits may be capable of supporting water supplies at a local rather than regional scale and may form an important source of baseflow to surface water bodies. They have therefore been assessed as moderate value receptors; and
- Peat and Glacial Till are classed as Unproductive in this area and have, therefore, been assessed as low value receptors in terms of water resources.

Bedrock aquifers

15.3.12 The basis of the receptor values attributed to the bedrock aquifers present within the study area, as shown in Table 36 is 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 rock formation. This has, therefore, been assessed as a moderate value receptor; and
- the Wilkesley Halite Member and Northwich Halite Member of the Mercia Mudstone Group outcrop, is classified as Unproductive and has, therefore, been assessed as a low value receptor in terms of water resources.

WFD status of groundwater bodies

15.3.13 A summary of locations, current overall WFD status, and future overall status objectives associated with the designated bedrock groundwater bodies within the study area is provided in Table 36. The value attributed to each of these receptors is also indicated.

15.3.14 The superficial deposits in the study area are not formally designated as WFD groundwater bodies but may be hydraulically connected to the WFD bedrock aquifers.

Abstractions and permitted discharges (groundwater)

- 15.3.15 There are two licensed groundwater abstractions located in the study area, as shown on Map WR-02-005. Both abstractions are from superficial deposits and the water is used for general farming and domestic supply at The Grange, near to Checkley. Both supplies have default source protection zones (SPZs) and have been assessed as high value receptors. There are no other SPZs in the study area.
- 15.3.16 Information obtained from the local authorities indicates that there are no unlicensed groundwater abstractions located within the study area. Unregistered private groundwater supplies may also be present.
- 15.3.17 There are two consented discharges to groundwater within the study area. These discharges have been assessed as low value receptors

Groundwater - surface water interaction

- 15.3.18 Desk-based assessment using Ordnance Survey maps identified 11 features within the study area that had potential to be springs. Access was possible to inspect three of these features, all three of which were confirmed as land drainage features of low value. The remaining eight potential spring features are assumed to be high value receptors, pending site inspection.
- 15.3.19 There are 63 ponds within the area of land required for the construction and operation of the Proposed Scheme that will be affected by the Proposed Scheme. These provide a range of aquatic habitats. The nature and relative value of these features, the magnitude of the impacts that the Proposed Scheme will have on them, and the mitigation proposed, are described in Section 8, Ecology and biodiversity.
- 15.3.20 Betley Mere SSSI and Ramsar Site is likely to have a dependence on groundwater.

Existing baseline - flood risk and land drainage

- 15.3.21 The Environment Agency's Flood map for planning (rivers and sea) 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).
- 15.3.22 The updated Flood map for surface water 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. The British Geological Survey (BGS) national dataset, Areas susceptible to groundwater flooding, has been used to assess the future risk of groundwater flooding.
- 15.3.23 The following reports were used to help determine the baseline flood risk within the study area:
- Crewe and Nantwich Borough Council Strategic Flood Risk Assessment (SFRA);
 - Weaver Goway Catchment Flood Management Plan (CFMP);

- CEC Preliminary Flood Risk Assessment (PFRA);
- CEC Local Flood Risk Management Strategy (LFRMS); and
- CEC Strategic Flood Risk Assessment (SFRA).

15.3.24 River and surface water flood zones are shown in Map Series WR-01 in Volume 2: CA5 Map Book.

River flooding

15.3.25 The study area includes substantial areas of floodplain (Flood Zone 2 and 3) associated with the River Lea and Checkley Brook in the south, and the Mere Gutter and Gresty Brook in the east. Table 37 shows the watercourses within the study area and the receptors that would potentially be affected by any changes in flood magnitude. The value of these receptors, based on Table 52 in the SMR, is also indicated.

Table 37: River flood risk sources and receptors

Source	Location	Receptor potentially affected	Receptor value
River Lea / Checkley Brook	Various	Agricultural land	Low
	SJ 75559 46689	Main road (A531 Newcastle Road)	Low
	SJ 75197 46847	Checkley Lane	Low

Surface water flooding

15.3.26 There are numerous areas that are susceptible to surface water flooding within the study area. These are identified on Maps WR-01-107b to 109. The key sources and receptors with potential to be affected are shown in Table 38. The value of these receptors, based on Table 50 of the SMR, is also indicated.

Table 38: Surface water flooding sources and receptors

Source	Location (NGR)	Receptor potentially affected	Receptor value
Surface water flow path	Various	Agricultural land	Low
	SJ 75380 47225	Residential property at Wrinehill	High
	SJ 75363 48138	Residential property south of Betley	High
	SJ 73251 48065	Residential property on Mill Lane / Den Lane	High
	SJ 71461 51250	Commercial property on Newcastle Road	High
	Various	Residential properties in and around Crewe	High
	Various	Agricultural land	Low

Artificial water bodies

- 15.3.27 Flooding from artificial water bodies may occur from failure of an impounding structure, such as a dam or canal embankment. The flood risk assessment (Volume 5: Appendix WR-004-005) considers the risks associated with artificial water bodies within the study area, including Betley Hall Lake. No significant flood risk issues have been identified associated with this impounded water body.

Groundwater flooding

- 15.3.28 The formal source of public information regarding historical incidents of groundwater flooding in the South Cheshire area is CEC SFRA and PFRA. From these reports it can be concluded that there is no history of groundwater flooding in the study area.
- 15.3.29 The Environment Agency's Areas susceptible to groundwater flooding map indicates a potential for groundwater flooding in floodplain areas along the main river network, where permeable superficial deposits are likely to be in hydraulic connection with surface watercourses. There is also a potential risk where the permeable Alluvium, River Terrace Deposits and Glaciofluvial Deposits overlie the low permeability Glacial Till.

Land drainage

- 15.3.30 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.

Future baseline

Construction (2020)

- 15.3.31 Volume 5: Appendix CT-004-000 provides details of the committed developments in the South Cheshire area that are assumed to have been implemented by 2020.
- 15.3.32 There are no committed developments identified in this area that will materially alter the baseline conditions in 2020 for water resources and flood risk receptors.

Operation (2027)

- 15.3.33 Volume 5: Appendix CT-004-000 provides details of the committed developments in the South Cheshire area that are assumed to have been implemented by 2027.
- 15.3.34 There are no committed developments identified in this area that will materially alter the baseline conditions in 2027 for water resources and flood risk receptors.

Climate change

- 15.3.35 Detailed analysis of the potential impacts of climate change on the Proposed Scheme has been undertaken and is reported in Volume 3, Route-wide effects (Section 4). In general the design of the Proposed Scheme has adopted a precautionary approach to potential future increase in peak river flows and rainfall intensities, using the latest guidance issued by the Environment Agency in February 2016.

- 15.3.36 Although no definitive guidance is available, climate change may also affect future surface water and groundwater resources. However, any such changes are unlikely to change the significance of effects identified in this assessment.

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 necessary to limit the potential effects. Section 16 of the draft Code of Construction Practice²¹⁸ (CoCP) includes a range of mitigation measures that aim to reduce construction impacts as far as is reasonably practicable. The avoidance and mitigation measures that are of particular relevance to water resources and flood risk during construction are described in the following sections of this report.

Water resources and WFD

- 15.4.2 The avoidance of sensitive receptors has reduced the risks associated with the Proposed Scheme not complying with the requirements of the WFD. Examples of this avoidance strategy include:
- avoidance of channels and floodplain areas – the route of the Proposed Scheme will avoid passing along river or stream valleys and structures, such as viaduct piers, will be set back from the channels;
 - avoidance, where reasonably practicable, of groundwater dependent terrestrial ecosystems, including natural springs that can play a key role in the hydrology and hydrogeology of such ecosystems; and
 - avoidance, where reasonably practicable, of major public water supplies and smaller licensed and unlicensed abstractions of surface water and groundwater.
- 15.4.3 The presence of any unregistered private water supplies, their function and the means of protecting or if necessary replacing them will be discussed with any landowners potentially affected by the Proposed Scheme.
- 15.4.4 The temporary works shown on Map Series CT-05 in the Volume 2: CA5 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 Where watercourse diversions and/or realignments are proposed, the aim will be to design these with equivalent hydraulic capacity to the existing channels. The design of the Proposed Scheme will also aim to ensure that field subsurface drainage systems can be adapted to discharge into the new channel. Where such watercourses are natural channels, the design aim will be to incorporate appropriate features to retain, and where reasonably practicable, enhance their hydromorphological condition.

²¹⁸ Volume 5: Appendix CT-003-000, Draft Code of Construction Practice.

- 15.4.6 For watercourses that are not in their natural condition, the design aim will be to incorporate measures, where reasonably practicable, to improve their hydromorphological condition, provided this is compatible with the watercourses' flood risk and land drainage functions.
- 15.4.7 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.
- 15.4.8 Method statements will be required for all watercourse crossings and channel realignments required for the establishment of construction site haul routes. The method statements will describe how potential changes to flood risk, water quality and channel morphology will be safeguarded during the establishment, use and decommissioning of all site haul routes.
- 15.4.9 Permanent culverts proposed on the smaller watercourse crossings within this study area include Blakenhall South culvert, Blakenhall spur culvert, Wrinehill Road culvert, Gonsley drop inlet culvert, Half Moon inverted siphon, Network Rail access road culvert and the extension of four existing culverts under the WCML. The detailed design of these culverts will be developed in general accordance with Construction Industry Research and Information Association (CIRIA) and Environment Agency guidance and in consultation with the Environment Agency. The design has sought to mitigate the impact on the hydromorphology of the affected watercourses, as follows:
- drop inlet culverts have been avoided wherever reasonably practicable and are proposed on minor headwater channels or ditches only; culvert lengths have been reduced as far as is reasonably practicable; and
 - invert levels will be set below the firm bed of the watercourse to allow a natural substrate to develop along the bed of the culvert.

- 15.4.10 The wider issues associated with these culverts, and how their detailed design aim will be to ensure no deterioration in the status of any of the relevant water body's WFD quality elements, are considered within the WFD Compliance Assessment Report (Volume 5: Appendix WR-001-000).
- 15.4.11 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 practice. This will also be applicable to springs potentially affected by construction works, although additional measures may be required to mitigate temporary construction impacts on springs that are to be relocated
- 15.4.12 Existing groundwater abstraction boreholes or monitoring points will be protected from physical damage, insofar as reasonably practicable. If boreholes are to be decommissioned and replaced with alternatives, the contractors will follow the latest good practice, insofar as reasonably practicable, including appropriate backfilling of abandoned boreholes in order to prevent pollution pathways. This will also be applicable to springs potentially affected by construction works, although additional measures may be required to mitigate temporary construction impacts on springs that are to be relocated.
- 15.4.13 Measures will be introduced, as required, to mitigate the temporary and permanent effects on groundwater flows and water quality during excavation and construction of foundations and cuttings as far as is reasonably practicable. The types of measure likely to be adopted could include:
- installation of cut-off ²¹⁹ structures around excavations;
 - ensuring cut-off structures are driven to sufficient depths to meet an underlying strata or zone of lower permeability;
 - promoting groundwater recharge, such as discharging pumped water to recharge trenches around excavations to maintain baseline groundwater and surface water conditions; and
 - incorporating passive bypasses within the design, which could comprise a 'blanket' of permeable material, such as gravel, placed around temporary structures allowing groundwater to bypass the below-ground works, without a rise in groundwater levels on the upstream side.
- 15.4.14 The exact requirements will be refined and method of mitigation will be designed following ground investigation at cutting locations.
- 15.4.15 Approximately half of the proposed borrow pit north of Checkley Lane will be excavated into the Glaciofluvial Deposits, within the surface water catchment of Betley Mere SSSI. There is a potential surface water connection between the borrow pit and the drains discharging to the mere. The mere is also believed to have

²¹⁹ Impermeable barrier preventing water flow

interaction with the Glaciofluvial Deposit aquifer as both a source and sink of water. Therefore, excavation of the borrow pit within the Betley Mere catchment would have the potential to disrupt surface and groundwater flows towards the mere, without appropriate avoidance measures. The specific measures adopted to avoid the potential for impacts on Betley Mere will include²²⁰:

- provision of a 1m vertical buffer between the base of the borrow pit excavations and the groundwater level. This will ensure that there are no significant impacts on groundwater flows;
- adherence to the measures described in the draft CoCP;
- treatment and recirculation of any surface water runoff intercepted by the borrow pit into the downstream catchment at an appropriate rate and location, therefore ensuring that there will be no significant impact on the volume of water reaching the mere; and
- such reasonable ancillary measures as may be required.

15.4.16 The details of this mitigation will be agreed with the Environment Agency in consultation with Natural England to ensure that there are no significant effects on Betley Mere SSSI.

Flood risk and land drainage

15.4.17 The design of the Proposed Scheme will aim to mitigate permanent impacts on flood risk and land drainage as follows:

- the Checkley Brook viaduct has been designed to minimise, insofar as reasonably practicable, the area of land required for the Proposed Scheme within the floodplain and hydraulic modelling has been undertaken to inform local mitigation works designed to avoid increases in flood risk to vulnerable receptors. The Proposed Scheme includes replacement floodplain storage areas to replace storage lost as a result of the viaduct piers;
- the temporary works shown on Map Series CT-05 in the Volume 2: CA5 Map Book have been informed by a detailed consideration of the flood risk constraints and have sought to avoid flood zones wherever reasonably practicable;
- provision has been made to pass surface water runoff and land drainage flows beneath sections of raised embankment that will cross surface water flow paths, where reasonably practicable. This will be achieved using perimeter drainage and culverts, with their inverts set below the likely level of any upstream field subsurface drainage systems;
- in locations where the route of the Proposed Scheme will cross watercourses, the design aim is for structures to accommodate flood flows up to and

²²⁰ Or alternative methods agreed with the relevant stakeholders to ensure that there will be no significant impact to the flow or quality of groundwater and surface water reaching Betley Mere. If it can be confirmed that there is no hydrological connectivity between the borrow pit area and Betley Mere, these measures may not be required, subject to agreement with relevant stakeholders.

including the 1 in 100 year (1%) annual probability storm with an allowance for climate change based on latest guidance issued by the Environment Agency;

- runoff from the footprint of the Proposed Scheme 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 are 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 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 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.

15.4.18 The nominated undertaker will, insofar as reasonably practicable, ensure that flood risk is managed throughout the construction period and will require construction contractors to consider flooding issues when planning sites and storing materials. If necessary, temporary provision will be made to reduce the potential for impacts on existing land drainage systems during construction. Some of the specific measures referred to in Section 16 of the draft CoCP include:

- preparation of flood risk assessments and method statements for temporary works, including main construction and satellite compound drainage, watercourse crossings and realignments and temporary realignments in consultation with the Environment Agency, and where applicable, the LLFA and other relevant regulators;
- location of storage, machinery, equipment and temporary buildings outside flood risk areas where reasonably practicable;
- construction of outfalls during periods of low flow to reduce the risk of scour and erosion;
- design of temporary watercourse realignments with equivalent hydraulic capacity to the existing channels, ensuring that field subsurface drainage

systems can be adapted to discharge into the new channel; and

- having regard to the requirement for construction activities to avoid any increases in flood risk to vulnerable receptors.

15.4.19 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 is limited as far as is reasonably practicable.

Assessment of impacts and effects

15.4.20 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 to as low a level as is reasonably practicable.

Temporary effects – Water resources and WFD

Surface water

15.4.21 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, including Betley Mere SSSI. The draft CoCP is, however, closely focused on addressing these issues and is considered adequate to mitigate any associated impacts on water quality, such that no significant effects are anticipated.

Groundwater

Aquifers

15.4.22 Construction of the proposed cuttings in the South Cheshire area will involve earthworks above the Glaciofluvial Deposits Secondary A aquifer. The embedded mitigation is considered sufficient to ensure no temporary significant effects related to pollution of this aquifer and the integrity of its associated WFD groundwater body. Where the impacts of the borrow pit and cuttings have the potential to affect additional local receptors that rely on this water resource, for example springs and abstractions, these are reported below.

Abstractions

15.4.23 Construction activities associated with the Crewe South cutting and the borrow pit north of Checkley Lane have the potential to impact on groundwater at the two private licensed groundwater abstractions at The Grange. However, as set out in the draft CoCP this risk will be assessed by the contractor. If required, a suitable replacement with an alternative or mains water supply would be provided.

Groundwater – surface interactions

- 15.4.24 Construction of the Crewe South cutting and Crewe South portal could have an impact on a potential spring feature near Basford House. This feature has been assessed as a high value receptor on precautionary basis and this would, therefore, potentially result in a temporary moderate adverse effect, which would be significant.
- 15.4.25 Parts of the Crewe South cutting and HS2 spurs are within the catchment of the Betley Mere SSSI. There will be no groundwater pathway between the Proposed Scheme and Betley Mere at this location. There will, therefore, be negligible impacts on the groundwater supply in both quantity and quality to Betley Mere SSSI from construction of these elements and there will consequently be no significant effect.

Temporary effects - Flood risk and land drainage

- 15.4.26 Construction of the Checkley Brook viaduct and the bridge over Basford Brook at Basford East will require temporary working within the floodplain. Construction sequencing and temporary works design will be carefully considered and assessed in terms of potential impacts on flood risk. These activities will be implemented in consultation with the Environment Agency. It is not anticipated that these temporary activities will result in significant effects related to flood risk and land drainage.

Permanent effects – Water resources and WFD

- 15.4.27 Permanent effects are those initially caused by activity to construct the Proposed Scheme but which will also remain after the Proposed Scheme has been constructed.

Surface water

- 15.4.28 The avoidance and mitigation measures set out above for the assessment of temporary effects will be sufficient to ensure there will be no significant permanent effects related to surface water resources and WFD.

Groundwater

Aquifers

- 15.4.29 Implementation of the avoidance and mitigation measures will ensure that there are no permanent significant effects related to the impact of the proposed cuttings on water levels and quality in the aquifers intercepted by the Proposed Scheme. Where the impacts of the cuttings on the aquifers could affect additional local receptors that rely on the groundwater resource, for example springs and abstractions, the impacts on these are described below.

Groundwater - surface water interaction

- 15.4.30 With the implementation of the avoidance and mitigation measures described above, the Proposed Scheme will not cause any change in the quality and quantity of groundwater flowing to the Betley Mere SSSI.

Permanent effects – Flood risk and land drainage

- 15.4.31 The design of all watercourse and surface water crossings along the route of the Proposed Scheme, including the Checkley Brook viaduct, will ensure that the effects

related to construction of the Proposed Scheme will not be significant in relation to flood risk and land drainage.

- 15.4.32 The Basford Brook bridge will cross Basford Brook at Basford East Development Site. A bridge crossing over Basford Brook has been subject to a previous successful planning permission (12/4115N) for the Crewe Green Link Road (South)), which included a flood risk assessment as part of the planning application. Development of the bridge has not been implemented under the planning permission, and the location of the consented bridge falls within the land required for the Proposed Scheme. As such, the Basford Brook bridge, and associated highway embankment, have been included within the Proposed Scheme. Hydraulic modelling has not been undertaken as part of the assessment of the Proposed Scheme. Therefore, it has been assumed, on a precautionary basis, that the bridge could have a minor impact on flood risk. Given that there are high value receptors in this area, this would result in a moderate adverse effect, which is significant.
- 15.4.33 The construction of the road across the floodplain, which will connect to the Basford Brook bridge, has the potential to affect flood risk in this area. On a precautionary basis, this has been assessed as having potential to result in a moderate adverse impact, with implications for high value receptors upstream and downstream of the crossing, which is significant.

Other mitigation measures

- 15.4.34 Additional mitigation measures have been developed 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.
- 15.4.35 The potential spring near Basford House will be surveyed and its value reviewed. If this feature is identified as a true expression of groundwater, and therefore, still classified as a high value receptor following survey, mitigation options for its protection or replacement will be implemented.
- 15.4.36 The design of the bridge and road crossing of Basford Brook at Basford East Development Site will be developed, informed by a hydraulic modelling assessment, with a view to ensuring that the bridge, and its associated embankment, do not result in an increase in flood risk to vulnerable receptors.

Summary of likely residual significant effects

- 15.4.37 In the absence of the other mitigation measures set out above, the Proposed Scheme has the potential to result in residual significant effects as follows:
- a temporary moderate adverse effect on the potential spring located near Basford House, which is significant; and
 - a permanent moderate adverse effect related to flood risk associated with the bridge and road crossing of Basford Brook at Basford East Development Site, which is significant.

- 15.4.38 It is currently anticipated that it should be possible to develop the means of mitigating these impacts, to ensure that there are no residual significant effects arising from construction of the Proposed Scheme.

Cumulative effects

- 15.4.39 No significant cumulative temporary or permanent effects during construction with regard to water resources or flood risk are anticipated.

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 is provided in Volume 5: Appendix WR-002-000.
- 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, as outlined in the flood risk assessment in Volume 5: Appendix WR-003-002. 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 route-wide WFD compliance assessment is provided in Volume 3: Route-wide effects. This describes the measures embedded into the design that are specifically designed to ensure that the Proposed Scheme complies with the requirements of the WFD.

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 There will be no residual significant effects on surface water, groundwater or flood risk during operation of the Proposed Scheme.

Cumulative effects

- 15.5.8 A review of the committed developments within the study area has identified no potential for significant cumulative permanent effects in the study area.

Monitoring

- 15.5.9 Volume 1, Section 9 sets out the general approach to monitoring of water resources and flood risk during operation of the Proposed Scheme.
- 15.5.10 There are no area-specific requirements for monitoring water resources and flood risk during the operation of the Proposed Scheme.

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