In Parliament – Session 2021 - 2022

HS2

High Speed Rail (Crewe – Manchester) Environmental Statement

Volume 2: Community Area reports

MA01: Hough to Walley's Green

M16

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Department for Transport

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Contents

Tables

Figures

Preface

The Environmental Statement

This document forms part of Volume 2 of the Environmental Statement (ES) that accompanies the deposit of the High Speed Rail (Crewe – Manchester) hybrid Bill (hereafter referred to as the Bill). This Bill would authorise:

- the Phase 2b Western Leg, which comprises the section of the proposed High Speed Two (HS2) rail network from Crewe to Manchester, with connections onto the West Coast Main Line;
- a number of works that are required beyond the route, such as to the existing conventional rail network, to enable the operation of the Western Leg; and
- provision for future Northern Powerhouse Rail services to connect with HS2.
- Collectively, these are referred to in this ES as 'the Proposed Scheme'. The ES describes the Proposed Scheme and reports its likely significant environmental effects and the measures proposed to mitigate adverse effects.

The hybrid Bill for Phase One of the HS2 network, between London and the West Midlands, was the subject of an ES deposited in November 2013. The Phase One hybrid Bill received Royal Assent in February 2017. The main works on Phase One commenced in April 2020.

The hybrid Bill for Phase 2a of the HS2 network, between the West Midlands and Crewe, was the subject of an ES deposited in July 2017. The Phase 2a Bill received Royal Assent in February 2021.

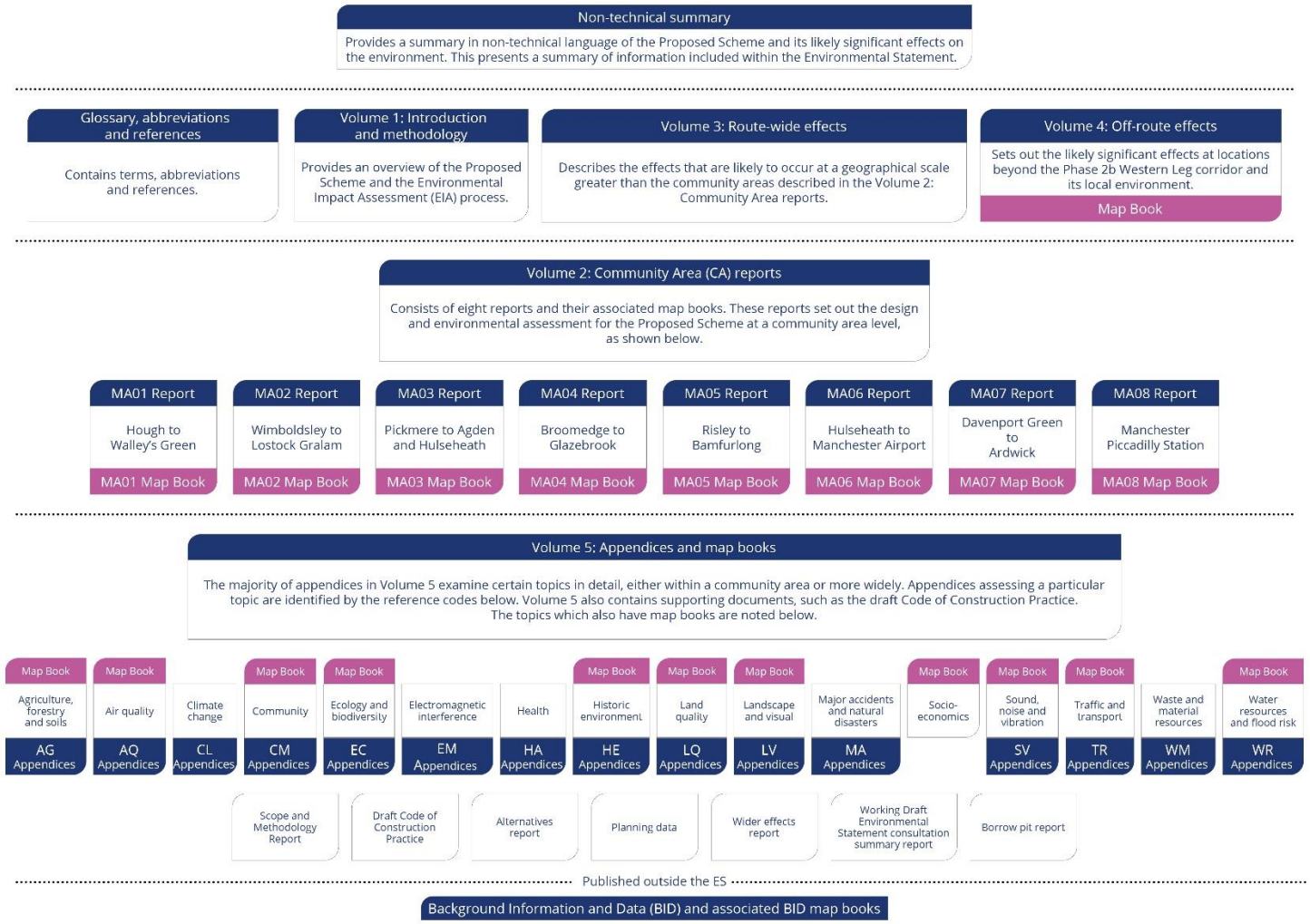
Consultation on the Environmental Statement

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

Structure of the Environmental Statement

This report is part of the suite of documents that make up the ES for the Proposed Scheme. The structure of the ES is shown in Figure 1 and described in more detail in Volume 1. The ES has been prepared by persons who have sufficient expertise to ensure the completeness and technical quality of the statement.

Figure 1: Structure of the Environmental Statement



1 Introduction

1.1 Introduction to HS2

1.1.1 High Speed Two (HS2) is a new high speed railway proposed by the Government to connect major cities in Britain. It will transform intercity and long distance passenger rail travel in the UK, providing the first major increase in intercity rail capacity for over a century and freeing up substantial capacity for rail travel and freight on the conventional rail network. London, Birmingham, Manchester and cities in the Midlands, the North and Scotland will be served by high speed trains running at speeds of up to 360kph (225mph) on HS2 lines and on the existing conventional rail network. As part of the Proposed Scheme, new stations will be built at Manchester Piccadilly and Manchester Airport, in addition to the new stations in London and the West Midlands included in HS2 Phase One.

1.1.2 The Proposed Scheme that is the subject of this ES consists of:

- the HS2 Western Leg from Crewe to Manchester, including:
  - new stations at Manchester Airport and Manchester Piccadilly;
  - a depot north of Crewe;
  - maintenance facilities north of Crewe and at Ashley; and
  - a connection onto the West Coast Main Line (WCML) near Bamfurlong;
- the Crewe Northern Connection, connecting the route of the Proposed Scheme with the WCML and enabling future Northern Powerhouse Rail (NPR) services to connect with HS2;
- provision for the NPR London to Liverpool, Manchester to Liverpool, and Manchester to Leeds junctions, to enable these future NPR routes to connect with HS2; and
- a number of works at locations beyond the Western Leg route corridor, referred to as 'off-route works', which include:
  - works to enable HS2 trains to call at existing stations further north on the WCML; and
  - construction of depots to provide overnight stabling for HS2 trains serving the north of England and Scotland.

1.1.3 The Proposed Scheme will connect with HS2 Phase 2a at Hough, to the south of Crewe.

1.1.4 Construction of the Proposed Scheme is assumed to commence in 2025, with operation assumed to start in 2038.

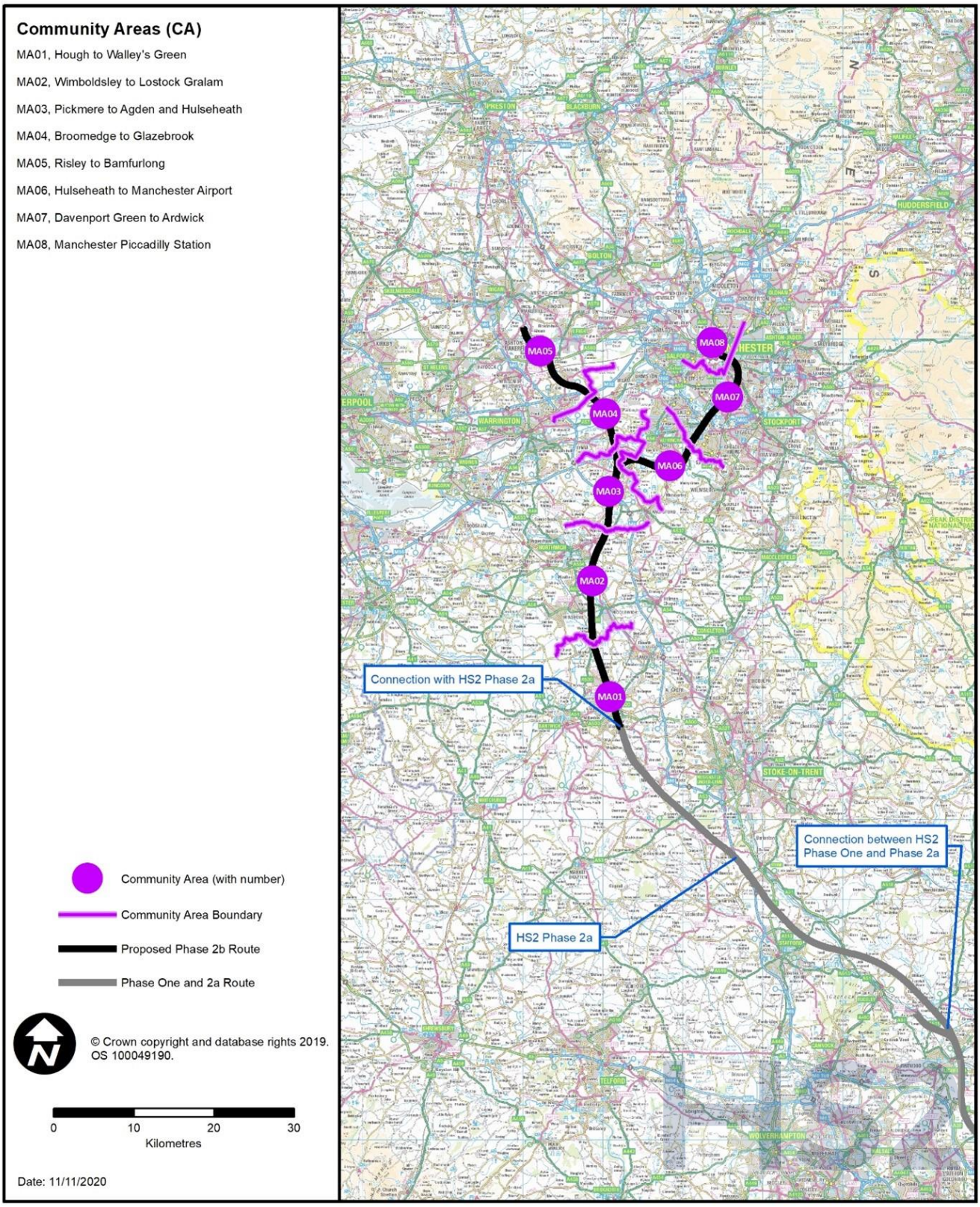
1.1.5 The environmental effects of the Proposed Scheme have been assessed. The findings of the assessment are reported in the ES, of which this Volume 2 report forms a part. The ES has been deposited alongside the Bill, in accordance with the requirements of Parliamentary

Standing Order 27A (SO27A)[1]. A working draft ES was consulted on during the development of the Phase 2b proposals to help inform the design and assessment of the Proposed Scheme.

1.1.6 For environmental assessment and community engagement purposes, the Proposed Scheme has been divided into eight community areas (CA). These are shown in Figure 2. This CA report relates to the Hough to Walley's Green area (MA01).

[1] House of Commons (2019), *Standing Order 27A of the Standing Orders of the House of Commons relating to private business (environmental assessment)*, House of Commons. Available online at: https://www.parliament.uk/business/publications/commons/sessional-orders-private1/.

Figure 2: The HS2 Phase 2b Western Leg 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 Hough to Walley's Green area. The report also describes the proposed means to avoid, prevent, reduce or, if possible, offset 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 list of the local alternatives considered;
- Section 3: consultation and stakeholder engagement; and
- Sections 4 to 15: an assessment of the following environmental topics:
  - agriculture, forestry and soils (Section 4);
  - air quality (Section 5);
  - community (Section 6);
  - ecology and biodiversity (Section 7);
  - health (Section 8);
  - historic environment (Section 9);
  - land quality (Section 10);
  - landscape and visual (Section 11);
  - socio-economics (Section 12);
  - sound, noise and vibration (Section 13);
  - traffic and transport (Section 14); and
  - water resources and flood risk (Section 15).

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

- an introduction to the topic;
- a description of the existing 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 monitoring measures that have been identified to address any significant adverse effects.

1.3.3 Environmental effects have been assessed in accordance with the scope, methodology, assumptions and limitations set out in Volume 1 and the EIA Scope and Methodology Report (SMR)[2]. Volume 1 also sets out assumptions relating to the impact of Covid-19 on the environmental baseline.

1.3.4 The maps relevant to the Hough to Walley's Green area are provided in a separate corresponding document entitled Volume 2: MA01 Map Book, which should be read in conjunction with this report. The maps contain grid references that are referred to in this report to enable features to be located.

1.3.5 The Proposed Scheme described in this report is that shown on the Map Series CT-05 (construction) and CT-06 (operation) (Volume 2: MA01 Map Book). There is some flexibility during detailed design to alter the horizontal and vertical alignments and other details within the limits shown on the plans and sections submitted to Parliament and as set out in the Bill, and this flexibility is included within the scope of the environmental assessment. Further explanation is provided in Volume 1, Section 1.

1.3.6 In addition to the environmental topics covered in Sections 4 to 15 of this report, climate change, electromagnetic interference, major accidents and disasters, and waste and material resources are addressed in Volume 3 on a route-wide basis. An assessment of potential environmental effects beyond the route corridor and its associated local environment has also been undertaken and this 'off-route' assessment is reported in Volume 4.

1.3.7 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.

1.3.8 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 (www.hs2.org.uk). The BID reports and maps present survey information, collated from published and unpublished sources, and other background data, and are referenced at various places within the ES.

[2] Volume 5: Appendix CT-001-00001, Environmental Impact Assessment Scope and Methodology Report.

2 Overview of the area and description of the Proposed Scheme

2.1 Overview of the area

General

2.1.1 The Proposed Scheme in the Hough to Walley's Green area will comprise four main components:

- the HS2 main line (referred to in this report as the route of the Proposed Scheme), which will be 10.8km in length in this area;
- modifications to the West Coast Main Line (WCML), to accommodate Crewe Northern Connection and enable access Crewe North rolling stock depot (RSD) which will be located within the Wimboldsley to Lostock Gralam area (MA02);
- the Crewe Northern Connection, which will enable future Northern Powerhouse Rail (NPR) services to connect with HS2; and
- the WCML reception tracks, connecting Crewe North RSD with both the WCML and the route of the Proposed Scheme.

2.1.2 The Proposed Scheme in the Hough to Walley's Green area will be within the local authority area of Cheshire East Council (CEC). The Proposed Scheme will pass through the parishes of Basford, Warmingham and Minshull Vernon and under the town of Crewe.

2.1.3 The boundary between the Proposed Scheme and HS2 Phase 2a north of Newcastle Road at Hough forms the southern boundary of the Hough to Walley's Green area. The boundary between the parishes of Minshull Vernon, Stanthorne and Wimboldsley forms the northern extent of the Proposed Scheme in the area. The Wimboldsley to Lostock Gralam area (MA02) lies to the north, as shown in Figure 3.

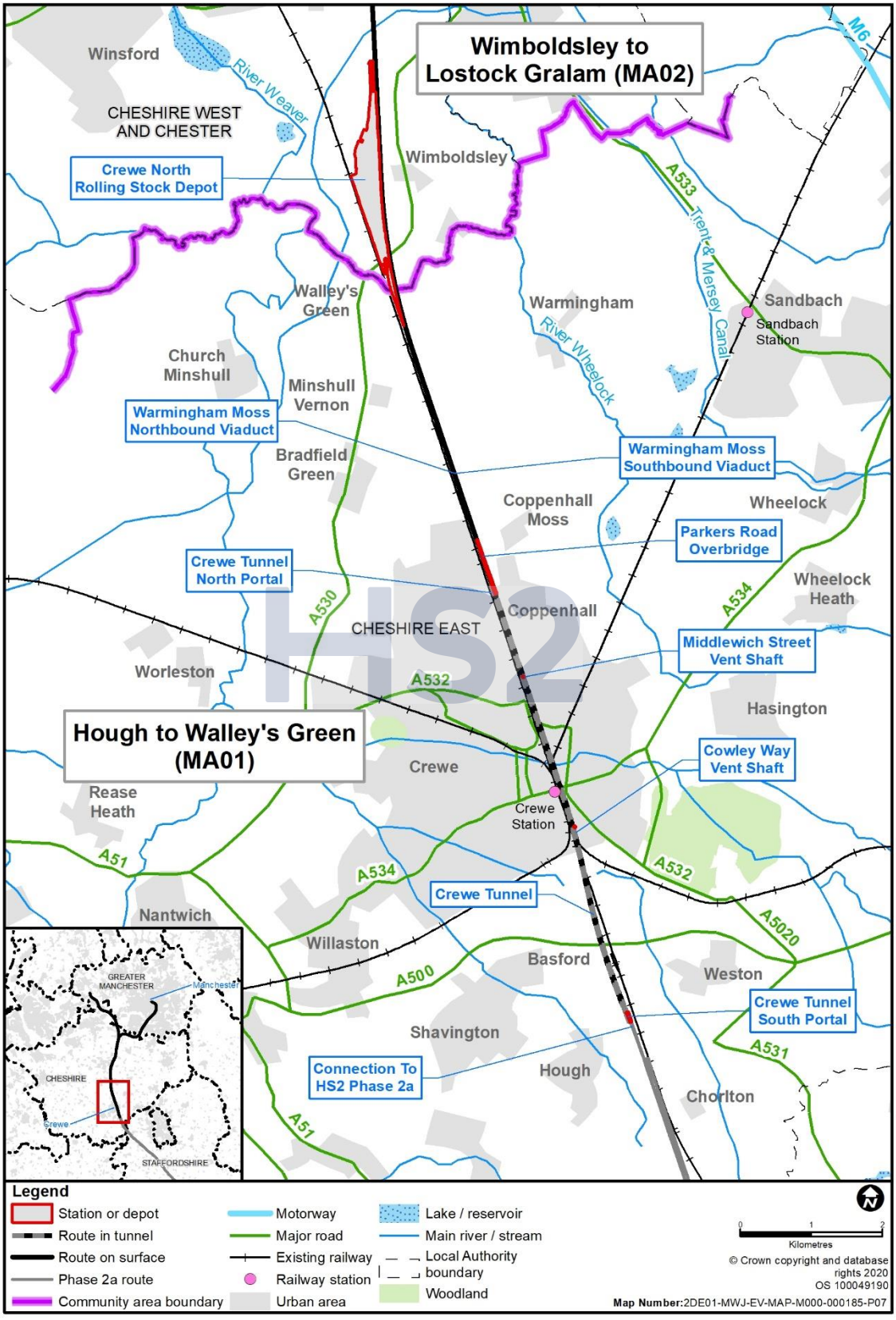
Settlement, land use and topography

2.1.4 The southern part of the Hough to Walley's Green area is predominantly urban in character through Crewe, with mainly industrial, commercial, railway and residential land uses. To the north of Crewe, the area is predominantly rural in character, with agriculture being the main land use.

2.1.5 The main settlement is Crewe. There are a number of key residential areas within Crewe including Wistaston and Wistaston Green to the south, and Coppenhall, Maw Green and Barrows Green to the north. Crewe Gates Farm Industrial Estate dominates the south-east part of Crewe. To the north of Crewe is the hamlet of Walley's Green. Several isolated farms are also situated along the route of the Proposed Scheme, with Spring Farm and Parkfield Farm to the west, and Moss Farm, Moss Fields Farm and Park Hall Farm to the east.

2.1.6 The highest and lowest lying areas of Crewe are 65m above Ordnance Datum (AOD) at its highest point and 55m AOD at its lowest point. Crewe is crossed by the Gresty and Valley brooks, which provide the only variations within an otherwise generally flat landscape. To the north of Crewe, the land is low-lying. The lowest point is 51m AOD and the highest point is 53m AOD, sloping very gently westwards to the River Weaver and eastwards to the River Wheelock.

Figure 3: Community area context map



Key transport infrastructure

2.1.7 The principal highways within this area include the A500 Newcastle Road/Shavington Bypass, the A531 Newcastle Road, the A534 Nantwich Road/Crewe Road/Crewe Green Road/Haslington Bypass/Wheelock Bypass/Old Mill Road/Congleton Road, and the A530 Middlewich Road/Nantwich Road. Within Crewe, key roads include the A532 Weston Road/Macon Way/Manchester Bridge/Earle Street/Vernon Way/West Street/Coppenhall Lane, the A5019 Vernon Way and the A5078 Oak Street/Dunwoody Way. The M6 passes through the Hough to Walley's Green area.

2.1.8 Crewe has a large train station, serving as a key interchange. Several railway lines radiate out from Crewe including the WCML, Crewe to Manchester Line, North Wales Coast Line, Crewe to Shrewsbury Line and the Crewe to Derby Line. The WCML connects London to Scotland, running south-north through this area and stopping at Crewe Station. The route of the Proposed Scheme will run parallel to, or in tunnel under, the WCML throughout much of the Hough to Walley's Green area.

2.1.9 The Middlewich Branch of the Shropshire Union Canal is located in the north-west of this area and the Trent and Mersey Canal is located in the east of this area.

2.1.10 In the north of the Hough to Walley's Green area, the route of the Proposed Scheme will cross several public rights of way (PRoW), which provide important links across the existing WCML. The Crewe and Nantwich Circular Walk passes through the area. The route of the Proposed Scheme will pass several national, regional and local cycle routes including: Cheshire Cycleway south of Crewe, through Hough; Route 551 south of Crewe, through Hough; Route 451 through the centre of Crewe; and Route 5 west of Sandbach.

Socio-economic profile

2.1.11 The professional, scientific and technical sector accounts for the largest proportion of businesses within the CEC area (19%), followed by the construction (9%) and business administration and support services (9%) sectors[3].

2.1.12 According to the Annual Population Survey (2020)[4], the employment rate (the proportion of residents aged 16-64 in employment) within the CEC area was 81% (181,600 people). The unemployment rate was 5% in the CEC area in 2019.

2.1.13 The same survey indicates that 42% of residents aged 16-64 in the CEC area were qualified to National Vocational Qualification Level 4 (NVQ4) and above, while 6% of residents had no qualifications.

[3] Office for National Statistics (2020), *UK Business Counts - local units by industry and employment size band*. Available online at: http://www.nomisweb.co.uk/datasets/idbrlu.

[4] Office for National Statistics (2020), *Annual Population Survey*. Available online at: http://www.nomisweb.co.uk/datasets/apsnew. This number includes the jobs held by residents of CEC irrespective of where they work.

Notable community facilities

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

2.1.15 Crewe is a large town with numerous community resources including nursery, primary and secondary schools, and an engineering college. A specialist health care facility - the Sherborne Court Neurological Centre for adults with neurological diseases and brain injuries - is also present in the town. There are also numerous places of worship, community centres, libraries, other medical facilities, care homes (including Bentley Manor Care Home) and public houses.

2.1.16 Within northern Crewe is Sir William Stanier Academy, Bright Stars Children's Day Nursery, Mablins Lane Primary School and Mablins Lane Children's Centre. Notable community facilities located in the smaller settlements in the Hough to Walley's Green area include: Chorlton Golf Course; Hough Methodist Church; Church of All Saints, Weston Cemetery and Weston Village Primary School in Weston; and Oakfield Lodge School in Coppenhall Moss.

Recreation, leisure and open space

2.1.17 The Hough to Walley's Green area is crossed by several routes that are promoted as destinations for recreation. These include the Shropshire Union Canal towpath, the Crewe and Nantwich Circular Walk, the Cheshire Ring Canal Walk, the South Cheshire Way, National Cycle Route 5 and Regional Cycle Route 70.

2.1.18 Waterways which pass through the area include the Trent and Mersey Canal, the River Weaver, the River Wheelock and a short section of the Shropshire Union Canal.

2.1.19 Notable recreation, leisure and open space facilities within Crewe include Crewe Alexandra Football Club football ground (Alexandra Stadium); Crewe Golf Club to the east of the town; Queens Park and Queens Park Golf Club to the west; and the Cumberland Arena and adjacent playing fields, to the east. Other notable facilities outside of Crewe include Chorlton Golf Course to the south of the Hough to Walley's Green area and Winton Equestrian Centre to the north of Crewe.

Policy and planning context

2.1.20 Volume 1 provides an overview of the case for HS2.

Planning framework

2.1.21 Relevant development plan documents and other planning policies have been considered in relation to environmental topics, as part of considering the Proposed Scheme in the local

context. Development plan documents and other planning policies relevant to the Hough to Walley's Green area are listed in Volume 5: Appendix CT-004-00000, Planning data. These have been considered and referred to where appropriate to the assessment described in Sections 4 to 15 of this Volume 2 report.

Committed development

2.1.22 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. Section 7 of Volume 1 sets out the approach to identifying and considering committed developments in the assessment. The committed developments relevant to the assessment of the Proposed Scheme in the Hough to Walley's Green area are listed in Volume 5: Appendix CT-004-00000, Planning data and are shown in Volume 5, Planning Data/Committed Development Map Book: maps CT-13-301 to CT-13-304a.

2.1.23 These have been considered to determine whether they would result in a material change to the future baseline or have the potential to give rise to cumulative effects for each environmental topic. The committed developments considered in the assessment for the Hough to Walley's Green area are reported in the relevant topic sections of this report.

Interface with Phase 2a

2.1.24 The route of the Proposed Scheme will connect to HS2 Phase 2a at Hough. HS2 Phase 2a received Royal Assent in February 2021 with construction assumed to commence in 2024. It is therefore considered to be a committed development in the context of this assessment.

2.1.25 The HS2 Phase 2a scheme described in the Volume 2, Community Area report: South Cheshire area (CA5)[5] of the Phase 2a Environmental Statement (ES) overlaps with the Hough to Walley's Green area south of Hough. The assessment of the Proposed Scheme assumes that the main civils works of the Phase 2a scheme will have been constructed in this area, prior to the commencement of operation of the Proposed Scheme. These works include:

- Crewe tunnel south portal (retained cutting);
- Basford cutting;
- Casey Lane closure and diversion;
- balancing pond at Casey Lane;
- realignment of WCML tracks;
- extended tracks to access Basford Hall Sidings;

[5] High Speed Two Ltd (2019), *High Speed Rail (West Midlands – Crewe), Supplementary Environmental Statement 2 and Additional Provision 2 Environmental Statement, Volume 2: Community Area report, CA5: South Cheshire*. Available online at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/775955/J14_HS2_Phase_2a_AP2_ES_Volume_2_CA5_South_Cheshire.pdf.

- diversion of Regional Cycle Route 70; and
- Basford Cycle Track between Weston Lane and Casey Lane.

2.1.26 As a result of the Proposed Scheme a number of changes to the Phase 2a permanent scheme design will be required at the interface with HS2 Phase 2a. These changes are described in Section 2.2.

2.1.27 The assessment of the Proposed Scheme assumes that the demolitions that were identified in the Phase 2a ES will have been undertaken prior to construction of the Proposed Scheme.

2.1.28 The Crewe Tunnel south portal satellite compound, which will be used to manage civil and railway systems works during the construction of HS2 Phase 2a, will continue to be used during the construction of the Proposed Scheme, as set out in Section 2.3. It is also assumed that the installation of track and railways systems to connect Phase 2a and the south end of Crewe tunnel will be carried out as part of the Proposed Scheme.

2.1.29 The significant environmental effects of the Phase 2a scheme were reported in the ES deposited with the HS2 Phase 2a Bill and subsequent additional provisions ESs and Supplementary Environmental Statements (SESs[6]). Where there is the potential for cumulative impacts to arise with the Proposed Scheme, this is reported in Sections 4 to 15 of this report.

Crewe Hub

2.1.30 HS2 Ltd is working with the Department for Transport (DfT), Network Rail, CEC and other stakeholders to support the development of proposals for an enhanced transport hub at Crewe (referred to as Crewe Hub). A public consultation on Crewe Hub was launched at the same time as the Phase 2a Bill deposit, in July 2017. The outcome of the consultation was published in March 2018 and confirmed the Government's support for the Crewe Hub vision. The scope of the West Midlands to Crewe (Phase 2a) Hybrid Bill was subsequently modified to support the proposals[6]. The design changes included:

- reconfiguration of the existing WCML tracks to the south of Crewe Station; and
- the alteration of Platforms 5 and 6 at Crewe Station.

2.1.31 The consultation response also indicated that a junction between the WCML and HS2 would be required north of Crewe Station to facilitate Crewe Hub. This junction is included in the Proposed Scheme as Crewe Northern Connection.

2.1.32 Crewe Hub itself does not form part of the Proposed Scheme. It is assumed that in due course any necessary development consent would be secured separately for these emerging

[6] High Speed Two Ltd (2019), *High Speed Rail (West Midlands – Crewe) Supplementary Environmental Statement 2 and Additional Provision 2 Environmental Statement*. Available online at: https://www.gov.uk/government/collections/hs2-phase-2a-supplementary-environmental-statement-2-and-additional-provision-2-environmental-statement-february-2019.

proposals, which would include an assessment of environmental effects arising, including any cumulative effects with other committed development such as the Proposed Scheme.

Changes to the design since the working draft ES

2.1.33 A number of changes have been introduced to the Proposed Scheme in this area since the working draft ES was published. The key changes in this area (including approximate dimensions where appropriate) are as follows:

- introduction of Crewe Northern Connection, comprising:
  - two lines (northbound and southbound) to connect the WCML to the route of the Proposed Scheme (see Volume 2: MA01 Map Book, map CT-06-306, A6 to CT-06-308a, C7);
  - three embankments (Warmingham Moss Southbound RSD embankment, Warmingham Moss Southbound embankment No.1 and Warmingham Moss Southbound embankment No.2) (see Volume 2: MA01 Map Book, map CT-06-306, H6 to CT-06-308a, C7; CT-06-306, B6 to E6 and CT-06-306, I7 to CT-06-307, B7);
  - two viaducts (Warmingham Moss Northbound viaduct and Warmingham Moss Southbound viaduct) (see Volume 2: MA01 Map Book, map CT-06-306, E6 to I7 and map CT-06-306, F6 to map CT-06-307, H6); and
  - removal of Footpath Warmingham 16/2 accommodation overbridge. The Footpath Warmingham 16/2 will be diverted south of its existing alignment to cross the route of the Proposed Scheme and the WCML on Footpath Crewe 29/1 accommodation overbridge (see Volume 2: MA01 Map Book, map CT-06-306, D4 to D7).
- introduction of reception tracks from the WCML to Crewe North RSD (referred to as the WCML reception tracks), comprising:
  - two lines (northbound and southbound) to provide access from the WCML to Crewe North RSD, located in the Wimboldsley to Lostock Gralam (MA02) area (see Volume 2: MA01 Map Book, map CT-06-306, C6 to CT-06-308a, C6);
  - Warmingham Moss Northbound WCML embankment) (see Volume 2: MA01 Map Book, map CT-06-306, D6 to G6);
  - a cutting (Warmingham Moss Southbound RSD cutting) (see Volume 2: MA01 Map Book, map CT-06-307, D6 to G6);
  - Footpath Crewe 29/1 offline culvert (see Volume 2: MA01 Map Book, map CT-06-306, D5); and
  - Footpath Crewe 12/1 diversion (see Volume 2: MA01 Map Book, map CT-06-306, D4 to F6).
- introduction of Crewe North IMB-R as a permanent base and satellite site to Phase 2a Stone IMB-R, to support the maintenance of railway infrastructure. The Crewe North IMB-R will continue into the Wimboldsley to Lostock Gralam area (MA02). Further information on Crewe North IMB-R can be found in Volume 2: Community Area report, Wimboldsley to Lostock Gralam (MA02) (see Volume 2: MA01 Map Book, map CT-06-308a, A7 to F6);

- changes to the WCML as a result of the introduction of Crewe Northern Connection and WCML reception tracks comprising realignment of two of the four existing WCML lines, one to the west and one to the east, between the existing Parkers Road Overbridge and Burnt Covert (see Volume 2: MA01 Map Book, map CT-06-306, A6 to CT-06-307, D6).
- changes to the route of the Proposed Scheme in the Hough to Walley's Green area as a result of design development comprising:
  - removal of Spring Farm accommodation overbridge and eastern access (see Volume 2: MA01 Map Book, map CT-06-306, H5 to J8);
  - removal of Spring Farm culvert (see Volume 2: MA01 Map Book, map CT-06-306, E6 to E7);
  - introduction of Warmingham Moss offline culvert (see Volume 2: MA01 Map Book, map CT-06-306, E5);
  - removal of Minshull Vernon embankment, which has been incorporated within Coppenhall Moss North embankment (see Volume 2: MA01 Map Book, map CT-06-307, B6);
  - Footpath Crewe 29/1 accommodation overbridge has moved 68m north and lengthened to the west and north-east of the location proposed in the working draft ES (see Volume 2: MA01 Map Book: map CT-06-306, D4 to E7); and
  - Crewe tunnel north portal building and rescue area and auto-transformer station will be located 100m to the north of the location proposed in the working draft ES (see Volume 2: MA01 Map Book, map CT-06-305, G6).
- Crewe tunnel south portal and tunnel portal building and rescue area, which was provided for in the HS2 Phase 2a scheme, will now form part of the Proposed Scheme (see Volume 2: MA01 Map Book, map CT-06-302, B6);
- changes to the construction of the Proposed Scheme as a result of design development comprising:
  - combining of the Crewe tunnel south satellite compound with the Crewe tunnel south portal satellite compound (see Volume 2: MA01 Map Book, map CT-05-301, E4 to F6);
  - two additional civil engineering satellite compounds (see Volume 2: MA01 Map Book, map CT-05-306, F7 to G8 and F5 to H5); and
  - a temporary footbridge at Parkers Road will provide access over the WCML and the Proposed Scheme during the temporary closure of the existing Parkers Road Overbridge (see Volume 2: MA01 Map Book, map CT-05-306, J5 to J6).
- introduction of utilities works including the diversion of a National Grid high pressure gas pipeline and Scottish Power overhead power lines throughout the Hough to Walley's Green area, as described in Section 2.2; and
- introduction of two telecommunications sites in the Hough to Walley's Green area, as described in Section 2.2 (see Volume 2: MA01 Map Book, map CT-06-302, B6 and map CT-06-307, B7).

2.1.34 In addition, the location and layout of construction compounds, stockpiles and site haul routes have been considered as part of the development of the design. Mitigation such as noise barriers, landscape earthworks, compensatory planting and replacement ponds and wetlands have also been included throughout the Hough to Walley's Green area to reduce adverse effects from the Proposed Scheme.

2.2 Description of the Proposed Scheme

General

2.2.1 The following section describes the main features of the Proposed Scheme in the Hough to Walley's Green area, including the proposed environmental mitigation measures that have been identified. Further general information on typical permanent features is provided in Volume 1, Section 5. Similarly, a general description of the approach to mitigation is explained in Volume 1, Section 9. Some of the ecological mitigation described in this section has been provided on a precautionary basis. This is described in Section 7, 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 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 Hough to Walley's Green area has four main components (as illustrated on Figure 4 and Figure 5):

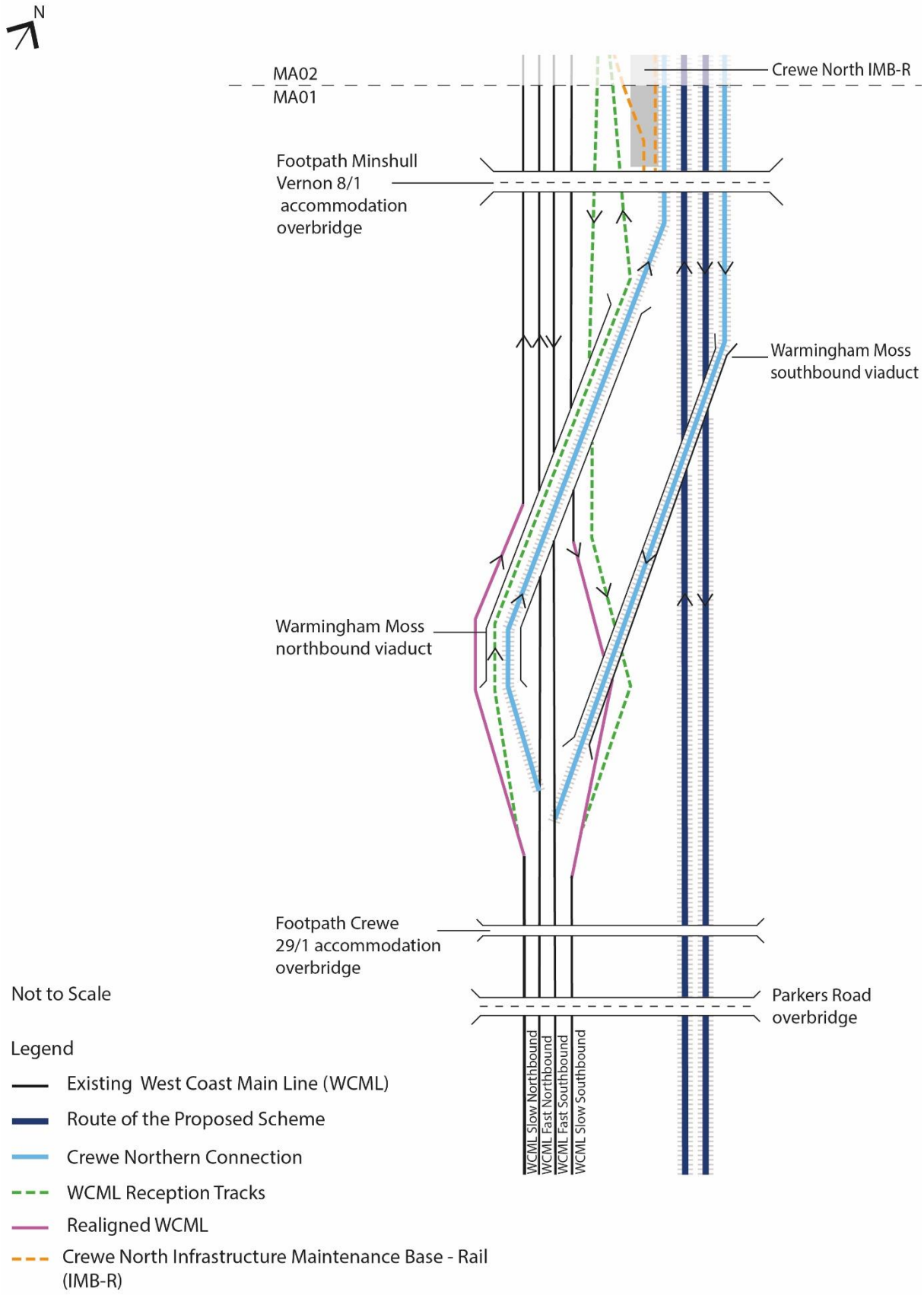
- the route of the Proposed Scheme: approximately 10.8km in length, continuing from HS2 Phase 2a northwards under Crewe (in Crewe tunnel) and on to the Wimboldsley to Lostock Gralam area (MA02);
- modifications to the WCML: realignment of sections of the existing WCML and modification of existing railway systems and equipment are required to accommodate Crewe Northern Connection and WCML reception tracks;
- Crewe Northern Connection: lines to connect the route of the Proposed Scheme to the WCML and enable future NPR services to connect with HS2 at Crewe; and
- WCML reception tracks: tracks to connect the WCML to Crewe North RSD.

2.2.4 Each of these components and their associated 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.

2.2.5 Where reference is made to the Proposed Scheme, this includes two or more of the components listed above. The components are also described individually, where relevant.

2.2.6 In addition to the features described below, the Proposed Scheme in the area will also include maintenance access points and routes, and hedgerow planting. There will also be additional utilities works in the area, which may include works to low voltage overhead or underground lines, gas pipes, sewers and telecommunication cables.

Figure 4: Schematic of interaction between HS2, the WCML, Crewe Northern Connection and Crewe North IMB-R



The route of the Proposed Scheme

2.2.7 The route of the Proposed Scheme through the Hough to Walley's Green area will be approximately 10.8km long. The route will extend from the connection with HS2 Phase 2a in the south and travel north under Crewe (in tunnel) and on to the Wimboldsley to Lostock Gralam area (MA02).

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

2.2.9 All dimensions in the sections below are approximate.

2.2.10 The route of the Proposed Scheme will consist of 813m of cutting, 3.5km of embankments and 6.5km of tunnel (including portals) in the Hough to Walley's Green area.

2.2.11 These components and their associated key features are described in four separate sections below. In general, the Proposed Scheme is described from south to north.

Connection to Phase 2a at Hough

2.2.12 The route of the Proposed Scheme will connect to HS2 Phase 2a at the Crewe tunnel south portal (see Volume 2: MA01 Map Book, map CT-06-302, B6).

2.2.13 The Proposed Scheme will include changes to the design of Phase 2a, to enable the connection between the two schemes. Key features of this 285m section will include:

- Crewe tunnel south portal, a porous portal 150m in length at the southern end of Crewe tunnel, with a headwall[7] at the northern end of the portal cutting (see Volume 2: MA01 Map Book, map CT-06-302, B6);
- landscape earthworks, with associated landscape mitigation planting, to the west of the Crewe tunnel south portal extending for 120m in length and 4m in height to provide visual screening for residents at Casey Lane (see Volume 2: MA01 Map Book, map CT-06-302, B5 to C6);
- Crewe tunnel south portal building, 27m in length, 24m in width and 7m in height, containing the control equipment for rail tunnel operations. An emergency rescue area, 42m by 23m in area, will also be located at the portal to accommodate emergency evacuation of passengers and vehicular access for emergency services. Access will be provided from Casey Lane (see Volume 2: MA01 Map Book, map CT-06-302, B6); and
- Crewe tunnel south portal telecommunications site, 6m by 6m in area, to the south of the route of the Proposed Scheme, including a railway telecommunications mast up to 15m in height. Access will be provided from Casey Lane to the north (see Volume 2: MA01 Map Book, map CT-06-302, B6).

[7] A supporting, protecting or retaining wall built at the front or top of a structure or area.

Crewe tunnel

2.2.14 The route of the Proposed Scheme will enter Crewe tunnel 350m north of the existing Newcastle Road and continue north underneath Crewe, before emerging from Crewe tunnel north portal, north of the B5076 Bradfield Road. This section of route is illustrated on maps CT-06-302 to CT-06-305 in the Volume 2: MA01 Map Book.

2.2.15 Key features of this 6.5km section will include:

- Crewe tunnel, a twin bored tunnel, 6.2km in length and up to 43m in depth, passing under Crewe. The top of the bored tunnel will be up to 35m below existing ground level and track level will be up to 43m below ground level. Both excavated bores will be 10m in external diameter with a lined internal diameter of 9m. There will be cross passages up to every 500m providing access between the two bores (see Volume 2: MA01 Map Book, Map CT-06-302, B6 to CT-06-305, G6);
- a pumping station and pumping station for railway drainage, immediately north-west of the Crewe tunnel south portal building. Access will be provided from Casey Lane (see Volume 2: MA01 Map Book, map CT-06-302, B6 to C6);
- an underground attenuation tank for railway drainage, immediately west of the Cowley Way vent shaft auto-transformer station (see Volume 2: MA01 Map Book, map CT-06-303, G5);
- Cowley Way vent shaft auto-transformer station, 34m by 24m in area, to the east of the route of the Proposed Scheme, 450m south-east of Crewe Station. Access will be provided from Cowley Way to the north-east (see Volume 2: MA01 Map Book, map CT-06-303, G5 to G6);
- a substation, 20m by 20m in area, immediately east of the Cowley Way vent shaft auto-transformer station (see Volume 2: MA01 Map Book, map CT-06-303, G6);
- Cowley Way vent shaft and headhouse, with emergency rescue area located south of Cowley Way. The vent shaft will be 24m in internal diameter and up to 40m in depth. The headhouse will be 34m in length, 28m in width and 11m in height. Access will be provided from Cowley Way (see Volume 2: MA01 Map Book, Map CT-06-303, G6);
- diversion of a Cadent Gas intermediate pressure gas main, for 1.9km in length, to accommodate the Crewe tunnel (located within the section of route shown on Volume 2: MA01 Map Book, map CT-06-303;
- diversion of a Cadent Gas medium pressure gas main, for 1.1km in length, to accommodate Cowley Way ventilation shaft (located within the section of route shown on Volume 2: MA01 Map Book, map CT-06-303);
- a substation, 5m by 5m in area, immediately west of Audley Street West (see Volume 2: MA01 Map Book, map CT-06-304, I5);
- Middlewich Street vent shaft and headhouse, with associated landscape mitigation planting to help integrate the Proposed Scheme into the surrounding landscape. The vent shaft will be 24m in internal diameter and up to 40m in depth. The headhouse will

be circular, 33m in diameter and 8m in height. Access will be provided from the B5067 Middlewich Street (see Volume 2: MA01 Map Book, map CT-06-304, J5 to J6);

- an underground attenuation tank, 8m by 8m, for railway drainage, immediately north-east of the Middlewich Street vent shaft and headhouse (see Volume 2: MA01 Map Book, map CT-06-304, J6);
- Crewe tunnel north portal auto-transformer station, 28m by 27m in area, 150m north of Bradfield Road, including a railway telecommunications mast up to 15m in height. Access will be provided from Broughton Road to the east (see Volume 2: MA01 Map Book, map CT-06-305, G5 to G6);
- a substation, 20m by 20m in area, immediately east of Crewe tunnel north portal auto-transformer station (see Volume 2: MA01 Map Book, map CT-06-305, G6);
- a pumping station and pumping station storage tank for railway drainage, to the east of the route of the Proposed Scheme. Access will be provided from Broughton Road (see Volume 2: MA01 Map Book, map CT-06-305, G6);
- an area of landscape mitigation planting south of the Crewe tunnel north portal auto-transformer station to provide visual screening for residents on Broughton Road (see Volume 2: MA01 Map Book, map CT-06-305, G5 to G6);
- a new electricity supply, two 33kv Scottish Power underground cables, for 4.3km in length, from the existing Scottish Power primary substation in south-west Crewe to the Crewe Tunnel North Portal (located within the section of route shown on Volume 2: MA01 Map Book, maps CT-06-305, CT-06-305-L1, CT-06-305-L2 and CT-06-305-L3);
- Crewe tunnel north portal, a porous portal 150m in length at the northern end of the Crewe tunnel, with a headwall at the southern end of the portal cutting (see Volume 2: MA01 Map Book, map CT-06-305, G6);
- Crewe tunnel north portal building, 27m in length, 24m in width and 7m in height, containing the control equipment for rail tunnel operations. An emergency rescue area, at least 550m in area, will also be located adjacent to the portal to accommodate emergency evacuation of passengers and vehicular access for emergency services. Access will be provided from Broughton Road (see Volume 2: MA01 Map Book, map CT-06-305, G6);
- an area of landscape mitigation planting to the east and west of the Crewe tunnel north portal to provide visual screening for residents to the west and for residents on Broughton Road to the east (see Volume 2: MA01 Map Book, map CT-06-305, G5 and G6); and
- permanent diversion or decommissioning of minor utilities within this section, including Cadent Gas gas mains, Scottish Power overhead power lines and underground cables, United Utilities wastewater sewers and United Utilities water mains (located within the section of route shown on Volume 2: MA01 Map Book, map CT-06-303).

Crewe north portal cutting (retained cutting) to Coppenhall Moss south embankment

2.2.16 The route of the Proposed Scheme will continue north-west from Crewe tunnel north portal towards Parkers Road, into Crewe north portal cutting (retained cutting) and into Coppenhall Moss cutting before continuing onto Coppenhall Moss south embankment.

2.2.17 The route of the Proposed Scheme will run parallel to, and to the east of, the WCML through this section. The Crewe Northern Connection will also run through this section and is described further in the Crewe Northern Connection section below. This section of route is illustrated on maps CT-06-305 to CT-06-307 in the Volume 2: MA01 Map Book.

2.2.18 Key features of this 1.5km section will include:

- Crewe north portal cutting (retained cutting), 593m in length, up to 16m in depth and up to 33m in width (see Volume 2: MA01 Map Book, map CT-06-305, G6 to map CT-06-306, B7);
- the continuation of an area of landscape mitigation planting, located along the eastern side of the route of the Proposed Scheme to provide visual screening for residents in Coppenhall Moss, Warmingham Moss, at Moss Farm and Moss Fields Farm (see Volume 2: MA01 Map Book, map CT-06-305, G6 to map CT-06-306, B7);
- permanent relocation of a mobile telecommunications mast, from 370m north of Bradfield Road to 225m north-east of the junction of Underwood Lane and B5076 Bradfield Road, adjacent to the Proposed Scheme (see Volume 2: MA01 Map Book, map CT-06-305, H5);
- extension of the existing Parkers Road Overbridge on its existing alignment, up to 29m in length and up to 4m above ground level and up to 8m above track level (see Volume 2: MA01 Map Book, map CT-06-305, J5 to J6);
- installation of a combined public water sewerage pumping station, located adjacent to Parkers Road, to reconnect the network crossing Parkers Road Overbridge (see Volume 2: MA01 Map Book, map CT-06-305, J6);
- a noise fence barrier, 1.3km in length and up to 5m in height, located along the western side of the route of the Proposed Scheme, from the existing Parkers Road Overbridge to Coppenhall Moss north embankment, to provide acoustic screening for residents on Parkers Road, Spring Farm, White House, Springfield Cottage and Barrows Green (see Volume 2: MA01 Map Book, map CT-06-305, J6 to map CT-06-306, H7);
- a noise fence barrier, 960m in length and 3m in height, located along the western side of the existing and realigned WCML, from the existing Parkers Road Overbridge to the end of Warmingham Moss northbound WCML embankment to provide acoustic screening for residents on Parkers Road, Spring Farm, White House, Springfield Cottage, Barrows Green (see Volume 2: MA01 Map Book, map CT-06-305, J5 to map CT-06-306, F6);
- four ecological mitigation ponds, within an area of grassland habitat creation, to the east of Coppenhall Moss cutting, 275m west of Kent's Lane to provide replacement habitat for

great crested newt with surrounding terrestrial habitat (see Volume 2: MA01 Map Book, map CT-06-306, B7 to C8);

- permanent relocation of a mobile telecommunications mast from its existing location 10m south of Parkers Road, to 400m north of Parkers Road. Access will be provided from Parkers Road (see Volume 2: MA01 Map Book, map CT-06-306, C7);
- Coppenhall Moss cutting, 220m in length, up to 5m in depth and up to 40m in width (see Volume 2: MA01 Map Book, map CT-06-306, B7 to C7);
- landscape earthworks, with associated landscape mitigation planting, 1.3km in length and up to 6m in height, beginning 240m north of the existing Parkers Road Overbridge and continuing along the east of Coppenhall Moss south embankment. The landscape earthworks will provide visual screening for residents in Coppenhall Moss (see Volume 2: MA01 Map Book, map CT-06-306, B7 to I7);
- diversion of a section of Footpath Crewe 29/1, up to 68m north of its existing alignment, on an embankment 415m long and up to 11m in height, crossing the route of the Proposed Scheme and the WCML on Footpath Crewe 29/1 accommodation overbridge, increasing journey length by 715m (see Volume 2: MA01 Map Book, map CT-06-306, C7 and D4);
- Footpath Crewe 29/1 accommodation overbridge crossing the route of the Proposed Scheme and the WCML, 133m in length and up to 9m above ground level and up to 8m above track level. Access will be provided from Footpath Crewe 29/1, Footpath Crewe 12/1 and Footpath Warmingham 16/2 (see Volume 2: MA01 Map Book, map CT-06-306, D4 to E7);
- Footpath Crewe 29/1 offline culvert, 157m south-west of the Proposed Scheme, to convey Hoggins Brook under a diverted section of Footpath Crewe 29/1 (see Volume 2: MA01 Map Book, map CT-06-306, D5);
- diversion of a section of Footpath Crewe 12/1 up to 2km west and north of its current alignment. The footpath will connect with Footpath Crewe 29/1 and Footpath Leighton 7/1 on the western side of the WCML, increasing journey length by 271m (see Volume 2: MA01 Map Book, map CT-06-306, D4 to F6);
- diversion of a section of the Footpath Warmingham 16/2, up to 330m south of its current alignment, crossing the route of the Proposed Scheme and the WCML on Footpath Crewe 29/1 accommodation overbridge, increasing journey length by 1.2km (see Volume 2: MA01 Map Book, map CT-06-306, D7 and F7);
- a balancing pond for railway drainage, adjacent to an area of grassland habitat creation 88m west of Coppenhall Moss cutting. Access will be provided from a track joining Moss Lane (see Volume 2: MA01 Map Book, map CT-06-306, D6);
- four ecological mitigation ponds, within an area of grassland habitat creation to the north-west of Footpath Crewe 29/1 accommodation overbridge, 40m north of a section of Footpath Crewe 12/1 to provide replacement habitat for great crested newt with surrounding terrestrial habitat (see Volume 2: MA01 Map Book, Map CT-06-306, D4 to E6);

- an area of woodland habitat creation, 315m to the west of the route of the Proposed Scheme adjacent to and east of Moss Lane, to provide replacement habitat and connectivity between existing habitats (see Volume 2: MA01 Map Book, map CT-06-305, E2 to D4);
- Coppenhall Moss south embankment, 864m in length and up to 4m in height, with landscape mitigation planting on the eastern side to help integrate the Proposed Scheme into the surrounding landscape. This embankment will run parallel to the realigned WCML (southbound) and southbound WCML reception track (see Volume 2: MA01 Map Book, map CT-06-306, B7 to G7);
- a balancing pond for railway drainage, 79m east of Coppenhall Moss south embankment. Access will be provided via a track joining Moss Lane (see Volume 2: MA01 Map Book, map CT-06-306, D7 to E8);
- four ecological mitigation ponds, within an area of grassland habitat creation to the east of Coppenhall Moss cutting, 268m south of Moss Lane to provide replacement habitat for great crested newt with surrounding terrestrial habitat (see Volume 2: MA01 Map Book, map CT-06-306, D8 to map CT-06-306-R1, F2);
- Warmingham Moss offline culvert, 148m west of the Proposed Scheme, to convey Hoggins Brook under Footpath Minshull Vernon 17/1 (see Volume 2: MA01 Map Book, map CT-06-306, E5);
- landscape earthworks, with associated landscape mitigation planting, 1.1km in length and up to 5m in height, beginning east of Spring Farm Business Park, adjacent to the western side of the WCML, and continuing along the west of Warmingham Moss northbound viaduct. The landscape earthworks will provide visual screening for residents in Coppenhall Moss and Warmingham Moss (see Volume 2: MA01 Map Book, map CT-06-306, E6 to CT-06-307, B6);
- underground diversion of an existing Scottish Power 132kV overhead power line for 440m, to pass under the route of the Proposed Scheme east of Spring Farm Business Park (see Volume 2: MA01 Map Book, map CT-06-306, E8 to F5);
- diversion of a section of Footpath Minshull Vernon 2/1, up to 530m south of its current alignment, joining Footpath Crewe 12/1, crossing the WCML and the route of the Proposed Scheme on Footpath Crewe 29/1 accommodation overbridge, increasing journey length by 1.2km (see Volume 2: MA01 Map Book, map CT-06-306, D7 to F7);
- the route of the Proposed Scheme will pass beneath Warmingham Moss southbound viaduct (described in the Crewe Northern Connection section below) (see Volume 2: MA01 Map Book, map CT-06-306, E6 to I7);
- Coppenhall Moss culvert, 298m east of Spring Farm Business Park, to convey the realigned Hoggins Brook under the WCML, the route of the Proposed Scheme and Crewe Northern Connection (see Volume 2: MA01 Map Book, map CT-06-306, G6 to G7); and
- permanent diversion or decommissioning of minor utilities within this section, including Openreach underground cables and Scottish Power overhead power lines and underground cables (located within the section of route shown on Volume 2: MA01 Map Book, map CT-06-305 and map CT-06-306).

Coppenhall Moss north embankment to the end of the Hough to Walley's Green area

2.2.19 The route of the Proposed Scheme will continue on Coppenhall Moss north embankment to the end of the Hough to Walley's Green area. This section of route is illustrated on maps CT-06-306 to CT-06-308a in the Volume 2: MA01 Map Book.

2.2.20 Key features of this 2.7km section will include:

- Coppenhall Moss north embankment, 2.7km in length and up to 4m in height. This embankment will run parallel to the WCML reception tracks (described in the WCML reception tracks section below) and Crewe Northern Connection (described in the Crewe Northern Connection section below) (see Volume 2: MA01 Map Book, map CT-06-306, H7 to CT-06-308a, C7);
- diversion of a Scottish Power 132kV overhead power line for 1km to the north of Spring Farm Business Park. The diverted power line will initially be carried on four Scottish Power pylons 30m in height, with the span between pylons ranging from 70m to 270m, before the power line transitions to underground crosses the route of the Proposed Scheme and reconnects to the existing network south of Hole House (see Volume 2: MA01 Map Book, map CT-06-306, I5 to CT-06-307, B8);
- landscape earthworks, with associated landscape mitigation planting, 3m in height, beginning at Coppenhall Moss north embankment extending for 360m in length, to the east of the route of the Proposed Scheme. The landscape earthworks will provide visual screening for residents to the east of the Proposed Scheme (see Volume 2: MA01 Map Book, map CT-06-306, I7 to CT-06-307, B7);
- closure of the existing Spring Farm Business Park access where it would otherwise cross the Proposed Scheme (see Volume 2: MA01 Map Book, map CT-06-307, A7);
- a balancing pond for railway drainage, within an area of landscape mitigation planting to help integrate the Proposed Scheme into the surrounding landscape, 25m east of the Warmingham Moss telecommunications site. Access will be provided from an existing track joining School Lane (see Volume 2: MA01 Map Book, map CT-06-307, B7);
- an area of landscape mitigation planting west of the realigned WCML to help integrate the Proposed Scheme into the surrounding landscape. The landscape mitigation planting will provide visual screening for users of the Crewe and Nantwich Circular Walk to the west of the route of the Proposed Scheme (see Volume 2: MA01 Map Book, map CT-06-307, B6 to C6);
- Warmingham Moss telecommunications site, with associated landscape mitigation planting to help integrate the Proposed Scheme into the surrounding landscape, 49m by 24m in area, to the east of the Proposed Scheme, including a railway telecommunications mast up to 25m in height. Access will be provided from an existing track joining Warmingham Road (see Volume 2: MA01 Map Book, map CT-06-307, B7);

- four ecological mitigation ponds, within an area of grassland habitat creation, to the west of the realigned WCML, adjacent to the south side of Larch Wood to provide replacement habitat for great crested newt (see Volume 2: MA01 Map Book, map CT-06-307, B4 to C5);
- diversion of an underground National Grid gas transmission 450mm high pressure gas pipeline, for 275m, to pass under the Proposed Scheme north of Spring Farm Business Park (see Volume 2: MA01 Map Book, map CT-06-307, C5 to C7);
- an area of woodland habitat creation adjacent to the south side of Burnt Covert to provide replacement habitat and habitat connectivity (see Volume 2: MA01 Map Book, map CT-06-307, C5 to D6);
- diversion of a United Utilities 450mm potable water main, for 512m to pass under the Proposed Scheme 175m south of Parkfield Farm (see Volume 2: MA01 Map Book, map CT-06-307, E5 to F7);
- diversion of a section of Footpath Minshull Vernon 13/1, up to 500m north of its current alignment. A new section of PRoW will be introduced, running parallel to, and to the east of, the route of the Proposed Scheme, before connecting with Footpath Minshull Vernon 8/1 and crossing the route of the Proposed Scheme, WCML reception tracks and the WCML on Footpath Minshull Vernon 8/1 accommodation overbridge, increasing journey length by 1.1km (see Volume 2: MA01 Map Book, map CT-06-307, E7 to G7);
- realignment of a section of Footpath Minshull Vernon 8/1, up to 100m north of its current alignment on an embankment, 315m in length, crossing the route of the Proposed Scheme on Footpath Minshull Vernon 8/1 accommodation overbridge increasing journey length by 85m (see Volume 2: MA01 Map Book, map CT-06-307, F4 to G7);
- Footpath Minshull Vernon 8/1 accommodation overbridge, 115m in length and up to 10m above ground and track level, with associated landscape mitigation planting to help integrate the Proposed Scheme into the surrounding landscape, (see Volume 2: MA01 Map Book, map CT-06-307, G5 to G7);
- a balancing pond for railway drainage, west of the Proposed Scheme, 192m south of Parkfield Farm. Access will be provided from a track joining the A530 Middlewich Road (see Volume 2: MA01 Map Book, map CT-06-307, E5 to E6);
- underground diversion of a Scottish Power 33kV overhead power line, for 730m to pass under the Proposed Scheme 175m south of Parkfield Farm (see Volume 2: MA01 Map Book, map CT-06-307, E5 to F7);
- realignment of a section of the existing access to Parkfield Farm up to 95m north of its current alignment for 440m, crossing the Proposed Scheme on Footpath Minshull Vernon 8/1 accommodation overbridge, increasing journey length by 81m (see Volume 2: MA01 Map Book, map CT-06-307, G5 to G8);
- an area of woodland habitat creation to the east of the Proposed Scheme, adjacent to the realigned access to Parkfield Farm to provide replacement habitat (see Volume 2: MA01 Map Book, map CT-06-307, G7 to H6);
- an area of landscape mitigation planting along the eastern side of the route of the Proposed Scheme, from west of Park House Farm continuing into the Wimboldsley to

Lostock Gralam area (MA02) to help integrate the Proposed Scheme into the surrounding landscape (see Volume 2: MA01 Map Book, map CT-06-307, H7 to map CT-06-308a, D7);

- a balancing pond for railway drainage, 380m north of Parkfield Farm. Access will be provided from a track joining the A530 Middlewich Road (see Volume 2: MA01 Map Book, map CT-06-307, I5 to I6);
- three ecological mitigation ponds to the east of the route of the Proposed Scheme, 130m west of Park House Farm to provide replacement habitat for great crested newt with surrounding wetland habitat (see Volume 2: MA01 Map Book, map CT-06-307, I7);
- realignment of a section of the existing access to Park House Farm, up to 35m east of its existing alignment to avoid the route of the Proposed Scheme and to retain access to Park House Farm (see Volume 2: MA01 Map Book, map CT-06-307, I7 to J7);
- three ecological mitigation ponds to the east of the Proposed Scheme and up to 145m west of Park House Farm, to provide replacement habitat for great crested newt with surrounding grassland habitat (see Volume 2: MA01 Map Book, map CT-06-307, J7);
- area of woodland habitat creation to the west of the WCML, continuing into the Wimboldsley to Lostock Gralam area (MA02) to provide replacement habitat (see Volume 2: MA01 Map Book, map CT-06-308a, B6 to E4);
- diversion of a United Utilities potable water main, for 523m in length, perpendicular to and under the Proposed Scheme and WCML 100m west of Park Hall Farm (see Volume 2: MA01 Map Book, map CT-06-308a, C5 to D7);
- realignment of the A530 Nantwich Road, crossing the Proposed Scheme on A530 Nantwich Road overbridge as described in Volume 2, Community Area report: Wimboldsley to Lostock Gralam (MA02) (see Volume 2: MA01 Map Book, map CT-06-308a, D3 to G9);
- a balancing pond for highways drainage, west of the Proposed Scheme, 100m south of the Verdin Arms public house, within an area of woodland habitat creation. Access will be provided from the realigned A530 Nantwich Road (see Volume 2: MA01 Map Book, map CT-06-308a, D4);
- an area of woodland habitat creation, to the west of the A530 Middlewich Road to provide replacement habitat (see Volume 2: MA01 Map Book, map CT-06-308a, E3 to F1); and
- permanent diversion or decommissioning of minor utilities within this section, including Openreach underground cables, Scottish Power overhead power lines and underground cables, a mobile telecommunications mast, United Utilities clean water mains and Level 3 telecommunications cables (located within the section of route shown on Volume 2: MA01 Map Book, map CT-06-306, map CT-06-306 and map CT-06-308a).

Modifications to the WCML

2.2.21 Existing conventional rail infrastructure in the Hough to Walley's Green area will be modified to enable connections between the WCML and the Proposed Scheme, via Crewe Northern

Connection and the WCML reception tracks. This section of the Proposed Scheme is illustrated on maps CT-06-306 to CT-06-307 in the Volume 2: MA01 Map Book.

2.2.22 This will require two lines of the WCML to be realigned north of Parkers Road. The WCML slow line southbound will be realigned to the eastern side of the existing WCML. The WCML slow line northbound will be realigned to the western side (see Volume 2: MA01 Map Book, map CT-06-306, A6 to CT-06-307, D6).

2.2.23 Key features associated with the WCML slow line southbound will include:

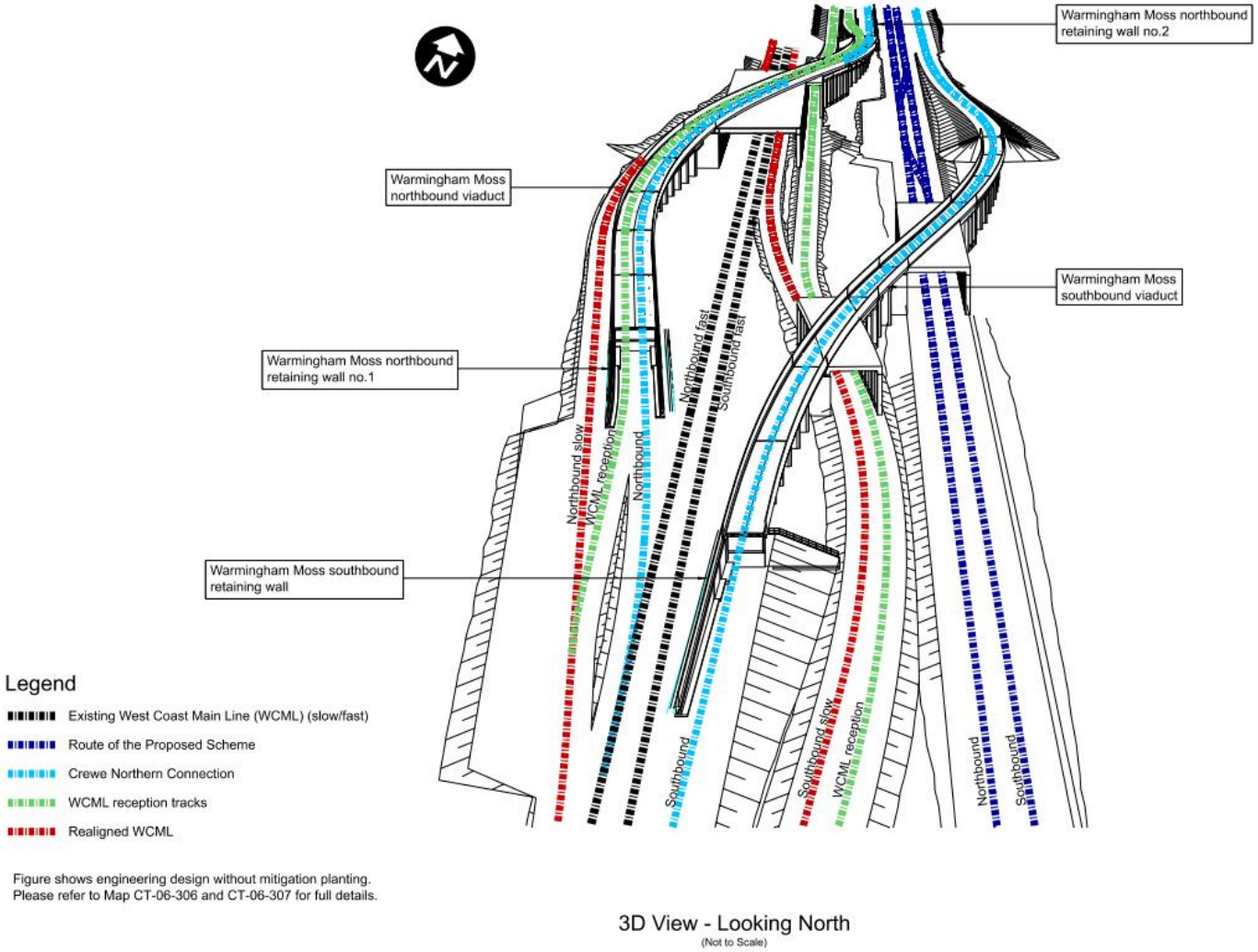
- realignment of the WCML slow line southbound, 1.3km in length, located up to 29m to the east of the existing WCML (see Volume 2: MA01 Map Book, map CT-06-306, A6 to J6); and
- Warmingham Moss southbound WCML embankment, 630m in length and up to 3m in height. This embankment will carry the realigned WCML slow line southbound and the WCML reception track southbound between, and parallel to, the existing WCML and the route of the Proposed Scheme (see Volume 2: MA01 Map Book, map CT-06-306, B6 to F6).

2.2.24 Key features associated with the WCML slow line northbound will include:

- realignment of the WCML slow line northbound, 1.6km in length, located up to 37m to the west of the existing WCML (see Volume 2: MA01 Map Book, map CT-06-306, F6 to CT-06-307, B6);
- Warmingham Moss northbound WCML embankment, 196m in length and up to 3m in height. This embankment will carry the realigned WCML slow line northbound parallel to, and to the west of, the existing WCML (see Volume 2: MA01 Map Book, map CT-06-306, D6 to G6);
- Warmingham Moss northbound retaining wall No.1, up to 141m in length and up to 6m above ground level, located both to the west and east of the route of the Proposed Scheme, 325m east of Spring Farm Business Park (see Volume 2: MA01 Map Book, map CT-06-306, E6 to CT-06-307, C5);
- Warmingham Moss northbound retaining wall No. 2, 359m in length and up to 8m above ground level, located to the west of the route of the Proposed Scheme, 240m west of Hole House (see Volume 2: MA01 Map Book, map CT-06-307, D6 to E6); and
- Warmingham Moss northbound WCML cutting, 550m in length, up to 6m in depth and 35m in width. This cutting will carry the realigned WCML slow line northbound parallel to, and to the west of, the existing WCML (see Volume 2: MA01 Map Book, maps CT-06-306, I6 to CT-06-307, C6).

2.2.25 A number of rail system modifications will also be required along the WCML. This will include new switches and crossings, the relocation of existing and addition of new overhead line equipment, and modifications to railway systems equipment.

Figure 5: Schematic of Warmingham Moss northbound viaduct and Warmingham Moss southbound viaduct



Crewe Northern Connection

2.2.26 Crewe Northern Connection will connect the route of the Proposed Scheme to the WCML, enabling high speed services to call at Crewe Station, and future NPR services to connect with HS2. Crewe Northern Connection northbound will provide connections towards Manchester and Liverpool and Crewe Northern Connection southbound will provide connections towards Crewe and London.

2.2.27 Crewe Northern Connection southbound line will connect from the eastern side of the WCML north of Parkers Road. It will run parallel to the WCML before crossing over a realigned section of the WCML and the route of the Proposed Scheme on Warmingham Moss southbound viaduct (described below). Crewe Northern Connection northbound line will connect from the western side of the WCML. It will run parallel to the WCML before crossing it on Warmingham Moss northbound viaduct. Crewe Northern Connection southbound line and Crewe Northern Connection northbound line will run on separate features and these are described in detail below.

2.2.28 To the east of Burnt Covert, Crewe Northern Connection southbound line will continue on Coppenhall Moss north embankment, which will also carry the route of the Proposed Scheme (described above), and run parallel to, and to the east of, the route of the Proposed Scheme. Crewe Northern Connection northbound line will also continue on Coppenhall Moss north embankment and run parallel to, and to the west of, the route of the Proposed Scheme (see Volume 2: MA01 Map Book, maps CT-06-306, H6 to CT-06-308a, C7).

2.2.29 Key features associated with Crewe Northern Connection southbound will include:

- Warmingham Moss southbound embankment No.1, 450m in length and up to 3m in height, located to the west of the route of the Proposed Scheme, with associated landscape earthworks, which will run parallel to the eastern side of the route of the Proposed Scheme, to help integrate Crewe Northern Connection southbound into the surrounding landscape (see Volume 2: MA01 Map Book, map CT-06-306, B6 to E6);
- Warmingham Moss southbound retaining wall, 145m in length and up to 6m above ground level, located to the west of the route of the Proposed Scheme, 555m north of Parkers Road (see Volume 2: MA01 Map Book, map CT-06-306, B6 to D6);
- Warmingham Moss southbound viaduct, 685m in length and up to 14m in height above existing ground level to carry Crewe Northern Connection southbound line over the realigned WCML slow line southbound, the WCML reception track southbound (as described in the WCML reception track section), and Coppenhall Moss south embankment, which will carry the route of the Proposed Scheme. The viaduct will then run parallel to, and at a higher level than, the eastern side of the route of the Proposed Scheme (see Volume 2: MA01 Map Book, map CT-06-306, E6 to I7);
- Warmingham Moss southbound embankment No.2, 574m in length and up to 9m in height, with associated landscape earthworks to help integrate Crewe Northern Connection southbound into the surrounding landscape. This embankment will carry Crewe Northern Connection southbound line parallel to the route of the Proposed

Scheme (see Volume 2: MA01 Map Book, maps CT-06-306, I7 to J7 and CT-06-307, A7 to C7); and

- landscape earthworks, up to 6m in height, beginning north of Parkers Road Overbridge and continuing along the eastern side of the route of the Proposed Scheme. The landscape earthworks will help integrate Crewe Northern Connection southbound into the surrounding landscape (see Volume 2: MA01 Map Book, map CT-06-306, B7 to I7).

2.2.30 Key features associated with Crewe Northern Connection northbound will include:

- Warmingham Moss northbound viaduct, 1.2km in length and up to 15m in height. This viaduct will run parallel to, and to the west of, the WCML before carrying Crewe Northern Connection northbound line and the WCML reception track northbound over the WCML and the WCML reception track southbound (as described in the WCML reception track section) (see Volume 2: MA01 Map Book, map CT-06-306, H6 to J7 and map CT-06-307, A6 to B6); and
- Warmingham Moss Northbound WCML embankment, 370m in length and up to 3m in height, with associated landscape earthworks to help integrate Crewe Northern Connection northbound into the surrounding landscape (see Volume 2: MA01 Map Book, map CT-06-306, D6 to G6).

WCML reception tracks

2.2.31 The WCML reception tracks will connect the WCML to Crewe North RSD and on to Crewe North IMB-R, which are described in Volume 2, Community Area report: Wimboldsley to Lostock Gralam area (MA02).

2.2.32 The WCML reception track southbound will run from the east side of the WCML north of Parkers Road Overbridge and will run parallel to the route of the Proposed Scheme for 606m until it passes beneath Warmingham Moss southbound viaduct, Warmingham Moss northbound viaduct and Footpath Minshull Vernon 8/1 accommodation overbridge. (see Volume 2: MA01 Map Book, maps CT-06-306, B6 to J6 and CT-06-307, A6).

2.2.33 The WCML reception track northbound will run from the west side of the WCML north of Parkers Road Overbridge and will run parallel to the WCML for 500m until it passes over the WCML and WCML reception track southbound and beneath Footpath Minshull Vernon 8/1 accommodation overbridge. (see Volume 2: MA01 Map Book, maps CT-06-306, D6 to J6 and CT-06-307, A6 to H6).

2.2.34 North of Footpath Minshull Vernon 8/1 accommodation overbridge, the WCML reception track northbound and the WCML reception track southbound will run parallel with the WCML into the Wimboldsley to Lostock Gralam area (MA02). (see Volume 2: MA01 Map Book, maps CT-06-307, H6 to J6 and CT-06-308a, A7 to C6).

2.2.35 Key features associated with the WCML reception tracks will include:

- Warmingham Moss southbound RSD embankment, 529m in length and up to 3m in height (see Volume 2: MA01 Map Book, maps CT-06-306, G6 to I6); and

- Warmingham Moss southbound RSD cutting, 189m in length, up to 7m in depth and 9m in width (see Volume 2: MA01 Map Book, map CT-06-306, I7 to J7).

Demolitions

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

2.2.37 The following have been identified for demolition: two residential properties, three commercial/business properties (including farm outbuildings), two other structures and a field-scale solar array. These will be needed for construction of the permanent features or, in some cases, to enable the construction works for the Proposed Scheme. 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 describes the key construction activities that are envisaged to be needed to build the Proposed Scheme in the Hough to Walley's Green 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 construction works on that land 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 identified by the nominated undertaker and provided where it is safe and reasonably practicable to do so. The routes through these areas may change over the duration of the construction period.

2.3.6 Volume 1, Section 5 and Section 6 provide details of the permanent features of the Proposed Scheme and typical construction techniques. For the purposes of the environmental assessment, standard construction techniques as described in Section 6 of Volume 1 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 as far as reasonably practicable. The CoCP will contain generic control measures and standards to be implemented throughout the construction process. The LEMPs will set out how the project will adapt and deliver the required environmental and community protection measures within each area through the implementation of specific measures required to control dust and other emissions from activities in the area.

2.3.8 In addition, HS2 Ltd has produced a Community Engagement Framework[8] which sets out how HS2 Ltd and its contractors, as well as their sub-contractors, will undertake community engagement during the construction of the HS2 project. The framework is being implemented on Phase One of HS2 and will apply to all phases of HS2.

2.3.9 The objectives of the framework include:

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

2.3.10 A draft CoCP has been prepared (see Volume 5: Appendix CT-002-00000). It will remain a draft document through the parliamentary process and the CoCP will be finalised at Royal Assent. The CoCP sets out measures to be implemented by the nominated undertaker.

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

Overview of the construction process

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

- advance works including: site investigations further to those already undertaken; preliminary mitigation works; preliminary enabling works;
- civil engineering works including: establishment of construction compounds; site haul routes, site preparation and enabling works; main earthworks and structure works; tunnelling; foundations for and construction of buildings; 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; site restoration; and removal of construction compounds;
- site finalisation works; and
- systems testing and commissioning.

2.3.12 General information about the construction process is set out in more detail in Volume 1, Section 6, and the draft CoCP (see Volume 5: Appendix CT-002-00000) 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

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

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

Engineering works

Introduction

2.3.14 Construction of the Proposed Scheme will require the following broad types of engineering works in the Hough to Walley's Green area, and within land adjacent to the route:

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

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

2.3.16 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 than main compounds. Compounds will either be used for civil engineering works, for railway installation works, or for both.

General overview of construction compounds

2.3.17 Main compounds will be used for 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.

2.3.18 Satellite compounds will be used 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.

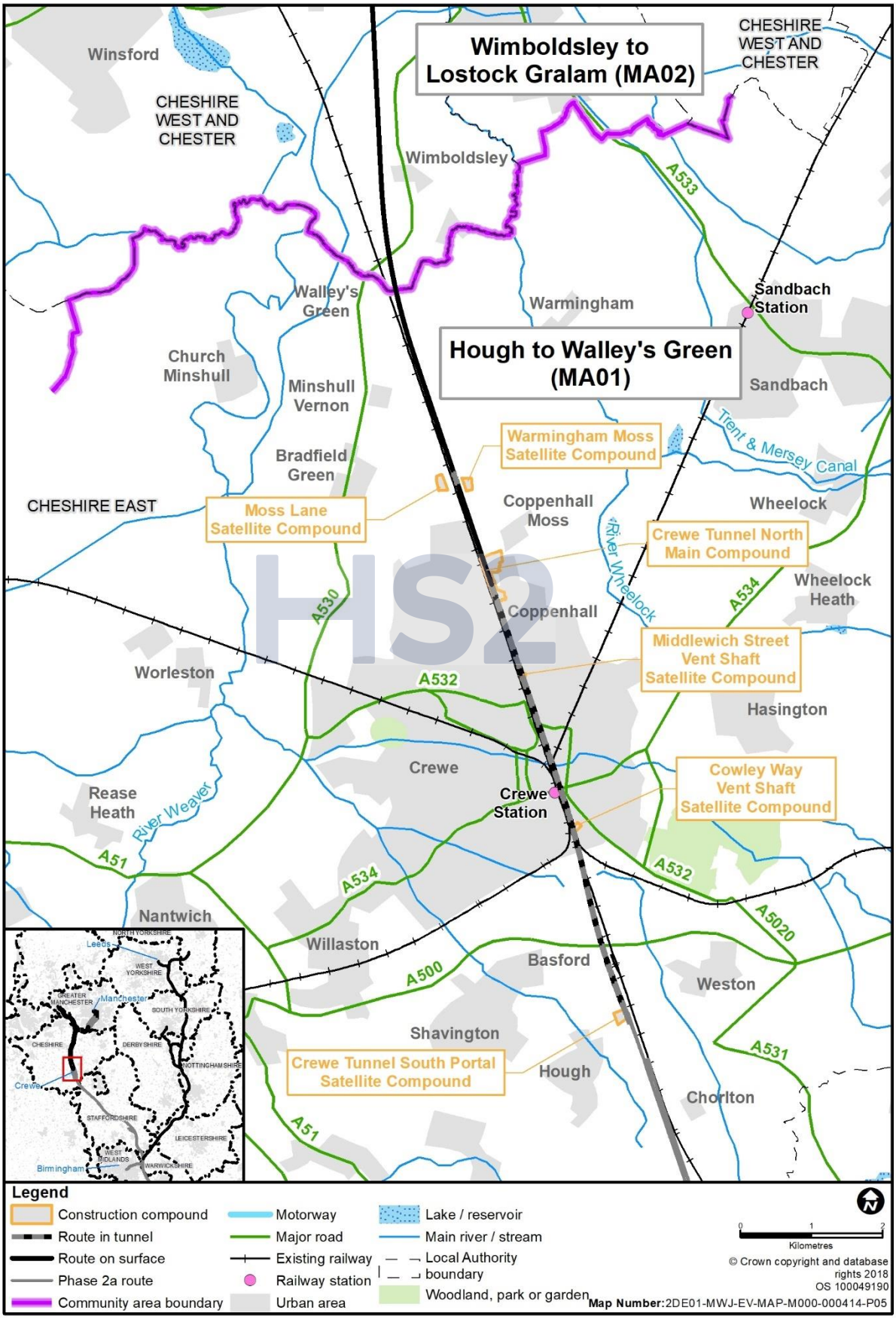
2.3.19 The Crewe tunnel north main compound will be located in the Hough to Walley's Green area. This compound will be used as the base for managing five civil engineering satellite compounds in the area as well as 13 civil engineering satellite compounds in the Wimboldsey to Lostock Gralam area (MA02) (see Volume 2, Community Area report: Wimboldsley to Lostock Gralam area (MA02)). The Crewe tunnel north main compound will continue to be used as a railway installation satellite compound following the completion of civil engineering works. It will also be used to manage the transfer of excavated material, by conveyor, from the Crewe tunnel to the Crewe Rolling Stock Depot satellite compound 3 located in the Wimboldsley to Lostock Gralam area.

2.3.20 The five civil engineering satellite compounds in the Hough to Walley's Green area will continue in use as railway installation satellite compounds following the completion of the civil engineering works. These railway systems compounds will be managed from the Crewe tunnel north main railway systems compound.

2.3.21 The location of construction compounds in the Hough to Walley's Green area is shown on Figure 6. Map Series CT-05 (in the Volume 2: MA01 Map Book) show in detail the locations of the construction compounds described below.

2.3.22 A number of utility diversions will be required. For the purpose of this assessment, it is assumed that utility diversions in this area will be managed from the compounds listed below.

Figure 6: Location of construction compounds in the Hough to Walley's Green area



2.3.23 Figure 7 and Figure 8 show the management relationship for civil engineering works compounds and for the railway installation works. Details of the works associated with individual compounds are provided in subsequent sections of this report.

2.3.24 In the Hough to Walley's Green area there will be worker accommodation at Crewe tunnel north main compound for the construction workforce. Details of the location and duration of worker accommodation are provided in the description of the compound.

2.3.25 Soil stripped as part of the works, prior to it being used when the land is reinstated, will be stored for the duration of construction. The location of topsoil storage areas will generally be adjacent to compounds and areas of construction activity. These areas are referred to as material stockpiles and are shown on maps CT-05-306 to CT-05-308a, in the Volume 2: MA01 Map Book.

2.3.26 Some areas will include transfer nodes. Transfer nodes are additional areas of land required to unload, store and load bulk earthworks materials that are moved to and from the site on public highways. These areas will allow material to be transferred between road vehicles and site vehicles during construction to balance traffic movements on the road network. There will be no transfer nodes within the Hough to Walley's Green area.

2.3.27 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

2.3.28 Construction vehicles, where loaded, will carry materials, plant, other equipment and the workforce. Vehicle movements will take place on public roads, within construction compounds and transfer nodes and between the compounds or transfer nodes and working areas. Where reasonably practicable, movements between the construction compounds or transfer nodes and the working areas will be on designated haul routes within the construction site, often along the line of the route of the Proposed Scheme or running parallel to it.

2.3.29 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 Hough to Walley's Green area are described in subsequent sections of this report.

Use of borrow pits

2.3.30 The Proposed Scheme will require material with suitable engineering properties for the construction of a high speed railway. This is described as acceptable engineering material and will be provided, in part, through excavation of cuttings and other earthworks undertaken to construct the Proposed Scheme. A borrow pit is an area where additional

acceptable engineering material will be extracted for use in the construction of the Proposed Scheme.

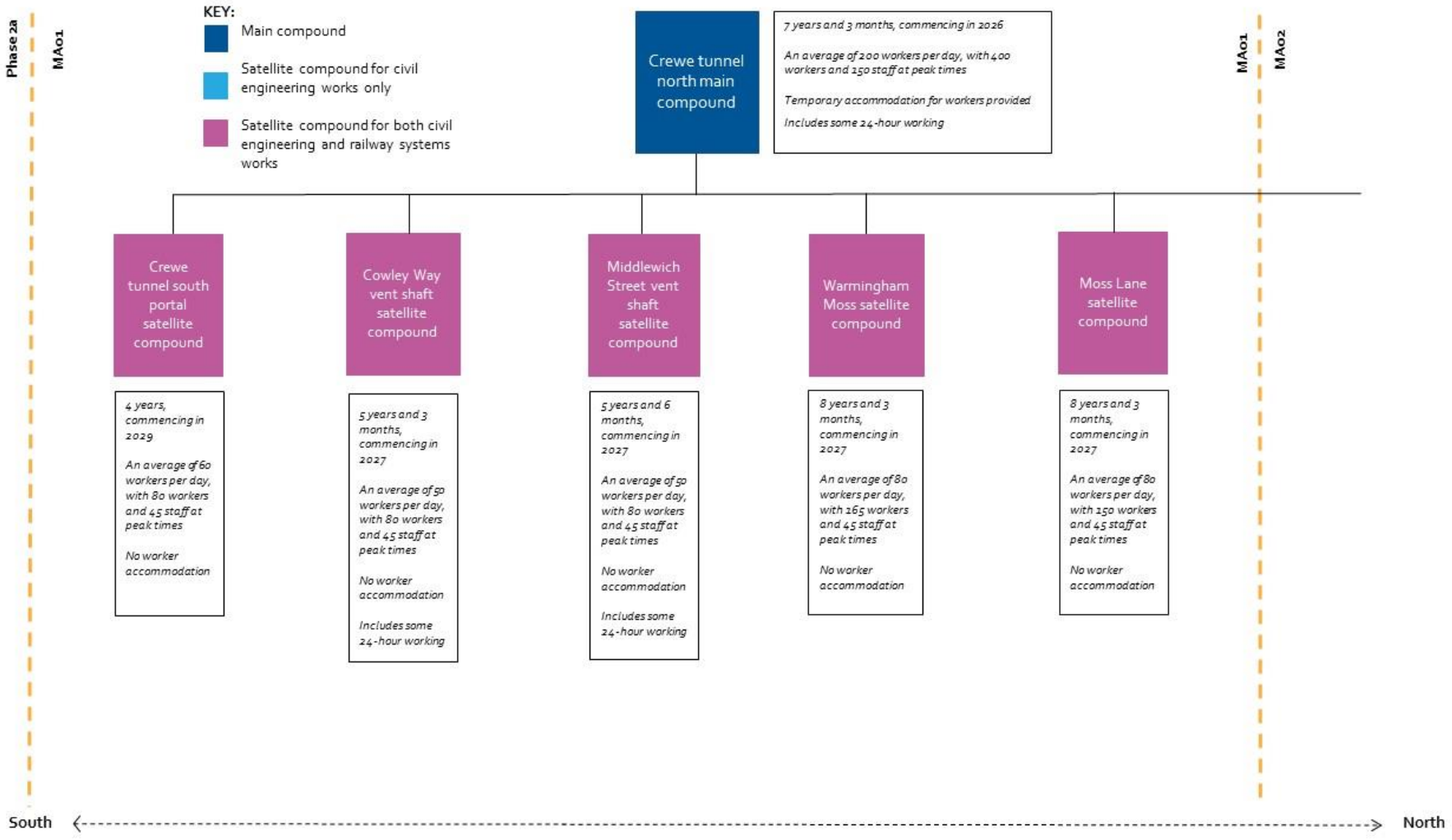
2.3.31 Volume 5: Appendix CT-008-00000 Borrow Pit report sets out the need for and approach to identifying suitable borrow pit locations, as well as the use and restoration strategy for the proposed borrow pits. General information on borrow pits is also provided in Volume 1, Section 6.

2.3.32 The borrow pits required for construction of the Proposed Scheme are all located in the Wimboldsley to Lostock Gralam area (MA02). Material from these borrow pits may be used in the construction of earthworks in other areas. Material excavated from Crewe tunnel, cuttings and other earthworks as part of the construction of the Proposed Scheme may be used to backfill or restore the borrow pits. This material will, where reasonably practicable, be transported via conveyor or site haul routes. However, some of the material may be provided from more distant locations across the Proposed Scheme. As such it may be necessary to transport some of this material along public roads.

Construction compounds

2.3.33 This section provides a summary of the works to be managed from the construction compounds in the Hough to Walley's Green area, as illustrated in Figure 7 and Figure 8. All dates and durations of activities and number of workers are indicative. All compounds will undertake initial site set-up works, and at the end of its use, finalisation works including site reinstatement, landscaping and planting (as necessary).

Figure 7: Construction compounds for civil engineering works



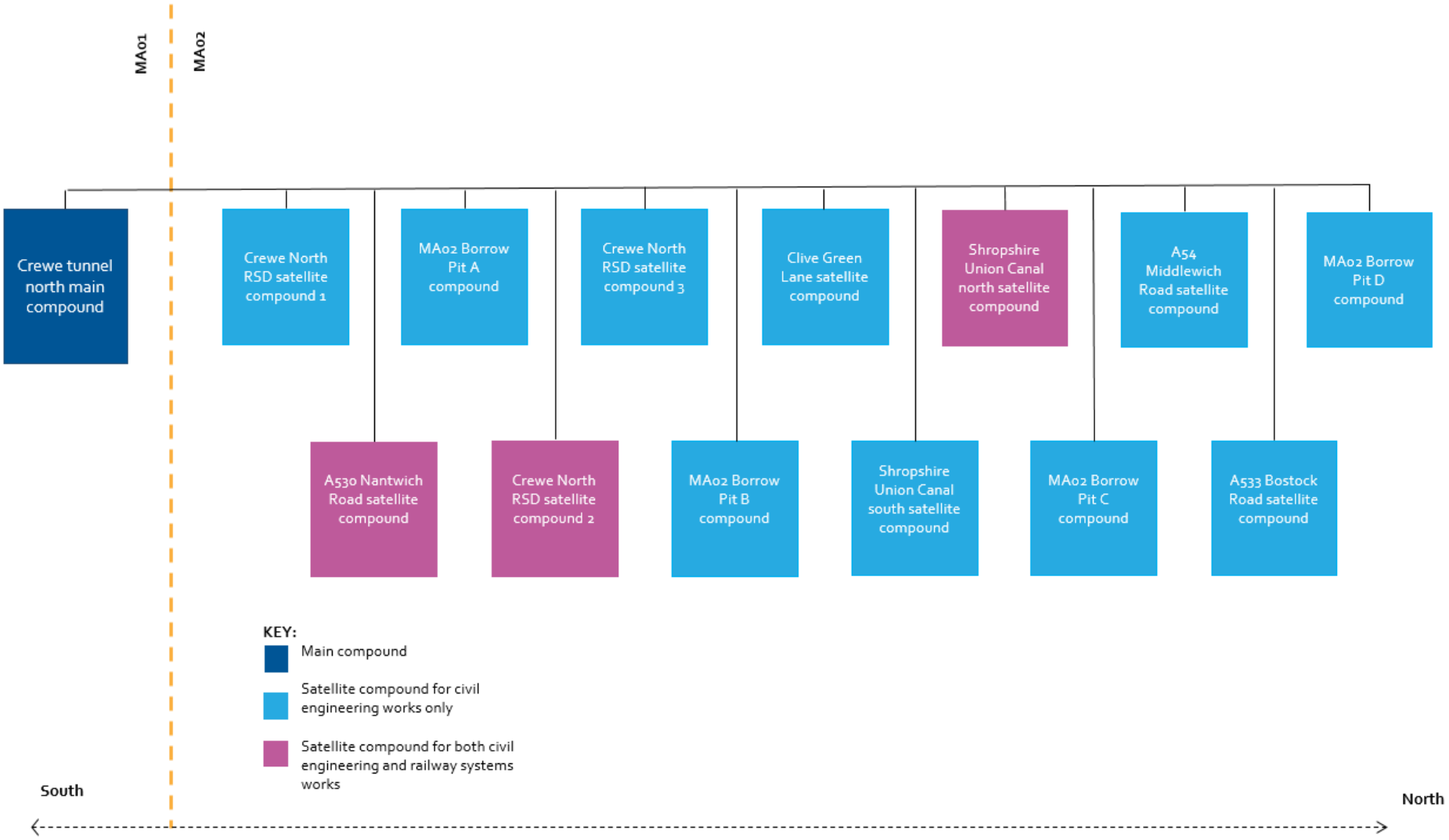
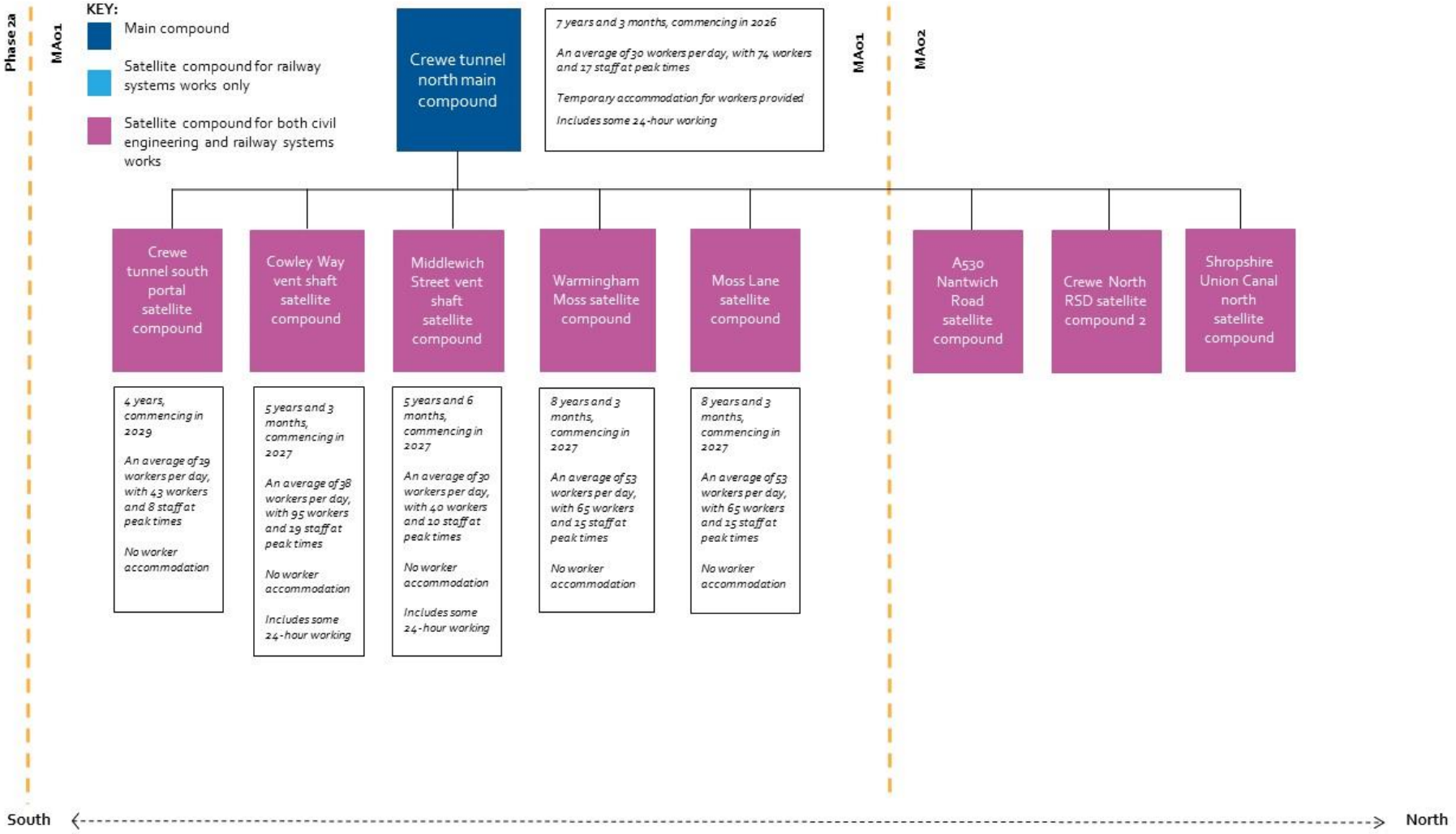

MA01
MA02
Crewe tunnel north main compound
Crewe North RSD satellite compound 1
MA02 Borrow Pit A compound
Crewe North RSD satellite compound 3
Clive Green Lane satellite compound
Shropshire Union Canal north satellite compound
A54 Middlewich Road satellite compound
MA02 Borrow Pit D compound
A530 Nantwich Road satellite compound
Crewe North RSD satellite compound 2
MA02 Borrow Pit B compound
Shropshire Union Canal south satellite compound
MA02 Borrow Pit C compound
A533 Bostock Road satellite compound
KEY:
Main compound
Satellite compound for civil engineering works only
Satellite compound for both civil engineering and railway systems works
South
North

Figure 8: Construction compounds for railway systems works



Crewe tunnel south portal satellite compound

2.3.34 This compound (see Volume 2: MA01 Map Book, map CT-05-302, B4 to C6) will be used to manage civil engineering works for a period of two years and six months, followed by both civil engineering and railway systems works for a period of three months, and then railway systems works only for a period of one year and three months. It will be accessed primarily via Casey Lane during civil engineering and railway systems works.

2.3.35 This compound will be used to manage civil and railway systems works during the construction of HS2 Phase 2a. Following which, the area in which this compound is located will be reconfigured and go on to be used to manage civil and railway systems works during the construction of the Proposed Scheme.

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

2.3.37 The compound will be used to manage the construction of the following infrastructure associated with the Crewe tunnel:

- Crewe tunnel south portal, a porous portal at the southern end of Crewe tunnel, which will take two years and six months to complete;
- Crewe tunnel south portal building and rescue area at the southern end of the Crewe tunnel, which will take one year and six months to complete; and
- Crewe tunnel south portal telecommunications site, which will take six months to complete.

2.3.38 The compound will be used to manage the dismantling and removal of the two tunnel boring machines[9] (TBMs) – one for the western bore and one for the eastern bore of the Crewe tunnel.

2.3.39 Key railway systems installation works in the Hough to Walley's Green area to be managed from this compound include the installation of the mechanical and electrical systems for the Crewe tunnel and the Crewe tunnel south portal building, which will take one year and three months to complete.

2.3.40 The compound will be used to support the installation of HS2 Phase 2a track and railway systems between the connection with HS2 Phase 2a and the south end of Crewe tunnel, which will take nine months to complete.

Cowley Way vent shaft satellite compound

2.3.41 This compound (see Volume 2: MA01 Map Book, map CT-05-303, G5 to H6) will be used to manage civil engineering works for a period of three years and nine months, followed by both civil engineering and railway systems works for a period of six months, and then

[9] A tunnelling machine, which consists of a rotary cutting head that occupies the full face of the tunnel. A system of conveyers or pumps is used to remove the excavated material.

railway systems works only for a period of one year. It will be accessed primarily via Cowley Way.

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

Table 1: Demolitions required as a result of the works to be managed from the Cowley Way vent shaft satellite compound

Type	Description	Location	Feature resulting in the demolition
Commercial	Two single story portacabin buildings	Cowley Way, Crewe	Cowley Way vent shaft and Cowley Way vent shaft auto-transformer station

2.3.43 The compound will be used to manage the construction and installation of the Cowley Way vent shaft and headhouse. The construction of the Cowley Way vent shaft and headhouse will take four years to complete and installation of railway systems equipment will take a further one year to complete.

2.3.44 The compound will be used to manage the construction and installation of the Cowley Way vent shaft auto-transformer station. The construction of the Cowley Way vent shaft auto-transformer station foundation, buildings and railway systems equipment will take two years and three months to complete.

2.3.45 The works to be managed from this compound will involve the following works to utilities:

- permanent diversion of an underground Cadent Gas medium pressure gas main, which will take one year to complete;
- permanent diversion of an underground Cadent Gas intermediate pressure gas main, which will take one year to complete;
- permanent diversion of two underground Cadent Gas gas mains, one will take one year to complete, and one will take six months to complete; and
- decommissioning of three Scottish Power power lines, which will each take three months to complete.

Middlewich Street vent shaft satellite compound

2.3.46 This compound (see Volume 2: MA01 Map Book, map CT-05-304, I5 to J6) will be used to manage civil engineering works for a period of four years and nine months, followed by railway systems works for a period of nine months. It will be accessed primarily via Ridgeway Street and the B5076 Middlewich Street.

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

2.3.48 The compound will be used to manage the construction and installation of the Middlewich Street vent shaft and headhouse. The construction of the Middlewich Street vent shaft and headhouse will take four years and six months to complete and installation of railway systems equipment will take a further nine months to complete.

2.3.49 The works to be managed from this compound will include the permanent diversion of two United Utilities wastewater sewers, which will each take three months to complete.

Crewe tunnel north main compound

2.3.50 This compound (shown on Volume 2: MA01 Map Book, map CT-05-305, G5 to J8) will:

- be used to manage civil engineering works for a period of five years, followed by both civil engineering and railway systems works for a period of one year, followed by railway systems works only for a period of one year and three months;
- provide main compound support to five civil engineering satellite compounds and five railway systems compounds in the Hough to Walley's Green area, as illustrated on Figure 7 and Figure 8;
- provide main compound support to 13 civil engineering satellite compounds and four railway systems compounds in the Wimboldsley to Lostock Gralam area (see Volume 2: MA02 Map Book, maps CT-05-308b, CT-05-309 and CT-05-310);
- provide four temporary material stockpiles to the east of the Proposed Scheme (see Volume 2: Map CT-05-306, A7 to E8;
- be accessed from Parkers Road and Broughton Road; and
- provide temporary worker accommodation for up to 70 workers including welfare facilities and parking for five years and seven months (see Volume 2: Map CT-05-305, J7 to J8).

2.3.51 The works to be managed from this compound will require demolition of the following buildings, as described in Table 2.

Table 2: Demolitions required as a result of the works to be managed from the Crewe tunnel north main compound

Type	Description	Location	Feature resulting in the demolition
Residential	One residential property with outbuildings	Bridge Farm, Parkers Road, Crewe	Crewe north portal cutting (retained cutting)
Residential	One residential property	Moss Bridge Farm, Parkers Road, Crewe	Crewe north portal cutting (retained cutting)
Commercial	Farm	Bridge Farm, Parkers Road, Crewe	Crewe north portal cutting (retained cutting)
Commercial	Equestrian Centre	Moss Bridge Farm, Parkers Road, Crewe	Crewe north portal cutting (retained cutting)

2.3.52 The compound will be used to manage the construction of the following tunnel and associated infrastructure:

- Crewe tunnel, which will take three years to complete;
- Crewe tunnel north portal, a porous portal at the northern end of Crewe tunnel, which will take one year to complete;

- Crewe tunnel portal building and rescue area at the northern end of the Crewe tunnel, which will take one year and six months to complete; and
- a surface water pumping station and storage tank for drainage of the Crewe tunnel, which will take three months to complete.

2.3.53 The compound will provide an area for the short-term storage and transfer of materials associated with the tunnelling works. Two TBMs for construction of the Crewe twin bore tunnel will be driven from this compound. Excavated material will be transported via a covered conveyor of approximately 5km, running along and parallel to the route of the Proposed Scheme, from the tunnel face to the Crewe North RSD area in the Wimboldsley to Lostock Gralam area (MA02).

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

- extension of the existing Parkers Road Overbridge, which will take one year and nine months to complete; and
- Footpath Crewe 29/1 accommodation overbridge, which will take one year and three months, over a period of three years and six months, to complete.

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

- Crewe north portal cutting (retained cutting), which will take three years and six months to complete;
- Coppenhall Moss cutting, which will take one year and nine months to complete; and
- Coppenhall Moss south embankment, which will take four years and six months to complete.

2.3.56 The works to be managed from this compound will require the following works to public roads:

- temporary traffic management of a section of the A530 Middlewich Road, Pyms Lane and Underwood Lane for a period of nine months. On completion of construction, the A530 Middlewich Road, Pyms Lane and Underwood Lane traffic management will be removed; and
- temporary closure of a section of Parkers Road between Broughton Road and Bleasdale Road, with vehicle users diverted via an alternate route along Groby Road, Remer Street and the B5076 North Street/Bradfield Road for one year and three months. Non-motorised users will be diverted via a temporary footbridge for a period of one year and three months. On completion of construction, Parkers Road will be permanently reinstated along its existing alignment on Parkers Road Overbridge.

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

- temporary diversion of a 210m section of Footpath Crewe 13 for a period of one year and three months, with users diverted along Hythe Avenue and Parkers Road, increasing

journey length by 127m. On completion of construction, the Footpath Crewe 13/3 will be permanently reinstated along its existing alignment;

- temporary closure of Footpath Crewe 29/1 for a period of three years and eight months, with users diverted along Footpath 30/1 to Parkers Road and Footpath Crewe 12/1, increasing journey length by 720m. On completion of construction, the Footpath Crewe 29/1 will be permanently diverted over Footpath Crewe 29/1 accommodation overbridge and north to Footpath Warmingham 16/1, increasing journey length by 715m;
- temporary diversion of a 190m section of Footpath Crewe 12/1 at the junction with Footpath Crewe 29/1 for a period of five years and seven months, with users diverted north along the edge of the houses on Perry Fields, Magecroft and Thornfields to Moss Fields and onto Moss Lane, increasing journey length by 273m. On completion of construction, this section of Footpath Crewe 12/1 will be permanently diverted around the western side of Footpath Crewe 29/1 accommodation overbridge and north to join with Footpath Leighton 7/1;
- temporary diversion of Footpath Minshull Vernon 17/1 and Footpath Leighton 7/1 west at the intersection of Footpath Crewe 12/1 and Footpath Crewe 29/1 for a period of five years and seven months, with users diverted along Moss Lane and Moss Fields, along the edge of the houses on Thornfields, Magecroft and Perry Fields, increasing journey length by 296m. On completion of construction, the Footpath Minshull Vernon 17/1 and Footpath Leighton 7/1 will be permanently reinstated along their existing alignment;
- temporary diversion of Footpath Minshull Vernon 2/1 for a period of five years and seven months, with users diverted along Hythe Avenue and Parkers Road to the west and with users diverted to the south of Moss Farm to Footpath Crewe 28/1 to the east, increasing journey length by 2.4km. On completion of construction, Footpath Minshull Vernon 2/1 will be permanently realigned along the diverted Footpath Crewe 12/1 and Footpath Crewe 29/1 accommodation overbridge, increasing journey length by 1.2km; and
- temporary diversion of Footpath Warmingham 16/2 for a period of five years and seven months, with users diverted to the south of Moss Farm to Footpath Crewe 28/1, increasing journey length by 2.4km. On completion of construction, Footpath Warmingham 16/2 will be permanently diverted across Footpath Crewe 29/1 accommodation overbridge, increasing journey length by 1.2km.

2.3.58 Key railway systems installation works in the Hough to Walley's Green area to be managed from this compound include the installation of the mechanical and electrical systems for the Crewe tunnel and the Crewe tunnel north portal building, which will take one year to complete.

2.3.59 The compound will be used to manage the construction and installation of Crewe tunnel north portal auto-transformer station, located 150m north of Bradfield Road. The construction of the Crewe tunnel north portal auto-transformer station will take one year to complete. The installation of the Crewe tunnel north portal auto-transformer station railway systems equipment will take one year and three months to complete.

2.3.60 The compound will be used to manage the connection of the realigned section of the WCML to Crewe Northern Connection. The compound will also be used to manage the connection of the realigned section of the WCML to the WCML reception tracks. These works will require the installation of crossover connections, which will take six months to complete.

2.3.61 The works to be managed from this compound will involve the following works to utilities:

- construction of two new underground Scottish Power electricity cables, which will take one year to complete;
- permanent relocation of a Vodafone/O2 telecommunications mast, which will take three months to complete;
- permanent diversion of a United Utilities combined water sewerage pumping station, which will take three months to complete;
- permanent relocation of a mobile telecommunications mast, which will take three months to complete;
- permanent diversion of a Cadent Gas pipeline, which will take three months to complete;
- permanent diversion of two Scottish Power electricity cables, which will each take three months to complete;
- permanent diversion of a United Utilities wastewater sewer, which will take three months to complete;
- permanent diversion of a United Utilities potable water main, which will take three months to complete; and
- permanent diversion of an Openreach telecommunications cable, which will take three months to complete.

Warmingham Moss satellite compound

2.3.62 This compound will be used to manage civil engineering and railway systems works (see Volume 2: MA01 Map Book, map CT-05-306, F8 to G7). It will:

- be used to manage civil engineering works for a period of two years and six months, followed by civil engineering and railway systems works for a period of four years and three months, followed later by rail systems works only for a period of three months;
- provide four temporary materials stockpiles immediately to the east of the Proposed Scheme (see Volume 2: MA01 Map Book, map CT-05-306, G7 to J8, and CT-05-307, B7 to E7, F7 to G7 and H7 to I7); and
- be accessed primarily via a site haul route and Parkers Road.

2.3.63 The works to be managed from this compound will require demolition of the following buildings, as described in Table 3.

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

Type	Description	Location	Feature resulting in the demolition
Other	Footbridge over the WCML	Warmingham, Crewe	Crewe Northern Connection
Other	Spring Farm Overbridge	Warmingham, Crewe	Crewe Northern Connection

2.3.64 This compound will be used to manage the construction of Crewe Northern Connection southbound and associated earthworks, which will take four years and nine months, over a period of five years and nine months, comprising:

- Coppenhall Moss north embankment, which will take two years and six months to complete;
- Warmingham Moss southbound retaining wall, which will take one year and three months to complete (partially managed from Moss Lane satellite compound);
- Warmingham Moss southbound viaduct, which includes Warmingham Moss southbound embankment no. 1 and no. 2, which will take three years and nine months to complete; and
- Crewe Northern Connection southbound line, which will take five years and nine months to complete.

2.3.65 The works to be managed from this compound will require the construction of Footpath Crewe 29/1 offline culvert, which will take six months to complete.

2.3.66 The works to be managed from this compound will require the construction of Coppenhall Moss culvert to convey Hoggins Brook under the WCML, Crewe Northern Connection and the route of the Proposed Scheme, which will take six months to complete.

2.3.67 Key railway systems works to be managed from this compound will include track installation works within the Hough to Walley's Green area, which will take three years and three months to complete over a period of three years and nine months. The compound will also be used to manage the construction of the Warmingham Moss telecommunications site, which will take six months to complete.

2.3.68 The works to be managed from this compound will involve the following works to utilities:

- permanent underground realignment of the 132kV Scottish Power overhead power line, which will take six months to complete;
- permanent realignment of a United Utilities 450mm potable water main, which will take six months to complete;
- permanent diversion of two Scottish Power overhead electricity cables, which will each take three months to complete;
- permanent diversion of a Scottish Power underground electricity cable, which will take three months to complete; and

- permanent diversion of a United Utilities potable water main, which will take six months to complete.

Moss Lane satellite compound

2.3.69 This compound will be used to manage civil engineering and railway systems works (see Volume 2: MA01 Map Book, map CT-05-306, F5 to H5). It will:

- be used to manage civil engineering works for a period of two years and six months, followed by both civil engineering and railway systems works for a period of four years and three months, followed later by railway systems works only for a period of six months;
- provide four temporary materials stockpiles immediately to the west of the Proposed Scheme (see Volume 2: MA01 Map Book, map CT-05-306, E6 to F5, H5 and H5 to CT-05-307, B6 and CT-05-307, B6 to C6); and
- be accessed primarily via a site haul route and the A530 Middlewich Road.

2.3.70 The works to be managed from this compound will require demolition of the following buildings, as described in Table 4.

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

Type	Description	Location	Feature resulting in the demolition
Other	Field scale solar array	Moss Farm, Warmingham	Crewe North Connection

2.3.71 This compound will be used to manage the construction of:

- Coppenhall Moss north embankment, which will take two years and six months to complete;
- Crewe Northern Connection northbound and associated earthworks (Warmingham Moss northbound viaduct and Warmingham Moss Northbound WCML embankment), which will take four years, over a period of five years and nine months, to complete; and
- Footpath Minshull Vernon 8/1 accommodation overbridge, which will take two years and three months to complete.

2.3.72 The works to be managed from this compound will require the permanent realignment of Parkfield Farm access, 95m north of its existing alignment. On completion of construction of Footpath Minshull Vernon 8/1 accommodation overbridge, Parkfield Farm access will be permanently realigned over Footpath Minshull Vernon 8/1 accommodation overbridge. The removal of the existing Parkfield Farm access will take six months to complete.

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

- temporary diversion of Footpath Minshull Vernon 13/1 to the south of Minshull Vernon 8/1 for a period of one year, with users diverted to the north along an existing track, increasing journey length by 989m. On completion of construction, a section of Footpath

Minshull Vernon 13/1 will be permanently diverted along a new section of PRoW, before connecting with Footpath Minshull Vernon 8/1 and crossing over Footpath Minshull Vernon 8/1 accommodation overbridge, increasing journey length by 1.1km; and

- permanent realignment of Footpath Minshull Vernon 8/1 100m north of its existing alignment, which will take one year and ten months to complete and will be constructed offline. The realignment will be constructed offline i.e. it will be constructed away from the existing route, which will remain open during construction. On completion of construction, Footpath Minshull Vernon 8/1 will be permanently realigned over Footpath Minshull Vernon 8/1 accommodation overbridge, increasing journey length by 85m.

2.3.74 The works to be managed from this compound will require the construction of Warmingham Moss offline culvert to convey Hoggins Brook under the Footpath Minshull Vernon 17, which will take three months to complete.

2.3.75 Key railway systems works to be managed from this compound will include track installation works within the Hough to Walley's Green area, which will take three years and nine months to complete over a period of four years and three months.

2.3.76 The works to be managed from this compound will involve the following works to utilities:

- permanent diversion of a Scottish Power overhead electricity cable, which will take three months to complete;
- permanent relocation of a mobile telecommunications mast, which will take nine months to complete;
- decommissioning of an Openreach telecommunications cable, which will take three months to complete;
- permanent diversion of a Scottish Power underground electricity cable, which will take three months to complete; and
- permanent realignment of an underground National Grid high pressure gas pipeline, which will take nine months to complete.

A530 Nantwich Road satellite compound

2.3.77 This compound will be located within the Wimboldsley to Lostock Gralam area (MA02). It is described in Volume 2, Community Area report: Wimboldsley to Lostock Gralam area (MA02).

2.3.78 The compound will be used to manage the construction of Park House Farm access realignment, within the Hough to Walley's Green area. The construction of the Park House Farm access realignment will take six months to complete.

2.3.79 No demolitions will be required in the Hough to Walley's Green area as a result of the works to be managed from this compound.

2.3.80 The works to be managed from this compound will involve the following works to utilities in the Hough to Walley's Green area:

- permanent diversion of a Scottish Power 33kV overhead power line, which will take three months to complete;
- permanent diversion of an Openreach telecommunications cable, which will take three months to complete;
- permanent diversion of a Level 3 telecommunications cable, which will take three months to complete; and
- permanent realignment of a United Utilities 533mm potable water main, to pass under the Proposed Scheme west of Park Hall Farm, which will take six months to complete.

Construction waste and material resources

2.3.81 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 suitable and reasonably practicable.

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

2.3.83 Local excess or shortfall of excavated material within the Hough to Walley's Green area will be managed through the mitigation earthworks design approach adopted for the Proposed Scheme, as well as the use of borrow pits in the Wimboldsley to Lostock Gralam area (MA02), with the aim of contributing to an overall balance of excavated material on a route-wide basis. The overall balance of excavated material will be presented in Volume 3, Section 15.

2.3.84 Forecasts of the amount of waste generated at temporary worker accommodation sites will be reported in Volume 3, Section 15.

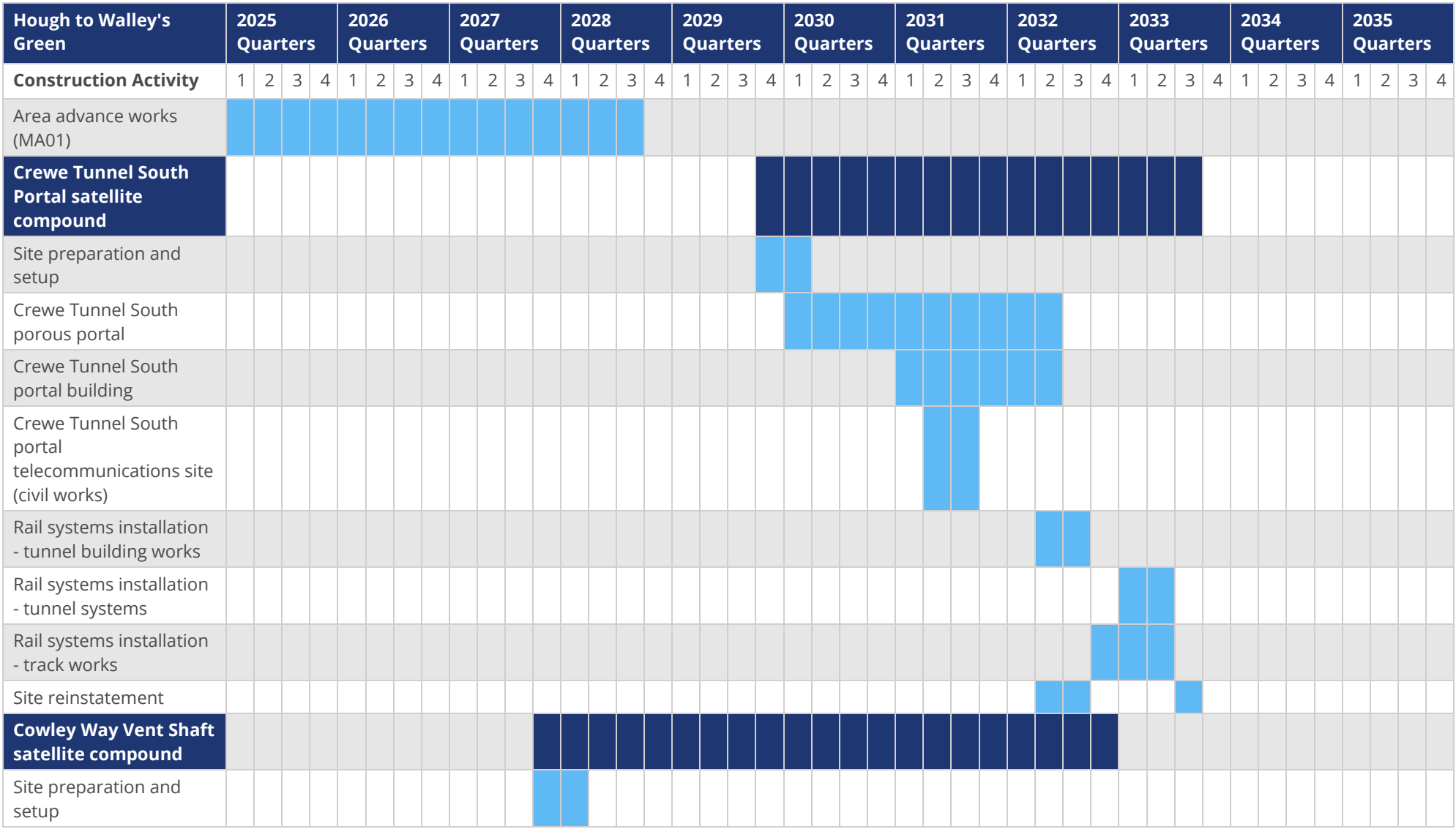
Commissioning of the railway

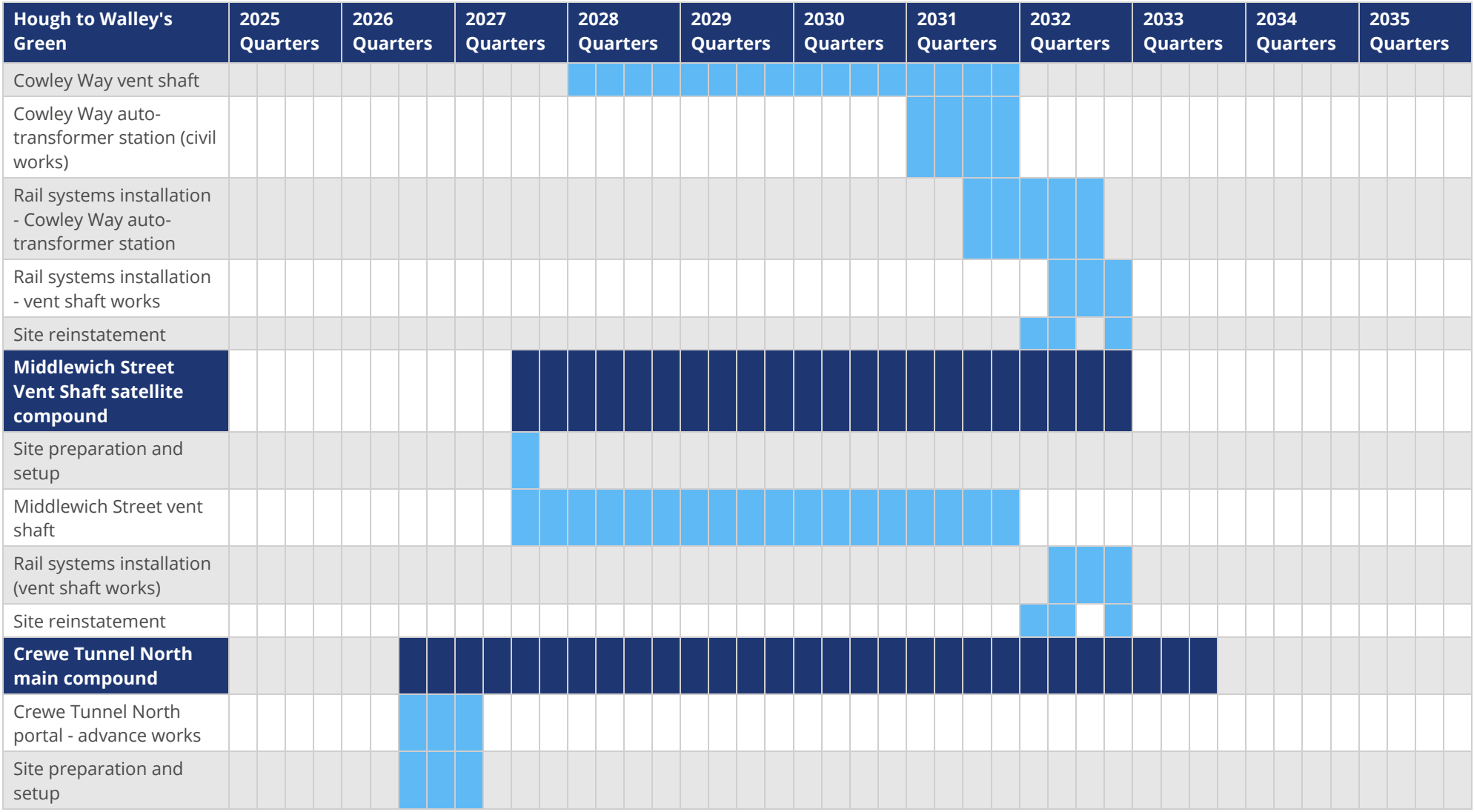
2.3.85 Commissioning is the process of testing the infrastructure to ensure that it operates as expected. It will be carried out in the period prior to opening. Further details are provided in Volume 1, Section 6.

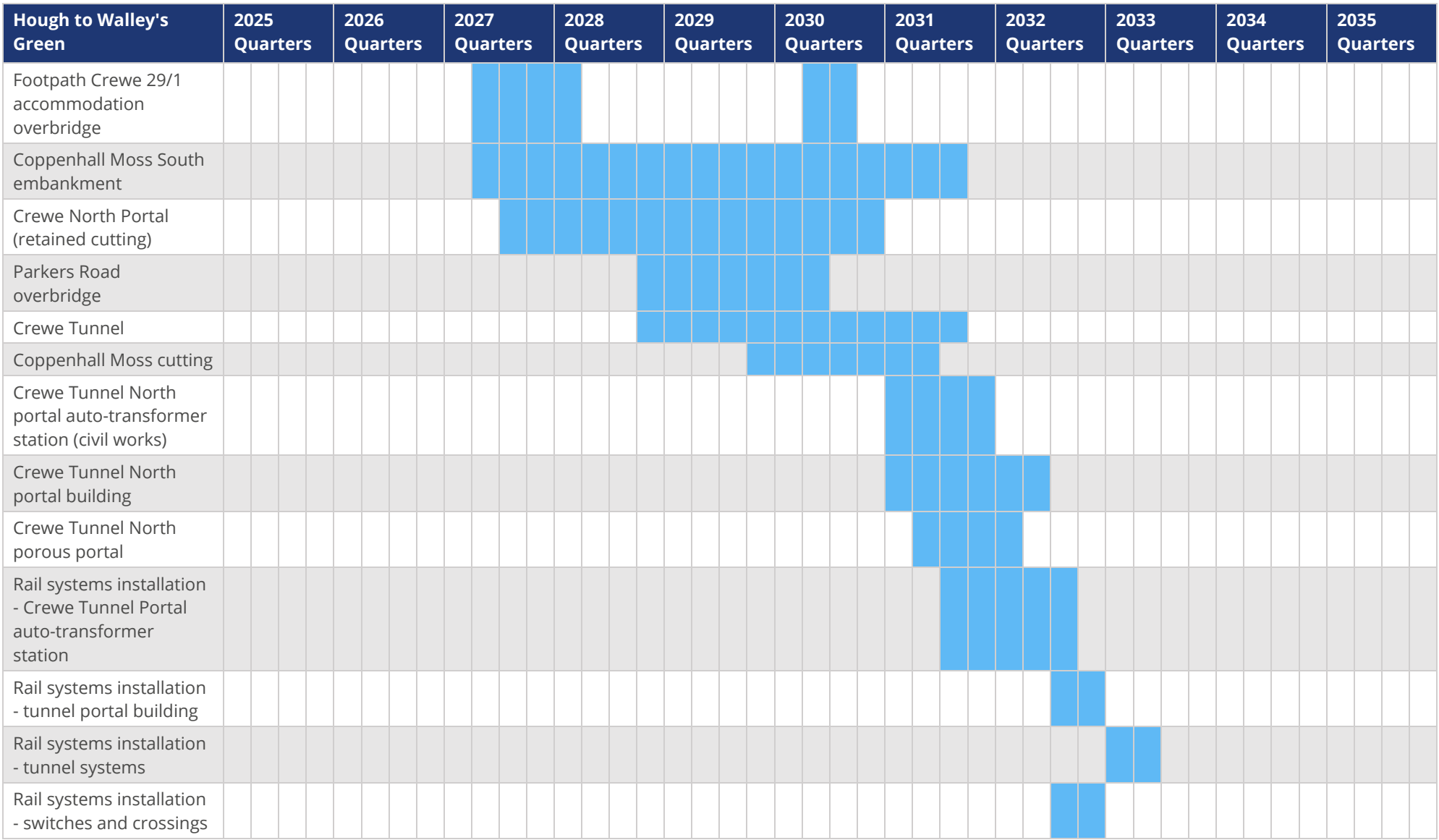
Construction programme

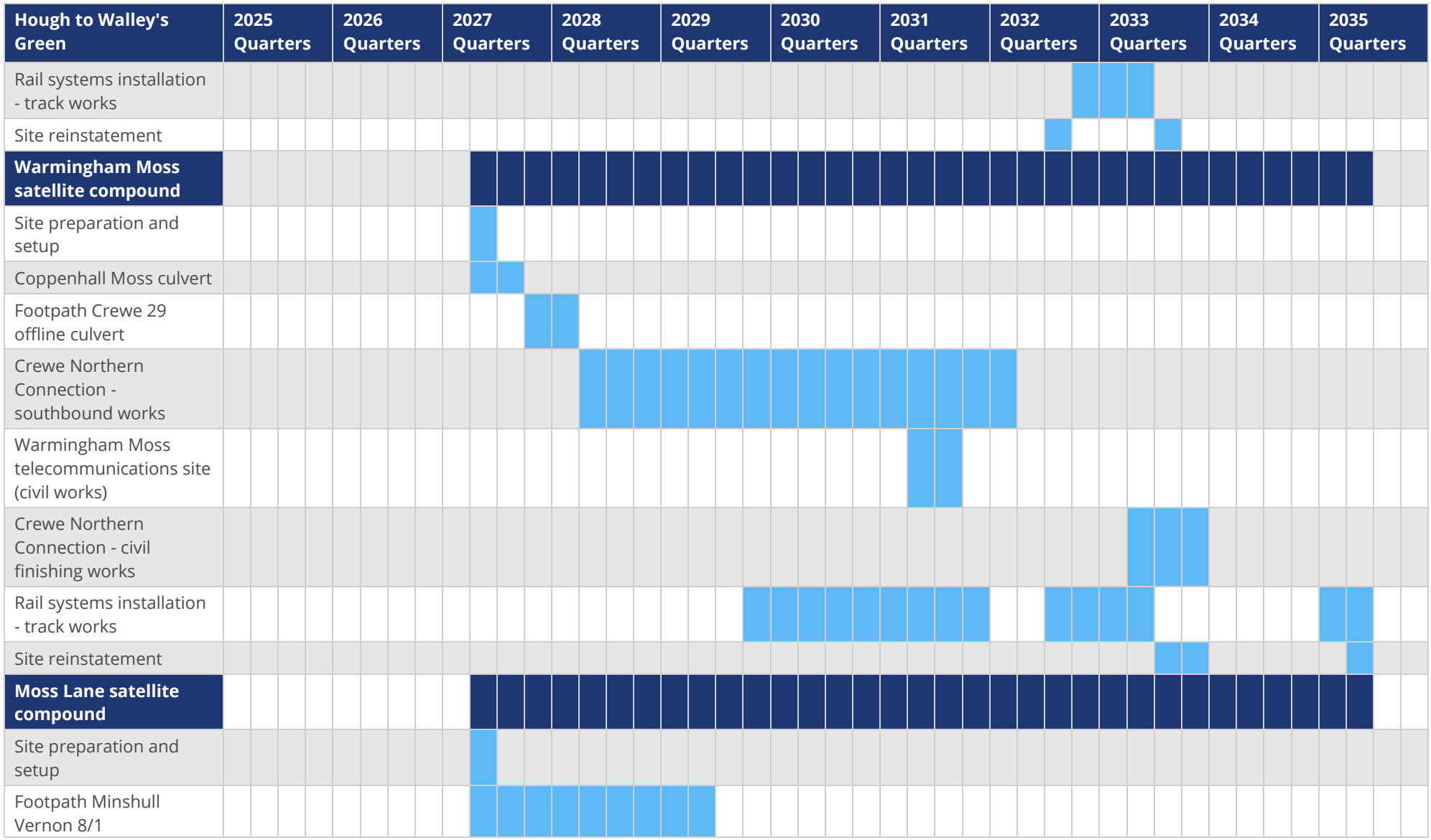
2.3.86 A construction programme illustrating indicative periods for each of the core construction activities described above is provided in Figure 9.

Figure 9: Indicative construction programme between 2025 and 2035




Hough to Walley's Green
2025 Quarters
2026 Quarters
2027 Quarters
2028 Quarters
2029 Quarters
2030 Quarters
2031 Quarters
2032 Quarters
2033 Quarters
2034 Quarters
2035 Quarters
Cowley Way vent shaft
Cowley Way auto-transformer station (civil works)
Rail systems installation - Cowley Way auto-transformer station
Rail systems installation - vent shaft works
Site reinstatement
Middlewich Street Vent Shaft satellite compound
Site preparation and setup
Middlewich Street vent shaft
Rail systems installation (vent shaft works)
Site reinstatement
Crewe Tunnel North main compound
Crewe Tunnel North portal - advance works
Site preparation and setup


Hough to Walley's Green
2025 Quarters
2026 Quarters
2027 Quarters
2028 Quarters
2029 Quarters
2030 Quarters
2031 Quarters
2032 Quarters
2033 Quarters
2034 Quarters
2035 Quarters
Footpath Crewe 29/1 accommodation overbridge
Coppenhall Moss South embankment
Crewe North Portal (retained cutting)
Parkers Road overbridge
Crewe Tunnel
Coppenhall Moss cutting
Crewe Tunnel North portal auto-transformer station (civil works)
Crewe Tunnel North portal building
Crewe Tunnel North porous portal
Rail systems installation - Crewe Tunnel Portal auto-transformer station
Rail systems installation - tunnel portal building
Rail systems installation - tunnel systems
Rail systems installation - switches and crossings


Hough to Walley's Green
2025 Quarters
2026 Quarters
2027 Quarters
2028 Quarters
2029 Quarters
2030 Quarters
2031 Quarters
2032 Quarters
2033 Quarters
2034 Quarters
2035 Quarters
Rail systems installation - track works
Site reinstatement
Warmingham Moss satellite compound
Site preparation and setup
Coppenhall Moss culvert
Footpath Crewe 29 offline culvert
Crewe Northern Connection - southbound works
Warmingham Moss telecommunications site (civil works)
Crewe Northern Connection - civil finishing works
Rail systems installation - track works
Site reinstatement
Moss Lane satellite compound
Site preparation and setup
Footpath Minshull Vernon 8/1

Hough to Walley's Green	2025 Quarters				2026 Quarters				2027 Quarters				2028 Quarters				2029 Quarters				2030 Quarters				2031 Quarters				2032 Quarters				2033 Quarters				2034 Quarters				2035 Quarters			
accommodation overbridge																																													
Coppenhall Moss North embankment																																													
Crewe Northern Connection - northbound works																																												
Crewe Northern Connection - civil finishing works																																												
Rail systems installation - track works																																												
Site reinstatement																																												
Track laying and testing and commissioning																																												
Area track laying																																												
Testing and commissioning																																												

Monitoring during construction

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

2.3.88 The CoCP and the relevant LEMP 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

Introduction

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

HS2 services

2.4.2 It is anticipated that there will be up to 12 trains per hour each way passing through the Hough to Walley's Green area. Services are expected to operate between 05:00 and midnight from Monday to Saturday and between 08:00 and midnight on Sunday.

2.4.3 In this area, trains will run at speeds of up to 225mph (360kph). The trains will be either single 200m trains or two 200m trains coupled together, depending on demand and time of day.

Maintenance

2.4.4 Volume 1, Section 4 describes the maintenance regime for the Proposed Scheme.

2.4.5 Provision for railway maintenance vehicles will be made at the Crewe North rolling stock depot. Further information on this depot can be found in Volume 2, Community Area report: Wimboldsley to Lostock Gralam area (MA02).

Operational waste and material resources

2.4.6 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 and is reported in Volume 3, Section 15.

2.4.7 Forecasts of the amount of waste arising from track maintenance and ancillary infrastructure and the associated potential significant environmental effects are provided in Volume 5: Appendix WM-001-00000.

Monitoring during operation

2.4.8 The nominated undertaker will be responsible for monitoring during operation of the Proposed Scheme. General monitoring measures during operation are set out in area-specific monitoring measures for each environmental topic area, which are presented in Sections 4 to 15 of this report.

2.4.9 Relevant local authorities and consenting authorities, such as the Environment Agency, will be consulted on the monitoring procedures to be implemented during operation prior to construction commencement.

2.5 Route section alternatives

2.5.1 The Proposed Scheme described in Section 2.2 has been selected following design development, which included consideration of environmental impacts.

2.5.2 The Alternatives Report (Volume 5: Appendix CT-003-00000) describes the local alternatives considered as part of the design development of the Proposed Scheme. Local alternative options for the following elements of the Proposed Scheme in the Hough to Walley's Green area are reported in Volume 5:

- Crewe tunnel vent shaft location; and
- Crewe tunnel north portal location.

3 Stakeholder engagement and consultation

3.1 Introduction

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

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

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

3.1.4 Feedback from stakeholder engagement and the consultations on the working draft Environmental Statement (ES) and design refinements has been considered as part of the design and assessment of the Proposed Scheme presented in this ES.

3.2 Key stages of Phase 2b engagement and consultation

3.2.1 This section provides a summary of consultation activities and engagement undertaken or underway in the Hough to Walley's Green area since the initial preferred route announcement. This summary of engagement is in addition to the route-wide engagement outlined in Volume 1, Section 3.

Draft EIA Scope and Methodology Report (SMR) consultation

3.2.2 The draft EIA SMR (the 2017 SMR) was consulted on between July and September 2017 and was issued to statutory bodies, non-government organisations and local authorities. It was made available on the gov.uk website, allowing comment by local interest groups and the public. A total of 107 responses to the 2017 SMR were received, as a result of which changes were made. A revised EIA SMR was published in October 2018 (the 2018 SMR) as part of the working draft ES (described in the following section).

3.2.3 The changes between the draft 2017 SMR and the publication of the 2018 SMR were set out in the EIA SMR Consultation Report[10] also published in October 2018. The assessment set out in this ES follows the scope and methodology in the EIA SMR in Volume 5 of this ES[11].

Consultation on the working draft ES

3.2.4 As set out in Volume 1 Section 3, two parallel consultations were undertaken by HS2 Ltd in 2018: a consultation on the working draft ES and a consultation on the working draft EQIA. These consultations were relating to the full Phase 2b Scheme (including both Eastern Leg and Western Leg). As part of the process of consultation, stakeholders were invited to comment on the full Phase 2b scheme and the working draft ES and working draft EQIA Report. Documents were made available on the gov.uk website.

3.2.5 As part of the consultation, information events were held in communities along both the Eastern and Western legs of the full Phase 2b route. Within the Hough to Walley's Green area, events were held at Crewe (November 2018).

3.2.6 A total of 37,899 responses were received through the consultation on the working draft ES. These responses were analysed. The themes and issues relevant to the Hough to Walley's Green area included commentary on:

- management of construction works and the potential impact to the community at the interface between the Proposed Scheme and Phase 2a;
- impacts of Cowley Way vent shaft including potential conflict with the Cheshire East Crewe Hub Master Plan and impacts on local businesses;
- location of Crewe tunnel north portal in Coppenhall and the associated noise and vibration effects for residents living on Sherborne Estate and Broughton Road during construction and operation;
- impact of increased construction traffic on local highways in and around Crewe including Broughton Road and Middlewich Street as a result of the Crewe tunnel north main compound;
- impact on Crewe's highway network as a result of the temporary closure of Parkers Road;
- loss of recreational and community facilities including the temporary loss and permanent impact on green space as a result of the construction of Middlewich Street vent shaft;
- impacts of construction works (noise and dust) on vulnerable people close to Middlewich Street vent shaft, including Bentley Manor Care Home and the Sherborne Court Neurological Centre; and
- access to public rights of way (PRoW) north of Crewe during construction and operation.

[10] High Speed Two Ltd (2018), *HS2 Phase 2b: Crewe to Manchester and West Midlands to Leeds, Environmental Impact Assessment Scope and Methodology Report, Consultation Summary Report*. Available online at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/745512/HS2_Phase_2b_EIA_Scope_and_Methodology_Report_Consultation_Summary_Report.pdf.

[11] Volume 5: Appendix CT-001-00001, Environmental Impact Assessment Scope and Methodology Report.

3.2.7 A working draft ES Consultation Summary Report[12] has been published as part of the ES detailing how consultation responses have been taken into consideration in the development of the Proposed Scheme design and its assessment.

3.2.8 Feedback from that consultation and ongoing stakeholder engagement have been considered as part of the development of the Proposed Scheme, and the assessment and identification of mitigation opportunities for the Hough to Walley's Green area.

Consultation on design refinements

3.2.9 Design refinements to the Proposed Scheme in Hough to Walley's Green area were consulted upon between October and December 2020. These design refinements related to the inclusion of Crewe Northern Connection in the design of the Proposed Scheme to enable the benefits of Northern Powerhouse Rail (NPR) and the Crewe Hub to be realised in future with more and quicker services to the north.

3.2.10 Documents containing information about the proposed design refinements, along with supporting information such as visualisations and construction and operational plans, were made available at on the gov.uk webpage. Information was also made available on the hs2.org.uk webpage, where an interactive map and a virtual exhibition room provided alternative ways for people to access the information. Printed copies of the consultation materials were sent free of charge following requests to the HS2 Helpdesk.

3.2.11 Stakeholders were invited to comment on the proposed design refinements either by using an online response form or submitting comments by post.

3.2.12 A total of 326 responses were received through the consultation on design refinements. These responses were analysed and the themes and issues relevant to the Hough to Walley's Green area included:

- potential disruption to local communities and villages in south Cheshire during the construction phase, including increased noise and air quality impacts;
- impacts and opportunities on local jobs and businesses generated from Crewe Northern Connection, including on Spring Farm Business Centre;
- potential impacts on carbon emissions and biodiversity, including on woodland, river and canal habitats;
- landscape and visual impacts on views, green space and the character of the local countryside;
- support for the proposal because of the potential for improved capacity and connectivity, for freight and passengers between the North West England, the Midlands, Scotland and London;
- disruption to other rail services;

[12] Volume 5: Appendix CT-007-00001, Working Draft Environmental Statement: Consultation Summary Report.

- impact of increased congestion on local roads in the Crewe area arising from the closure of Parkers Road, particularly during the construction phase; and
- impacts on committed developments in the area including a solar farm and housing developments off Broughton Road in Crewe.

3.2.13 A summary of the comments received is available at the gov.uk website.

3.3 Engagement and consultation with stakeholder groups

Communities

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

3.3.2 The purpose of this engagement has been to provide affected communities with information on the development of the Proposed Scheme and to give the opportunity to raise issues in relation to the design and assessment of the Proposed Scheme. Feedback from communities has helped inform the baseline information and evolving assessment of impacts in this ES and concurrent EQIA, as well as identify opportunities for mitigation within the design.

3.3.3 Programmes of public information events were held to share new information with communities and engage them on it. HS2 Ltd notified people of these by sending leaflets to addresses along the route, advertising in local media and via social media. Public information events were held in September 2017, between June and July 2018, October and December 2018, June and July 2019. In October and November 2020, information events were held using online channels including webinars and a virtual exhibition room. Information events were held between June and September 2021 using a combination of in-person information events and online webinars. Members of local communities and other interested parties were invited to engage on issues pertinent to the development of the Proposed Scheme design and its assessment.

3.3.4 Engagement has been, and will continue to be, undertaken with community stakeholders, particularly those close to the Proposed Scheme. These stakeholders include educational establishments, organisations with specialist interests or those catering to the needs of vulnerable people within the community. This has informed the assessment of community and health impacts in this ES, whilst also informing the concurrent EQIA.

3.3.5 Table 5 summarises key engagement undertaken with community stakeholders to date, including the focus of the engagement and how this has informed the design and assessment of the Proposed Scheme.

Table 5: Engagement to date with community stakeholders

Stakeholder	Area of focus	How this has informed the design and assessment of the Proposed Scheme
Active Travel Crewe	Meeting to discuss the Proposed Scheme and provide an update on consultation activities.	Informing local understanding of the Proposed Scheme and the consultation process to ensure local issues are considered in the assessment and design development process.
Bentley Manor Care Home	Meetings to discuss the Proposed Scheme and understand potential impacts. The discussions were particularly focussed on the location of the proposed Middlewich Street vent shaft, concerns regarding construction noise and construction traffic impacts, and the need for 24 hour emergency access. This also provided an opportunity to inform the EQIA.	Information has been used to improve understanding of baseline conditions and provide an opportunity to consider any mitigation that may be required. HS2 Ltd will continue to engage with Bentley Manor Care Home in regard to the Proposed Scheme design and mitigation.
Cheshire East Local Access Forum	Meeting to discuss the interface between the Proposed Scheme and use of open space and PRoW.	Information has been used to improve understanding of baseline conditions and provide an opportunity to identify and consider refinements to PRoW in and around Crewe.
Cheshire East Voluntary Action	Engagement to identify and discuss the approach to working with local community groups.	Information has been used to improve understanding of baseline conditions as well as potential impacts on the local community.
Community & Voluntary Services (CVS) Cheshire East	Meeting to discuss the Proposed Scheme through Cheshire and provide an update on consultation activities.	Informing local understanding of the Proposed Scheme and the consultation process to ensure local issues are considered in the assessment and design development process.
Councillor Brian Roberts, Crewe West	Meeting to discuss the Proposed Scheme and provide an overview of the HS2 programme. The Councillor provided community insight based on their knowledge of the Ward.	Information has been used to improve understanding of baseline conditions and provide an opportunity to consider any mitigation that may be required.
Councillor Jill Rhodes, Crewe North	Meeting to discuss the Proposed Scheme and provide an overview of the HS2 programme. The Councillor provided community insight based on their knowledge of the Ward.	Information has been used to improve understanding of baseline conditions and provide an opportunity to consider any mitigation that may be required.
Councillor Hazel Faddes, Councillor Suzanne Brookfield, Crewe East	Meeting to discuss the Proposed Scheme and provide an overview of the HS2 programme. The Councillors provided community insight based on their knowledge of the Ward.	Information has been used to improve understanding of baseline conditions and provide an opportunity to consider any mitigation that may be required.
Crewe Engineering and Design University Technology College	Meeting to discuss potential impacts of the Proposed Scheme on staff and pupils, as well as potential opportunities from accessing the HS2 Skills, Education and Employment Programme for the college.	Information has been used to improve understanding of baseline conditions as well as potential impacts and educational opportunities.

Stakeholder	Area of focus	How this has informed the design and assessment of the Proposed Scheme
Crewe Neighbourhood Partnership Group	Meeting to discuss the Proposed Scheme and provide an update on consultation activities, as well as potential impacts and opportunities for organisations through the Community and Environment Fund.	Information has been used to improve understanding of baseline conditions and provide an opportunity to consider any mitigation that may be required.
IRIS Vision	Meeting to discuss the Proposed Scheme and provide an update on consultation activities.	Information has been used to improve understanding of baseline conditions and provide an opportunity to consider any mitigation that may be required.
Leighton Hospital and the Health Care Partnership	Meeting to discuss the Proposed Scheme, provide an update on consultation activities, gather information on Leighton Hospital's development plans and discuss the potential impact of construction on service provision.	Information has been used to improve understanding of baseline conditions and provide an opportunity to consider any mitigation that may be required, particularly relating to routes to be taken by construction traffic.
Mablins Lane Primary School	Meeting to discuss potential impacts of the Proposed Scheme on staff and pupils, as well as potential opportunities from accessing the HS2 Skills, Education and Employment Programme.	Information has been used to improve understanding of baseline conditions as well as potential impacts and educational opportunities.
Oakfield Lodge School	Meeting to discuss the Proposed Scheme and understand potential impacts, particularly regarding pupils attending Oakfield Lodge. This also provided an opportunity to inform the EQIA	Information has been used to improve understanding of baseline conditions and provide an opportunity to consider any mitigation that may be required.
Ocean - African and Caribbean Charity	Meeting to discuss the Proposed Scheme and provide an update on consultation activities.	Information has been used to improve understanding of baseline conditions and provide an opportunity to consider any mitigation that may be required.
Shah Jalal Masjid Mosque	Meeting to provide an update on the Proposed Scheme and consultation activities. This also provided an opportunity to understand potential impacts on the local Islamic community and particularly patterns of movement within the congregation.	Information has been used to improve understanding of baseline conditions and provide an opportunity to consider any mitigation that may be required.
Sherborne Court Neurological Centre	Meetings to provide an update on consultation activities and discuss potential impacts of the Proposed Scheme, in particular the location of the Middlewich Street vent shaft. Discussions focused on the need for 24 hour emergency access, potential impacts of construction noise and construction traffic as well as building on experience of previous engagement with the owners from assets on Phase 2a. This also provided an opportunity to inform the EQIA.	Information has been used to improve understanding of baseline conditions and provide an opportunity to consider any mitigation that may be required. HS2 Ltd will continue to engage with Sherborne Court Neurological Centre in regard to the Proposed Scheme design and mitigation.

Stakeholder	Area of focus	How this has informed the design and assessment of the Proposed Scheme
Sir William Stanier Secondary School	Meetings to discuss potential impacts of the Proposed Scheme on staff and pupils, as well as potential opportunities from accessing the HS2 Skills, Education and Employment Programme.	Information has been used to improve understanding of baseline conditions as well as potential impacts and educational opportunities.
St Paul's Centre	Meeting to discuss potential impacts on users of this church-based community outreach and support for vulnerable people.	Information has been used to improve understanding of baseline conditions and provide an opportunity to consider any mitigation that may be required.
Sustrans	Meetings to discuss potential impacts that the Proposed Scheme could have on the cycle network and what support would be available to improve the network. In addition, a further discussion took place regarding the groups that Sustrans have links within Cheshire and how they could contribute to the Proposed Scheme.	Information has been used to improve understanding of baseline conditions and provide an opportunity to consider any mitigation that may be required.
What's Happening on North Street (Community Group)	Meeting to discuss the Proposed Scheme, provide an update on the HS2 programme, and to understand any potential impacts on the local community.	Information has been used to improve understanding of baseline conditions and provide an opportunity to consider any mitigation that may be required.
Wishing Well Project	Meeting to discuss the Proposed Scheme and provide an update on the HS2 programme.	Information has been used to improve understanding of baseline conditions and provide an opportunity to consider any mitigation that may be required.
Winton Equestrian Centre	Meeting to discuss the Proposed Scheme and how it will impact on the equestrian centre.	Information has been used to improve understanding of baseline conditions and equality impacts.
YMCA Crewe	Meeting to discuss the Proposed Scheme, provide an update on the HS2 programme, and understand potential impacts on the local community.	Information has been used to improve understanding of baseline conditions and provide an opportunity to consider any mitigation that may be required.

MPs, local authorities and parish councils

3.3.6 HS2 Ltd has offered to engage with all relevant MPs during the development of the Proposed Scheme in order to discuss key issues and concerns.

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

3.3.8 Table 6 summarises key engagement undertaken with MPs, local authorities and parish councils to date, including the focus of the engagement and how this has informed the design and assessment of the Proposed Scheme.

Table 6: Engagement to date with MPs, local authorities and parish councils

Stakeholder	Area of focus	How this has informed the design and assessment of the Proposed Scheme
Laura Smith former MP for Crewe and Nantwich	Discussions regarding Crewe Hub, the interface and cumulative effects of Phase 2a with the Phase 2b Scheme, and the location of Cowley Way vent shaft.	Information used to improve understanding of baseline conditions of the Proposed Scheme as well potential impacts and mitigation opportunities. In response to engagement the Proposed Scheme in this area now includes Crewe Northern Connection which provides a connection between HS2 and a Northern Powerhouse Rail (NPR) route between London and Liverpool, referred to as NPR London to Liverpool junction.
Kieran Mullan, MP for Crewe and Nantwich	Attended briefing to provide an update regarding Crewe Hub, the interface and cumulative effects of Phase 2a with the Proposed Scheme, the potential interface with development proposals for an enhanced transport hub at Crewe (Crewe Hub) and the location of the Cowley Way vent shaft. Discussions also held regarding access to Leighton Hospital and construction traffics routes in and around the local area.	Feedback has been used to improve understanding of key areas of local interest and provide opportunity for further discussion.
Cheshire East Council	Series of meetings to discuss the Proposed Scheme, provide updates on consultation activities and understand potential impacts on the community. Key discussion points included preferred vent shaft locations for Crewe tunnel and how options could interface with Crewe Masterplan, the impacts on local community groups and voluntary organisation, and briefings in advance of Design Refinement Consultation. A further briefing was also held at Director level to provide an update on Crewe Northern Connection.	Information used to improve understanding of baseline conditions of the Proposed Scheme as well potential impacts and mitigation opportunities. In response to engagement the Proposed Scheme in this area now includes Crewe Northern Connection which provides a connection between HS2 and a NPR route between London and Liverpool, referred to as NPR London to Liverpool junction.
Crewe Town Council	Series of meetings to discuss the Proposed Scheme, with key discussion points including the potential interface with development proposals for an enhanced transport hub at Crewe (Crewe Hub), Rural Support Zone principles, tunnelling, community engagement and consultation activities, vent shaft locations, construction compound locations and ongoing design development.	Information used to improve understanding of baseline conditions of the Proposed Scheme as well potential impacts and mitigation opportunities. In response to engagement the Proposed Scheme in this area now includes Crewe Northern Connection which provides a connection between HS2 and a NPR route between London and Liverpool, referred to as NPR London to Liverpool junction.

Stakeholder	Area of focus	How this has informed the design and assessment of the Proposed Scheme
Cheshire Association of Local Councils	Meetings to discuss the Proposed Scheme including ongoing design development, construction logistics and mitigation proposals and opportunities as well as impacts on the local highways network including the A530 Church Minshull and the proposed Middlewich Eastern bypass.	Information used to inform understanding of baseline conditions and assessment of the Proposed Scheme as well as potential impacts and mitigation opportunities. Feedback also informed the planning of engagement and consultation activity in the Hough to Walley's Green area.
Minshull Vernon Parish Council	Attended stakeholder forums to offer update on the Proposed Scheme and consultation activities, as well as understand potential impacts on the local community.	Information used to inform understanding of baseline conditions and assessment of the Proposed Scheme as well as potential impacts on the local community.
Moston Parish Council	Meeting to explain the HS2 programme and discussions regarding the movement of construction traffic between the route of the Proposed Scheme and the M6.	Information used to inform understanding of baseline conditions and assessment of the Proposed Scheme as well as potential impacts on the local community.
Warmingham Parish Council	Meetings to discuss the Proposed Scheme, provide updates on consultation activities and the programme and understand potential impacts on the community. A key discussion point included concerns relating to construction traffic movement to and from the M6.	Information used to inform understanding of baseline conditions and assessment of the Proposed Scheme as well as potential impacts on the local community.

3.3.9 Local authorities and parish councils will continue to be engaged as part of the development of the Proposed Scheme with ongoing dialogue on key topics such as highways, PRoW and the draft Code of Construction Practice (CoCP)[13].

Expert, technical and specialist groups

3.3.10 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 authorities and utility companies operational within the Hough to Walley's Green area.

3.3.11 Engagement with statutory bodies, local authorities and utility companies within the Hough to Walley's Green area 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.

[13] Volume 5: Appendix CT-002-00000, Draft Code of Construction Practice.

3.3.12 Engagement has focused on the technical areas that inform the assessment, including air quality, landscape and visual, sound, noise and vibration and traffic and transport. Briefings were offered to specialist and technical stakeholders across the Proposed Scheme during the period of consultation on the working draft ES to provide information on the evolving design and assessment of the Proposed Scheme in their respective areas.

3.3.13 Engagement has been offered to blue light emergency service stakeholders including fire and rescue, police force and ambulance service providers, with meetings undertaken to share information on the Proposed Scheme. This has included design review meetings to present design detail on fire engineering and safety design aspects of the Proposed Scheme.

3.3.14 Engagement will continue with these stakeholders as the project progresses, including consultation to support the development of local traffic management plans prior to construction starting.

3.3.15 Table 7 includes engagement undertaken with technical and specialist groups and how this has informed the design and assessment of the Proposed Scheme in the Hough to Walley's Green area.

Table 7: Engagement to-date with expert, technical and specialist groups

Type	Stakeholder	Area of focus	How this has informed the design and assessment of the Proposed Scheme
Statutory and national	British Geological Survey	Geological conditions	Information has been used to improve understanding of baseline geological issues route-wide and provided an opportunity to inform the assessment and consider any proposed mitigation.
Statutory and national	Canal & River Trust	Waterways	Information has been used to inform the historic environment, ecological and landscape and visual assessment and improve understanding of baseline conditions for route-wide application, including the water resources and flood risk assessment.
Statutory and national	Coal Authority	Coal mining	Information has been used to improve understanding of baseline conditions for coal mining route-wide, informing the assessment and proposed mitigation.
Statutory and national	Department for Environment, Food and Rural Affairs	Agriculture and land quality issues	Informed agricultural and land quality assessment methodology, baseline conditions for route-wide application, assessment and proposed mitigation.
Statutory and national	Environment Agency	Land quality, ecology and biodiversity and water and flood risk issues	Informed land quality, ecology and biodiversity, water resources, surface water flood risk and Water Framework Directive methodology. Improved understanding of baseline conditions, (including the provision of data), along the route of the Proposed Scheme and the proposed mitigation.

Type	Stakeholder	Area of focus	How this has informed the design and assessment of the Proposed Scheme
Statutory and national	Animal and Plant Health Agency (APHA)	Land quality issues	Information on the location of farm burial and pyre sites associated with the 1967/8 and 2001 outbreaks of foot and mouth disease as well as anthrax infected cattle burial sites has been obtained from APHA. This has been used to improve understanding of land contamination baseline conditions along the route of the Proposed Scheme and to inform the assessment and proposed mitigation.
Statutory and national	Forestry Commission	Forestry, ecology and landscape issues	Informed the ecological and landscape assessment methodology and improved understanding of baseline conditions and the assessment and proposed mitigation.
Statutory and national	Highways England	Strategic road network, traffic and transport issues	Informed the assessment of road network capacity and identification of proposed future Highways England works that informed the design and mitigation.
Statutory and national	Historic England	Nationally designated heritage assets and the heritage assessment methodology	Informed 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.
Statutory and national	Homes England	Land at Basford East, David Whitby Way, Crewe	Informed understanding of local baseline conditions and safeguarded land in the vicinity of the Homes England site.
Statutory and national	National Farmers Union	Farming issues	Information was used to improve understanding of route-wide issues for farmers and growers.
Statutory and national	Country Land and Business Association	Farming issues	Information was used to improve understanding of route-wide issues for farmers and growers.
Statutory and national	National Trust	Owned assets and related impacts	Informed considerations around National Trust owned assets route-wide and factors to be considered in the design and assessment of the Proposed Scheme.
Statutory and national	Natural England	Ecology, agricultural land quality, surface water, groundwater and landscape and visual related issues	Provided information regarding the natural environment on a route-wide basis. Informed methodological approach and detailed local conditions and factors to be taken into consideration in the assessment.
Statutory and national	Network Rail	Rail infrastructure	Informed route-wide considerations around the rail infrastructure network and factors to be considered in the design and assessment of the Proposed Scheme, including the proposed interface with the West Coast Main Line (WCML) and Phase 2a.

Type	Stakeholder	Area of focus	How this has informed the design and assessment of the Proposed Scheme
Statutory and national	Public Health England	Public health issues	Informed methodology and factors to be taken into consideration in the health assessment.
Statutory and national	The Woodland Trust	Woodland and ancient woodland issues	Information was used to confirm that there are currently no sites within the Ancient Woodland Inventory in this area.
Statutory sub-national	Transport for the North	Connectivity to Northern Powerhouse Rail	Discussions around integration of HS2 with NPR including Crewe Northern Connection.
Local Authority technical meetings	Cheshire East Council	Meetings to discuss the air quality and sound, noise and vibration assessment including proposed mitigation.	Information used to improve understanding of baseline conditions and factors used to inform the Proposed Scheme design and assessment including the area north of Crewe close to the Crewe north tunnel portal.
Local Authority technical meetings	Cheshire East Council	Meetings to discuss the ecology and biodiversity assessment, including the mitigation strategy.	Information used to improve understanding of baseline conditions, support the identification of sensitive ecological sites, and consider appropriate mitigation and compensation for habitat loss associated with the Proposed Scheme
Local Authority technical meetings	Cheshire East Council	Meetings with technical leads to collate data and discuss the historic environment assessment.	Information on local conditions and factors used to refine the Proposed Scheme design and assessment.
Local Authority technical meetings	Cheshire East Council	Meetings to discuss known and potential contaminated land, proposed assessment and mitigation measures for land quality.	Identified local areas of land contamination, potential impacts and proposed mitigation.
Local Authority technical meetings	Cheshire East Council	Meetings with technical leads to collate data and discuss landscape and visual impacts, viewpoint locations and site walkovers.	Informed the identification of viewpoint locations to be assessed and reported within the ES, as well as the extent of the landscape and visual study area and obtaining information to improve understanding of baseline conditions.
Local Authority technical meetings	Cheshire East Council	Meeting to collate baseline data on socio-economic characteristics.	Information has been used to improve understanding of baseline conditions and provide an opportunity to consider any mitigation that may be required.
Local Authority technical meetings	Cheshire East Council	Meetings to provide information on the Proposed Scheme and obtain relevant baseline information and discuss transport survey requirements and assessment methodology relating to traffic and transport.	Improved understanding of local traffic flows, highways operations and future proposals, and informed the emerging design and assessment of the Proposed Scheme.

Type	Stakeholder	Area of focus	How this has informed the design and assessment of the Proposed Scheme
Local Authority technical meetings	Cheshire East Council	Meetings with the Lead Local Flood Authorities to provide information on the Proposed Scheme and obtain relevant baseline information related to water resources and flood risk.	Information used to improve understanding of baseline conditions and provide an opportunity to consider any mitigation that may be required.
Local Authority technical meetings	Cheshire West and Chester Council	Meetings with technical leads to collate data and discuss the historic environment assessment.	Improved understanding of local baseline conditions and informed the design and assessment of the Proposed Scheme
Local Authority technical meetings	Cheshire West and Chester Council	Meetings with technical leads to collate data and discuss landscape and visual impact impacts, viewpoint locations and site walkovers.	Informed the identification of viewpoint locations to be assessed and reported within the ES, as well as the extent of the landscape and visual study area and obtaining information to improve understanding of baseline conditions.
Local technical specialist group	Cheshire Archaeology Planning Advisory Service	Meetings with technical leads to collate data and discuss the historic environment assessment.	Information on local conditions and factors used to refine the Proposed Scheme design and assessment.
Local technical specialist group	Cheshire Wildlife Trust	Meeting to discuss the Proposed Scheme, provide an update on consultation activities and to understand key areas of concern relating to impacts on local wildlife sites.	Identified sensitive ecological sites and appropriate mitigation and compensation for habitat loss associated with the Proposed Scheme.
Local technical specialist group	Railway Heritage Trust	Meetings with technical leads to collate data and discuss the historic environment assessment.	Information used to improve understanding of baseline conditions and provide an opportunity to consider any mitigation that may be required.
Utilities	Airwave	Network provision of telecommunications services	Informed route-wide considerations relating to the utilities network and factors to be considered in the design and assessment of the Proposed Scheme, and specifically in relation to the mobile mast located close to Brierley Police Station at Prince Albert Street, in Crewe.
Utilities	Cadent Gas	Network provision of gas	Informed route-wide considerations relating to the impact that the design and assessment of the Proposed Scheme will have on Cadent Gas assets, and specifically in relation to diversion of assets at Weston Road, A534 Nantwich Road and Warmingham, and also the abandonment of the existing gas pipeline crossing the route of the Proposed Scheme north of Spring Farm Business Park.

Type	Stakeholder	Area of focus	How this has informed the design and assessment of the Proposed Scheme
Utilities	EE and 3 Mobile	Network provision of telecommunications services	Identified telecommunication services and informed understanding of potential impacts of the Proposed Scheme and mitigation requirements on the relocation of EE masts affected by the Proposed Scheme.
Utilities	Instalcom	Network provision of telecommunications services	Identified telecommunication services and informed understanding of potential impacts of the Proposed Scheme and mitigation requirements on Instalcom assets located at the crossing of the WCML, Warmingham Moss northbound viaduct and Warmingham Moss southbound viaduct.
Utilities	Level 3	Network provision of telecommunications services	Informed route-wide considerations relating to the impact of the Proposed Scheme on Level 3 utilities assets and factors to be considered in the design and assessment of the Proposed Scheme.
Utilities	National Grid Transmission (Gas)	Network provision of gas	Informed considerations relating to the utilities network and factors to be considered in the design and assessment of the Proposed Scheme at several locations including Warmingham Moss telecommunications site, as well as the major realignment of assets at the A534 Nantwich Road and A532 Weston Road.
Utilities	Openreach	Network provision of telecommunications services	Identified telecommunication services and informed understanding of potential impacts of the Proposed Scheme and mitigation requirements. This included assets at Crewe tunnel north portal, Crewe tunnel south portal, Middlewich Street and Cowley Way vent shafts and Warmingham Moss telecommunication site.
Utilities	SP Energy Networks	Network provision of electricity and gas	Informed considerations relating to the utilities network and factors to be considered in the design and assessment of the Proposed Scheme, as well as mitigation requirements at several locations including Crewe tunnel north portal, Crewe tunnel south portal, and Warmingham Moss telecommunications site, as well as assessment of electrical power supply to the Crewe tunnel south portal satellite compound, Crewe tunnel north main compound, and Middlewich Street and Cowley Way vent shafts.

Type	Stakeholder	Area of focus	How this has informed the design and assessment of the Proposed Scheme
Utilities	United Utilities	Network provision of water and wastewater services	Informed considerations relating to the utilities network and factors to be considered in the design and assessment of the Proposed Scheme, as well as mitigation requirements. This included assets in the vicinity of Crewe tunnel north portal, Crewe tunnel south portal and Warmingham Moss telecommunication site, and the provision of potable water supplies and sewerage facilities for these critical sites.
Utilities	Vodafone and O2	Provision of mobile telecommunications networks and cabling for wired/fixed telecommunications services, as well as mobile masts.	Informed route-wide considerations and factors to be considered in the design and assessment of the Proposed Scheme and its impact on existing Vodafone network and mobile masts.
Utilities	Vodafone Ltd	Network provision of telecommunications services with respect to below ground assets.	Informed route-wide considerations and factors to be considered in the design and assessment of the Proposed Scheme and its impact on existing below ground Vodafone assets.

3.3.16 HS2 Ltd has pursued engagement with all affected utility and technical stakeholders across the Proposed Scheme. Where possible HS2 Ltd has obtained information and designs from these stakeholders to inform and promote the collaborative development of the Proposed Scheme.

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

Directly affected individuals, farmers and growers

3.3.18 This group includes those with land and property potentially affected by the Proposed Scheme, including individuals, farmers and growers within the Hough to Walley's Green area.

3.3.19 As part of information events held in October 2018, June 2019, between October and November 2020 and between June and September 2021 (including using online channels where necessary), targeted engagement was also offered to those stakeholders who have land or property directly affected by the construction and operation of the Proposed Scheme. These appointments provided an opportunity to meet with technical experts, to gain a better understanding of the emerging design and share their thoughts on how this might affect them. Whilst these opportunities did not replace their right to respond formally to consultation, their feedback has also been considered during design development.

3.3.20 Information events provided affected individuals, farmers and growers with the opportunity to gain an understanding of compensation and assistance available for property owners. Facilities were available at the events to have private meetings with HS2 Ltd staff.

3.3.21 In addition, engagement has been offered via letter and through known land agents to all farmers and growers directly affected by the Proposed Scheme whether permanently or temporarily. Where offers have been accepted and it has been possible, visits have been made to the land and property affected although some interviews have needed to be undertaken virtually. The purpose of this engagement has been to obtain baseline information and provide the opportunity to raise issues and discuss mitigation in relation to the Proposed Scheme. Information gathered from farm interviews has informed the assessment presented in this ES. Key issues raised through this engagement include loss of land for landscape, ecological and other mitigation, likely long-term viability of farm holdings including holding severance and impacts to soil following restoration.

3.3.22 Engagement with directly affected individuals and growers will continue as the project develops and opportunities for engagement with farmers and growers will continue to be offered throughout the parliamentary process.

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

Major asset owners and businesses

3.3.24 This group includes those with property potentially affected by the Proposed Scheme, including major asset holders and businesses within the Hough to Walley's Green area.

3.3.25 As part of the information events held in October 2018, June 2019, between October and November 2020 and between June and September 2021 (including using online channels where necessary), targeted engagement was also offered to those stakeholders who have land, property or business operations directly affected by the construction and operation of the Proposed Scheme. These appointments provided an opportunity for these stakeholders to meet with technical experts, to gain a better understanding of the emerging design and share their thoughts on how this might affect them. Whilst these opportunities did not replace their right to respond formally to consultation, their feedback has also been considered during design development.

3.3.26 Engagement has been undertaken with major asset owners and businesses within the Hough to Walley's Green area including Network Rail, Sherborne Court Neurological Centre, Leighton Hospital, Bentley Manor Care Home, Bentley Motors, McColl's (2 Ridgway Street), Guinness Partnership, Royal Mail and Crewe Truck Stop. The purpose of this engagement has been to obtain baseline information and provide these stakeholders with the opportunity to raise issues and discuss mitigation in relation to the Proposed Scheme.

3.3.27 Key issues raised during this engagement have included:

- land requirements and impacts on access, property and business viability during both the construction and operational phases of the Proposed Scheme;
- the effects of noise and visual impacts from the operation and construction of the Proposed Scheme; and
- the impacts on local highways and traffic flows, particularly during construction of the Proposed Scheme.

3.3.28 Engagement with these stakeholders will continue as the project develops.

4 Agriculture, forestry and soils

4.1 Introduction

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

4.1.2 Engagement with farmers and landowners has 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 the farm pack for each farm holding as set out within a Phase 2b Farmers and Growers Guide[14].

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-001-0MA01 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: MA01 Map Book. The Proposed Scheme is described in Section 2.

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 Section 8 of Volume 1 and the EIA Scope and Methodology Report (SMR).

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

[14] To be prepared for Phase 2b in due course, as per previous Phases found here: https://www.gov.uk/government/publications/hs2-guide-for-farmers-and-growers.

land are made with reference to the prevalence of best and most versatile (BMV) land and forestry land in the general locality, taken as a 4km corridor centred on the route of the Proposed Scheme.

4.2.3 The quality of agricultural land in England and Wales is assessed according to the Agricultural Land Classification (ALC) 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 commercial land use feature providing resources such as timber and fuel. The impacts on this feature are calculated quantitatively in terms of the physical extent of commercial forestry land required. The qualitative effects on forestry land and woodland are addressed principally in Section 7, Ecology and biodiversity, and Section 11, Landscape and visual.

4.2.5 The primary functions provided by soils, other than for food and biomass production, include flood water attenuation, carbon storage or the support of ecological habitats. This section describes these functions and assesses the ability of the soils to fulfil their primary functions after construction of the Proposed Scheme. Soil attributes, other than for food and biomass production, are identified in this section, but the resulting function or service provided is assessed in other sections, notably: Section 7, Ecology and biodiversity; Section 9, Historic environment; Section 11, Landscape and visual; and Section 15, Water resources and flood risk. The function of soil as a carbon store is described in Volume 3, Route-wide effects (Section 4, Climate change).

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

4.2.7 Common assumptions that have been used in assessing the effects of the Proposed Scheme are set out in Volume 1 (Section 8). These assumptions include the restoration of agricultural land that is required temporarily for construction to agricultural use, and the handing back of land used temporarily to the original landowner. It is also assumed that buildings and other farm infrastructure on the land holding will not be replaced as this will ultimately be at the discretion of the landowner. For this reason, financial compensation is not a consideration in the assessment of effects on farm holdings, as set out under impacts on holdings below. The details of land use have been obtained from face-to-face interviews wherever possible; elsewhere, information has been obtained from publicly available sources. Land use data have been collected since 2017 for the purposes of the assessment reported in this section.

4.3 Environmental baseline

Existing baseline

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

Soil and land resources

Soil parent materials

4.3.2 A full description of the geological characteristics of the Hough to Walley's Green area is provided in Volume 5: Appendix AG-001-0MA01, Section 10, Land quality and Section 15, Water resources and flood risk. This section only considers geology as a soil parent material, which is a soil-science name for a weathered rock or deposit from and within which a soil has formed[15]. The soil association developed in each parent material is identified below. Individual soil associations are described under 'Description and distribution of soil types' below.

4.3.3 The majority of the Hough to Walley's Green area is underlain by reddish glacial till and lake deposits. Where these superficial deposits overlie Sidmouth Mudstone, it gives rise to slowly permeable and seasonally waterlogged clay soils in the Crewe association.

4.3.4 River terrace deposits, comprising sand and gravel, are present in a limited strip in the valley of Gresty Brook and Swill Brook, to the south of Crewe. Where this parent material gives rise to well drained, deep sandy loam and loamy sand soils, they are placed in the Newport 1 association. Where this parent material is seasonally waterlogged by a fluctuating ground-water table, it produces soils in the Blackwood association.

Topography and drainage

4.3.5 The study area is located on the Cheshire Plain, characterised by broadly flat countryside with rivers and streams. The land from Hough to Crewe slopes northward over a gentle to moderate gradient (less than 7 degrees) from 65m above Ordnance Datum (AOD) to 55m AOD. To the north of Crewe, the open countryside has a gentle gradient of between approximately 0 and 3 degrees, and ranges in elevation from 51m AOD to 53m AOD.

4.3.6 The study area includes areas of floodplain in Flood Zone 2 (between a 1 in 100 year and 1 in 1,000 year annual probability of river flooding) and Flood Zone 3 (1 in 100 year or greater

[15] British Geological Survey (2011), *Soil Parent Material Model*. Available online at: Soil Parent Material Model - British Geological Survey (bgs.ac.uk).

annual probability of river flooding)[16]. The floodplains in the study area are associated with Gresty Brook, Valley Brook and Hoggins Brook. Further details are provided in Section 15, Water resources and flood risk.

Description and distribution of soil types

4.3.7 The broad characteristics of the soils present in the study area are described by the Soil Survey of England and Wales[17] and their general distribution is shown on the National Soil Map[18] which is replicated in Volume 5, Agriculture, forestry and soils (Map AG-02-301 Soil associations). The soils are grouped into soil associations of a range of soil types that are spatially related. They are described in more detail in Volume 5: Appendix AG-001-0MA01.

4.3.8 The Wetness Class (WC) of a soil is classified according to the depth and duration of waterlogging in the soil profile. There are six categories: from WC I, which is well drained, to WC VI, which is permanently wet.

4.3.9 The soil association data have been supplemented by detailed soil surveys on all land where access has been granted. These surveys assist with ALC and the planning of soil handling and restoration. The detailed surveys and existing survey records have identified three soil associations within this study area.

4.3.10 Soils grouped in the Crewe association are the most prevalent and extend from Crewe to Walley's Green. Crewe association soils are comprised of fine loamy over clay soils, developed in reddish, stoneless, glacial till and lake deposits overlying the Sidmouth Mudstone. These soils are seasonally waterlogged for long periods during the winter and are WC IV.

4.3.11 Soils in the Newport 1 association are the next most prevalent group which extend from Casey Bridge to the south of Crewe. This association comprises deep sandy loam and loamy sand soils which are developed in glacial river sand and gravel deposits. These soils are generally well drained and are WC I.

4.3.12 Soils grouped in the Blackwood association are the least prevalent and occur in the far south of the study area between Hough and Casey Bridge. This association comprises deep, permeable sandy and sandy loam soils which are developed in glacial river deposits. These glacial river deposits are variable in stone content and frequently overlie clay deposited in glacial lakes, or glacial till, at depth. These soils experience fluctuating levels of groundwater, but where the water-table has been lowered the soils are well drained (WC I) or only slightly

[16] Environment Agency (2021), *Flood map for planning*. Available online at: https://flood-map-for-planning.service.gov.uk.

[17] Soil Survey of England and Wales (1984), *Soils and their use in Midland and Western England*, Bulletin No. 12, Harpenden.

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

seasonally waterlogged (WC II). Where undrained, soils in this association are waterlogged for long periods during the winter (WC III to WC IV).

4.3.13 The sensitivity of the soils disturbed during construction activity is reflected by their textural characteristics, in the light of local Field Capacity Days (FCD), as set out in the SMR. FCD is a meteorological parameter which indicates an estimated duration of the period when the soil moisture deficit is zero. Soils usually return to field capacity (zero deficit) during the autumn or early winter and the field capacity period, measured in days, ends in the spring when evapotranspiration exceeds rainfall and a moisture deficit begins to accumulate. In areas of the highest number of FCD, 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 reinstatement of land; whereas soils with a high sand fraction in areas with the fewest FCD and during the driest times of the year are the least susceptible.

4.3.14 Clayey and seasonally waterlogged soils in the Crewe associations are found between Crewe and Walley's Green and make up approximately 119ha (90%) of the study area. These soils are of high sensitivity due to a high clay fraction/heavy textured soils where FCD are between 172 days and 176 days.

Soil and land use interactions

Agricultural land quality

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

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

4.3.17 Local agro-climatic data have been interpolated from the Meteorological Office's standard 5km grid point dataset[19] for three points within the study area and are set out in Volume 5: Appendix AG-001-0MA01. The data show the climate in the area to be cool and moist. The number of FCD, when the moisture deficit[20] in the soil is zero, ranges from 172 to 176 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. Moisture deficits, which give an indication of the vulnerability of soils to drought, are moderate to moderately small.

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

[20] 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.

4.3.18 Average annual rainfall and accumulated temperature within this study area do not in themselves place any limitation on agricultural land quality. However, the interactions of climate with soil characteristics are important in determining the wetness and droughtiness limitations of the land. Droughtiness is 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.

4.3.19 Site factors such as gradient and microrelief are not limiting to agricultural land quality within this study area. Microrelief is the complex change of slope angle and direction over short distances, or the presence of boulders or rock outcrops, which can severely limit the use of agricultural machinery.

4.3.20 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 WC based on soil structure, evidence of waterlogging and the number of FCD. The topsoil texture then determines its ALC grade. Vulnerability to drought is determined by the moisture retention of different soil textures and thicknesses of each soil horizon, soil structures, stone content and moisture deficits.

4.3.21 The most prevalent group of soil associations, comprising slowly permeable soils in the Crewe association, is affected mostly by soil wetness. Following Table 6 'Grade according to soil wetness' in the ALC guidelines[21], where the number of FCD is between 151 and 175, soils with heavy clay loam or clay topsoil and slowly permeable clay subsoil (WC IV) are limited by soil wetness to Subgrade 3b. Where the number of FCD falls in the next category (176-225), soils with heavy clay loam or clay topsoil and slowly permeable clay subsoil (WC IV) are limited by soil wetness to Grade 4. Survey data has determined that soils in the Crewe association between Basford and Walley's Green are limited by soil wetness to Subgrade 3b, whilst soils in the Crewe association north of Walley's Green are limited by soil wetness to Grade 4.

4.3.22 The next most prevalent group comprising well drained (WC I) deep sandy loam and loamy sand soils of the Newport 1 association is mainly limited by soil droughtiness to Grade 2 and Subgrade 3a in stony soils. A detailed ALC carried out by the Ministry of Agriculture, Fisheries and Food (MAFF) between Shavington and Crewe[22] determined that agricultural land with Newport 1 soils near Basford are limited by soil droughtiness to Grade 2 or Subgrade 3a.

4.3.23 The least prevalent group comprising deep permeable sandy and sandy loam soils in the Blackwood association are affected by a high water-table (WC III to IV). The quality of agricultural land is limited by soil wetness to Grade 2 where the profile is seasonally waterlogged (WC III), or Subgrade 3a where the profile is waterlogged for long periods during

[21] 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*. Available online at: http://publications.naturalengland.org.uk/publication/6257050620264448.

[22] Ministry of Agriculture, Fisheries and Food (1989), *Agricultural Land Classification, Crewe and Nantwich Local Plan*, MAFF Ref. ALCW04289.

the winter (WC IV). A detailed ALC carried out by the MAFF between Shavington and Crewe determined that agricultural land with soils in the Blackwood association near Hough is limited by soil wetness to Grade 2 or Subgrade 3a.

4.3.24 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 locality, set as a 4km corridor centred on the route of the Proposed Scheme. Department for the Environment, Food and Rural Affairs (Defra) predictive mapping[23] shows that there is a low likelihood of encountering BMV agricultural land in the locality, which makes such land a resource of high sensitivity in this study area.

4.3.25 The distribution of agricultural land quality in the study area is shown in Table 8, described in more detail in Volume 5: AG-001-0MA01 and shown on Map AG-04-301 to Map AG-04-304a (Volume 5, Agriculture, forestry and soils Map Book).

Table 8: Distribution of grades of agricultural land in the study area

Agricultural land quality	Area within study area (ha)	Percentage of agricultural land area within study area (%)
Grade 1	0	0
Grade 2	0	0
Subgrade 3a	5.8	4.4
BMV subtotal	**5.8**	**4.4**
Subgrade 3b	109.6	82.6
Grade 4	17.3	13.0
Grade 5	0	0
Total agricultural land	**132.7**	**100**

Other soil interactions

4.3.26 Soil fulfils a number of functions and services for society, in addition to those of food and biomass production, that are central to social, economic and environmental sustainability. These are outlined in sources such as the Soil Strategy for England[24] and the Government's White Paper, The Natural Choice: securing the value of nature[25] and reinforced in the policies set out in the 25 year Environment Plan[26], 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;

[23] Department for Environment, Food and Rural Affairs (2005), *Likelihood of Best and Most Versatile Agricultural Land*.

[24] Department for Environment, Food and Rural Affairs (2009), *Soil Strategy for England.* Available online at: https://www.gov.uk/government/publications/safeguarding-our-soils-a-strategy-for-england.

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

[26] HM Government (2018), *A Green Future: Our 25 Year Plan to Improve the Environment.* Available online at: https://www.gov.uk/government/publications/25-year-environment-plan.

- the protection of cultural heritage;
- the provision of raw materials; and
- the provision of a platform for human activities, such as construction and recreation.

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

4.3.28 The floodplains of the Gresty Brook, Valley Brook and Hoggins Brook occupy land where water has to flow or be stored in times of flood, as set out in Section 15, Water resources and flood risk. The soils in this study area function as water stores for flood attenuation, as well as providing ecological habitat reported in Section 7, Ecology and biodiversity.

Land use

Land use description

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

4.3.30 Woodland in this study area is limited to Larch Wood and Burnt Covert to the north near Minshull Vernon. Neither are understood to be commercially managed. A full description of woodland habitats in the Hough to Walley's Green area is set out in Section 7, Ecology and biodiversity.

4.3.31 Some agricultural land is subject to historical agri-environment management prescriptions that seek to retain and enhance the landscape and biodiversity qualities and features of farmland. These were associated with the Environmental Stewardship Scheme (the Entry Level Stewardship (ELS), the Organic Entry Level Stewardship (OELS) or the Higher Level Stewardship (HLS)). The Countryside Stewardship Scheme (CSS) has been the main agri-environment scheme in England since 2015. The CSS incorporates elements of the Environmental Stewardship Scheme, the English Woodlands Grant Scheme and Catchment Sensitive Farming grants. Holdings that have land entered into an agri-environment scheme are identified in Table 9. These schemes are under review following the introduction of the Agriculture Act 2020[27].

[27] *Agriculture Act 2020* (c.21). London, Her Majesty's Stationary Office. Available online at: https://www.legislation.gov.uk/ukpga/2020/21/contents/enacted.

Number, type and size of holdings

4.3.32 Table 9 sets out the main farm holdings within this study area. The details of holdings have been obtained from face-to-face interviews with farm owners and occupiers. The interviews undertaken account for holdings which collectively cover approximately 85% of the total study area. Publicly available sources have been used to obtain information about farm holdings where it has not been possible to arrange interviews.

4.3.33 Grassland farming predominates in the Hough to Walley's Green area, with a number of dairy, beef and sheep holdings. Some arable production is undertaken but is minimal due, in part, to the relatively poor quality of the agricultural land, even though most of the study area has field drainage. The average holding size is less than 60ha. The boundaries of the holdings in the Hough to Walley's Green area are shown on Maps AG-01-300 to AG-01-304a (Volume 5, Agriculture, forestry and soils Map Book) along with the location of the main farm buildings.

4.3.34 Table 9 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-01-113b to AG-01-115a (Volume 5, Agriculture, forestry and soils Map Book) and Volume 5: Appendix AG-001-0MA01.

Table 9: Summary characteristics of holdings

Holding reference/name	Holding type	Holding size (ha)	Diversification	Agri-environment scheme	Sensitivity to change
MA01/1 Heath Farm ^	Arable	100	DIY livery, agricultural contracting, workshop	None	Medium
MA01/2 Chorlton Bank Farm* ^	Grassland	7.0	Not known	None	Low
MA01/3 The Moss* ^	Arable	92	Not known	None	Medium
MA01/4 Oakhanger Hall ^	Dairy and arable	304	Game shoot	ELS	Medium
MA01/5 Carters Green Farm	Dairy and arable	337	None	None	High
MA01/6 Church Farm*	Grassland	187	Not known	None	Medium
MA01/7	Grassland	24	Not known	None	Medium

Holding reference/name	Holding type	Holding size (ha)	Diversification	Agri-environment scheme	Sensitivity to change
Chaise Farm*					
MA01/8 Bridge Farm	Grassland	1.3	None	None	Low
MA01/9 Moss Bridge Farm (Winton Equestrian Centre) (WEC)	Riding school and livery yard	7.2	Phone mast	None	Medium
MA01/10 Land north of WEC*	Grassland	7.0	Not known	None	Low
MA01/11 Moss Farm, Moss Lane, Crewe	Beef cattle	21	None	None	Low
MA01/12 Hollyhurst Farm	Beef cattle	16	None	Mid-tier CSS	Low
MA01/13 Moss Farm, Moss Lane, Land End	Grassland let to others	26	Field scale solar array	None	Low
MA01/14 Land at Moss Lane, Crewe (1)*	Grassland	2.3	Not known	None	Low
MA01/15 Land at Moss Lane, Crewe (2)*	Grassland	2.2	None	None	Low
MA01/16 Spring Farm	Arable and grassland	71	Commercial business park in farm buildings, wind turbines	None	Medium
MA01/17 Lane Ends Farm	Dairy	93	Farm buildings let	Mid-tier CSS	Medium
MA01/18 Parkfield Farm	Dairy	112	Wind turbines	ELS	High
MA01/19 Elm Tree House*	Arable and grassland	42	Not known	None	Medium
MA01/20 Bellaport Home Farm*	Grassland	30	Not known	None	Medium
MA01/21 Minshull Hill Farm	Dairy	95	None	None	Medium
MA01/22 Land north of Minshull Hill Farm*	Grassland	20	Not known	None	Medium
MA01/23	Grassland	14	Not known	None	Medium

Holding reference/name	Holding type	Holding size (ha)	Diversification	Agri-environment scheme	Sensitivity to change
Moat House Farm*					
MA01/24 The Bull Pen*	Grassland	12	Not known	None	Medium
MA01/25 Newfield Hall Farm	Dairy heifer rearing	36	None	None	Medium
MA01/26 Park House Farm	Sheep	111	Farm building converted to dwellings and let out	Mid-tier CSS	Medium
MA01/27 Newfield Farm*	Grassland	26	Not known	None	Medium

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

^ Included in HS2 Phase 2a assessment, see High Speed Rail (West Midlands - Crewe) Environmental Statement Volume 2: Community Area report CA5, South Cheshire.

Future baseline

Construction (2025)

4.3.35 Volume 5: Appendix CT-004-00000 provides details of the developments in the Hough to Walley's Green area that are assumed to have been implemented by 2025. The committed developments of relevance to agriculture, forestry and soil during construction in this area are set out in Table 10.

Table 10: Committed developments relevant to agriculture, forestry and soil during construction

Map book reference[28]	Planning reference	Description	How this is considered in the assessment
n/a	n/a	HS2 Phase 2a West Midlands to Crewe	Informing future baseline. Considered in cumulative effects.

4.3.36 HS2 Phase 2a will be under construction by 2025. As such, HS2 Phase 2a has been included as part of the future baseline and considered within this assessment.

4.3.37 Four farm holdings will be directly affected by both HS2 Phase 2a and the Proposed Scheme. These are:

- Heath Farm (reference MA01/1 in the assessment of the Proposed Scheme and CA5/13 in HS2 Phase 2a);

[28] Volume 5, Planning Data/Committed Development Map Book: Maps CT-13-301 to CT-13-304a.

- Chorlton Bank Farm (reference MA01/2 in the assessment of the Proposed Scheme and CA5/15 in HS2 Phase 2a);
- The Moss (reference MA01/3 in the assessment of the Proposed Scheme and CA5/16 in HS2 Phase 2a); and
- Oakhanger Hall (reference MA01/4 in the assessment of the Proposed Scheme and CA5/5 in HS2 Phase 2a).

4.3.38 The combined effects of HS2 Phase 2a and the Proposed Scheme, against a baseline without either phase, have been considered. The effects arising as a result of the combination of the HS2 Phase 2a and the Proposed Scheme during construction are reported under Cumulative effects.

Operation (2038)

4.3.39 Volume 5: Appendix CT-004-00000 also provides details of the developments in the Hough to Walley's Green area that are assumed to have been implemented by 2038.

4.3.40 It is not considered that the operation of HS2 Phase 2a will materially alter the baseline conditions for agriculture, forestry and soils in the Hough to Walley's Green area.

4.3.41 The combined effects of HS2 Phase 2a and the Proposed Scheme, against a baseline without either phase, have been considered. There will be no significant cumulative effects as a result of the combined operation of HS2 Phase 2a and the Proposed Scheme.

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 severance impacts on land holdings:

- provision of Footpath Minshull Vernon 8/1 accommodation overbridge to mitigate severance of Parkfield Farm (MA01/18) (CT-06-307 in the Volume 2: MA01 Map Book); and
- provision of a realigned agricultural access to Park House Farm (MA01/26) to maintain access to the holding (CT-06-308a in the Volume 2: MA01 Map Book).

4.4.2 Other design refinements to limit the impact of the Proposed Scheme on agriculture, forestry and soil resources include:

- rationalisation of balancing ponds to locate them in the least sensitive agricultural locations;
- inclusion of locally slackened slopes to improve agricultural land use or steepened slopes to limit the area of agricultural land required for the construction of the Proposed Scheme;

- rationalisation of road realignments to limit the area of agricultural land required for the construction of the Proposed Scheme;
- inclusion of agricultural tracks to provide access to severed land; and
- rationalisation and relocation of mitigation planting to limit the area of agricultural land required and reduce potential impacts on holdings.

4.4.3 In addition, there is a need to avoid or reduce environmental impacts to soils during construction so that they will be in a suitable condition to support their proposed use for agricultural land, landscape planting and ecological mitigation following construction.

4.4.4 Compliance with the Code of Construction Practice (CoCP) will avoid or reduce environmental impacts during construction. Those measures that are particularly relevant to agriculture, forestry and soils are set out in the draft CoCP[29] and relate to:

- the reinstatement of agricultural land that is used temporarily during construction to agriculture, where this is the agreed end use (Section 6);
- the provision of a method statement 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);
- special provisions for handling peat and peaty soils, where the disturbance of these soils cannot be avoided (Section 6);
- the adoption of measures to prevent, as far 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).

[29] Volume 5: Appendix CT-002-00000, Draft Code of Construction Practice.

4.4.5 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.

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

Assessment of impacts and effects

4.4.7 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 and forestry interests to access and effectively use residual parcels of land. There may also be the loss of, or disruption to, buildings and operational infrastructure such as drainage. The Proposed Scheme seeks to reduce this disruption, and where appropriate and reasonably practicable, incorporate residual parcels of land no longer effective for agricultural use due to their size and/or shape as part of environmental mitigation works, such as ecological habitat creation.

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

- part of the operational railway or associated infrastructure and kept under the control of the operator;
- highway, public rights of way (PRoW) or utility diversion/realignment;
- returned to agricultural use (with aftercare management to ensure effective field drainage and 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

4.4.9 During the construction phase, the total area of agricultural land used within the Hough to Walley's Green area will be approximately 133ha as shown in Table 11. Of this total, it is anticipated that approximately 52ha will be restored and available for agricultural use following construction.

Table 11: 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	0.0
Grade 2	0	0	0.0
Subgrade 3a	5.8	4.4	4.5
BMV subtotal	**5.8**	**4.4**	**4.5**
Subgrade 3b	109.6	82.6	44.7
Grade 4	17.3	13.0	2.8
Grade 5	0	0	0.0
Total agricultural land	**132.7**	**100**	**52.0**

4.4.10 The disturbance during construction to approximately 6ha of BMV land is assessed as an adverse impact of low magnitude, comprising approximately 4% of the agricultural land requirement. BMV land is assessed as a receptor of high sensitivity because of its scarcity in this locality. The effect of the Proposed Scheme on BMV land during the construction phase is, therefore, assessed as moderate adverse, which is significant.

4.4.11 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.

Impacts on soils

4.4.12 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.

4.4.13 Successful soil handling is dependent upon movements being undertaken under appropriate weather and ground conditions using the appropriate equipment. The principles of soil handling are well established and set out in advisory material such as Defra's Code of Practice for the Sustainable Use of Soils[30]. These principles will be followed throughout the construction period.

4.4.14 Implementation of the measures set out in the draft CoCP will ensure displaced soil from the Proposed Scheme mostly fulfils its pre-existing functions on-site, which are production of food, water stores for flood attenuation and providing ecological habitat. This results in an impact of low magnitude on the displaced soils. The sensitivity of the majority of soil in the

[30] Department for Environment, Food and Rural Affairs (2009), *Construction Code of Practice for the Sustainable Use of Soils on Construction Sites.*

study area is high, therefore the significance of the effect on soils of high sensitivity will be moderate adverse, which is significant.

4.4.15 Peaty, clayey and seasonally waterlogged soils, including those in the Crewe association, are most vulnerable to structural degradation if moved in wet conditions or by inappropriate equipment. These soils are of high sensitivity, susceptible to compaction and smearing which could affect their successful reinstatement. These soils are found between Crewe and Walley's Green covering a total area of approximately 119ha (90%) within the study area.

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 as far 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 dry. When reinstated, opportunities will be taken to use peat soils to create habitats, enhance biodiversity and build carbon reserves.

Impacts on holdings

4.4.17 Land may be required for the Proposed Scheme from holdings temporarily, during the construction period, or permanently. In most cases, the temporary and permanent land requirement 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. During the construction period, some agricultural land will be restored and the impact on individual holdings will reduce.

4.4.18 The effects of the Proposed Scheme on individual agricultural and related interests during the construction period are summarised in Table 12. The 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 could 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.

4.4.19 The effects of severance during construction are judged on the ease and availability of access to severed land. 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-001-0MA01.

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

4.4.21 Wimboldsley Hall Farm and Wimboldsley Grange Farm (MA02/1), Lea Hall Farm (MA02/2) and Park Hall Farm (part of Dairy Farm, Whatcroft (MA02/13)) all have land in both the Hough to Walley's Green area and the Wimboldsley to Lostock Gralam area (MA02). As the main operational farm buildings for these holdings are in the Wimboldsley to Lostock

Gralam area (MA02), the impacts and effects on these holdings are assessed and reported in Volume 2, Community Area report: Wimboldsley to Lostock Gralam (MA02).

Table 12: Summary of temporary impacts and effects on holdings from construction

Holding reference/ name	Sensitivity to change	Total area required from holding	Construction severance	Disruption	Scale of construction effect	Area to be restored
MA01/1 Heath Farm	Medium	0.4ha (<1%) Negligible	Negligible	Negligible	Negligible	0.4ha
MA01/2 Chorlton Bank Farm	Low	1.2ha (17%) Medium	Negligible	Negligible	Minor adverse	0.6ha
MA01/3 The Moss	Medium	0.1ha (<1%) Negligible	Negligible	Negligible	Negligible	0.1ha
MA01/4 Oakhanger Hall	Medium	4.0ha (1%) Negligible	Negligible	Negligible	Negligible	3.3ha
MA01/5 Carters Green Farm	High	0.3ha (<1%) Negligible	Negligible	Negligible	Minor adverse	0.3ha
MA01/6 Church Farm	Medium	2.5ha (1%) Negligible	Negligible	Negligible	Negligible	0.8ha
MA01/7 Chaise Farm	Medium	6.1ha (25%) High	Negligible	Negligible	Major/moderate adverse due to the proportion of land required.	5.3ha
MA01/8 Bridge Farm	Low	1.3ha (100%) High	Negligible	Negligible	Moderate adverse due to the proportion of land required.	0.4ha
MA01/9 Moss Bridge Farm (Winton Equestrian Centre) (WEC)	Medium	7.2ha (100%) High	Negligible	Medium	Major/moderate adverse due to the proportion of land required.	0ha
MA01/10 Land north of WEC	Low	5.8ha (83%) High	Negligible	Negligible	Moderate adverse due to the proportion of land required.	3.0ha
MA01/11 Moss Farm, Moss Lane, Crewe	Low	6.1ha (29%) High	Negligible	Negligible	Moderate adverse due to the proportion of land required.	0.1ha
MA01/12 Hollyhurst Farm	Low	5.9ha (37%) High	Negligible	Negligible	Moderate adverse due to the proportion of land required.	0.4ha

Holding reference/ name	Sensitivity to change	Total area required from holding	Construction severance	Disruption	Scale of construction effect	Area to be restored
MA01/13 Moss Farm, Moss Lane, Land End	Low	15.8ha (61%) High	Negligible	Negligible	Moderate adverse due to the proportion of land required.	8.1ha
MA01/14 Land at Moss Lane, Crewe (1)	Low	0.2ha (8%) Low	Negligible	Negligible	Negligible	0.1ha
MA01/15 Land at Moss Lane, Crewe (2)	Low	0.5ha (24%) High	Negligible	Negligible	Moderate adverse due to the proportion of land required.	0.4ha
MA01/16 Spring Farm	Medium	24.2ha (34%) High	Negligible	Low	Major/moderate adverse due to the proportion of land required.	15.4ha
MA01/17 Lane Ends Farm	Medium	1.3ha (1%) Negligible	Negligible	Negligible	Negligible	0.8ha
MA01/18 Parkfield Farm	High	39.3ha (35%) High	Low	Low	Major adverse due to the proportion of land required.	12.7ha
MA01/19 Elm Tree House	Medium	<0.1ha (<1%) Negligible	Negligible	Negligible	Negligible	<0.1ha
MA01/20 Bellaport Home Farm	Medium	0.6ha (2%) Negligible	Low	Negligible	Minor adverse	0.6ha
MA01/21 Minshull Hill Farm	Medium	2.3ha (2%) Negligible	Negligible	Negligible	Negligible	0ha
MA01/22 Land north of Minshull Hill Farm	Medium	2.2ha (11%) Medium	Negligible	Negligible	Moderate adverse due to the proportion of land required.	0.9ha
MA01/23 Moat House Farm	Medium	0.6ha (4%) Negligible	Low	Negligible	Minor adverse	0.3ha
MA01/24 The Bull Pen	Medium	0.4ha (3%) Negligible	Negligible	Negligible	Negligible	0.4ha
MA01/25 Newfield Hall Farm	Medium	4.7ha (13%) Medium	Negligible	Negligible	Moderate adverse due to the proportion of land required.	2.1ha

Holding reference/ name	Sensitivity to change	Total area required from holding	Construction severance	Disruption	Scale of construction effect	Area to be restored
MA01/26 Park House Farm	Medium	7.5ha (7%) Low	Low	Negligible	Minor adverse	0.1ha
MA01/27 Newfield Farm	Medium	1.1ha (4%) Negligible	Negligible	Negligible	Negligible	0.1ha

4.4.22 Overall, 27 holdings in the Hough to Walley's Green area will be affected during construction, of which 12 will experience moderate, moderate/major or major adverse effects, which are significant for each holding.

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

Permanent effects of construction

Impacts on agricultural land

4.4.24 Following construction and restoration, the area of agricultural land that will remain permanently required will be approximately 81ha, as shown in Table 13.

Table 13: Agricultural land required permanently

Agricultural land quality	Total area required (ha)	Percentage of agricultural land (%)
Grade 1	0	0
Grade 2	0	0
Subgrade 3a	1.3	1.6
BMV subtotal	**1.3**	**1.6**
Subgrade 3b	64.9	80.4
Grade 4	14.5	18.0
Grade 5	0	0
Total agricultural land	**80.7**	**100**

4.4.25 Of this total requirement, approximately 5.2ha (6.5%) will comprise newly planted woodland on Subgrade 3b (3.7ha) and Grade 4 (1.5ha) agricultural land for visual screening and habitat creation to mitigate environmental effects arising from the Proposed Scheme. The mitigation is described in Section 7, Ecology and biodiversity and Section 11, Landscape and visual.

4.4.26 No agricultural land will be used as replacement floodplain storage in the Hough to Walley's Green area.

4.4.27 Within the Hough to Walley's Green study area, the permanent requirement for approximately 1ha of BMV land, which is approximately 2% of the agricultural land requirement, is assessed as an impact of negligible magnitude. BMV land is assessed as a

receptor of high sensitivity because of its scarcity in this locality. The permanent effect on BMV land is, therefore, assessed as minor adverse, which is not significant.

Impacts on holdings

4.4.28 The permanent effects from the construction of the Proposed Scheme on individual agricultural and related interests are summarised in Table 14. 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 impact is 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-001-001.

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

Table 14: Summary of permanent impacts and effects on holdings from construction

Holding reference/ name	Sensitivity to change	Land required from holding	Severance	Infrastructure	Scale of effect
MA01/1 Heath Farm	Medium	0ha (0%) Negligible	Negligible	Negligible	Negligible
MA01/2 Chorlton Bank Farm	Low	0.6ha (9%) Low	Negligible	Negligible	Negligible
MA01/3 The Moss	Medium	0ha (0%) Negligible	Negligible	Negligible	Negligible
MA01/4 Oakhanger Hall	Medium	0.7ha (<1%) Negligible	Negligible	Negligible	Negligible
MA01/5 Carters Green Farm	High	0ha (0%) Negligible	Negligible	Negligible	Negligible
MA01/6 Church Farm	Medium	1.7ha (1%) Negligible	Negligible	Negligible	Negligible
MA01/7 Chaise Farm	Medium	0.8ha (4%) Negligible	Negligible	Negligible	Negligible
MA01/8 Bridge Farm	Low	0.9ha (70%) High	Negligible	High (property demolition)	Moderate adverse due to the proportion of land required and property demolition.

Holding reference/ name	Sensitivity to change	Land required from holding	Severance	Infrastructure	Scale of effect
MA01/9 Moss Bridge Farm (Winton Equestrian Centre) (WEC)	Medium	7.2ha (100%) High	Negligible	High (property demolition)	Major/moderate adverse due to the proportion of land required and property demolition.
MA01/10 Land north of WEC	Low	2.8ha (39%) High	Negligible	Negligible	Moderate adverse due to the proportion of land required.
MA01/11 Moss Farm, Moss Lane, Crewe	Low	6.0ha (28%) High	Negligible	Negligible	Moderate adverse due to the proportion of land required.
MA01/12 Hollyhurst Farm	Low	5.5ha (35%) High	Negligible	Negligible	Moderate adverse due to the proportion of land required.
MA01/13 Moss Farm, Moss Lane, Land End	Low	7.7ha (30%) High	Negligible	High (demolition of solar array)	Moderate adverse due to the proportion of land required and demolition of solar array.
MA01/14 Land at Moss Lane, Crewe (1)	Low	0.1ha (4%) Negligible	Negligible	Negligible	Negligible
MA01/15 Land at Moss Lane, Crewe (2)	Low	0.1ha (4%) Negligible	Negligible	Negligible	Negligible
MA01/16 Spring Farm	Medium	8.8ha (12%) Medium	Negligible	Negligible	Moderate adverse due to the proportion of land required.
MA01/17 Lane Ends Farm	Medium	0.5ha (<1%) Negligible	Negligible	Negligible	Negligible
MA01/18 Parkfield Farm	High	26.6ha (24%) High	Low	Negligible	Major adverse due to the proportion of land required.
MA01/19 Elm Tree House	Medium	0ha (0%) Negligible	Negligible	Negligible	Negligible
MA01/20 Bellaport Home Farm	Medium	0ha (0%) Negligible	Negligible	Negligible	Negligible

Holding reference/ name	Sensitivity to change	Land required from holding	Severance	Infrastructure	Scale of effect
MA01/21 Minshull Hill Farm	Medium	2.3ha (2%) Negligible	Negligible	Negligible	Negligible
MA01/22 Land north of Minshull Hill Farm	Medium	1.3ha (6%) Low	Negligible	Negligible	Minor adverse
MA01/23 Moat House Farm	Medium	0.3ha (2%) Negligible	Negligible	Negligible	Negligible
MA01/24 The Bull Pen	Medium	<0.1ha (<1%) Negligible	Negligible	Negligible	Negligible
MA01/25 Newfield Hall Farm	Medium	2.6ha (7%) Low	Negligible	Negligible	Minor adverse
MA01/26 Park House Farm	Medium	7.4ha (7%) Low	Negligible	Negligible	Minor adverse
MA01/27 Newfield Farm	Medium	1.0ha (4%) Negligible	Negligible	Negligible	Negligible

4.4.30 Overall, the construction of the Proposed Scheme will permanently affect 22 holdings in the Hough to Walley's Green area. Eight holdings will experience moderate, major/moderate or major adverse permanent effects, which are significant for each holding. Five holdings will only be affected temporarily during construction with negligible permanent effects.

4.4.31 Three holdings will be significantly affected by property demolition: Bridge Farm (MA01/8) and Moss Bridge Farm (WEC) (MA01/9) with the loss of residential property and buildings; and Moss Farm, Moss Lane, Lane End (MA01/13) due to the loss of field-scale solar array.

4.4.32 Although financial compensation will be available under existing statutory arrangements, 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

4.4.33 Other mitigation will incorporate climate change adaptation and resilience measures, as far 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.

4.4.34 A farm pack, as set out within the Phase 2b Farmers and Growers Guide, will be provided to all farmers and landowners, setting out baseline conditions on the land holding 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. In instances where replacement facilities need to be provided, HS2 Ltd will identify the likely impact on existing facilities and its timing, as soon as reasonably practicable.

Summary of likely residual significant effects

4.4.35 During construction, the total area of agricultural land required will be approximately 133ha, of which approximately 6ha is BMV land. This is assessed as a temporary moderate adverse effect, which is significant.

4.4.36 Twenty-seven holdings will be affected temporarily, of which 12 will experience temporary moderate, major/moderate or major adverse residual effects, which are significant for each holding.

4.4.37 Twenty-two holdings will be affected permanently, with eight experiencing moderate, moderate/major or major permanent effects following construction, which is significant for each holding.

4.4.38 Soil displaced from the Proposed Scheme will mostly fulfil its pre-existing functions on-site, which are production of food, water stores for flood attenuation and providing ecological habitat resulting in an impact of low magnitude on the displaced soils. The sensitivity of the soil in the study area is high, and therefore, the significance of the effect on soils of high sensitivity will be moderate adverse, which is significant.

Cumulative effects

4.4.39 There will be no cumulative effects on agricultural land or soils in the Hough to Walley's Green area.

4.4.40 There are four holdings that will be directly affected by both Phase 2a and the Proposed Scheme. These are:

- Heath Farm (reference MA01/1 (CA5/13 in Phase 2a));
- Chorlton Bank Farm (reference MA01/2 (CA5/15 in Phase 2a));
- The Moss (reference MA01/3 (CA5/16 in Phase 2a)); and
- Oakhanger Hall (reference MA01/4 in (CA5/5 in Phase 2a)).

4.4.41 As reported in HS2 Phase 2a ES, Community Area report CA5, South Cheshire, the construction of HS2 Phase 2a will temporarily require 15.9ha (16% of the holding) and permanently require 10ha (10%) from Heath Farm (MA01/1), which will result in a moderate adverse temporary construction effect, which is significant, and a minor adverse permanent construction effect, which is not significant.

4.4.42 Construction of the Proposed Scheme will temporarily require an area of 0.4ha (approximately 1%) from the same area of land at Heath Farm temporarily required for

Phase 2a, resulting in a negligible temporary construction effect, which is not significant. No land will be required permanently at Heath Farm as a result of construction of the Proposed Scheme, resulting in a negligible permanent construction effect, which is not significant.

4.4.43 The combination of HS2 Phase 2a and the Proposed Scheme during construction will therefore result in a moderate adverse temporary construction effect on Heath Farm (MA01/1), which is significant, and a minor adverse permanent construction effect, which is not significant.

4.4.44 As reported in HS2 Phase 2a ES, Community Area report CA5, South Cheshire, the construction of HS2 Phase 2a will temporarily require 3ha (43% of the holding) and permanently require 1.4ha (20%) from Chorlton Bank Farm (MA01/2), which will result in a moderate adverse temporary construction effect, which is significant, and a minor adverse permanent construction effect, which is not significant.

4.4.45 Construction of the Proposed Scheme will temporarily require an area of 1.2ha (approximately 17%) from Chorlton Bank Farm resulting in a minor adverse temporary construction effect, which is not significant. An area of 0.6ha (approximately 9%) will be required permanently at Chorlton Bank Farm as a result of construction of the Proposed Scheme, resulting in a negligible permanent construction effect, which is not significant. The land temporarily and permanently required for the Proposed Scheme will be from the same area of land at Chorlton Bank Farm required for Phase 2a, therefore no additional land is required from this holding as a result of the Proposed Scheme.

4.4.46 The combination of HS2 Phase 2a and the Proposed Scheme during construction will therefore result in a moderate adverse temporary construction effect on Chorlton Bank Farm (MA01/2), which is significant, and a minor adverse permanent construction effect, which is not significant.

4.4.47 As reported in HS2 Phase 2a ES, Community Area report CA5, South Cheshire, the construction of HS2 Phase 2a will temporarily require 23.9ha (26% of the holding) and permanently require 13.3ha (14%) from The Moss (MA01/3), which will result in a major/moderate adverse temporary construction effect, and a moderate adverse permanent construction effect, both of which are significant.

4.4.48 Construction of the Proposed Scheme will temporarily require an area of 0.1ha (less than 1%) from the same area of land at The Moss temporarily required for Phase 2a, resulting in a negligible temporary construction effect, which is not significant. No land will be required permanently at The Moss as a result of construction of the Proposed Scheme, resulting in a negligible permanent construction effect, which is not significant.

4.4.49 The combination of HS2 Phase 2a and the Proposed Scheme during construction will therefore result in a major/moderate adverse temporary construction effect on The Moss (MA01/3), and a moderate adverse permanent construction effect, both of which are significant.

4.4.50 As reported in HS2 Phase 2a ES, Community Area report CA5, South Cheshire, the construction of HS2 Phase 2a will temporarily require 108.4ha (36% of the holding) and

permanently require 54.4ha (19%) from Oakhanger Hall (MA01/4), which will result in a major adverse temporary construction effect, and a major/moderate adverse permanent construction effect, both of which are significant.

4.4.51 Construction of the Proposed Scheme will temporarily require an area of 4ha (approximately 1%) and permanently require an area of 0.7ha (less than 1%) of land from Oakhanger Hall, resulting in negligible effects which are not significant. The land temporarily and permanently required for the Proposed Scheme will be from the same area of land at Oakhanger Hall required for Phase 2a, therefore no additional land is required from this holding as a result of the Proposed Scheme.

4.4.52 The combination of HS2 Phase 2a and the Proposed Scheme during construction will therefore result in a major adverse temporary construction effect and a major/moderate adverse permanent construction effect on Oakhanger Hall, both of which are significant.

4.4.53 There will be no cumulative severance, disruption and infrastructure effects on farm holdings resulting from the interface with HS2 Phase 2a.

4.4.54 There will be no cumulative effects arising from the construction of the Proposed Scheme as a consequence of other development projects affecting agriculture, forestry or soil in the study area.

4.5 Effects arising from operation

Avoidance and mitigation measures

4.5.1 No measures are included 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 The livestock farm buildings at Parkfield Farm (MA01/18, noise assessment receptor reference: 610148) lie within approximately 100m of the route of the Proposed Scheme. Operational airborne sound levels at this location have been included in the assessment and the results are presented in Volume 5: Appendix SV-003-0MA01.

4.5.4 The predicted operational airborne sound levels have been considered against the specific criteria defined in the Agriculture, forestry and soils section of the SMR. 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 The combined effects of HS2 Phase 2a and the Proposed Scheme, against a baseline without either phase, have been considered. There will be no significant operational cumulative effects as a result of the combination of HS2 Phase 2a and the Proposed Scheme.

4.5.10 There will be no cumulative effects arising from the operation of the Proposed Scheme as a consequence of other development projects affecting agriculture, forestry or soil in the study area.

Monitoring

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

4.5.12 In the Hough to Walley's Green area there will be no significant residual agriculture, forestry and soil effects during the operation of the Proposed Scheme. As a result, no area-specific monitoring is required.

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 Hough to Walley's Green area. Oxides of nitrogen (NOx) including nitrogen dioxide (NO_2), fine particulate matter (particles of size less than 2.5µm and 10µm in diameter, referred to as $PM_{2.5}$ and PM_{10}, respectively) and dust have been considered in the assessment. Emissions of all or some of these air pollutants are likely to arise from construction activities, demolition, site preparation works and the use of site haul routes. Emissions will also arise from road traffic during construction and operation of the Proposed Scheme.

5.1.2 Engagement with 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.

5.1.3 Detailed reports on the air quality data and assessments for this area are contained within Volume 5: Appendix AQ-001-0MA01. Additional information on air quality monitoring and traffic data used in the assessment is set out in Background Information and Data (BID), BID AQ-002-0MA01[31].

5.1.4 Maps showing the location of the key environmental features and the key construction and operational features of the Proposed Scheme can be found in the Volume 2: MA01 Map Book. Air quality mapping is presented in the Volume 5, Air quality Map Book, map AQ-01-301.

5.1.5 The Proposed Scheme is described in Section 2.

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 EIA Scope and Methodology Report (SMR)[32] and Volume 5: Appendix AQ-001-0MA01.

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

- from construction activities;

[31] High Speed Two Ltd (2022), High Speed Rail (Crewe - Manchester), *Background Information and Data, Air quality,* BID AQ-002-0MA01. Available online at: https://www.gov.uk/government/collections/hs2-phase-2b-crewe-manchester-environmental-statement.

[32] Volume 5: Appendix CT-001-00001, Environmental Impact Assessment Scope and Methodology Report.

- from changes in the nature of traffic during construction and operation; for example, increases in traffic flows during construction or where road closures or restrictions cause diversions and heavier traffic on adjacent roads; or
- from changes to road alignment.

5.2.3 The assessment of construction dust emissions has been undertaken for sensitive receptors located up to 350m from dust generating activities. The assessment of traffic emissions has been undertaken for sensitive receptors located up to 200m from roads screened in for further assessment.

5.2.4 The assessment has incorporated HS2 Ltd's policies on vehicle emissions[33]. These include the use of Euro VI heavy goods vehicles (HGV), Euro 4 petrol and Euro 6 diesel cars and light goods vehicles (LGV) during construction of the Proposed Scheme.

5.2.5 The assessment of construction traffic impacts has used traffic data based on an estimate of the average daily flows in the peak year during the construction period (2025-2037). Two construction scenarios have been assessed for air quality to capture peak construction traffic activity at different times in the construction period. It has been assumed that the changes in construction traffic will occur for the whole year. In some cases, this is a conservative approach, as the duration of the peak traffic flows may well be much shorter. These scenarios have been assessed against the relevant future baseline case without the Proposed Scheme. The assessment also assumes vehicle emission rates and background pollutant concentrations from year 2025. As both pollutant emissions from vehicle exhausts and background pollutant concentrations are anticipated to reduce year by year as a result of vehicle emission controls, the year 2025 represents the worst case for the construction assessment.

5.2.6 The predicted impacts across all assessed construction scenarios for each receptor are presented in Volume 5: Appendix AQ-001-0MA01. Predicted concentrations and significant effects are presented for the worst case construction traffic scenario assessed.

5.3 Environmental baseline

Existing baseline

Background air quality

5.3.1 The main sources of air pollution in the Hough to Walley's Green area are emissions from road vehicles and agricultural activities. The main roads within the area are the A500 Newcastle Road/Shavington Bypass, the A531 Newcastle Road, the A534 Nantwich Road/Crewe Road/Crewe Green Road/Haslington Bypass/Wheelock Bypass/Old Mill Road/Congleton Road, and the A530 Middlewich Road/Nantwich Road. Within Crewe, key roads include the A532 Weston Road/Macon Way/Manchester Bridge/Earle Street/Vernon

[33] High Speed Two Ltd (2022), *Phase 2b Western Leg Information Paper E14: Air quality*.

Way/West Street/Coppenhall Lane, the A5019 Vernon Way and the A5078 Oak Street/Dunwoody Way. The M6 passes through the Hough to Walley's Green area.

5.3.2 There are three industrial installations (regulated by the Environment Agency) with permits for emissions to air for NOx and/or PM_{10}, namely: E.ON UK Cogeneration (combustion plant), 3C Waste Limited (waste landfilling) and Red Hall Farming Limited (intensive farming). Their details are presented in BID AQ-002-0MA01. The contribution of these industrial processes to local air quality is included within the background concentrations.

5.3.3 Estimates of background air quality have been taken from the Department for Environment, Food and Rural Affairs (Defra)[34] for the baseline year of 2018. The data are estimated for 1km grid squares for NOx, NO_2, PM_{10} and $PM_{2.5}$. Background concentrations were within the air quality standards for all pollutants within the Hough to Walley's Green area.

Local monitoring data

5.3.4 There are currently 14 local authority diffusion tube sites located within the Hough to Walley's Green area for monitoring NO_2 concentrations. These are located in Crewe near the A534 Nantwich Road, Wistaston Road and Earle Street.

5.3.5 HS2 Ltd has undertaken additional monitoring for the purpose of verifying the air quality assessment at two locations in this area.

5.3.6 Measurements of NO_2 were within the air quality standard at all sites with available data in 2018.

5.3.7 Details of the location of all monitoring sites are presented in map AQ-01-301 and the monitoring data are presented in Volume 5: Appendix AQ-001-0MA01 and BID AQ-002-0MA01.

Air quality management areas

5.3.8 There are no air quality management areas (AQMA) within the Hough to Walley's Green area.

Receptors

5.3.9 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.

5.3.10 Most of the receptors which may be affected by the Proposed Scheme are residential. Other receptors include Shavington Academy, Hungerford Primary Academy, Springfield School Crewe, Oakfield Lodge Primary and Nursery School, Mablins Lane Community Primary

[34] Department for Environment, Food and Rural Affairs (2021), *Defra Background Pollutant Concentration Maps*. Available online at: https://uk-air.defra.gov.uk/data/laqm-background-maps?year=2018.

School, St. Johns Church of England Primary School and Playgroup (Sandbach), Bright Stars Children's Day Nursery, Monks Coppenhall Academy and Day Nursery, Bentley Manor Care Home, Sherborne Court Neurological Centre, Leighton Hospital, Neild House Care Home, Lilliput Farm Day Nursery (Sandbach) and Warmingham Church of England Primary School.

5.3.11 The air quality assessment has also included receptors in ecological sites sensitive to nitrogen deposition and dust. There is one international/national designated ecological site of relevance to the air quality assessment identified in the Hough to Walley's Green area, namely Oakhanger Moss Site of Special Scientific Interest (SSSI), which is part of the Midland Meres and Mosses Phase 2 Ramsar site. Other relevant local sensitive ecological sites identified close to the Proposed Scheme include Basford Brook Local Wildlife Site (LWS), Mere Gutter with Basford Brook LWS, Spring Plantation Grassland LWS, Shropshire Union Canal (Middlewich Branch) LWS, Moss Bridge Marsh LWS and Crewe Swift Colony LWS.

Future baseline

5.3.12 Volume 5: Appendix CT-004-00000 provides details of the developments in the Hough to Walley's Green area that are assumed to be implemented by 2025. The potential cumulative impact from committed developments on air quality in conjunction with the effects from the construction and operation of the Proposed Scheme has been considered as part of this assessment. The future air quality baselines are defined as the 'without the Proposed Scheme' scenarios at each stage.

Construction (2025)

5.3.13 Future background pollutant concentrations have been sourced from the Defra background maps for the first year of construction in 2025, which predict NO_2, PM_{10} and $PM_{2.5}$ levels in 2025 to be lower than in the 2018 baseline and within the relevant air quality standards.

5.3.14 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: Appendix AQ-001-0MA01. HS2 Phase 2a will be under construction by 2025. It is considered that the construction of HS2 Phase 2a will not change the future baseline air quality conditions for the Hough to Walley's Green area. The combined effects of HS2 Phase 2a and the Proposed Scheme, against a baseline without either phase, have also been considered.

Operation (2038)

5.3.15 Future background pollutant concentrations have been sourced from the Defra background maps for 2030, which is the latest available year of data. These predict NO_2, PM_{10} and $PM_{2.5}$ levels in 2030 to be lower than in the 2018 baseline and within the relevant air quality standards. The 2030 background maps have been used as representative of the future baseline conditions during operation of the Proposed Scheme.

5.3.16 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:

Appendix AQ-001-0MA01. HS2 Phase 2a will be operational by 2038. It is considered that the operation of HS2 Phase 2a will not change the future baseline air quality conditions for the Hough to Walley's Green area. The combined effects of HS2 Phase 2a and the Proposed Scheme, against a baseline without either phase, have also been considered.

5.4 Effects arising during construction

Avoidance and mitigation measures

5.4.1 Emissions to the atmosphere will be controlled and managed during construction through the route-wide implementation of the Code of Construction Practice (CoCP). The draft CoCP[35] includes a range of mitigation measures that are accepted by the Institute of Air Quality Management (IAQM) as being suitable to reduce impacts to as low a level as is reasonably practicable. These measures are generally sufficient to avoid any significant effects from dust during construction.

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

- contractors being required to manage dust, air pollution, odour and exhaust emissions during construction works;
- inspection and visual monitoring, undertaken in consultation with the local authorities, to assess the effectiveness of the measures taken to control dust and air pollutant emissions;
- cleaning (including watering) of vehicle routes and designated vehicle waiting areas to suppress dust;
- the use of water spray systems on demolition sites to dampen down fugitive dust;
- keeping soil stockpiles away from 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 Prior to commencement of activities, there will be further detailed assessment for each worksite to determine site specific dust mitigation.

[35] Volume 5: Appendix CT-002-00000, Draft Code of Construction Practice.

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 NO_2, PM_{10} and $PM_{2.5}$ concentrations.

Construction dust effects

5.4.6 The risks of demolition of existing buildings, earthworks, construction of new structures and trackout have been assessed for their effect on dust soiling, human health and ecological sites. 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. The human health effects of dust relate mainly to short-term exposure to PM_{10}.

5.4.7 The identified risks potentially arising from construction dust within the Hough to Walley's Green area are shown in Table 15. The risks are dependent on the magnitude of dust generating activities and the location of sensitive receptors in relation to these activities. A range of risks is shown, as there are several construction locations in the area.

Table 15: Summary of risks for construction dust assessment

Activity	Dust soiling	Human health	Ecological effects
Demolition	Negligible to medium	Negligible to low	Not applicable
Earthworks	Medium to high	Medium	Low
Construction	Medium to high	Medium	Low
Trackout	Low to high	Low to medium	Low

5.4.8 With the application of the established national best practice mitigation measures contained in the draft CoCP, no significant effects are anticipated from the risks associated with the dust generating activities. Further details of the assessment can be found in Volume 5: Appendix AQ-001-0MA01 where the scale of dust emissions and the sensitivity of the area and receptors are fully described.

Construction traffic effects

5.4.9 Construction activity could also affect local air quality through the additional traffic generated on the highway network and site haul routes as a result of construction vehicles and through changes to traffic patterns arising from temporary road diversions and realignments.

5.4.10 The assessment of construction traffic emissions has been undertaken for 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.

5.4.11 Construction traffic data in the study area have 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 during construction of the Proposed Scheme. There were two construction traffic scenarios assessed in this area.

5.4.12 Receptors expected to experience the greatest change in concentrations have been included in the air quality model. Eight modelled residential receptors are predicted to experience significant adverse effects for NO_2 concentrations in the Hough to Walley's Green area. The modelled receptors are located on the B5076 North Street/Bradfield Road and Broughton Road and effects here are indicative of effects at other receptors along these roads. NO_2 concentrations in this area are within the air quality standard. No significant effects are predicted in relation to annual mean PM_{10} and $PM_{2.5}$ concentrations. No significant air quality effects are anticipated at any of the ecological receptors in this area.

Permanent effects

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

Other mitigation measures

5.4.14 Measures to monitor, manage and reduce significant air quality effects are set out in Section 7 of the draft CoCP. No further mitigation measures in relation to air quality during construction of the Proposed Scheme have been identified in this area.

Summary of likely residual significant effects

5.4.15 The methods outlined within the draft CoCP are considered effective at reducing dust emissions, and therefore, no significant residual effects are anticipated from this source. There will be a residual significant adverse effect in relation to NO_2 concentrations modelled at five residential receptors on the B5076 North Street/Bradfield Road and three on Broughton Road. Effects at these receptors are representative of effects at some other properties along these roads.

Cumulative effects

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

5.4.17 The combined effects of HS2 Phase 2a and the Proposed Scheme, against a baseline without either scheme, have been considered. There will be no significant cumulative effects for air quality as a result of the combination of HS2 Phase 2a and the Proposed Scheme.

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 will arise from changes in the volume, composition and/or speed of road traffic, changes in road alignment.

5.5.3 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.

Operational traffic effects

5.5.4 The assessment of operational traffic emissions has been undertaken for a 'without the Proposed Scheme' scenario and a 'with the Proposed Scheme' scenario in 2038. The traffic data for each scenario include the additional traffic from future committed developments.

5.5.5 Traffic data in the study area have 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 during operation of the Proposed Scheme. The realigned A530 Nantwich Road was screened in for further assessment in the Hough to Walley's Green area.

5.5.6 No designated ecological receptors of relevance to the operational phase air quality have been identified within 200m of the screened in roads in the area. No further assessment of ecological receptors was therefore required for this area.

5.5.7 Receptors expected to experience the greatest change in concentrations have been included in the air quality model. No significant effects are predicted at any modelled receptors during operation of the Proposed Scheme. Concentrations of NO_2, PM_{10} and $PM_{2.5}$ are within the relevant air quality standards both with and without the Proposed Scheme.

Other mitigation measures

5.5.8 No other mitigation measures are proposed in relation to air quality during operation of the Proposed Scheme.

Summary of likely residual significant effects

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

Cumulative effects

5.5.10 The data used in 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.

5.5.11 The combined effects of HS2 Phase 2a and the Proposed Scheme, against a baseline without either scheme, have been considered. There will be no significant cumulative effects for air quality as a result of the combination of HS2 Phase 2a and the Proposed Scheme.

Monitoring

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

5.5.13 On the basis of there being no significant residual operational effects, there are no area-specific requirements for monitoring air quality effects during operation of the Proposed Scheme in the Hough to Walley's Green area.

6 Community

6.1 Introduction

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

6.1.2 The assessment draws on information gathered from engagement with the users and operators of community resources. Local authorities, parish councils and operators of community resources that have been engaged with are identified in Section 3, Stakeholder engagement and consultation. The purpose of this engagement has been to understand how the resources are used and to obtain relevant baseline information to inform the design development and assessment of the Proposed Scheme.

6.1.3 Further details of the community assessments undertaken within the Hough to Walley's Green area are contained in Volume 5: Appendix CM-001-0MA01.

6.1.4 Community assessment maps are provided in the Map Series CM-01 in Volume 5, Community Map Book. Maps showing the location of the key environmental features (Map Series CT-10) and the key construction (Map Series CT-05) and key operational (Map Series CT-06) features of the Proposed Scheme are provided in the Volume 2: MA01 Map Book. The Proposed Scheme is described in Section 2.

6.1.5 All distances, lengths and area measurements provided in this section are approximate.

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 EIA Scope and Methodology Report (SMR)[36].

6.2.2 The study area includes the land required both temporarily and permanently for the construction and operation of the Proposed Scheme. It also includes a wider area including proposed construction traffic routes within which community resources could be affected by a combination of two or more significant residual effects arising from noise, vibration, poor air quality, heavy goods vehicle (HGV)[37] traffic, and visual intrusion. Overall, the study area is taken as the area of land that encompasses the likely significant community effects of the Proposed Scheme.

[36] Volume 5: Appendix CT-001-00001, Environmental Impact Assessment Scope and Methodology Report.

[37] HGV traffic effects are where there is a 30% or more increase in HGV traffic movements which have been identified as significant by traffic and transport. The increase in HGV traffic results in a traffic-related severance effect for non-motorised users. They contribute to in-combination effects on community resources that are located adjacent to the routes that experience the increase in HGV movements.

6.2.3 Effects relating to the severance of public rights of way (PRoW) (public footpaths and bridleways) and highway and pedestrian diversions are assessed in Section 14, Traffic and transport. However, where PRoW and other routes are a promoted destination in their own right as a recreation resource, they have been considered within this assessment. Where impacts on public open space and recreational routes are considered, these have been informed by open space and PRoW condition surveys, where it has been possible to undertake such surveys.

6.2.4 Where reasonably practicable, public footpaths and routes will be re-instated or convenient alternatives provided. HS2 Ltd will seek to provide a temporary or permanent alternative route in advance of a closure of a road or PRoW. No significant effects on these routes are likely once the mitigation measures have been implemented. If a temporary or permanent alternative route cannot be provided in advance of any road or PRoW closure, then this will be discussed with the relevant local authority and local groups.

6.2.5 Isolation effects may arise from either physical islanding of properties or an increase in journey times and/or distance between residential areas and the community resources that residents use on a regular basis.

6.2.6 The assessment of in-combination effects draws upon: Section 5, Air quality; Section 11, Landscape and visual; Section 13, Sound, noise and vibration; and Section 14, Traffic and transport. Likely significant in-combination effects on community resources are reported in this section. Durations of in-combination effects on community resources have been identified where information on the duration of contributing effects is provided in the relevant source assessments.

6.2.7 Worker accommodation will be located at the Crewe tunnel north main compound. Construction worker impacts on community resources are considered at a route-wide level in Volume 3, Route-wide effects Section 6.

6.2.8 Due to the large number and relatively high density of public houses, cafes, restaurants and other food outlets in the study area, impacts on these resources are only assessed where the nearest alternative resources are over 1km away, unless they have been identified as highly valued by the local community.

6.2.9 No area-specific limitations or assumptions have been identified for this area.

6.3 Environmental baseline

Existing baseline

6.3.1 The Proposed Scheme in the Hough to Walley's Green area will be 10.8km in length and lies within the Cheshire East Council (CEC) local authority area. The route of the Proposed Scheme extends from Hough, passing beneath the mainly urban settlement of Crewe in tunnel, emerging on the northern edge of Crewe. Other settlements in the area include Hough, Basford, Chorlton, Weston, Warmingham, Minshull Vernon and Walley's Green.

6.3.2 The Hough to Walley's Green area is predominately urban in nature through Crewe. To the north of Crewe, the area is predominantly rural in character. The majority of community facilities are located in Crewe and its suburbs.

Hough and surrounds

6.3.3 Hough and its surrounds cover the settlements of Hough, Chorlton, Basford and Weston, from the southern boundary of the Hough to Walley's Green area to the southern outskirts of Crewe.

6.3.4 Hough is a settlement comprising approximately 350 residential properties. The nearest residential properties are located 600m south-west of the route of the Proposed Scheme. Hough provides several community facilities, including Hough Methodist Church, Hough Village Hall and The White Hart public house.

6.3.5 Chorlton comprises approximately 300 residential properties. The nearest residential properties are located 800m south-east of the route of the Proposed Scheme. There are no known community facilities within Chorlton. Wychwood Park Golf Club is located in Chorlton but is outside of the study area.

6.3.6 Basford comprises approximately 100 residential properties. The nearest residential properties are located 250m west of the route of the Proposed Scheme. There are no known community facilities within Basford.

6.3.7 Weston comprises approximately 350 residential properties. It is located to the east of the route of the Proposed Scheme. The nearest residential properties are located 650m from the route of the Proposed Scheme. Weston provides several community facilities including All Saints Church, Weston Cemetery and Weston Village Primary School.

6.3.8 Crewe and Nantwich Circular Walk is a 47km promoted walking route that circles the towns of Crewe and Nantwich. It passes through Hough and Weston in the south, where it is also part of the South Cheshire Way, another promoted route. The PRoW follows the following footpaths: Footpath Warmingham 16/2, Footpath Crewe 29/1, Footpath Crewe 12/1, Footpath Minshull Vernon 17/1, Footpath Minshull Vernon 8/1, and Footpath Minshull Vernon 13/1. National Cycle Route 70 also passes through Hough.

Crewe

6.3.9 Crewe comprises approximately 30,000 residential properties. The route of the Proposed Scheme passes underneath Crewe in tunnel. Crewe has several suburbs including Leighton, Maw Green, Sydney and Coppenhall Moss.

6.3.10 Within the study area there are numerous community facilities, including children's nurseries, primary and secondary schools, and an engineering college. There are several places of worship, community centres, libraries, emergency services, and medical and care facilities. There are two specialist schools in the area: Springfield School, which provides education for children with complex needs including severe learning disabilities and speech

and communication needs; and Oakfield Lodge School, which is a pupil referral unit and provides alternative education provision for children who are unable to attend mainstream school. Oakfield Lodge School is located 750m east of the route of the Proposed Scheme.

6.3.11 Healthcare facilities within the study area include Bentley Manor Care Home, a residential nursing home for elderly residents requiring physical or mental support. Sherborne Court Neurological Centre, a specialist health care facility that serves adults of all ages with mental health conditions and physical disabilities, is also located within the study area.

6.3.12 Crewe has recreational facilities within the study area including playing fields, sports clubs and centres, recreational grounds and allotments. Community facilities within the study area include The Alexandra Stadium and the Cumberland Arena and adjacent playing fields.

6.3.13 The Crewe and Nantwich Circular Walk follows Crewe Footpath 29/1, Crewe Footpath 12/1, Minshull Vernon Footpath 17/1 and Leighton Footpath 7 to the north of Crewe. National Cycle Route 451 passes through Crewe; National Cycle Route 551 runs to the south of Crewe. Winton Equestrian Centre is a livery yard and stables located to the north of Crewe.

Walley's Green and surrounds

6.3.14 Walley's Green and surrounds covers Warmingham, Bradfield Green, Minshull Vernon and Walley's Green. These settlements are located at the northern end of the Hough to Walley's Green area.

6.3.15 Warmingham comprises approximately 100 residential properties. The nearest residential properties are located 1.7km east of the route of the Proposed Scheme. Bradfield Green comprises approximately 40 residential properties. The nearest residential properties are located 570m west of the route of the Proposed Scheme. Minshull Vernon comprises approximately 10 residential properties. The nearest residential properties are located 50m west of the route of the Proposed Scheme. Walley's Green comprises approximately 30 residential properties and the nearest residential properties are located 550m west of the route of the Proposed Scheme.

6.3.16 Warmingham provides several community facilities including The Bear's Paw public house, St Leonard's Church and Warmingham Church of England Primary School. National Cycle Route 5 (linking Reading to Holyhead) passes through Warmingham.

6.3.17 Minshull Vernon and Walley's Green provide several community facilities including the Minshull Vernon United Reformed Church and St Peter's Church on the A530 Middlewich Road. The Crewe and Nantwich Circular Walk crosses the Proposed Scheme near Warmingham and Minshull Vernon using Footpath Crewe 29/1 and Footpath Crewe 12/1.

Future baseline

Construction (2025)

6.3.18 Volume 5: Appendix CT-004-00000 provides details of the developments in the Hough to Walley's Green area that are assumed to have been implemented by 2025. The following committed developments of relevance to the community assessment that would materially alter the future baseline during construction of the Proposed Scheme in this area, are set out in Table 16.

Table 16: Committed developments of relevance to community during construction

Map book reference[38]	Planning reference	Description	How this is considered in the assessment
MA01/210	15/0366N	Location: land to the east of Broughton Road, Crewe, CW1 4NS. Erection of up to 129 homes with associated highways and open amenity space, landscaping and ecological protection zone	Informing future baseline
MA01/033	15/1537N	Location: land at Basford East, Crewe. Outline planning application (with all matters reserved) for a mixed-use development comprising residential use (Use Class C3) (up to 325 residential dwellings); employment use (Use Class B1), local centre comprising health centre and community facility (Use Class D1), food/non-food retail (Use Class A1), public house/restaurant (Use Class A4/A3) and associated works including construction of a new access road with access from the Crewe Green Link Road South, creation of footpaths and provision of public open space and landscaping	Informing future baseline
MA01/031	LPS2 (Cheshire East Local Plan Strategy)	Location: land at Basford East, Crewe. Mixed use development site comprising up to 19ha of B1 Office Space, 5ha of B2 floor space, 850 homes, new local centre, one primary school, retail provision, public house/restaurant, and community facility	Potential for cumulative effects
MA01/324	19/2545N	Location: land at Basford East, Crewe Approval of all reserved matters following outline approval 15/1537N for the infrastructure works at Basford East	Informing future baseline
MA01/263	18/5040N	Location: Mill Street and Lockitt Street, Crewe. Outline Planning Application with all matters reserved except for access for the erection of up to 70 dwellings with associated infrastructure	Informing future baseline
MA01/330	19/2985N	Location: 142 Earle Street, Crewe, CW1 2AF. Change of Use from residential accommodation to Residential Children's Home (C2)	Informing future baseline

[38] Volume 5, Planning Data/Committed Development Map Book: Maps CT-13-301 to CT-13-304a.

Map book reference[38]	Planning reference	Description	How this is considered in the assessment
MA01/411	17/3272N	Location: 41 Mablins Lane, Crewe, CW1 3RF. Proposed demolition of Sunnyside Farm & 41 Mablins Lane and erection of 20 dwellings (4 x 2 bedroom and 16 x 3 bedroom), new access road, car parking and landscaping	Informing future baseline
MA01/380	18/3256N	Location: The Bungalow, 93 Hall O'Shaw Street, Crewe, CW1 4AD Full planning permission for the erection of a residential building containing 16 self-contained specialised supported living apartments (Use Class C3), together with associated parking and open space	Informing future baseline
MA01/154	LPS11	Location: Broughton Road, Crewe. Local plan allocation: Residential development site that will deliver around 175 homes	Informing future baseline
n/a	n/a	HS2 Phase 2a West Midlands to Crewe	Does not influence the future baseline

6.3.19 It is assumed that the following committed developments will be implemented and have been included as part of the future baseline and considered in this assessment:

- MA01/210 will result in a residential development located 80m to the east of the land required for the construction of the Proposed Scheme;
- MA01/033 will result in a residential development with a health centre and community facility, located immediately to the east of the land required for construction of the Proposed Scheme;
- MA01/324 will result in a residential development with a health centre and community facility, located immediately to the east of the land required for the construction of the Proposed Scheme;
- MA01/263 will result in a residential development located 220m to the west of the land required for the construction of the Proposed Scheme;
- MA01/330 will result in a residential children's home located 200m to the east of the land required for the construction of the Proposed Scheme;
- MA01/411 will result in a residential development located 350m to the west of the land required for the construction of the Proposed Scheme;
- MA01/380 will result in a development of supported living apartments, located 400m to the east of the land required for the construction of the Proposed Scheme; and
- MA01/154 will result in a residential development located 40m to the east of the land required for the construction of the Proposed Scheme.

6.3.20 The implementation of committed development MA01/031 will result in a residential development, with offices, a school and other facilities. Land required for the construction of the Proposed Scheme passes through the site, having the potential to result in cumulative effects.

6.3.21 HS2 Phase 2a will be under construction by 2025. It is not considered that the construction of HS2 Phase 2a will inform the future baseline conditions for community in the Hough to Walley's Green area. The combined effects of HS2 Phase 2a and the Proposed Scheme, against a baseline without either phase, have been considered. There will be no significant cumulative effects as a result of the combination of HS2 Phase 2a and the Proposed Scheme.

Operation (2038)

6.3.22 Volume 5: Appendix CT-004-00000 provides details of the developments in the Hough to Walley's Green area that are assumed to have been implemented by 2038. The following committed developments of relevance to the community assessment during operation in this area are set out in Table 17.

Table 17: Committed developments of relevance to community during operation

Map book reference	Planning reference	Description	How this is considered in the assessment
n/a	n/a	HS2 Phase 2a West Midlands to Crewe	Does not influence the future baseline

6.3.23 HS2 Phase 2a will be in operation by 2038. It is not considered that the operation of HS2 Phase 2a will inform the future baseline conditions for community in the Hough to Walley's Green area. The combined effects of HS2 Phase 2a and the Proposed Scheme, against a baseline without either phase, have been considered. There will be no significant cumulative effects as a result of the combination of HS2 Phase 2a and the Proposed Scheme.

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 to avoid or reduce, insofar as reasonably practicable, the environmental impacts during construction:

- a temporary footbridge at Parkers Road to provide access over the WCML and the Proposed Scheme during the temporary closure of the existing Parkers Road Overbridge; and
- between Coppenhall Moss and Leighton, continued access to the Crewe and Nantwich Circular Walk will be provided by temporarily diverting Footpath Warmingham 16/2 south to Footpath Crewe 29/1 overbridge. Footpath Crewe 13/1 and Footpath Crewe 12/1 will also be permanently diverted.

6.4.2 The draft Code of Construction Practice (CoCP)[39] includes a range of provisions that will help mitigate community effects associated with construction of the Proposed Scheme within this area, including:

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

Assessment of impacts and effects

Hough and surrounds

Temporary effects

Residential properties

6.4.3 Construction of the Proposed Scheme including utility works and/or highways works will be required on residential land in the area. Where the scale of impact will be small, and the duration short (up to three months), these works will result in minor adverse effects, which will not be significant at a community level. A description of the affected properties is included within Volume 5: Appendix CM-001-0MA01.

Community facilities

6.4.4 No temporary construction effects on community facilities are anticipated in this area.

[39] Volume 5: Appendix CT-002-00000, Draft Code of Construction Practice.

Recreational facilities

6.4.5 No temporary construction effects on recreational facilities are anticipated in this area.

Public open space and recreational routes

6.4.6 No temporary construction effects on public open space or recreational routes are anticipated in this area.

Permanent effects

6.4.7 No permanent construction effects are anticipated in this area.

Crewe

Temporary effects

Residential properties

6.4.8 Construction of the Proposed Scheme, including utility works and/or highways works will be required on residential land in the area. Where the scale of impact will be small, and the duration short (up to three months), these works will result in minor adverse effects, which will not be significant at a community level. A description of the affected properties is included within Volume 5, Appendix CM-001-0MA01.

6.4.9 Sydney Road, Crewe, is a designated route for construction traffic and is expected to experience a significant increase in HGV traffic movements. These significant HGV traffic effects are expected to combine with significant traffic noise effects on approximately 25 residential properties on Sydney Road, between Crewe Green Roundabout and the railway overbridge, during the peak months of construction. Together these noise and HGV traffic effects will result in a moderate adverse in-combination effect on amenity for residents at these properties, which is significant.

6.4.10 The B5076 North Street in Crewe is a designated route for construction traffic and is expected to experience a significant increase in HGV traffic movements. These significant HGV traffic effects are expected to combine with significant air quality effects on approximately five residential properties. Together these HGV traffic and air quality effects will result in a moderate adverse in-combination effect on amenity for residents at these properties, which is significant.

6.4.11 The B5076 Bradfield Road in Crewe is a designated route for construction traffic and is expected to experience a significant increase in HGV traffic movements. These significant HGV traffic effects are expected to combine with significant air quality effects on approximately 20 residential properties. Together these HGV traffic and air quality effects will result in a moderate adverse in-combination effect on amenity for residents at these properties, which is significant.

6.4.12 Construction of the Proposed Scheme will be in proximity to a group of approximately 250 residential properties in the vicinity of Broughton Road, Coppenhall. Residents of these properties will experience significant noise, vibration and visual effects due to construction of the Crewe tunnel north portal, the Crewe north portal cutting and the presence of the Crewe tunnel north main construction compound. Significant noise effects from these works are likely to last for approximately five years and six months during the daytime, two years and four months during the evening, and two years and six months during the night-time. Significant vibration effects will occur for approximately six months. In addition, Broughton Road is a designated route for construction traffic and 70 properties along Broughton Road are expected to experience significant traffic noise effects. Approximately 40 of these 70 properties along Broughton Road will also experience significant air quality effects. Together these noise, vibration, visual and air quality effects will result in a major adverse in-combination effect on amenity of residents at these properties, which is significant.

6.4.13 Construction of the Proposed Scheme will be in proximity to a group of approximately 45 residential properties in Crewe (north) in the vicinity of Wareham Drive. Residents of these properties will experience significant noise and visual effects due to the construction of the Crewe tunnel north portal and Crewe tunnel north portal cutting. Significant noise effects from these works are likely to last for approximately six months during the daytime. Together these noise and visual effects will result in a moderate adverse in-combination effects on amenity of residents at these properties, which is significant.

6.4.14 Construction of the Proposed Scheme will be in proximity to a group of approximately 20 residential properties in the vicinity of Perry Fields, Leighton, a suburb of Crewe. Residents of these properties will experience significant noise and visual effects due to the construction of Coppenhall Moss cutting and Coppenhall Moss south embankment. Significant noise effects from these works are likely to last for approximately five months. Together these noise and visual effects will result in a moderate adverse in-combination effect on amenity for residents at these properties, which is significant.

Community facilities

6.4.15 Oakfield Lodge School is a pupil referral unit and provides education for children who have been referred by CEC following a permanent exclusion from mainstream education. The school is located on Warmingham Road, approximately 750m west of the Proposed Scheme. Warmingham Road is a designated construction traffic route and is expected to experience a significant increase in HGV traffic movements. Construction works associated with Coppenhall Moss cutting, Coppenhall Moss south embankment and Footpath Crewe 29/1 overbridge will result in significant noise effects. Significant noise effects will last for approximately three years and seven months. Together these noise and HGV traffic effects will result in a major adverse in-combination effect on Oakfield Lodge School, which is significant.

Recreational facilities

6.4.16 No temporary construction effects on recreational facilities are anticipated in this area.

Public open space and recreational routes

6.4.17 Yellow Park in Crewe is an area of informal open space between the WCML and the B5067 Middlewich Street and will be affected by the construction of Middlewich Street vent shaft. An area comprising 55% (0.66ha) of the open space will be required for Middlewich Street vent shaft satellite compound. Of the 0.66ha required for Middlewich Street vent shaft satellite compound, 0.22ha of land will be permanently required from Yellow Park at the western end of Ridgway Street, Audley Street West and Mellor Street. There is currently a children's play area within this open space, but this will not be affected by construction. There are a number of alternative facilities within 1km of Yellow Park. The works will last for four years and six months and will have a moderate adverse effect on users of the open space, which is significant.

Permanent effects

Residential properties

6.4.18 The construction of Crewe north portal cutting will require the demolition of two residential properties: Bridge Farm and Moss Bridge Farm on Parkers Road in Crewe. These residential properties will be permanently lost.

Community facilities

6.4.19 No permanent construction effects on community facilities are anticipated in this area.

Recreational facilities

6.4.20 The construction of Crewe north portal cutting will require the demolition of Winton Equestrian Centre on Parkers Road. The centre is open five days a week and provides private riding lessons and livery services, as well as organising regular competitions and show days. There are other equestrian centres in the local area, including Woodside Stables (3km from Winton Equestrian Centre), Oakhanger Riding and Pony Club Centre (10km from Winton Equestrian Centre) and Smiths Green Livery and Riding Centre (10km from Winton Equestrian Centre). The loss of this facility will result in a moderate adverse effect, which is significant.

Public open space and recreational routes

6.4.21 No permanent construction effects on open space or recreational routes are anticipated in this area.

Walley's Green and surrounds

Temporary effects

Residential properties

6.4.22 Construction of the Proposed Scheme including utility works and/or highways works will be required on residential land in the area. Where the scale of impact will be small, and the duration short (up to three months), these works will result in minor adverse effects, which will not be significant at a community level. A description of the affected properties is included within Volume 5: Appendix CM-001-0MA01.

6.4.23 The A530 Middlewich Road in Bradfield Green is a designated route for construction traffic and is expected to experience a significant increase in HGV traffic movements. These significant HGV traffic effects are expected to combine with significant traffic noise effects on approximately 30 residential properties on the A530 Middlewich Road, between the B5076 Flowers Lane and St Peter's Church, during the peak months of construction. Together these noise and HGV traffic effects will result in a moderate adverse in-combination effect on amenity for residents at these properties, which is significant.

Community facilities

6.4.24 No temporary construction effects on community facilities are anticipated in this area.

Recreational facilities

6.4.25 No temporary construction effects on recreational facilities are anticipated in this area.

Public open space and recreational routes

6.4.26 No temporary construction effects on public open space and recreational routes are anticipated in this area.

Permanent effects

6.4.27 No permanent construction effects are anticipated in this area.

Other mitigation measures

6.4.28 Winton Equestrian Centre will be compensated within the provisions of the Compensation Code if eligible.

6.4.29 HS2 Ltd is continuing to engage with Oakfield Lodge School and Cheshire East Council to identify reasonably practicable measures to help mitigate potential significant effects identified in the assessment.

Summary of likely residual significant effects

6.4.30 The construction of the Proposed Scheme will result in significant temporary residual effects on the following community resources:

- approximately 25 residential properties along Sydney Road, Crewe due to the combination of noise and HGV traffic effects;
- approximately 5 residential properties along the B5076 North Street, Crewe due to the combination of HGV traffic and air quality effects;
- approximately 20 residential properties along the B5076 Bradfield Road, Crewe due to the combination of HGV traffic and air quality effects;
- approximately 250 residential properties in the vicinity of Broughton Road, Crewe due to the combination of noise, vibration, visual and air quality effects;
- approximately 45 residential properties in the vicinity of Wareham Drive, Crewe due to the combination of noise and visual effects;
- approximately 20 residential properties in the vicinity of Perry Fields due to the combination of noise and visual effects;
- approximately 30 residential properties along the A530 Middlewich Road, Bradfield Green due to the combination of noise and HGV traffic effects;
- Oakfield Lodge School, Crewe due to the combination of noise and HGV traffic effects; and
- Yellow Park, Crewe due to land required for the construction of the Proposed Scheme.

6.4.31 The construction of the Proposed Scheme is likely to result in permanent residual significant effects on Winton Equestrian Centre.

Cumulative effects

6.4.32 No temporary or permanent cumulative effects have been identified in the Hough to Walley's Green area.

6.4.33 There will be no significant cumulative effects on community as a result of the combination of HS2 Phase 2a and the Proposed Scheme.

6.5 Effects arising from operation

Avoidance and mitigation measures

6.5.1 The following measures have been incorporated into the Proposed Scheme design as part of the design development process to avoid or reduce environmental impacts during operation:

- landscape earthworks and mitigation planting to the west of Crewe tunnel south portal to provide visual screening for residents of properties on Casey Lane;

- landscape mitigation planting around Middlewich Street vent shaft and headhouse to provide visual screening for residents of properties on the B5076 Middlewich Street;
- landscape mitigation planting to provide visual screening and a noise fence barrier to provide acoustic screening for residents of properties on Broughton Road;
- the location of Crewe tunnel north portal building, rescue area and auto-transformer station has been moved 100m north compared to the location presented in the working draft ES to reduce noise impacts on residents of properties on Broughton Road;
- landscape mitigation planting will provide visual screening for residents of properties in Coppenhall Moss, Warmingham Moss, Moss Farm and Moss Fields Farm;
- a noise fence barrier from the existing Parkers Road Overbridge to Coppenhall Moss north embankment will provide acoustic screening for residents of properties on Parkers Road, Spring Farm, White House and Springfield Cottage, and users of PRoW;
- landscape earthworks around Footpath Crewe 29/1 accommodation overbridge, the existing Parkers Road Overbridge and along both the east and west of Warmingham Moss viaduct to screen views to the west including Bradfield Green and Minshull Hall Court, and for users of various PRoW including Cheshire and Nantwich Circular Walk; and
- landscape earthworks, with associated landscape mitigation planting will provide visual screening for residents of property at Moss Fields Farm.

Assessment of impacts and effects

Hough and surrounds

6.5.2 No operational effects are anticipated in this area.

Crewe

6.5.3 A group of approximately 15 residential properties around the southern part of Middlewich Street, Crewe, will be in proximity to the route of the Proposed Scheme. The operation of the Proposed Scheme will result in significant visual effects due to the proximity of Middlewich Street vent shaft headhouse, and significant ground-borne noise effects during the daytime and night-time from trains travelling in the tunnel under the properties. Together these noise and visual effects will result in a major adverse effect on amenity for residents of these properties, which is significant. By year 30, visual effects will reduce to a level which is not significant. As such, there will be no significant in-combination effect for this community by year 30.

6.5.4 Bentley Manor Care Home in Crewe is located in proximity to the Proposed Scheme. The operation of the Proposed Scheme will result in significant adverse visual effects due to views of Middlewich Street vent shaft headhouse. In addition, the care home has been assessed on a precautionary basis to experience significant ground-borne noise effects affecting daytime activities and night-time sleep disturbance due to the running of the trains through the Crewe tunnel. Together these noise and visual effects will result in a major

adverse in-combination effect on the amenity of some residents of Bentley Manor Care Home, which is significant. By year 30, visual effects will reduce to a level which is not significant. As such, there will be no significant in-combination effect for residents of Bentley Manor Care Home by year 30.

Walley's Green and surrounds

6.5.5 No operational effects are anticipated in this area.

Other mitigation measures

6.5.6 HS2 Ltd continues to review the design and mitigation in relation to ground-borne noise effects, and any changes will be brought forward during the passage of the Bill in Parliament.

6.5.7 HS2 Ltd will engage with Bentley Manor Care Home to identify reasonably practicable measures to mitigate the residual significant effects identified in this assessment.

Summary of likely residual significant effects

6.5.8 The operation of the Proposed Scheme will result in residual significant effects on the following resources:

- approximately 15 residential properties on the B5067 Middlewich Street due to the combination of ground-borne noise and visual effects; and
- Bentley Manor Care Home in Crewe due to the combination of ground-borne noise and visual effects.

Cumulative effects

6.5.9 No cumulative effects have been identified in the Hough to Walley's Green area.

6.5.10 There will be no significant cumulative effects on community as a result of the combination of HS2 Phase 2a and the Proposed Scheme.

Monitoring

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

6.5.12 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 sections of this Volume 2 report.

7 Ecology and biodiversity

7.1 Introduction

7.1.1 This section of the report describes the ecological baseline and identifies the predicted impacts and likely significant effects on habitats and species that will arise from construction and operation of the Proposed Scheme in the Hough to Walley's Green area. This includes effects on sites recognised or designated on the basis of their importance for nature conservation.

7.1.2 Engagement has been undertaken with stakeholders including Natural England, the Environment Agency, the Forestry Commission, the Woodland Trust, Cheshire Wildlife Trust, Canal & River Trust, Cheshire East Council and Cheshire West and Chester Council. The purpose of this engagement has been to obtain relevant baseline information and inform the design development and assessment of the Proposed Scheme.

7.1.3 In addition, baseline information collated as part of the Environmental Statement (ES), the Supplementary Environmental Statement (SES) and Additional Provision Environmental Statement (AP ES) for HS2 Phase 2a[40,41] has been used to inform the assessment of the Proposed Scheme in the Hough to Walley's Green area.

7.1.4 Volume 5 contains supporting information to the ecological assessment reported in this section, including:

- ecological baseline data – designated sites (see Volume 5: Appendix EC-001-00001);
- an ecological register of local level effects, which are not reported individually in Volume 2 (Volume 5: Appendix EC-015-0MA01); and
- documents to support the Habitat Regulations Assessment Screening Report and Appropriate Assessment for the Wybunbury Moss component of the Midland Meres and Mosses Phase 1 Ramsar site and West Midlands Mosses Special Area of Conservation (SAC) (Volume 5: Appendix EC-016-00009) and the Oakhanger Moss component of the Midland Meres and Mosses Phase 2 Ramsar site (Volume 5: Appendix EC-016-00006).

[40] High Speed Two Ltd (2017), *HS2 Phase 2a (West Midlands – Crewe), Environmental Statement, Volume 2: Community Area reports and Map Books*. Available online at: https://www.gov.uk/government/publications/hs2-phase-2a-environmental-statement-volume-2-community-area-reports-and-map-books.

[41] High Speed Two Ltd (2017), *High Speed Rail (West Midlands – Crewe) Supplementary Environmental Statement and Additional Provision Environmental Statement, Volume 2: Community Area report, CA5: South Cheshire.* Available online at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/692598/G13_Volume_2_CA5_WEB.pdf.

7.1.5 Map Series EC-01 showing statutory and non-statutory designated sites of relevance to the assessment in the Hough to Walley's Green area is provided in the Volume 5, Ecology 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: MA01 Map Book.

7.1.7 In addition, ecological baseline information relating to habitats and species recorded in the Hough to Walley's Green area is set out in Background Information and Data (BID)[42] (BID EC-002-00001 to BID EC-014-00001[43]) and accompanying Map Series EC-02 and EC-04 to EC-12 (BID Ecology Map Books).

7.1.8 The Proposed Scheme is described in Section 2.

7.1.9 All distances, lengths and area measurements in this section are approximate.

7.2 Scope, assumptions and limitations

7.2.1 The scope, assumptions and limitations for the ecological assessment are set out in Volume 1, Section 8 and the EIA Scope and Methodology Report (SMR)[44] and in the Field Survey Methods and Standards (FSMS), which is included as an annex to the SMR.

7.2.2 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 set out in Volume 5: Appendix WR-001-0001, WFD compliance assessment.

7.2.3 Access was obtained for the majority of the land where general habitat survey (Phase 1 habitat survey) was proposed. However, access could not be gained in time for seasonally constrained surveys at Moss Bridge Marsh Local Wildlife Site (LWS). Further details are provided in Background Information and Data: BID EC-002-00001 to BID EC-014-00001.

7.2.4 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. This constitutes a 'reasonable worst case' basis for the subsequent assessment and development of mitigation.

7.2.5 BID EC-002-00001 to BID EC-014-00001 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 to indicate that a precautionary approach has been applied.

[42] High Speed Two Ltd (2022), High Speed Rail (Crewe to Manchester), *Background Information and Data*. Available online at: https://www.gov.uk/government/collections/hs2-phase-2b-crewe-manchester-environmental-statement.

[43] Note that BID EC-014-00001 contains data on badgers and is not published.

[44] Volume 5: Appendix CT-001-00001, Environmental Impact Assessment Scope and Methodology Report.

7.2.6 The precautionary approach to the assessment that has been adopted identifies the likely significant ecological effects of the Proposed Scheme. Use of the precautionary approach ensures that any limitations arising from the age of the datasets are taken into account. Unless otherwise stated, the description of effects assumes that land within 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. This includes areas identified specifically for habitat creation. With respect to utility works, it is normally assumed that all habitat is lost from the land required for the Proposed Scheme. This is assumed to be temporary except for mature woodland and areas of high-quality habitat. However, for some utility works, such as decommissioning of existing utilities, the construction methods are such that it has been possible to exclude significant effects at the following receptors:

- Mere Gutter with Basford Brook Local Wildlife Site (LWS); and
- Crewe Swift Colony LWS.

7.3 Environmental baseline

Existing baseline

Introduction

7.3.1 This section describes the ecological baseline relevant to the assessment: the designated sites, habitats and species recorded in this area. Further details are provided in the reports presented in Volume 5: Appendix EC-001-00001 and BID: BID EC-002-00001 to BID EC-014-00001, and maps presented in Volume 5, Map Series EC-01 and BID Ecology Map Books: Map Series EC-02 and EC-04 to EC-12. Statutory and non-statutory designated sites are shown on Volume 5, Map EC-01-300 to EC-01-304, more distant designated sites listed in this report are beyond the map extents. The extent of the EC-01 maps is such that some designated sites are identified on them that are not relevant to the assessment due to their distance from the Proposed Scheme. Such sites are not covered in this report.

7.3.2 Land required for and adjacent to the Proposed Scheme in the Hough to Walley's Green area consists mainly of farms and agricultural land with small patches of woodland connected by hedgerows with abundant trees. Areas of wet grassland are present and there are numerous ponds and occasional drains, but no major watercourses. A total of 6.5km of the route of the Proposed Scheme in the Hough to Walley's Green area will be in tunnel (including porous portals) beneath Crewe.

Designated sites

7.3.3 There are three statutory designated sites of international importance of potential relevance to the assessment in the Hough to Walley's Green area. They are:

- Midland Meres and Mosses Phase 1 Ramsar site, covering an area of 510.9ha is designated for nutrient-rich water bodies (meres), associated fringe habitats of reed swamp, fen carr and damp pasture, and quaking peat bog. The wide range of habitats supports numerous associated rare species of plants and invertebrates. The closest component unit of the Ramsar site to the Hough to Walley's Green area is Wybunbury Moss Site of Special Scientific Interest (SSSI), located 1.8km south-west of the land required for the construction of the Proposed Scheme and, at its closest point, is 70m north of the B5071 Stock Lane/Main Road, Wybunbury on which traffic will be redistributed as a result of the Proposed Scheme. Two further components of this Ramsar site, The Mere, Mere SSSI and Tatton Meres SSSI, are relevant to the Pickmere to Agden and Hulseheath area (MA03) and the Hulseheath to Manchester Airport area (MA06);
- Midland Meres and Mosses Phase 2 Ramsar site, covering an area of 1,588ha, is designated for the diverse range of habitats ranging from open water to raised bog. The wide range of habitats supports nationally important flora and fauna. The closest component unit of the Ramsar site, Black Firs and Cranberry Bog SSSI, is located 2.6km south-east of the land required for the construction of the Proposed Scheme and is adjacent to the A531 Main Road and 75m south of B5500 Nantwich Road, on which traffic will be redistributed as a result of the Proposed Scheme. Oakhanger Moss SSSI, which is also a component of this Ramsar site, is also relevant to the Hough to Walley's Green area, and one further component of this Ramsar site, Oak Mere SSSI, is relevant to the Wimboldsley to Lostock Gralam area (MA02); and
- West Midlands Mosses SAC, covering an area of 184.6ha, is designated for natural dystrophic lakes and ponds, and transition mires and quaking bogs. It comprises four constituent SSSI (of which three are also part of the Midland Meres and Mosses Phase 1 Ramsar site and one is included in the Midland Meres and Mosses Phase 2 Ramsar site). The closest component unit of the SAC is Wybunbury Moss SSSI, 1.8km south-west of the land required for the construction of the Proposed Scheme and, at its closest point, is 70m north of the B5071 Stock Lane/Main Road, Wybunbury on which traffic will be redistributed as a result of the Proposed Scheme.

7.3.4 There are four nationally important SSSI that are of potential relevance to the assessment in the Hough to Walley's Green area. For two of these sites, the land required for the construction of the Proposed Scheme in this area is within the Impact Risk Zone (IRZ) relevant to railway infrastructure as identified by Natural England. The remaining sites are of relevance due to predicted changes in traffic flows on the affected road network as a result of the Proposed Scheme. They are:

- Wybunbury Moss SSSI, covering an area of 23.3ha, is designated as one of the finest examples in the country of a schwingmoor[45] and supports an outstanding assemblage of invertebrates. This SSSI (part of which is also a National Nature Reserve (NNR) and part of the Midland Meres and Mosses Phase 1 Ramsar site) is located 1.8km south-west of the land required for the construction of the Proposed Scheme and at its closest point, is 70m north of the B5071 Stock Lane/Main Road, Wybunbury on which traffic will be redistributed as a result of the Proposed Scheme;
- Black Firs and Cranberry Bog SSSI, covering an area of 12.3ha, is designated for the presence of a large dystrophic water body with an outstanding example of a schwingmoor basin mire, and an area of alder woodland on seasonally moist acidic soils. The SSSI (which is also part of the Midland Meres and Mosses Phase 2 Ramsar site) is located 2.6km south-east of the land required for the construction of the Proposed Scheme and adjacent to and 75m south of the A531 Main Road and B5500 Nantwich Road respectively, on which traffic will be redistributed as a result of the Proposed Scheme. However, the Proposed Scheme within the Hough to Walley's Green area is not within the IRZ for this SSSI;
- Oakhanger Moss SSSI, covering an area of 13.6ha, is designated for the range of mire vegetation communities present, from open water to raised bog. The SSSI (which is also part of Midland Meres and Mosses Phase 2 Ramsar site) is located 4.4km east of the land required for the construction of the Proposed Scheme, and 120m west of the M6, on which traffic will be redistributed as a result of the Proposed Scheme. However, the Proposed Scheme within the Hough to Walley's Green area is not within the IRZ for this SSSI; and
- Sandbach Flashes SSSI, covering an area of 152.9ha over several distinct areas, is designated for the extremely rare inland saline habitats and the unusual plants and animals associated with them. The flashes are important for notable aquatic invertebrates, as well as wildfowl and waders, supporting large numbers of wigeon, teal, lapwing, snipe and curlew. The closest component of the SSSI is located 370m east of the land required for the construction of the Proposed Scheme in the Hough to Walley's Green area. Sandbach Flashes SSSI is also relevant to the Wimboldsley to Lostock Gralam area (MA02), where it is located 2.4km east of the land required for the construction of the Proposed Scheme.

7.3.5 There are 10 LWS that are of potential relevance to the assessment in the Hough to Walley's Green area, each of which is of county/metropolitan value. They are:

- Basford Brook LWS, covering an area of 4.3ha, is designated as a wildlife corridor comprising wet woodland, lowland mixed deciduous woodland, marshy grassland, neutral grassland and reedbeds. The LWS is located on the banks of Mere Gutter/Basford Brook within Wychwood Park Golf Club golf course, 804m east of the

[45] A schwingmoor is a quaking peat bog formed as a result of colonisation of the water surface by floating vegetation.

land required for the construction of the Proposed Scheme and 64m south of Newcastle Road, a construction traffic route;

- Mere Gutter with Basford Brook LWS, covering an area of 10.7ha, is a single watercourse and is designated for being one of three key sites for white-clawed crayfish in Cheshire. The LWS runs parallel to the route of the Proposed Scheme between Weston and Crewe and, at its closest point, is located adjacent to the land required for the construction of the Proposed Scheme at the A5020 David Whitby Way. Utilities works associated with the construction of the Proposed Scheme, comprising diversion of an existing gas pipeline, will bisect the LWS to the east of Basford Hall Sorting Sidings and the Proposed Scheme will pass beneath the site in tunnel to the north of the existing Basford Hall Sorting Sidings;
- Crewe Swift Colony LWS, covering an area of 13.3ha, is designated for a breeding colony of swifts. It comprises six streets in a 1930s housing development, which due to its construction (for example large, overhanging eaves), provides swifts with suitable nesting opportunities and is considered to be one of the largest colonies of breeding swifts in the UK. The LWS is located partially within land required for utilities works associated with the construction of the Proposed Scheme, comprising installation of an underground electricity cable, and is also located adjacent to the A532 West Street, a construction traffic route;
- Moss Bridge Marsh LWS, covering an area of 4.6ha, is designated for a mosaic of marshy grassland, neutral grassland, reedmace swamp and ditches and supports a population of grass snake. Veteran crack willow trees are also present. This LWS is located partially within the land required for the construction of the Proposed Scheme, north of Moss Bridge Farm and is immediately adjacent to a site haul route from Parkers Road, which is a construction traffic route;
- Moss Bridge Marsh Veteran Tree LWS, covering an area of 100m^2 comprises a single veteran oak in an area of neutral grassland located to the south of Moss Bridge Marsh LWS. The LWS is located 128m east of the land required for the construction of the Proposed Scheme;
- Spring Plantation Grassland LWS, covering an area of 1.1ha, is designated for species-rich neutral grassland and is bordered by species-rich hedgerows, which include veteran crack willows along the southern boundary of the LWS. This LWS is located partially within the land required for the construction of the Proposed Scheme, which includes a site haul route, east of Moss Lane;
- Ridding Farm Ponds LWS, covering an area of 0.3ha, comprises three well-vegetated ponds in an agricultural landscape. The LWS is located 360m north-east of the land required for the construction of the Proposed Scheme;
- Worsley Covert LWS, covering an area of 11.8ha, comprises a narrow strip of broadleaved woodland through which flows 1.7km of a tributary of the River Weaver. The LWS includes areas of ancient semi-natural woodland within Worsley Covert and Polestead Wood. The LWS is located 177m west of the land required for the construction

of the Proposed Scheme and 151m west of the A530 Middlewich Road, a construction traffic route;

- Shropshire Union Canal (Middlewich Branch) LWS, covering an area of 1.1ha, comprises a 7km stretch of canal, including a 570m section that passes through Polestead Wood. The LWS is designated for its species-rich neutral grassland along the canal banks and swamp habitat on the eastern bank. The LWS is located 43m west of land that has been identified for the purpose of habitat creation or enhancement as part of the Proposed Scheme. The LWS is located partially within the Hough to Walley's Green area. The remainder of the LWS is in the Wimboldsley to Lostock Gralam area (MA02); and
- Boundary Wood/Weaver Bank Wood LWS, covering an area of 7.5ha, comprises a narrow stretch of broadleaved woodland through which flows a tributary of the River Weaver. The LWS includes Weaver Bank, a Plantation on Ancient Woodland Site (PAWS). The LWS is located 111m west of land that has been identified for the purpose of habitat creation or enhancement as part of the Proposed Scheme, in the Hough to Walley's Green area. Boundary Wood/Weaver Bank Wood LWS is located partially within the Hough to Walley's Green area. The remainder of the LWS is in the Wimboldsley to Lostock Gralam area (MA02).

7.3.6 There are three Ancient Woodland Inventory (AWI) sites of potential relevance to the assessment in the Hough to Walley's Green area, each of which is of national value. They are:

- Worsley Covert AWI site, comprising 3.8ha of ancient semi-natural woodland, is located 177m west of the land required for the construction of the Proposed Scheme and 151m west of the A530 Middlewich Road, a construction traffic route. This AWI site is located entirely within Worsley Covert LWS;
- Polestead Wood AWI site, comprising 6.1ha of ancient semi-natural woodland, is located 333m south-west of land that has been identified for the purpose of habitat creation or enhancement as part of the Proposed Scheme. This AWI site is located entirely within Worsley Covert LWS; and
- Weaver Bank AWI site, comprising 6.4ha of PAWS, is located 111m west of land that has been identified for the purpose of habitat creation or enhancement as part of the Proposed Scheme, in the Hough to Walley's Green area. This AWI site is located entirely within Boundary Wood/Weaver Bank Wood LWS and partially within the Hough to Walley's Green area. The remainder of the AWI site is in the Wimboldsley to Lostock Gralam area (MA02).

7.3.7 Areas of semi-natural woodland within the AWI sites are likely to qualify as lowland mixed deciduous woodland, a habitat of principal importance in Section 41 of the Natural

Environment and Rural Communities (NERC) Act 2006[46] and a conservation priority of the Cheshire Biodiversity Action Plan[47] (local BAP).

Habitats

7.3.8 In addition to the ancient woodlands identified above, the following habitat types that occur in this area are relevant to the assessment.

Woodland

7.3.9 There are 18 other areas of lowland deciduous woodland that qualify or are likely to qualify as lowland mixed deciduous woodland or wet woodland, which are habitats of principal importance. They are:

- an unnamed woodland at Wychwood Park Golf Club, covering an area of 1.7ha, is located 5m south of Newcastle Road, a construction traffic route south of Weston Hall and 343m east of the land required for the construction of the Proposed Scheme. The woodland habitat is of up to district/borough value;
- Meremoor Moss, covering an area of 2.8ha, is located 13m north of the A500 Shavington Bypass, a construction traffic route, east of Weston and 1.6km east of the land required for the construction of the Proposed Scheme. The woodland habitat is of up to district/borough value;
- an unnamed woodland south of Crewe Station located either side of the A5020 David Whitby Way, covering an area of 7.9ha, is located partially within land required for utilities works associated with the construction of the Proposed Scheme, comprising diversion of an existing gas pipeline. The A5020 David Whitby Way is also a construction traffic route. The woodland habitat is of up to district/borough value;
- an unnamed woodland at Crewe Station sidings, covering an area of 2.3ha, is located above the route of the Proposed Scheme, which will be in tunnel, and partially within land required for utilities works associated with the construction of the Proposed Scheme, comprising diversion of an existing gas pipeline. The woodland habitat is of up to district/borough value;
- Oak Coppice, covering an area of 11.8ha, is located adjacent to the A5020 University Way, a construction traffic route in the south-east of Crewe. The woodland habitat is of up to county/metropolitan value;
- Quaker's Coppice, covering an area of 6.4ha, is located 19m west of the A5020 University Way and 25m north of the A532 Weston Road, both of which are construction traffic

[46] *Natural Environment and Rural Communities Act 2006 (No. 2006/2531), c.16,* Her Majesty's Stationery Office, London. Available online at: http://www.legislation.gov.uk/ukpga/2006/16/section/41.

[47] Cheshire Wildlife Trust (2007), *Cheshire Region Biodiversity Action Plans*. Available online at: https://www.cheshirewildlifetrust.org.uk/sites/default/files/2018-06/BAP%20list%20-%20updated%20April%202011.pdf.

routes in the south-east of Crewe. The woodland habitat is of up to district/borough value;

- an unnamed woodland adjacent to Wistaston Road, covering an area of 1.4ha, is located in the centre of Crewe, 27m south of the A5078 Dunwoody Way, a construction traffic route. The woodland habitat is of up to district/borough value;
- an unnamed woodland east of Flag Lane, covering an area of 1.4ha, is located in the centre of Crewe, adjacent to the A5078 Dunwoody Way, a construction traffic route. The woodland habitat is of up to district/borough value;
- an unnamed woodland east of Moss Lane, covering an area of 3ha, is located partially within the land required for the construction of the Proposed Scheme, north of Crewe. The woodland habitat is of up to district/borough value;
- Spring Plantation, covering an area of 0.5ha, is located 31m north of the land required for the construction of the Proposed Scheme, north of Crewe. The canopy is comprised of oak and the understorey is absent. The woodland habitat is of district/borough value;
- Larch Wood, covering an area of 1.8ha and comprising a canopy of horse chestnut, sycamore and wych elm with an understorey of hawthorn and elder. The species composition of this habitat is characteristic of National Vegetation Classification (NVC) W8 *Fraxinus excelsior – Acer campestris – Mercurialis perennis* woodland. The woodland is located partially within the land required for the construction of the Proposed Scheme, south of Parkfield and is of district/borough value;
- Burnt Covert, covering an area of 0.5ha, is located partially within land required for utilities works associated with the construction of the Proposed Scheme, south of Parkfield. The woodland habitat is of up to district/borough value;
- an unnamed woodland north of Newfield Hall Farm, covering an area of 1ha and comprising a canopy of ash, sycamore, common lime and oak. The field layer comprises dog rose, dog's mercury and Himalayan balsam, a non-native invasive species[48]. The woodland is located within the land required for the construction of the Proposed Scheme and is of district/borough value. This woodland is located partially within the Hough to Walley's Green area. The remainder of the woodland is in the Wimboldsley to Lostock Gralam area (MA02); and
- five small wooded areas (each less than 1.5ha), three of which are in the south-east of Crewe and two near Warmingham. They include: an area to the north of the A534 Nantwich Road; an area south and adjacent to the A534 Crewe Road; an area 10m west of the A5020 University Way; an area south-east of Parkfield and an area east of Parkfield. Each of these woodland areas are of up to local/parish value.

[48] *The Invasive Alien Species (Enforcement and Permitting) Order 2019, No. 527,* Her Majesty's Stationery Office, London. Available online at: http://www.legislation.gov.uk/uksi/2019/527/contents/made.

Grassland

7.3.10 Semi-improved acid grassland, covering an area of 2ha, occurs at Coppenhall, to the east of the West Coast Main Line (WCML). The sward includes sheep's sorrel, common vetch, creeping bent and creeping buttercup. The grassland likely qualifies as lowland acid grassland, a habitat of principal importance. This grassland is located within the land required for the construction of the Proposed Scheme and is of district/borough value.

7.3.11 Semi-improved neutral grassland, covering an area of 1.2ha, is located between Coppenhall and Coppenhall Moss, to the south of Parkers Road, Crewe. The sward includes common sorrel, soft rush, creeping buttercup, common knapweed, meadow foxtail and red fescue. The grassland is located partially within the land required for the construction of the Proposed Scheme and is of district/borough value.

7.3.12 Semi-improved neutral grassland and marshy grassland, covering an area of 5.9ha, occurs partially within and adjacent to Moss Bridge Marsh LWS. Desk study information indicates that the marshy grassland is floristically diverse with species present including wild angelica, marsh horsetail, greater bird's foot-trefoil, gypsywort, marsh woundwort, bittersweet, sneezewort, ragged robin, water pepper, valerian and marsh bedstraw. The drier neutral grassland areas include species such as black knapweed, greater bird's-foot trefoil, creeping cinquefoil, tormentil and trailing tormentil. The grassland likely qualifies as lowland meadow, a habitat of principal importance and a conservation priority of the local BAP. This LWS is located to the east of the WCML, north of Crewe, partially within the land required for the construction of the Proposed Scheme. This grassland is of county/metropolitan value.

7.3.13 Semi-improved neutral grassland and marshy grassland, covering an area of 0.9ha, occurs within Spring Plantation Grassland LWS. The sward is a mosaic dominated by soft rush with patches of species-rich grassland comprising black knapweed, meadowsweet, angelica, greater bird's-foot trefoil, meadow vetchling, cuckooflower, field wood-rush, selfheal and common sorrel. The grassland likely qualifies as lowland meadow. This LWS is located near Moss Lane to the west of the WCML and north of Crewe, partially within the land required for the construction of the Proposed Scheme. This grassland is of county/metropolitan value.

7.3.14 Other small areas of semi-improved neutral grassland and marshy grassland, each less than 1ha and none within wildlife site designations, are present to the north of Crewe within the land required for the construction of the Proposed Scheme. These areas of grassland are of local/parish value.

7.3.15 Species-poor semi-improved grassland covers an area of 26.3ha throughout the Hough to Walley's Green area within the land required for the construction of the Proposed Scheme. Areas of species-poor semi-improved grassland are of local/parish value.

Hedgerows

7.3.16 Spring Plantation Grassland LWS is designated, amongst other reasons, for its species-rich hedgerows, particularly along the southern boundary of the LWS. This LWS is located

partially within the land required for the construction of the Proposed Scheme, east of Moss Lane and is of county/metropolitan value.

7.3.17 In total, there is 28km of hedgerow within the land required for the construction of the Proposed Scheme in the Hough to Walley's Green area. Hedgerow with at least 80% cover of native woody species is a habitat of principal importance.

7.3.18 Of the 28km of hedgerow, 12.4km have not been subject to survey. To accord with Phase 1 habitat descriptions these hedgerows are mapped as native species-rich on map series EC-02 and they are included as native species-rich in the list below. Based on survey data, and on a precautionary basis, the hedgerow is assumed to consist of:

- 10.9km of native species-poor; and
- 17.1km of native species-rich, of which 1.0km are also classified as 'Important' according to the 'Wildlife and Landscape' criteria described in The Hedgerows Regulations 1997[49].

7.3.19 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 county/metropolitan value.

Watercourses

7.3.20 The route of the Proposed Scheme will pass beneath both Gresty Brook and Valley Brook in tunnel. Utilities works associated with the construction of the Proposed Scheme, comprising diversion of an existing gas pipeline, will also pass beneath Gresty Brook to the east of Basford Hall Sorting Sidings. These watercourses may qualify as habitats of principal importance and local BAP habitats. Gresty Brook and Valley Brook and adjacent habitats are intrinsically important and provide corridors for wildlife dispersal. As such they are of up to county/metropolitan value. Basford Brook, which is located to the east of the Proposed Scheme and adjacent to land required for the construction of the Proposed Scheme at its closest point, is also of county/metropolitan value.

7.3.21 Several smaller watercourses, including Broughton Road Drains, Parkers Road Drain and Hoggins Brook, Leighton Brook, and tributaries of Swill Brook, Fowle Brook and the River Weaver, will be crossed by the route of the Proposed Scheme. These smaller watercourses are of up to district/borough value. The unnamed tributaries of these smaller watercourses are of up to local/parish value.

Water bodies

7.3.22 There are 21 ponds located within, or partly within, the land required for the construction of the Proposed Scheme, and a further 146 ponds within 250m of the land required for the construction of the Proposed Scheme. On a precautionary basis it is assumed that all ponds

[49] *The Hedgerow Regulations 1997, No. 1160*, Her Majesty's Stationery Office, London. Available online at: https://www.legislation.gov.uk/uksi/1997/1160/contents/made.

could support 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

7.3.23 Ancient and veteran trees with potential relevance to the assessment in the Hough to Walley's Green area have been considered. An 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. The Ancient Tree Inventory includes some ancient and veteran trees.

7.3.24 There are no trees recorded on the Ancient Tree Inventory within the land required for the construction of the Proposed Scheme.

7.3.25 There are two LWS designated, at least in part, for the presence of veteran trees that are partially within the land required for the construction of the Proposed Scheme. Each of these trees is considered to be of national value. These are:

- veteran crack willows along the northern field boundary of Moss Bridge Marsh LWS; and
- veteran crack willows along the southern field boundary of Spring Plantation Grassland LWS.

Traditional orchards

7.3.26 Desk study information indicates the presence of two orchards that likely qualify as traditional orchard, a habitat of principal importance. Each of these orchards is considered to be of up to district/borough value. These are:

- an orchard at Foden Farm, covering an area of 0.2ha, located immediately adjacent to land required for the construction of the Proposed Scheme; and
- an orchard west of Wimboldsley Hall, covering an area of 0.2ha, located adjacent to land that has been identified for the purpose of habitat creation or enhancement as part of the Proposed Scheme. This orchard is located partially within the Hough to Walley's Green area. The remainder is in the Wimboldsley to Lostock Gralam area (MA02).

Protected and/or notable species

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

Table 18: Protected and/or notable species within the Hough to Walley's Green area

Resource/ feature	Value	Receptor	Baseline and rationale for valuation
Aquatic macro-invertebrates	Regional	Population of lesser silver water beetle in a pond near Moss Bridge Farm.	This species of beetle was recorded during field surveys in a pond north of Parkers Road which is located within land that has been identified for habitat creation or enhancement, as part of the Proposed Scheme. The lesser silver water beetle is rare in the UK with Cheshire being one of only a few locations known to support the species; it is classified as endangered[50] and is a conservation priority of the local BAP.
Aquatic macro-invertebrates	Up to district/ borough	Potential aquatic macro-invertebrate assemblage using suitable habitats present at and adjacent to Moss Bridge Marsh LWS.	The presence of suitable habitat in the Hough to Walley's Green area with the potential to support a notable assemblage of aquatic invertebrate species has been identified through consultation with Cheshire Wildlife Trust. The suitable habitats present include marshy grassland, reedmace swamp and a network of drainage ditches. These habitats are within and adjacent to land required for the construction of the Proposed Scheme.
Amphibians	Up to county/ metropolitan	A meta-population (a group of at least four spatially separated populations which interact, GCNMP[51] 1.1.1) of great crested newt in a network of 71 ponds to the south-east of Hough.	An assumed medium meta-population of great crested newt was identified across 71 ponds, which includes populations identified through desk study records at two ponds. The ponds are located between 170m and 2km from land required for the construction of the Proposed Scheme. This meta-population includes ponds identified within amphibian meta-population (AMP) 5.3 and AMP 5.4, containing medium size populations, identified from field surveys undertaken for HS2 Phase 2a and reported in the HS2 Phase 2a SES and AP ES[52]. Great crested newt is an Annex 2 species, a species of principal importance, and a conservation priority of the local BAP.

[50] Listed as endangered in the Red Data Book of British Insects. Shirt, D. B. (1987), *British Red Data Books: Insects,* Joint Nature Conservation Committee.

[51] Each great crested newt meta-population (GCNMP) has been given an identifying number. Meta-populations are described in BID EC-007-00001 Ecological baseline data - amphibian and pond and canal surveys.

[52] High Speed Two Ltd (2018), *High Speed Rail (West Midlands – Crewe) Supplementary Environmental Statement and Additional Provision Environmental Statement, Volume 2: Community Area report, CA5: South Cheshire.* Available online at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/692598/G13_Volume_2_CA5_WEB.pdf.

Resource/ feature	Value	Receptor	Baseline and rationale for valuation
Amphibians	Up to county/ metropolitan	A meta-population (GCNMP 1.1.3) of great crested newt in a network of 14 ponds to the east of Shavington.	An assumed medium meta-population of great crested newt was identified across 14 ponds, which includes populations identified through desk study records at three ponds. The ponds are located between 19m and 524m from land required for the construction of the Proposed Scheme.
Amphibians	Up to county/ metropolitan	A meta-population (GCNMP 1.1.4) of great crested newt in a network of 23 ponds to the south of Wistaston.	An assumed medium meta-population of great crested newt was identified across 23 ponds, which includes populations identified through desk study records at 15 ponds. The ponds are located between 127m and 1.1km from land required for the construction of the Proposed Scheme.
Amphibians	Up to county/ metropolitan	A meta-population (GCNMP 1.1.5) of great crested newt in a network of 10 ponds to the north of Basford.	An assumed medium meta-population of great crested newt was identified across 10 ponds, which includes populations identified through desk study records at three ponds. The ponds are located between 117m and 736m from land required for the construction of the Proposed Scheme.
Amphibians	Up to county/ metropolitan	A meta-population (GCNMP 1.1.6) of great crested newt in a network of 10 ponds to the north of Weston.	An assumed medium meta-population of great crested newt was identified across 10 ponds, which includes populations identified through desk study records at seven ponds. The ponds are located between 18m and 436m from land required for the construction of the Proposed Scheme.
Amphibians	Up to county/ metropolitan	A meta-population (GCNMP 1.1.8) of great crested newt in a network of 10 ponds to the west of Stowford.	An assumed medium meta-population of great crested newt was identified across 10 ponds, which includes populations identified through desk study records at five ponds, one of which was identified from information within other planning applications. The ponds are located between 54m and 214m from land required for the construction of the Proposed Scheme.
Amphibians	Up to county/ metropolitan	A meta-population (GCNMP 1.1.12) of great crested newt in a network of eight ponds to the west of Woolstanwood.	An assumed medium meta-population of great crested newt was identified across eight ponds, which includes populations identified through desk study records at one pond. The ponds are located between 105m and 791m from land required for the construction of the Proposed Scheme.
Amphibians	Up to county/ metropolitan	A meta-population (GCNMP 1.1.15) of great crested newt within a network of 31 ponds north-east of Crewe.	An assumed medium meta-population of great crested newt was identified across 31 ponds, which includes populations identified through desk study records at five ponds. The ponds are located immediately adjacent to and up to 1.5km from land required for the construction of the Proposed Scheme.

Resource/ feature	Value	Receptor	Baseline and rationale for valuation
Amphibians	Up to county/ metropolitan	A meta-population (GCNMP 1.1.16) of great crested newt in a network of six ponds to the north-east of Crewe.	An assumed medium meta-population of great crested newt was identified across six ponds, which includes a population identified through desk study records at two ponds. The ponds are located between 99m and 308m from land required for the construction of the Proposed Scheme.
Amphibians	Up to county/ metropolitan	A population (GCNP 1.1.17) of great crested newt in a network of three ponds to the north of Crewe.	An assumed medium population of great crested newt was identified across three ponds. Field surveys recorded small populations in two ponds, one of which was also positive for great crested newt DNA. The ponds are all located within the land required for the construction of the Proposed Scheme.
Amphibians	Up to county/ metropolitan	A meta-population (GCNMP 1.1.18) of great crested newt in a network of nine ponds to the north of Crewe.	An assumed medium meta-population of great crested newt was identified across nine ponds, which include populations identified through desk study records at two ponds. Field surveys recorded small populations in three ponds, two of which were also positive for great crested newt DNA. The ponds are located adjacent to and up to 400m from land required for the construction of the Proposed Scheme.
Amphibians	County/ metropolitan	A meta-population (GCNMP 1.1.19) of great crested newt in a network of 130 ponds to the north of Crewe and south-east of Middlewich.	An assumed large meta-population of great crested newt was identified across 130 ponds, which include populations identified through desk study records at 29 ponds. Presence/absence surveys recorded small populations in 17 ponds and medium populations in two ponds. Great crested newt DNA was recorded in 16 ponds. The ponds are located within and up to 1.2km from land required for the construction of the Proposed Scheme. This meta-population extends into the Wimboldsley to Lostock Gralam area (MA02).
Amphibians	County/ metropolitan	A meta-population (GCNMP 1.1.20) of great crested newt in a network of 56 ponds located north of Crewe to Walley's Green.	A medium meta-population of great crested newt was identified across 56 ponds, which include a population identified through desk study records at seven ponds. Field surveys recorded small populations in 10 ponds and medium populations in one pond. Great crested newt DNA was recorded in 13 ponds. The ponds are located within and up to 943m from land required for the construction of the Proposed Scheme.
Amphibians	Up to county/ metropolitan	A population (GCNP 1.1.22) of great crested newt in a network of three ponds located west of Walley's Green.	An assumed medium population of great crested newt was identified across three ponds. Field surveys recorded a small population in one pond. The ponds are located between 44m and 172m from land required for the construction of the Proposed Scheme. This population extends into the Wimboldsley to Lostock Gralam area (MA02).
Amphibians	Up to county/ metropolitan	Populations of great crested newt within un-surveyed ponds	Ponds that have not been surveyed are assumed to support breeding populations of great crested newt of medium size class.

Resource/ feature	Value	Receptor	Baseline and rationale for valuation
Amphibians	Local/parish	Populations of other amphibian species comprising palmate newt, smooth newt, common toad and common frog.	These common amphibian species have been identified within ponds throughout the Hough to Walley's Green area during surveys and, on a precautionary basis, are assumed to be present within the ponds that have not yet been surveyed. Woodland, rough grassland and hedgerow habitats are likely to be utilised 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.
Bats	County/ metropolitan	Bat assemblage between Coppenhall Moss and Walley's Green.	Field surveys confirmed the presence of common pipistrelle, soprano pipistrelle, Nathusius' pipistrelle, brown long-eared bat, noctule, Leisler's bat, serotine and *Myotis* species within this assemblage: • occasional roosts of common pipistrelle, soprano pipistrelle, brown-long eared bat, *Myotis* species and an unidentified species were recorded; • a feeding perch of an unidentified species at Moss Lane, Warmingham located 45m east of the land required for the construction of the Proposed Scheme; and • the WCML, which the route of the Proposed Scheme will run parallel to, acts as a key commuting corridor to connect suitable habitats within the local area. The assemblage is considered to be of county/metropolitan value on the basis that moderate numbers of foraging and commuting *Myotis* species and low to moderate numbers of noctule were recorded. These species are considered to be 'rarer' bats in England[53], although noctule are considered to be more common in Cheshire.

[53] Wray, 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.

Resource/ feature	Value	Receptor	Baseline and rationale for valuation
Bats	Local/parish	Bat assemblage east of Hough.	• Field surveys undertaken for HS2 Phase 2a[54], recorded the presence of common pipistrelle, soprano pipistrelle and brown long-eared bat; and • Field surveys for HS2 Phase 2a recorded five brown long-eared bat night roosts/feeding perches in buildings east of Hough, located between 85m and 110m from land required for the construction of the Proposed Scheme, and a non-breeding tree summer roost for a *Pipistrellus* species, 95m from land required for the construction of the Proposed Scheme.
Birds	County/ metropolitan	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 for HS2 Phase 2a, 380m from land required for the construction of the Proposed Scheme. These observations indicate the potential presence of a breeding pair. Barn owl is a Schedule 1 and Cheshire BAP priority species.
Birds	Up to county/ metropolitan	Potential breeding and wintering barn owl associated with habitat near Coppenhall.	A probable barn owl nest site was identified near Coppenhall within the land required for the construction of the Proposed Scheme. A potential nest site was also identified 230m east of the land required for the construction of the Proposed Scheme. There are 13 records of breeding barn owl within 2km of the land required for the construction of the Proposed Scheme between Coppenhall Moss and Warmingham.
Birds	Up to county/ metropolitan	Potential breeding and wintering barn owl associated with habitat near Warmingham.	A probable barn owl nest site was identified near Warmingham, 370m east of the land required for the construction of the Proposed Scheme. There are nine records of breeding barn owl within 2km of the land required for the construction of the Proposed Scheme in the Warmingham area.

[54] High Speed Two Ltd (2018), *High Speed Rail (West Midlands – Crewe) Supplementary Environmental Statement and Additional Provision Environmental Statement, Volume 2: Community Area report, CA5: South Cheshire.* Available online at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/692598/G13_Volume_2_CA5_WEB.pdf.

Resource/ feature	Value	Receptor	Baseline and rationale for valuation
Birds	District/borough	Wintering bird assemblage associated with habitats east of Hough.	A wintering bird assemblage was identified east of Hough, based on the results of field surveys for HS2 Phase 2a. This assemblage was recorded adjacent to land required for the construction of the Proposed Scheme. Notable species included green sandpiper, little egret, snipe, tree sparrow and yellowhammer. Although these species were recorded, the habitat is not considered suitable to support these species on a regular basis. Other records were for common and widespread wintering bird species, in low numbers and typical of open countryside and woodland. Habitats present within the land required for the construction of the Proposed Scheme are typical of the area and are widespread.
Birds	Local/parish	Breeding bird assemblage associated with habitat between Coppenhall Moss and Warmingham Moss.	Field surveys recorded a total of 42 bird species, 15 of which were notable, within and adjacent to land required for the construction of the Proposed Scheme. Breeding territories of 33 species were recorded of which seven are notable with four Red List species and six species of principal importance and/or conservation priorities of the local BAP. The species recorded are considered to be common and widespread in the habitat types surveyed and no large or important populations were recorded.
Birds	Local/parish	Wintering bird assemblage associated with habitat between Coppenhall Moss and Warmingham Moss.	Field surveys recorded a total of 31 species, 12 of which were notable, within and adjacent to land required for the construction of the Proposed Scheme. This included four Red List species and four species of principal importance and/or conservation priorities of the local BAP. The species recorded are considered to be common and widespread in the habitat types surveyed and no large or important populations were recorded.
Birds	Local/parish	Breeding bird assemblage associated with habitat between Moss Lane and Park Hall Farm.	Field surveys recorded a total of 46 bird species, 19 of which were notable, within and adjacent to the land required for the construction of the Proposed Scheme. Breeding territories of 30 species were recorded of which 10 are notable with six Red List species and six species of principal importance and/or conservation priority of the local BAP. The species recorded are considered to be common and widespread in the habitat types surveyed and no large or important populations were recorded.

Resource/ feature	Value	Receptor	Baseline and rationale for valuation
Birds	Local/parish	Wintering bird assemblage associated with habitat between Moss Lane and Park Hall Farm.	Field surveys recorded a total of 36 species, 15 of which were notable, within and adjacent to the land required for the construction of the Proposed Scheme. This included six Red List species and four species of principal importance and/or conservation priorities of the local BAP. The species recorded are considered to be common and widespread in the habitat types surveyed and no large or important populations were recorded.
Birds	Local/parish	Wintering bird assemblage associated with habitats between Lane Ends and Forge Bank.	Field surveys recorded a total of 48 bird species, 21 of which are notable, within habitats located between the land required for the construction of the Proposed Scheme and Sandbach Flashes SSSI. This included eight Red List species and seven species of principal importance and/or conservation priorities of the local BAP. An additional four notable species were recorded during vantage point surveys at Warmingham Moss, one of which is a Red List species. The species recorded are considered to be common and widespread in the habitat types surveyed and no large or important populations were recorded.
Reptiles	County/ metropolitan	Population of grass snake at Wychwood Park Golf Club and between the golf course and the WCML.	A population of grass snake was recorded from field surveys for HS2 Phase 2a, located at Wychwood Park Golf Club, 248m from land required for the construction of the Proposed Scheme. Grass snake is a species of principal importance and sustainable populations in Cheshire are of county/metropolitan value. Cheshire Wildlife Trust considers that sites supporting populations of grass snake should potentially be selected as LWS[55].
Reptiles	Up to county/ metropolitan	Population of grass snake at Moss Bridge Marsh LWS.	An assumed small population of grass snake has been identified from desk study information located within Moss Bridge Marsh LWS, within the land required for the construction of the Proposed Scheme.
Reptiles	District/ borough	Population of slow worm near Coppenhall Junction, north of Spring Farm and south of Larch Wood.	A small population of slow worm was recorded from field surveys near Coppenhall Junction, north of Spring Farm and south of Larch Wood, within the land required for the construction of the Proposed Scheme. Slow worm is a species of principal importance and a conservation priority of the local BAP.

[55] Cheshire Wildlife Trust (2014), *Local Wildlife Site Selection Criteria for the Cheshire Region*. Available online at: https://www.cheshirewildlifetrust.org.uk/sites/default/files/2018-06/Cheshire%20LWS%20selection%20criteria.pdf.

Resource/ feature	Value	Receptor	Baseline and rationale for valuation
White-clawed crayfish	County/ metropolitan	White-clawed crayfish population within Basford Brook.	The presence of white-clawed crayfish in this watercourse has been identified from field surveys and desk study information. Basford Brook runs parallel to the Proposed Scheme between Weston and Crewe and at its closest point is located adjacent to land required for the construction of the Proposed Scheme at the A5020 David Whitby Way. White-clawed crayfish is a species of principal importance and is a conservation priority of the local BAP.
Water vole	Up to county/ metropolitan	Populations of water vole using the watercourses in the Hough to Walley's Green area.	The presence of water vole within and up to 1km from the land required for the construction of the Proposed Scheme has been identified from desk study data. This includes records north of Crotia Mill Farm, east of the A5020 David Whitby Way, located within and immediately adjacent to land required for the construction of the Proposed Scheme, and at Electra Way, Crewe, 400m west of the land required for the construction of the Proposed Scheme. Water vole is a species of principal importance and a conservation priority of the local BAP. Water vole are largely absent in the north-west due to the presence of mink, encroachment of invasive plants and a lack of suitable burrowing sites[56].
Fish	Up to county/ metropolitan	Fish assemblage within Valley Brook.	The presence of brown/sea trout and stone loach have been identified from desk study data within Valley Brook, 2km downstream of the land required for the construction of the Proposed Scheme. The route of Proposed Scheme, which will be in tunnel, passes beneath Valley Brook. Brown/sea trout is a species of principal importance. Sites supporting naturally sustaining populations of this species are of up to county/metropolitan value and Cheshire Wildlife Trust considers that these sites should potentially be selected as LWS although it is noted that rivers in Cheshire are frequently stocked with this species[55].
Terrestrial invertebrates	Up to district/ borough	Potential terrestrial invertebrate assemblage using suitable habitats within the Hough to Walley's Green area.	There are desk study records of dingy skipper, small heath, wall and white-letter hairstreak within the land required for the construction of the Proposed Scheme. Dingy skipper, small heath, wall and white-letter hairstreak are species of principal importance and Red List species. Dingy skipper and white-letter hairstreak are conservation priorities of the local BAP.

[56] Powell, A. and Milburn, K. (2011), *Northwest Lowlands Water Vole Project - Final Report, June 2011*.

Resource/ feature	Value	Receptor	Baseline and rationale for valuation
Terrestrial invertebrates	Up to district/ borough	Potential terrestrial invertebrate assemblage using suitable habitats present at Moss Bridge Marsh LWS.	The presence of suitable habitat at Moss Bridge Marsh LWS with the potential to support a notable assemblage of terrestrial invertebrates has been identified following consultation with Cheshire Wildlife Trust. The habitats present include neutral grassland, marshy grassland, hedgerows and veteran crack willow trees. These habitats are within and adjacent to land required for the construction of the Proposed Scheme.
Otter	Up to district/ borough	Populations of otter using the watercourses in the Hough to Walley's Green area.	The presence of otter within 1km of the land required for the construction of the Proposed Scheme has been identified from desk study data. This includes records along Gresty Brook at the confluence with Basford Brook, located 168m south of the land required for the construction of the Proposed Scheme, and along Basford Brook itself, south and north of the A500 Shavington Bypass, located 266m and 280m from the land required for the construction of the Proposed Scheme. It is assumed that otters are using these and other watercourses and water bodies within the Hough to Walley's Green area for foraging, breeding and dispersal. Otter is an Annex 2 species, a species of principal importance and a conservation priority of the local BAP.
Vascular plants	Up to district/ borough	Creeping forget-me-not adjacent to the A5020 David Whitby Way.	A desk study record was identified for creeping forget-me-not located south-east of Crewe within the land required for the construction of the Proposed Scheme. This species is listed as potentially vulnerable in Cheshire.
Vascular plants	District/ borough	Small-leaved lime adjacent to Broughton Road.	Field surveys recorded a small-leaved lime south-west of Coppenhall Moss, within the land required for the construction of the Proposed Scheme. This species is listed as potentially vulnerable in Cheshire.
Badger	Local/parish	At least two social groups at undisclosed locations.	Three outlier setts, all close to each other, have been recorded during field surveys within the land required for the construction of the Proposed Scheme located to the north of Crewe. Two outlier setts were also recorded during field surveys for HS2 Phase 2a to the south of Crewe. These setts are located within the land required for the construction of the Proposed Scheme in the Hough to Walley's Green area. A third outlier sett was also recorded in this area, located immediately adjacent to land required for the construction of the Proposed Scheme. All three setts recorded for HS2 Phase 2a were located at the interface of HS2 Phase 2a and the Proposed Scheme within the Hough to Walley's Green area and will be directly affected by the construction of HS2 Phase 2a.

Future baseline

Construction (2025)

7.3.28 Volume 5: Appendix CT-004-00000 provides details of the developments in the Hough to Walley's Green area that are assumed to have been implemented by 2025. The following committed developments of relevance to ecology and biodiversity during construction in this area are set out in Table 19.

Table 19: Committed developments relevant to ecology and biodiversity during construction

Map book reference[57]	Planning reference	Description	How this is considered in the assessment
n/a	n/a	HS2 Phase 2a West Midlands to Crewe	Informing future baseline. Considered in cumulative effects

7.3.29 HS2 Phase 2a will be under construction by 2025. The presence of construction equipment (e.g. cranes, vehicles) as well as movement, lights and noise associated with the construction and the emerging final form of the Phase 2a scheme itself has the potential to affect ecological receptors that fall within the Hough to Walley's Green area of the Proposed Scheme. As such, HS2 Phase 2a has been included as part of the future baseline and considered within the assessment.

7.3.30 The combined effects of HS2 Phase 2a and the Proposed Scheme, against a baseline without either phase, have been considered. There will be no significant cumulative effects as a result of the combination of HS2 Phase 2a and the Proposed Scheme.

7.3.31 No additional committed developments have been identified in this study area that will materially alter the baseline conditions in 2025 for ecology and biodiversity.

Operation (2038)

7.3.32 Volume 5: Appendix CT-004-00000 provides details of the developments in the Hough to Walley's Green area that are assumed to have been implemented by 2038. The following committed developments of relevance to ecology and biodiversity during operation in this area are set out in Table 20.

Table 20: Committed developments relevant to ecology and biodiversity during operation

Map book reference	Planning reference	Description	How this is considered in the assessment
n/a	n/a	HS2 Phase 2a West Midlands to Crewe	Informing future baseline. Considered in cumulative effects

[57] Volume 5, Planning Data/Committed Development Map Book: Maps CT-13-301 to CT-13-304a.

7.3.33 The presence of HS2 Phase 2a during operation as well as noise and movement from trains running along it will alter the future baseline conditions for the Proposed Scheme. This has the potential to affect the presence and significance of ecological receptors within the Hough to Walley's Green area of the Proposed Scheme. As such, HS2 Phase 2a has been included as part of the future baseline and considered within the assessment.

7.3.34 The combined effects of HS2 Phase 2a and the Proposed Scheme, against a baseline without either phase, have been considered. The significant effects arising as a result of the combination of the HS2 Phase 2a and the Proposed Scheme during operation are reported under cumulative effects.

7.3.35 No additional committed developments have been identified in this study area that will materially alter the baseline conditions in 2038 for ecology and biodiversity.

7.4 Effects arising during construction

Avoidance and mitigation measures

7.4.1 The following measures have been included as part of the design of the Proposed Scheme (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 contribute towards limiting effects on habitats and species:

- Crewe tunnel will avoid direct effects on Mere Gutter with Basford Brook LWS;
- Crewe tunnel will reduce direct effects to lowland deciduous woodlands at Crewe Station sidings and north of the A534 Nantwich Road, which are likely to qualify as habitats of principal importance and local BAP habitats; and
- Crewe tunnel will avoid direct effects to three watercourses; Basford Brook, Gresty Brook and Valley Brook, ensuring that their banks are maintained and allowing free passage of wildlife along these watercourses.

7.4.2 The assessment assumes implementation of the measures set out within the draft Code of Construction Practice[58] (CoCP), which includes sensitive construction practices and habitat management plans.

7.4.3 Section 9 of the draft CoCP requires contractors to implement a range of measures to protect ecological receptors including the following:

- manage impacts from construction, including the timing of works, on designated sites, protected and notable species and other features of ecological importance such as ancient woodlands and watercourses;
- reduce habitat loss by keeping the working area to the reasonable minimum;
- reinstatement of areas of temporary habitat loss;

[58] Volume 5: Appendix CT-002-00000, Draft Code of Construction Practice.

- restoration and replacement planting;
- management measures for potential ecological impacts to control dust, water quality and flow, noise and vibration, and lighting;
- provision of a watching brief, where relevant;
- relocation or translocation of species, soil and/or plant material, as appropriate;
- consultation with Natural England, the Environment Agency, local wildlife trusts and relevant planning authorities prior to and during construction; and
- compliance with all wildlife licensing requirements, including those for protected and invasive species and designated sites.

Assessment of impacts and effects

7.4.4 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-015-0MA01.

Designated sites

7.4.5 Midland Meres and Mosses Phase 1 Ramsar site will not be affected by the construction of the Proposed Scheme in the Hough to Walley's Green area. The closest component unit of the Ramsar site, Wybunbury Moss SSSI, is located 1.8km south-west of land required for the construction of the Proposed Scheme. At its closest, Wybunbury Moss SSSI is located 70m north of the B5071 Stock Lane/Main Road on which traffic will be redistributed as a result of the Proposed Scheme. The potential impacts of nitrogen deposition caused by changes in traffic flows during construction of the Proposed Scheme close to Wybunbury Moss SSSI and two further constituent SSSI[59] of the Ramsar site has been assessed. This demonstrated that there will be no adverse effects on the integrity of the Ramsar site due to changes in air quality at Wybunbury Moss, as critical loads for nitrogen deposition are not exceeded within the SSSI, or at the two further constituent SSSI. The Midland Meres and Mosses Phase 1 Ramsar site is also subject to a Habitats Regulations Assessment in the context of potential hydrological effects of the construction of the Proposed Scheme on The Mere, Mere SSSI, and no adverse effects on the integrity of the site are reported. Overall, therefore, adverse effects on the integrity of the Ramsar site can be ruled out both alone or in-combination with other plans or projects.

7.4.6 West Midlands Mosses SAC, designated for its diverse range of habitats, the closest component of which is also Wybunbury Moss SSSI, will not be adversely affected by changes in air quality as a result of the Proposed Scheme, as detailed above in respect to Midland Meres and Mosses Phase 1 Ramsar site.

[59] The Mere, Mere SSSI, reported in Volume 2, Community Area report: Pickmere to Agden and Hulseheath (MA03), Section 7; and Tatton Meres SSSI, reported in Volume 2, Community Area report: Hulseheath to Manchester Airport (MA06), Section 7.

7.4.7 Midland Meres and Mosses Phase 2 Ramsar site will not be affected by the construction of the Proposed Scheme in the Hough to Walley's Green area. Black Firs and Cranberry Bog SSSI, which is the closest component of the Ramsar site, is located 2.6km south-east of the land required for the construction of the Proposed Scheme and is adjacent to the A531 Main Road and 75m south of B5500 Nantwich Road, on which traffic will be redistributed as a result of the Proposed Scheme. However, the increase in traffic flows on these roads is not significant and therefore adverse effects resulting from nitrogen deposition can be ruled out. Oakhanger Moss SSSI, also a component of the Ramsar site, is located 4.4km east of the land required for the construction of the Proposed Scheme in the Hough to Walley's Green area and 120m west of traffic redistribution on the M6. Rates of nitrogen deposition at this SSSI are predicted to be less than 1% of the critical load and therefore not significant. There will be no adverse effects from changes in air quality are Oak Mere SSSI[60], which is a further component of the Ramsar site located in the Wimboldsley to Lostock Gralam area (MA02). Overall, therefore, adverse effects on the integrity of the Ramsar site can be ruled out both alone or in-combination with other plans or projects.

7.4.8 Wybunbury Moss SSSI, a component part of the Midland Meres and Mosses Phase 1 Ramsar site and West Midlands Mosses SAC, is also designated for wetland habitats that also form the reason for designation of these sites. Consequently, in line with the documents to inform the Appropriate Assessment, additional nitrogen deposition caused by increases in traffic flows will not have any adverse effects on qualifying features. Therefore, adverse effects on the structure and function of the SSSI can be ruled out.

7.4.9 Black Firs and Cranberry Bog SSSI, a component part of the Midland Meres and Mosses Phase 2 Ramsar site, is also designated for wetland habitats that also form the reason for designation of the Ramsar site. As detailed above in respect to Midland Meres and Mosses Phase 2 Ramsar, significant effects resulting from nitrogen deposition can be ruled out. There will also be no significant effects on the groundwater regime. Therefore, there will be no adverse effects on the structure and function of the SSSI.

7.4.10 Oakhanger Moss SSSI, a component part of the Midland Meres and Mosses Phase 2 Ramsar site is also designated for wetland habitats that also form the reason for designation of the Ramsar site. Consequently, in line with the documents to inform the Appropriate Assessment, additional nitrogen deposition caused by increases in traffic flows will not have any adverse effect on qualifying features. Therefore, adverse effects on the structure and function of the SSSI can be ruled out.

7.4.11 Sandbach Flashes SSSI will not be affected by the construction of the Proposed Scheme. The closest component unit of the SSSI is located 370m east of the land required for the construction of the Proposed Scheme in the Hough to Walley's Green area, and 2.4km east of the land required for the construction of the Proposed Scheme in the Wimboldsley to Lostock Gralam area (MA02). The assessment of potential impacts provided in Section 15,

[60] Oak Mere SSSI, reported in Volume 2, Community Area report: Wimboldsley to Lostock Gralam (MA02), Section 7.

Water resources and flood risk concludes that there will be no significant permanent adverse effects on either surface water or groundwater flow to this site. The effects of any potential waterborne pollution, such as dust or surface runoff, will be negated through implementation of the measures in the draft CoCP so far as is reasonably practicable, adopting the good working practices for pollution prevention. The conclusion of no significant effect has been agreed with Natural England. Habitat within the land required for the construction of the Proposed Scheme provides suitable habitat for wintering wetland birds including wigeon, curlew, teal, snipe and lapwing, that are part of the reason for notification of as a SSSI. Field surveys for wintering birds did not record wigeon, curlew or teal. Neither lapwing nor snipe were recorded within the land required for the construction of the Proposed Scheme and were only rarely recorded, in low numbers, in the land to the east. As such, the loss or disturbance of habitat suitable for foraging and roosting within and close to land required for the construction of the Proposed Scheme is unlikely to result in a significant adverse effect on these species, particularly given the availability of similar habitat within the wider area. It is therefore considered that the construction of the Proposed Scheme will not adversely affect the wintering bird assemblage and there will be no significant effect on the integrity of Sandbach Flashes SSSI.

7.4.12 Construction of Coppenhall Moss south embankment and Warmingham Moss southbound WCML embankment will result in the permanent loss of 2.6ha (57%) of marshy grassland and semi-improved neutral grassland habitat within Moss Bridge Marsh LWS. Dewatering activities associated with construction of Coppenhall Moss cutting may also result in a minor localised reduction in groundwater levels from these parts of the LWS. A further 800m^2 (2%) will be lost to facilitate new fencing and public right of way diversions in this area. Habitat loss from this LWS will result in a permanent adverse effect on the structure and function of this site that is significant at the county/metropolitan level.

7.4.13 Construction of Warmingham Moss northbound WCML embankment will result in the permanent loss of 0.3ha (27%) of Spring Plantation Grassland LWS. Works associated with the diversion of overhead power lines will result in the further loss of 600m^2 (5%) of the site. Habitat loss from this LWS will result in a permanent adverse effect on the structure and function of this site that is significant at the county/metropolitan level.

Habitats

Woodland

7.4.14 There will be no significant effects on ancient woodlands in the Hough to Walley's Green area. However, there are a number of non-ancient woodlands that will be affected by the construction of the Proposed Scheme.

7.4.15 Construction of Warmingham Moss northbound WCML embankment and engineering earthworks associated with Footpath Crewe 29/1 accommodation overbridge will result in the permanent loss of 0.9ha (30%) of an unnamed woodland east of Moss Lane. The loss of

this woodland will have a permanent adverse effect that is significant at up to district/borough level.

7.4.16 Construction of a maintenance access route and installation of security fencing will result in the permanent loss of 600m^2 (3%) of semi-natural broadleaved woodland at Larch Wood. The loss of this woodland will have an adverse effect that is significant at district/borough level.

7.4.17 Construction of a maintenance access route will result in the permanent loss of 300m^2 (6%) of semi-natural broadleaved woodland at Burnt Covert. The loss of this woodland will have an adverse effect that is significant at up to district/borough level.

7.4.18 Realignment of the A530 Nantwich Road associated with construction of Crewe North RSD in the Wimboldsley to Lostock Gralam area (MA02) will result in the permanent loss of 0.5ha (50%) of semi-natural broadleaved woodland north of Newfield Hall Farm. Loss from the Hough to Walley's Green area will account for 0.3ha of the loss with the remainder of the loss (0.2ha) in the Wimboldsley to Lostock Gralam area (MA02). The loss of this woodland will have a permanent adverse effect that is significant at up to district/borough level.

Grassland

7.4.19 Works associated with the construction of Crewe tunnel north portal, including the Crewe tunnel north main compound and associated site haul routes, will result in the permanent loss of 2ha (100%) of semi-improved acid grassland at Coppenhall and 0.8ha (67%) of semi-improved neutral grassland at Coppenhall Moss. The loss of these grasslands will result in a permanent adverse effect that will be significant at up to district/borough level.

7.4.20 Construction of Coppenhall Moss cutting and Coppenhall Moss south embankment will result in the permanent loss of 2.6ha (60%) of marshy grassland and semi-improved neutral grassland within Moss Bridge Marsh LWS. A further 800m^2 (2%) will be lost from the LWS to facilitate new fencing and public right of way diversions in this area. A site haul route and temporary material stockpile area will result in the loss of an additional 2.9ha of marshy grassland and semi-improved neutral grassland habitat located adjacent to the LWS. The loss of this marshy grassland and semi-improved neutral grassland will result in a permanent adverse effect that will be significant at up to county/metropolitan level.

7.4.21 Construction of Warmingham Moss northbound WCML embankment will result in the permanent loss of 0.3ha (27%) of semi-improved neutral grassland habitat at Spring Plantation Grassland LWS. Works associated with the diversion of overhead power lines will result in the further loss of 600m^2 (5%) of this grassland. The loss of this semi-improved neutral grassland will result in a permanent adverse effect that will be significant at up to county/metropolitan level.

Hedgerows

7.4.22 On a precautionary basis, it is assumed that all hedgerows (28km) within the land required for the construction of the Proposed Scheme in the Hough to Walley's Green area will be

permanently lost and the remaining hedgerow network will be fragmented. This includes the native species-rich hedgerows at Spring Plantation Grassland LWS. 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 habitat creation. The combined loss and severance of hedgerows within the land required for the construction of the Proposed Scheme will have a permanent adverse effect that is significant at county/metropolitan level.

Watercourses

7.4.23 The Crewe tunnel will pass beneath both Gresty Brook and Valley Brook. 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, smaller watercourses, including Hoggins Brook, will be permanently realigned or culverted, reducing the connectivity of the habitat corridors associated with these watercourses. The habitat loss and reduction in connectivity will result in a permanent adverse effect that is significant at up to district/borough level.

Water bodies

7.4.24 On a precautionary basis it is assumed 17 of the 21 ponds located within the land required for the construction of the Proposed Scheme in the Hough to Walley's Green area will be permanently lost. This total, however, includes some ponds that are likely to be retained, such as those located within the land required for overhead line diversions/realignments. It is assumed that four ponds within land required for habitat creation will be retained. 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 construction of the Proposed Scheme will 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

7.4.25 No ancient trees will be affected by the construction of the Proposed Scheme in the Hough to Walley's Green area. It is assumed that all veteran trees recorded within the land required for the construction of the Proposed Scheme in the Hough to Walley's Green area will be permanently lost. Veteran trees are an irreplaceable resource and their permanent loss will result in a permanent adverse effect that is significant at the national level in each case. Where reasonably practicable, measures will be taken to protect and retain veteran trees within and adjacent to the land required for the construction of the Proposed Scheme to reduce the number that will be lost. On a precautionary basis, veteran trees are assumed to be lost as a result of:

- works associated with construction of Coppenhall Moss South embankment and Warmingham Moss southbound WCML embankment, which will result in the loss of an unknown number of veteran crack willows within the hedge line along the northern field boundary of Moss Bridge Marsh LWS; and

- works associated with construction of Warmingham Moss northbound WCML embankment and Warmingham Moss southbound embankment No. 1, which will result in the loss of an unknown number of veteran crack willows along the southern field boundary of Spring Plantation Grassland LWS.

Species

Aquatic macro-invertebrates

7.4.26 The pond north of Parkers Road, Moss Bridge, known to support a regionally important population of lesser silver water beetle, and a further potentially suitable pond 25m away are located within land that has been identified for the purpose of grassland habitat creation, as part of the Proposed Scheme. Therefore, it will be possible to retain these ponds and avoid any direct impacts on this population. Any potential indirect effects on this population will be controlled through implementation of measures set out in the draft CoCP such that the effects will not be significant. Measures in the draft CoCP that would be implemented include protection of retained habitat, provision of appropriate watching briefs to be implemented during construction works and adopting the good working practices for pollution prevention.

7.4.27 The presence of marshy grassland and drainage ditches within and adjacent to Moss Bridge Marsh LWS may support a potentially notable aquatic macro-invertebrate assemblage. The removal of these habitats for the construction of Coppenhall Moss south embankment and Warmingham Moss southbound WCML embankment with associated landscape earthworks, site haul route and a temporary material stockpile area will result in a permanent adverse effect on the assemblage, if present, that would be significant at up to district/borough level.

Amphibians

7.4.28 There are two populations and 12 meta-populations of great crested newt within the Hough to Walley's Green area where habitat loss resulting from the construction of the Proposed Scheme would result in significant adverse effects at up to the county/metropolitan. These are as follows:

- a meta-population (GCNMP 1.1.1) of great crested newt in a network of 71 ponds to the south-east of Hough;
- a meta-population (GCNMP 1.1.3) of great crested newt in a network of 14 ponds to the east of Shavington;
- a meta-population (GCNMP 1.1.4) of great crested newt in a network of 23 ponds to the south of Wistaston;
- a meta-population (GCNMP 1.1.5) of great crested newt in a network of 10 ponds to the north of Basford;
- a meta-population (GCNMP 1.1.6) of great crested newt in a network of 10 ponds to the north of Weston;

- a meta-population (GCNMP 1.1.8) of great crested newt in a network of 10 ponds to the west of Stowford;
- a meta-population (GCNMP 1.1.12) of great crested newt in a network of eight ponds to the west of Woolstanwood;
- a meta-population (GCNMP 1.1.15) of great crested newt within a network of 31 ponds north-east of Crewe;
- a meta-population (GCNMP 1.1.16) of great crested newt in a network of six ponds to the north-east of Crewe;
- a population (GCNP 1.1.17) of great crested newt in a network of three ponds to the north of Crewe;
- a meta-population (GCNMP 1.1.18) of great crested newt in a network of nine ponds to the north of Crewe;
- a meta-population (GCNMP 1.1.19) of great crested newt in a network of 130 ponds to the north of Crewe and south-east of Middlewich;
- a meta-population (GCNMP 1.1.20) of great crested newt in a network of 56 ponds to the north of Crewe to Walley's Green; and
- a population (GCNP 1.1.22) of great crested newt in a network of three ponds located west of Walley's Green.

7.4.29 Of the 21 ponds within the land required for the construction of the Proposed Scheme that require survey within the Hough to Walley's Green area, 14 have been confirmed as supporting great crested newt and two have been found not to support this species. The remaining five have not been surveyed due to access constraints and are assumed to support populations of great crested newt and the loss of the ponds supporting these populations could result in a permanent adverse effect on amphibian populations that will be, in each case, significant at up to county/metropolitan level.

Bats

7.4.30 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 significant adverse effects on the conservation status of a population will differ depending on the status of the species concerned.

7.4.31 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 and noise 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 will only temporarily deter bats from using foraging and commuting habitats and the implementation of measures that are described in the draft CoCP will reduce potential disturbance effects to a level that is not significant.

7.4.32 Construction of the Proposed Scheme will affect the bat assemblage between Coppenhall Moss and Walley's Green. This includes the loss and fragmentation of bat foraging and commuting habitat which includes hedgerows with mature trees, water bodies and small woodlands, including those alongside the WCML, which has been identified as a key commuting corridor used by this assemblage. Construction of Footpath Crewe 29/1 accommodation overbridge will result in the partial loss of the unnamed woodland east of Moss Lane; works associated with the realignment of an existing gas pipeline will result in the partial loss of Larch Wood; and construction of Walley's Green embankment and realignment of the A530 Nantwich Road will result in the partial loss of Burnt Covert and woodland north of Newfield Hall Farm. Although no roosts have been recorded within the land required for the construction of the Proposed Scheme in this area, it is assumed on a precautionary basis that construction of the Proposed Scheme between Warmingham Moss northbound WCML embankment and Walley's Green embankment will result in the loss of roosts from within these woodlands. It is also assumed on a precautionary basis that construction of the Proposed Scheme in the Hough to Walley's Green area will result in an increase in traffic using the access track at Moat House Farm, resulting in disturbance of occasional roosts of common pipistrelle and brown long-eared bat, located immediately adjacent to the land required for the construction of the Proposed Scheme. The loss and disturbance of these roosts and the partial loss of woodland foraging and commuting habitats will result in a permanent adverse effect to the bat assemblage which will be significant at the county/metropolitan level.

7.4.33 Loss of other suitable habitats within the land required for the construction of 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 an adverse effect on their conservation status.

Birds

7.4.34 Construction of the Proposed Scheme between Crewe tunnel north portal and Walley's Green embankment through the Hough to Walley's Green area will result in the loss of potential barn owl foraging habitat in the form of large areas of arable land, grassland and field margins and the loss of potential roosting sites within mature trees. This loss represents a permanent adverse effect on the potential barn owl populations identified near Coppenhall and near Warmingham, which will be significant at up to county/metropolitan level in each case.

Reptiles

7.4.35 Construction of Coppenhall Moss cutting and Coppenhall Moss south embankment will result in the partial loss of suitable reptile habitat from Moss Bridge Marsh LWS, north of Parkers Road. This site is known to support a breeding population of grass snake. The loss of habitat suitable for this species will result in a permanent adverse effect on the conservation

status of this grass snake population, which will be significant at up to county/metropolitan level.

7.4.36 Construction of Warmingham Moss northbound viaduct will result in the total loss of a small area of habitat, which supports a population of slow worm near Coppenhall Junction, north of Spring Farm and south of Larch Wood. The loss of habitat suitable for this species will result in a permanent adverse effect on the conservation status of this slow worm population, which will be significant at the district/borough level.

Terrestrial invertebrates

7.4.37 The presence of neutral grassland, marshy grassland, hedgerows and scattered scrub within and adjacent to Moss Bridge Marsh LWS may support a potentially notable terrestrial invertebrate assemblage. The removal of these habitats for the construction of Coppenhall Moss south embankment and Warmingham Moss southbound WCML embankment with associated landscape earthworks, site haul route and a temporary material stockpile area will result in a permanent adverse effect on the assemblage, if present, that will be significant at up to district/borough level.

Vascular plants

7.4.38 On a precautionary basis, it assumed that highway work along the A5020 David Whitby Way during the construction of the Proposed Scheme will likely result in the loss of creeping forget-me-not, which is assumed to be present in this location, as identified from desk study data. The loss, or a reduction in number, of this species from this location will result in a permanent adverse effect, which will be significant at up to the district/borough level.

7.4.39 On a precautionary basis, it is assumed that works associated with the construction of Crewe tunnel north portal, including the Crewe tunnel north main compound and associated site haul routes and material stockpiles, will result in the loss of small-leaved lime. This species was recorded during field surveys along Parkers Road. The loss, or a reduction in number, of this species from this location will result in a permanent adverse effect which will be significant at the district/borough level.

Other mitigation measures

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

Habitats

Woodland

7.4.41 The Proposed Scheme will result in the combined loss of 1.3ha of lowland mixed deciduous woodland at an unnamed woodland east of Moss Lane, at Larch Wood, Burnt Covert and at

an unnamed woodland north of Newfield Hall Farm, each of which is significant at the district/borough level.

7.4.42 In accordance with the Ecological Principles of Mitigation in the SMR, a route-wide, integrated strategic approach has been developed to compensate for the loss of woodland. The woodland habitat creation in this area is to compensate for the loss of woodland habitat 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.

7.4.43 Within the Hough to Walley's Green area, 6.7ha of woodland habitat planting will be undertaken to compensate primarily for adverse effects upon non-ancient woodland at locations including the following:

- 2ha to the east of Moss Lane to compensate for the loss of 0.9ha of woodland habitat lost in the vicinity and to enhance ecological connectivity north of existing woodland;
- 1.2ha to connect Larch Wood and Burnt Covert, which will enhance ecological connectivity and help maintain the integrity of both these woodlands. In particular, this will compensate for the loss of 600m^2 of woodland at Larch Wood and 300m^2 of woodland at Burnt Covert;
- 3.6ha to the north of Newfield Hall Farm to compensate for the loss of 0.5ha at the unnamed woodland north of Newfield Hall Farm and to enhance ecological connectivity with other areas of existing woodland in this area. Of this, 2.6ha will be located within the Hough to Walley's Green area and the remaining 1ha will be within the Wimboldsley to Lostock Gralam area (MA02); and
- 0.9ha in two locations north-east of Parkfield and north of Newfield Hall Farm to compensate for the loss of 0.4ha of smaller areas of woodland within the Hough to Walley's Green area.

7.4.44 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 become established, after which the overall effects on woodland will be reduced to a level that is not significant.

7.4.45 Landscape mitigation planting will provide some additional benefits to wildlife and will help to connect areas of higher quality habitat.

Grassland

7.4.46 In accordance with the Ecological Principles of Mitigation in the SMR a route-wide, integrated strategic approach has been developed to compensate for loss of grassland. The species-rich grassland creation in this area is required to compensate for the loss of grassland habitat in the local area as well as to ensure that the populations of protected and notable species including great crested newts, bats and barn owls are maintained. With these

objectives in mind, where reasonably practicable, the areas of grassland creation have been located so as to increase the size of existing higher quality habitat and to increase connectivity.

7.4.47 Measures to be taken in response to loss of habitat, including lowland meadow and marshy grassland, from within and adjacent to Moss Bridge Marsh LWS and Spring Plantation Grassland LWS will include recreation of damp grassland on areas affected during construction. A combined total of 13ha of additional species-rich grassland will be created on adjacent fields to the north and south of Moss Bridge Marsh LWS and to the south of Spring Plantation Grassland LWS. Details of approaches to grassland habitat creation are provided in the Ecological Principles of Mitigation in the SMR. Due to the extent of habitat creation and measures to ensure the successful establishment, there will be no significant effect on the conservation status of lowland meadow once the habitats have become fully established.

7.4.48 Additional grassland habitat creation within the Hough to Walley's Green area will include 2.2ha to the south of Larch Wood and 3.6ha to the west of Park House Farm, which will compensate for the loss of 2ha of semi-improved acid grassland at Coppenhall and 1.8ha of semi-improved neutral grassland at Coppenhall Moss.

Hedgerows

7.4.49 New hedgerows will be planted as replacement for those lost as a result of the Proposed Scheme. Where practicable, the hedgerows bordering Spring Plantation Grassland LWS that will be impacted will be translocated to the nearest suitable habitat creation areas. A total of 10.1km of new hedgerows will be planted and the species composition will be characteristic of the surrounding area. This represents a net reduction in hedgerow of 17.9km after mitigation, which is a residual adverse effect that is significant at the county/metropolitan level.

Watercourses

7.4.50 Where smaller watercourses are realigned, the channel will be naturalised, where reasonably practicable, 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

7.4.51 At least one pond will be created for every pond lost within the land required for the construction of the Proposed Scheme. New ponds will be established in accordance with the Ecological Principles of Mitigation in the SMR. 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

7.4.52 Where reasonably practicable, measures will be taken to protect the veteran trees that are assumed to be lost. Where loss is unavoidable, the trees will be soft-felled and sections placed within retained habitats to provide a continued deadwood resource. Veteran trees are irreplaceable and the loss of each of these trees represents a residual adverse effect that is significant at the national level.

Species

Aquatic macro-invertebrates

7.4.53 The loss of marshy grassland and ditches that may have the potential to support a notable assemblage of aquatic macro-invertebrates within and adjacent to Moss Bridge Marsh LWS will be addressed through the provision of wet grassland and ponds within ecological compensation areas to the north and south of Moss Bridge Marsh LWS, in proximity to the area of habitat lost. The habitats will be established in accordance with the Ecological Principles of Mitigation within the SMR. Following implementation of these measures, the adverse effect on the potential notable assemblage of aquatic macro-invertebrates within and adjacent to Moss Bridge Marsh LWS will be reduced to a level that is not significant.

Amphibians

7.4.54 Ponds, species-rich grassland and broadleaved woodland included as part of the Proposed Scheme will be designed to compensate for the loss of breeding sites, foraging habitat and places of shelter used by great crested newts and other amphibians. Compensation will be provided within ecological habitat creation areas north of Parkers Road, east of Moss Lane, west of Warmingham Road, south of Larch Wood and west of Park House Farm. Ponds, grassland and woodland will be established in accordance with the Ecological Principles of Mitigation within the SMR. Following implementation, the adverse effects on amphibian populations in the Hough to Walley's Green area will be reduced to a level that is not significant. HS2 Ltd will continue to survey ponds for great crested newt populations, and where it is confirmed that populations are absent then pond and terrestrial habitat provision will be re-assessed.

Bats

7.4.55 To replace roosts that will be lost to construction, artificial roosts will be provided across the Proposed Scheme in accordance with the Ecological Principles of Mitigation within the SMR. The habitat creation measures detailed above in response to habitat loss, including creation of grassland, hedgerows, new ponds and semi-natural woodlands will compensate for those bat foraging habitats lost within the land required for the construction of the Proposed Scheme as detailed below. Following the implementation of these measures, the effects on the bat assemblage between Coppenhall and Walley's Green will be reduced to a level that is not significant.

Birds

7.4.56 Habitat creation measures to be provided to address the adverse effects on barn owls near Coppenhall and Warmingham include the provision of grassland habitat to the north and south of Moss Bridge Marsh LWS and to the south of Spring Plantation Grassland LWS, north-west of Coppenhall; grassland habitat south of Larch Wood; and grassland and wetland habitat near Park House Farm, west of Warmingham. This will provide new foraging opportunities for these barn owls. Once the habitats have become established, the adverse effect resulting from the loss of foraging habitat on barn owl populations near Coppenhall and Warmingham will be reduced to a level that is not significant.

Reptiles

7.4.57 The loss of habitats potentially used by a grass snake population at Moss Bridge Marsh LWS will be addressed through the provision of grassland and ponds within ecological compensation areas to the south and north of Moss Bridge Marsh LWS, in proximity to the areas of habitat lost. This will compensate for the loss of breeding sites, foraging habitat and places of shelter used by grass snakes. The grassland and ponds will be established in accordance with the Ecological Principles of Mitigation within the SMR. Following implementation of these measures the adverse effect on the grass snake population north of Parkers Road at Winton Equestrian Centre LWS and Moss Bridge Marsh LWS will be reduced to a level that is not significant.

7.4.58 The loss of a small area of habitat used by the slow worm population near Coppenhall Junction, north of Spring Farm and south of Larch Wood, will be addressed through the provision of habitats within an ecological compensation area south of Larch Wood, 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 slow worms. The habitats will be established in accordance with the Ecological Principles of Mitigation within the SMR. Following implementation of these measures the adverse effect on the slow worm population near Coppenhall Junction, north of Spring Farm and south of Larch Wood will be reduced to a level that is not significant.

Terrestrial invertebrates

7.4.59 The loss of habitats with the potential to support a notable assemblage of terrestrial invertebrates within and adjacent to Moss Bridge Marsh LWS will be addressed through the provision of species-rich grassland and hedgerows, as well as areas of scrub within ecological compensation areas located to the north and south of Moss Bridge Marsh LWS. These areas will be located immediately adjacent to the area of habitat lost, as well as to the east of Moss Lane. The habitats will be established in accordance with the Ecological Principles of Mitigation within the SMR. Following implementation of these measures the adverse effect on the potential notable assemblage of terrestrial invertebrates within and adjacent to Moss Bridge Marsh LWS will be reduced to a level that is not significant.

Vascular plants

7.4.60 To address the adverse effects on potentially vulnerable vascular plants, where appropriate, translocation will be undertaken of creeping forget-me-not and small-leaved lime. New areas of habitat planting will also include these species where conditions are suitable, and management of the habitats will be appropriate for these species. Following the implementation of these measures, the adverse effects on the populations of these species will be reduced to a level that is not significant.

Badger

7.4.61 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 Ecological Principles of Mitigation within the SMR and the implementation of measures in the draft CoCP. This will include the provision of badger proof fencing and replacement setts where necessary.

Summary of likely residual significant effects

7.4.62 This section describes likely significant residual ecological effects during construction, taking account of the mitigation and compensation proposed.

7.4.63 On a precautionary basis, it is assumed that there will be a net loss in hedgerow of 17.9km, which will result in a permanent adverse residual effect that is significant at the county/metropolitan level. In addition to the mitigation described, opportunities will be sought for additional retention and replacement of hedgerow within the land required for temporary works.

7.4.64 The assumed loss of an unknown number of veteran trees from Moss Bridge Marsh LWS and Spring Plantation Grassland LWS will result in a permanent adverse residual effect that is significant at the national level in each case.

Cumulative effects

The Proposed Scheme and HS2 Phase 2a

7.4.65 There will be no significant cumulative effects during construction as a result of the combination of HS2 Phase 2a and the Proposed Scheme.

The Proposed Scheme and other committed developments

7.4.66 No cumulative effects on ecological receptors have been identified in the Hough to Walley's Green area.

7.5 Effects arising from operation

Avoidance and mitigation measures

7.5.1 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:

- provision of Crewe tunnel will ensure ecological connectivity is maintained along linear features including unnamed woodland at Crewe Station sidings and Basford Brook, Gresty Brook and Valley Brook, avoiding habitat fragmentation and barrier effects and allowing free passage of wildlife along these features; and
- where the route of the Proposed Scheme will cross a watercourse, a culvert or dry tunnel will be provided to allow passage for mammals such as otter and water vole.

Assessment of impacts and effects

7.5.2 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-015-0MA01.

Designated sites

7.5.3 The operation of the Proposed Scheme has the potential to result in collision of wintering wetland birds, one reason for the notification of Sandbach Flashes SSSI, with high speed trains and overhead line equipment. Of the SSSI assemblage, only lapwing are considered vulnerable to this impact (a peak count of 100 birds was recorded between land required for the construction of the Proposed Scheme and Sandbach Flashes SSSI). However, collisions are unlikely; this large flock was recorded on a single occasion, flying at a height of 50-60m. Individuals and pairs of lapwing were recorded infrequently within and between land required for the construction of the Proposed Scheme and Sandbach Flashes SSSI. Once established, landscape mitigation planting along Coppenhall Moss north embankment, as well as planting associated with Crewe North RSD, located within the Wimboldsley to Lostock Gralam area (MA02) will encourage birds to fly higher over the Proposed Scheme and further reduce collision risk. It is therefore considered that the operation of the Proposed Scheme will not adversely affect the wintering bird assemblage and there will be no significant effect on the integrity of Sandbach Flashes SSSI.

Species

Bats

7.5.4 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.

7.5.5 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 which they commonly utilise.

7.5.6 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 roads[61]. However, noise generated from passing trains will be regular but temporary and as such will differ from that resulting from a busy road.

7.5.7 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 route of the Proposed Scheme is in cutting, at ground level or on embankment) at the point the impact occurs.

7.5.8 Although it is possible that there may be infrequent incidental mortality of individual bats from the assemblage between Coppenhall and Walley's Green, due to the availability of alternative foraging and commuting habitat on either side of the Proposed Scheme, including areas of woodland, grassland and wetland creation, this is unlikely to result in a significant adverse effect on the conservation status of the bat assemblages present in the Hough to Walley's Green area.

Birds

7.5.9 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 embankments and are slow moving and are, therefore, likely to be subject to collision with high speed trains. Two pairs of barn owls potentially breeding in the vicinity of the Proposed Scheme near Coppenhall and near Warmingham will be affected. Research undertaken by the British Trust for Ornithology on

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

behalf of HS2 Ltd suggests that there may be effects on barn owls up to 3km away[62]. This means that more barn owls are likely to be affected than those in the vicinity of the Proposed Scheme identified above. This will result in a permanent residual adverse effect which will be significant at up to county/metropolitan level.

Other mitigation measures

7.5.10 A Barn Owl Mitigation Plan will be prepared to identify the measures that can be implemented to help offset the effects on barn owls. As the availability of nesting sites is a limiting factor for this species the provision of additional nest boxes 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

7.5.11 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 of the Proposed Scheme resulting in a residual significant effect at the county/metropolitan level. However, assuming the proposed mitigation measures for barn owl are implemented through liaison with landowners and other relevant stakeholders, the residual effect on barn owl would be reduced to a level that is not significant.

Cumulative effects

The Proposed Scheme and HS2 Phase 2a

7.5.12 Train strike from the operation of HS2 Phase 2a is likely to result in the permanent loss of a pair of barn owls using the territory at Basford Hall, east of Hough. This permanent loss will be significant at the county/metropolitan level[63].

7.5.13 Assessment of the Proposed Scheme has identified two pairs of barn owl potentially breeding in the vicinity of the Proposed Scheme near Coppenhall and near Warmingham that would be affected by operation of the Proposed Scheme, however as these pairs are not predicted to be affected by the operation of HS2 Phase 2a, there will not be a cumulative effect on barn owl at this location.

[62] Pringle, H., Siriwardena, G. & Toms, M. (2016), *Informing best practice for mitigation and enhancement measures for Barn Owls*, British Trust for Ornithology, Thetford.

[63] High Speed Two Ltd (2017), *High Speed Rail (West Midlands – Crewe), Environmental Statement, Volume 2: Community Area report, CA5: South Cheshire*. Available online at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/627569/E17_Volume_2_CA5_South_Cheshire_WEB.pdf.

7.5.14 Therefore, the combined effect during the operation of Phase 2a and the Proposed Scheme will remain significant at the county/metropolitan level.

The Proposed Scheme and other committed developments

7.5.15 No cumulative effects on ecology receptors have been identified from other committed developments in the Hough to Walley's Green area.

Monitoring

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

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

8 Health

8.1 Introduction

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

8.1.2 Engagement with key public health bodies, including Public Health England and local Directors of Public Health, has been undertaken to inform the health assessment process. Consultation with communities, local authorities and parish councils has been ongoing throughout the route design and assessment process, as described in Volume 1, Section 3. This has contributed to the measures identified to avoid and mitigate adverse health effects.

8.1.3 The assessment also draws on health-related information and views expressed in consultation responses from the owners and/or operators of the following affected resources within the Hough to Walley's Green study area:

- Bentley Manor Care Home;
- Sherborne Court Neurological Centre; and
- Oakfield Lodge School.

8.1.4 This section deals specifically with impacts at a local level within the Hough to Walley's Green area. Health effects assessed across the Proposed Scheme as a whole are reported in Volume 3, Route-wide effects, Section 8.

8.1.5 Further details of the health assessment, including the criteria used to assess effects on population health as described in the EIA Scope and Methodology Report (SMR)[64], are contained in Volume 5: Appendix HA-001-0MA01 Health assessment matrix.

8.1.6 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: MA01 Map Book. The Proposed Scheme is described in Section 2.

8.2 Scope, assumptions and limitations

8.2.1 The scope, assumptions and limitations for the health assessment are set out in Volume 1, Section 8 and the SMR.

8.2.2 As set out in the SMR, the health assessment is based on a broad understanding of health, consistent with the World Health Organization (WHO) definition of health as 'a state of

[64] Volume 5: Appendix CT-001-00001, Environmental Impact Assessment Scope and Methodology Report.

complete physical, mental and social well-being and not merely an absence of disease or infirmity'. An individual's health is mostly determined by genetics and lifestyle factors, but for a large enough population many other factors, or 'health determinants', are known to be important, and these factors may be affected by the Proposed Scheme.

8.2.3 The impacts of the Proposed Scheme on a range of environmental and socio-economic 'health determinants' could result in adverse or beneficial effects on health and wellbeing. This process of assessing these effects is documented in the health assessment matrices in Volume 5: Appendix HA-001-0MA01. 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 effects.

8.2.4 The health determinants of relevance within the Hough to Walley's Green area during construction (temporary and permanent impacts) are:

- neighbourhood quality;
- access to green space, recreation and physical activity;
- education; and
- social capital.

8.2.5 One health determinant, access to services, health and social care, has been identified as being relevant within the Hough to Walley's Green area during operation (permanent).

8.2.6 Additionally, health effects that are relevant along the route of the Proposed Scheme as a whole are reported in Volume 3, Route-wide effects, Section 8.

8.2.7 The geographic extent of the health assessment covers those areas where impacts on health determinants are predicted to occur. Health effects arising from impacts on a particular resource may affect communities across a wide area. These effects are described in the report section corresponding to the location of the resource itself. Health effects arising from reduced access to resources, for example as a result of traffic delays, are described in the report section corresponding to the community whose access is restricted.

8.2.8 The health assessment methodology is based on a review of published evidence showing how impacts on health determinants are linked to health effects in a large population. The health assessment is based on a review of evidence linking changes in health determinants to potential health outcomes. This information is presented in Volume 5: Appendix HA-002-00000. The strength of evidence varies; for example, the evidence linking physical activity to health outcomes is strong, whereas the evidence linking social capital with health outcomes is moderate. The strength of evidence does not necessarily determine the importance of a health effect but is an indication of the level of certainty in the assessment. Additionally, there is greater certainty in the prediction of an impact on a health determinant than the consequent effect on health.

8.2.9 There is no established or widely accepted framework for assessing the significant health effects of a development proposal. The SMR sets out a methodology for describing the

impacts on health determinants in terms of the magnitude and duration of the change and the extent of the population exposed to this change. It also draws attention to the strength of evidence that links a change in health determinant with health effects. This framework permits the assessment to describe the impacts on determinants in a largely qualitative manner, with some structure to the relative scale of these impacts to give a sense of the importance of the potential health effects. This does not, however, provide a clear basis for drawing conclusions as to whether a health effect is likely to be 'significant'.

8.3 Environmental baseline

Existing baseline

Description of communities in the Hough to Walley's Green area

8.3.1 The route of the Proposed Scheme will pass beneath the mainly urban settlement of Crewe in tunnel, emerging from Crewe tunnel north portal on the northern edge of Crewe. Other settlements in the area include the villages of Hough, Basford, Chorlton, Weston, Warmingham, Minshull Vernon and Walley's Green. The communities in proximity to the Proposed Scheme are described below. A more detailed description of community facilities is provided in Section 6, Community.

Hough and surrounds

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

8.3.3 Hough is a settlement comprising approximately 350 residential properties. The nearest residential properties are located 600m south-west of the route of the Proposed Scheme. Hough provides several community facilities, including Hough Methodist Church, Hough Village Hall and The White Hart public house.

8.3.4 Crewe and Nantwich Circular Walk is a 47km promoted walking route that circles the towns of Crewe and Nantwich. The walk passes through Weston and Hough in the south, where it is also part of the South Cheshire Way, another promoted route. National Cycle Route 70 also passes through Hough.

Crewe

8.3.5 Crewe comprises approximately 30,000 residential properties. Crewe has many community resources including children's nurseries, primary and secondary schools, and an engineering college. There are several places of worship, community centres, libraries, medical facilities and emergency services facilities. Notable education facilities include Oakfield Lodge School,

which is a pupil referral unit and provides alternative education provision for children who are unable to attend mainstream school.

8.3.6 Within Crewe there are a number of care facilities. Notable facilities within the study area include Bentley Manor Care Home, a residential nursing home for elderly residents requiring physical or mental support, and Sherborne Court Neurological Centre, a specialist health care facility that serves adults of all ages with mental health conditions and physical disabilities. North-west of Crewe is Leighton Hospital, approximately 1.6km from the route of the Proposed Scheme and outside of the study area.

8.3.7 National Cycle Route 451 passes through Crewe; National Cycle Route 551 runs to the south of Crewe. The Crewe and Nantwich Circular Walk follows Footpath Crewe 29/1, Footpath Crewe 12/1, Footpath Minshull Vernon 17/1 and Footpath Leighton 7 to the north of Crewe.

Walley's Green and surrounds

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

8.3.9 Warmingham comprises approximately 100 residential properties and is located to the north-east of the route of the Proposed Scheme. The nearest residential properties are 1.7km from the route of the Proposed Scheme. Bradfield Green, Minshull Vernon and Walley's Green are located on the A530 Middlewich Road running parallel to the west of the route of the Proposed Scheme. Bradfield Green comprises approximately 40 residential properties. The nearest residential properties are 570m from the route of the Proposed Scheme. Minshull Vernon comprises approximately 10 residential properties. The nearest residential properties are 50m from the route of the Proposed Scheme. Walley's Green comprises approximately 30 residential properties and the nearest residential properties are 550m from the route of the Proposed Scheme.

8.3.10 Community facilities in these areas include the Minshull Vernon United Reformed Church, St Peter's Church on the A530 Middlewich Road, Minshull Vernon and the Verdin Arms public house in Walley's Green (located in the Wimboldsley to Lostock Gralam area (MA02)). The Crewe and Nantwich Circular Walk will cross the route of the Proposed Scheme near Warmingham and Minshull Vernon.

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

8.3.11 A review of publicly available health and demographic information has been undertaken to inform the health assessment. The information gathered describes the populations that could be affected by the Proposed Scheme in terms of their key characteristics such as size, distribution, age structure, socio-economic status and health. It enables consideration of the nature of the populations affected and their sensitivity to potential health effects, as well as indicating the prevalence of specific vulnerable groups.

8.3.12 In the communities affected by the Proposed Scheme in the Hough to Walley's Green area, there is a relatively high population density in Crewe compared to the national average. In the other communities there is a relatively low population density compared to the national average.

8.3.13 Public health indicators have been benchmarked by Public Health England[65] to show how a local authority compares to England for each specific indicator. The benchmark is presented on a three-point scale: worse than, similar to and better than the English average. The data provided by Public Health England show that this population has a slightly better health status compared with the English average.

8.3.14 The English Indices of Deprivation[66] rank neighbourhoods from most to least deprived, according to a range of criteria and an overall (combined) ranking. There is a high degree of variation in levels of deprivation in the Hough to Walley's Green area, with neighbourhoods falling within all bands, from 10% most to 10% least deprived.

8.3.15 This area as a whole is considered to be slightly more resilient than the national average with regard to changes in the relevant health determinants. However, there are some vulnerabilities in terms of the health status of the population.

8.3.16 The available data provide detail down to local authority and ward level and enable a profile to be made of the population within the Hough to Walley's Green. The description of the whole population, and the populations within wards, does not preclude the possibility that there will be individuals or groups of people who do not conform to the overall profile.

Future baseline

Construction (2025)

8.3.17 Volume 5: Appendix CT-004-00000 provides details of the developments in the Hough to Walley's Green area that are assumed to have been implemented by 2025. The following committed developments of relevance to the health assessment that would materially alter the future baseline during construction of the Proposed Scheme in this area, are set out in Table 21.

[65] Public Health England (2019), *Local Authority health profiles*. Available online at: https://fingertips.phe.org.uk/profile/health-profiles.

[66] Ministry of Housing, Communities and Local Government (2019), *English indices of deprivation 2019*. Available online at: https://www.gov.uk/government/statistics/english-indices-of-deprivation-2019.

Table 21: Committed developments of relevance to health during construction

Map book reference[67]	Planning reference	Description	How this is considered in the assessment
MA01/210	15/0366N	Location: land to the east of Broughton Road, Crewe, CW1 4NS. Erection of up to 129 homes with associated highways and open amenity space, landscaping and ecological protection zone.	Informing future baseline.
MA01/033	15/1537N	Location: land at Basford East, Crewe. Outline planning application (with all matters reserved) for a mixed-use development comprising residential use (Use Class C3) (up to 325 residential dwellings); employment use (Use Class B1), local centre comprising health centre and community facility (Use Class D1), food/non-food retail (Use Class A1), public house/restaurant (Use Class A4/A3) and associated works including construction of a new access road with access from the Crewe Green Link Road South, creation of footpaths and provision of public open space and landscaping.	Informing future baseline.
MA01/031	LPS2 (Cheshire East Local Plan Strategy)	Location: land at Basford East, Crewe. Mixed use development site comprising up to 19ha of B1 Office Space, 5ha of B2 floor space, 850 homes, new local centre, one primary school, retail provision, public house/restaurant, and community facility.	Potential for cumulative effects.
MA01/324	19/2545N	Location: land at Basford East, Crewe Approval of all reserved matters following outline approval 15/1537N for the infrastructure works at Basford East.	Informing future baseline.
MA01/263	18/5040N	Location: Mill Street and Lockitt Street, Crewe. Outline Planning Application with all matters reserved except for access for the erection of up to 70 dwellings with associated infrastructure.	Informing future baseline.
MA01/330	19/2985N	Location: 142 Earle Street, Crewe, CW1 2AF. Change of Use from residential accommodation to Residential Children's Home (C2).	Informing future baseline.
MA01/411	17/3272N	Location: 41 Mablins Lane, Crewe, CW1 3RF. Proposed demolition of Sunnyside Farm & 41 Mablins Lane and erection of 20 dwellings (4 x 2 bedroom and 16 x 3 bedroom), new access road, car parking and landscaping.	Informing future baseline.

[67] Volume 5, Planning Data/Committed Development Map Book: Maps CT-13-301 to CT-13-304a.

Map book reference[67]	Planning reference	Description	How this is considered in the assessment
MA01/380	18/3256N	Location: The Bungalow, 93 Hall O'Shaw Street, Crewe, CW1 4AD. Full planning permission for the erection of a residential building containing 16 self-contained specialised supported living apartments (Use Class C3), together with associated parking and open space.	Informing future baseline.
MA01/154	LPS11	Location: Broughton Road, Crewe. Local plan allocation: Residential development site that will deliver around 175 homes.	Informing future baseline.
n/a	n/a	HS2 Phase 2a West Midlands to Crewe.	Does not influence the future baseline.

8.3.18 It is assumed that the following committed developments will be implemented and have been included as part of the future baseline and considered in this assessment:

- MA01/210 will result in a residential development located 80m to the east of the land required for the construction of the Proposed Scheme;
- MA01/033 will result in a residential development with a health centre and community facility, located immediately to the east of the land required for construction of the Proposed Scheme;
- MA01/324 will result in a residential development with a health centre and community facility, located immediately to the east of the land required for the construction of the Proposed Scheme;
- MA01/263 will result in a residential development located 220m to the west of the land required for the construction of the Proposed Scheme;
- MA01/330 will result in a residential children's home located 200m to the east of the land required for the construction of the Proposed Scheme;
- MA01/411 will result in a residential development located 350m to the west of the land required for the construction of the Proposed Scheme;
- MA01/380 will result in a development of supported living apartments, located 400m to the east of the land required for the construction of the Proposed Scheme; and
- MA01/154 will result in a residential development located 40m to the east of the land required for the construction of the Proposed Scheme.

8.3.19 The implementation of committed development MA01/031 will result in a residential development, with offices, a school and other facilities. The Proposed Scheme passes through the site, having the potential to result in cumulative effects.

8.3.20 HS2 Phase 2a will be under construction by 2025. It is not considered that the construction of HS2 Phase 2a will inform the future baseline conditions for health in the Hough to Walley's Green area. The combined effects of HS2 Phase 2a and the Proposed Scheme, against a baseline without either phase, have been considered. There will be no cumulative effects as a result of the combination of HS2 Phase 2a and the Proposed Scheme.

Operation (2038)

8.3.21 Volume 5: Appendix CT-004-00000 provides details of the developments in the Hough to Walley's Green area that are assumed to have been implemented by 2038. The following committed developments of relevance to the health assessment during operation in this area are set out in Table 22.

Table 22: Committed developments of relevance to health during operation

Map book reference	Planning reference	Description	How this is considered in the assessment
n/a	n/a	HS2 Phase 2a West Midlands to Crewe.	Does not influence the future baseline.

8.3.22 HS2 Phase 2a will be in operation by 2038. It is not considered that the operation of HS2 Phase 2a will inform the future baseline conditions for health in the Hough to Walley's Green area. The combined effects of HS2 Phase 2a and the Proposed Scheme, against a baseline without either phase, have been considered. There will be no cumulative effects as a result of the combination of HS2 Phase 2a and the Proposed Scheme.

8.4 Effects arising during construction

Avoidance and mitigation measures

8.4.1 Consideration of potential health issues is an integral part of the planning and design of the Proposed Scheme, alongside consideration of other environmental, community and economic issues. Insofar as reasonably practicable, mitigation measures have been incorporated into the design of the Proposed Scheme with the aim of avoiding or reducing adverse effects on people. The locations of construction compounds and site haul routes have been selected to reduce the number of people exposed to construction impacts insofar as reasonably practicable. The mitigation measures incorporated into the design of the Proposed Scheme in the Hough to Walley's Green area are described in Section 2 and include:

- a temporary footbridge at Parkers Road to provide access over the WCML and the Proposed Scheme during the temporary closure of the existing Parkers Road Overbridge; and
- diversion of Footpath Warmingham 16/2 south, between Coppenhall Moss and Leighton, to Footpath Crewe 29/1 accommodation overbridge. Footpath Crewe 13/1 and Footpath Crewe 12/1 will also be diverted.

8.4.2 Contractors will be required to comply with the environmental management regime for the Proposed Scheme, set out in the draft Code of Construction Practice (CoCP)[68], which

[68] Volume 5: Appendix CT-002-00000, Draft Code of Construction Practice.

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

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

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

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

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

Assessment of impacts and effects

8.4.6 Impacts on health determinants resulting from the construction of the Proposed Scheme are presented in the health assessment matrix in Volume 5: Appendix HA-001-0MA01. The health assessment criteria are described within the SMR. Within the assessment matrix, the assessment criteria are applied to determine which impacts are likely to lead to health and wellbeing effects at the population level. These effects are reported in the assessment sections below.

Neighbourhood quality

8.4.7 The neighbourhood quality assessment identifies changes in the character and amenity of neighbourhoods along the route of the Proposed Scheme. It includes public realm such as streets, footpaths, public squares, parks and playing fields. It does not include residential or other private property. The assessment identifies combinations of impacts on two or more of the following environmental factors within the public realm: traffic, noise and vibration, landscape and visual impacts. When these factors are altered people's levels of satisfaction with their living environment may change, which in turn may affect their mental wellbeing. This may include reduced feelings of attachment to, and pride in, their neighbourhood and reduced enjoyment of outside space.

8.4.8 A review of published research evidence linking neighbourhood quality with health and wellbeing can be found in Volume 5: Appendix HA-002-00000. The evidence linking the various aspects of neighbourhood quality with health outcomes ranges from moderate to strong.

8.4.9 The neighbourhood quality assessment uses information from other topics but does not apply the same assessment thresholds, as it is focused on neighbourhoods rather than individual receptors. The construction of the Proposed Scheme will affect neighbourhood quality through impacts such as noise, visual impacts and additional traffic, including heavy goods vehicles (HGVs)[69]. These impacts are described in Section 11, Landscape and visual, Section 13, Sound, noise and vibration and Section 14, Traffic and transport.

8.4.10 Sydney Road, Crewe, is a designated route for construction traffic and is expected to experience a significant increase in HGV traffic movements. Significant HGV traffic effects are expected to combine with significant traffic noise effects on residential properties on Sydney Road, between Crewe Green Roundabout and the railway overbridge, during the peak months of construction. People in this community are likely to experience these effects as changing the quality of their neighbourhood and to regard that change as adverse, in diminishing the amenity of the settlement.

8.4.11 The B5076 North Street, Crewe is a designated route for construction traffic and is expected to experience a significant increase in HGV traffic movements. Significant HGV traffic effects are expected to combine with significant air quality effects. People in this community are likely to experience these effects as changing the quality of their neighbourhood and to regard that change as adverse, in diminishing the amenity of the settlement.

8.4.12 The B5076 Bradfield Road, Crewe is a designated route for construction traffic and is expected to experience a significant increase in HGV traffic movements. Significant HGV traffic effects are expected to combine with significant air quality effects. People in this community are likely to experience these effects as changing the quality of their neighbourhood and to regard that change as adverse, in diminishing the amenity of the settlement.

8.4.13 The construction of Crewe tunnel north portal and Crewe north portal cutting (retained cutting) and the presence of Crewe tunnel north main construction compound will be visible from street level in the vicinity of Broughton Road, Crewe. Construction noise will be noticeable in the daytime for approximately five years and six months, during the evening for two years and four months, and during the night-time for approximately two years and six months. In addition, Broughton Road is a designated route for construction traffic and properties along Broughton Road are expected to experience significant noise effects from traffic. Some properties along Broughton Road will experience significant air quality effects.

[69] HGV traffic effects are where there is a 30% or more increase in HGV traffic movements which have been identified as significant by traffic and transport. The increase in HGV traffic results in a traffic-related severance effect for non-motorised users. They contribute to neighbourhood quality effects on health resources that are located adjacent to the routes that experience the increase in HGV movements.

People in this community 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 diminishing the amenity of the settlement.

8.4.14 The construction of Crewe tunnel north portal and Crewe north portal cutting (retained cutting) will be visible from street level around Wareham Drive in the north of Crewe. Construction noise will be noticeable for approximately six months. People in this community are likely to experience the construction of these features of the Proposed Scheme as changing the quality of their neighbourhood and to regard that change as adverse, in diminishing the amenity of the settlement.

8.4.15 The construction of Coppenhall Moss cutting and Coppenhall Moss south embankment will be visible from street level along Perry Fields, Leighton. Construction noise will be noticeable for approximately five months. People in this community are likely to experience the construction of these features of the Proposed Scheme as changing the quality of their neighbourhood and to regard that change as adverse, in diminishing the amenity of the settlement.

8.4.16 The A530 Middlewich Road, Bradfield Green is a designated route for construction traffic and is expected to experience a significant increase in HGV traffic movements. Significant HGV traffic effects are expected to combine with significant traffic noise effects on approximately 30 residential properties on the A530 Middlewich Road, between the B5076 Flowers Lane and St Peter's Church, during the peak months of construction. People in this community 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 diminishing the amenity of the settlement.

Access to green space, recreation and physical activity

8.4.17 There is moderate evidence to show that access to green space contributes to good mental health, including reduced stress and improved cognitive function and resilience. 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 HA-002-00000.

8.4.18 The route of the Proposed Scheme will intersect some public rights of way (PRoW) in the Hough to Walley's Green area. Effects relating to the severance and diversion of PRoW (public footpaths and bridleways) are described in Section 14, Traffic and transport. Surveys of the user numbers and condition of PRoW have been undertaken and are reported in Background Information and Data[70] (see BID TR-004-00001: Transport Assessment policy

[70] High Speed Two Ltd (2022), High Speed Rail (Crewe - Manchester), *Background Information and Data*. Available online at: https://www.gov.uk/government/collections/hs2-phase-2b-crewe-manchester-environmental-statement.

and data report). Where PRoW and other routes are a 'promoted' destination in their own right as a recreational resource, they are also assessed within the Section 6, Community. Effects on views from PRoW are assessed in Section 11, Landscape and visual effects. PRoW are not identified as sensitive receptors in the assessment of Sound, noise and vibration (Section 13) as they are, by their nature, transitory in their use, with users not staying in any one location for any length of time. However, during construction, the amenity and recreational value of some PRoW will be temporarily reduced due to their proximity to construction activities, as well as other aspects such as changes in the length and appearance, and the addition of features such as underpasses. This may result in some people using alternative routes or, where a suitable alternative is not available, being deterred from using PRoW, leading to adverse effects on wellbeing for some individuals. However, the impacts on PRoW are not considered to reduce access to green space and levels of physical activity to a level that would lead to adverse health effects on the population in the Hough to Walley's Green area.

8.4.19 Construction traffic, including HGVs, will be present on local roads within the Hough to Walley's Green area as described in Section 14, Traffic and transport. The presence of HGVs is likely to deter some non-motorised users (pedestrians, cyclists and equestrians) from using the affected routes, due to concerns about safety and amenity. 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 the possibility that people will choose instead to travel by car, temporarily reducing levels of physical activity and associated health and wellbeing benefits. Given the location of construction traffic routes and the number of HGV movements, it is considered that any reduction in physical activity would be small, and would not lead to adverse health effects on the population in the Hough to Walley's Green area.

8.4.20 The construction of Crewe north portal cutting will require the demolition of the Winton Equestrian Centre, a livery yard situated adjacent to the route of the Proposed Scheme. The centre is open five days a week and provides private riding lessons and livery services, as well as organising regular competitions and show days. Due to the demolition of the buildings, the Winton Equestrian Centre will no longer be able to provide livery services, riding lessons and competitions and therefore may reduce the opportunity for physical activity for equestrians. Other equestrian centres in the local area include Woodside Stables, Oakhanger Riding and Pony Club Centre and Smiths Green Livery and Riding Centre, which may provide alternatives for this form of recreation. However, the permanent loss of this facility is considered to result in an adverse health effect.

Education

8.4.21 There is moderate evidence linking low levels of education with poor mental and physical health. The majority of evidence linking education with health outcomes looks at educational attainment in the context of broader socio-demographic status. Educational attainment influences socio-economic factors such as earnings and home ownership, as well as self-

esteem and lifestyle choices. A review of published research evidence linking education with health and wellbeing can be found in Volume 5: Appendix HA-002-00000.

8.4.22 Health and wellbeing effects resulting from impacts on educational facilities are reported in this section. Health and wellbeing effects associated with construction skills and training are assessed in Volume 3: Route-wide effects, Section 8. Significant effects on education facilities resulting from noise are reported in Section 13, Sound, noise and vibration.

8.4.23 Oakfield Lodge School is a pupil referral unit and provides education for children who have been referred by Cheshire East Council following a permanent exclusion from mainstream education. The school is located on Warmingham Road, approximately 750m west of the Proposed Scheme. Warmingham Road is a designated construction traffic route and is expected to experience a significant increase in HGV traffic movements. Construction works associated with Coppenhall Moss cutting, Coppenhall Moss south embankment and Footpath Crewe 29/1 overbridge will result in significant noise effects. The change in the noise environment may affect educational activities within the school for a period of approximately three years and seven months. These effects may combine to reduce the beneficial wellbeing effects associated with educational attainment.

Social capital

8.4.24 The term 'social capital' refers to the connections between individuals within communities, and the increased likelihood that arises through these networks for individuals to feel valued, to feel a sense of belonging, to have companionship and to support each other. The Office for National Statistics[71] 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."

8.4.25 There is moderate evidence for a link between social capital and mental and physical health outcomes. A change in social capital has the potential to influence the mental health effects that are gained through social contact and support, social participation, reciprocity and trust. Adverse effects on health from changes in social capital could be experienced as a reduction in mental wellbeing or as physiological effects on the body's hormonal and immune systems, with increased susceptibility to mental and physical illness. A review of published research evidence linking social capital with health and wellbeing can be found in Volume 5: Appendix HA-002-00000.

8.4.26 The villages along the route of the Proposed Scheme support small, well-established communities. The size of the temporary construction workforce may be substantial relative to the size of these local communities. Workers will reside at Crewe tunnel north main

[71] Veronique Siegler (2014), *Measuring social capital*, Office for National Statistics. Available online at: https://webarchive.nationalarchives.gov.uk/20160107115718/http://www.ons.gov.uk/ons/dcp171766_371693.pdf.

compound for seven years and three months. During the day, the workforce will be present on construction sites and compounds throughout the area. This includes the main compound and the five satellite compounds in the vicinity of the settlements of Hough, Chorlton, central Crewe and the area immediately north of Crewe. The daily average number of workers at each site will typically be around 50 to 200. The duration of the works at each site will range from four years to eight years and three months. The presence of construction workers is likely to be noticeable outside of the urban area of Crewe, with construction vehicles using assigned local roads to access compounds and workers using facilities such as shops, restaurants and public houses within local settlements.

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

8.4.28 The draft CoCP includes a commitment to produce and implement a community engagement framework and provide appropriately experienced community relations personnel to implement the framework and provide a first point of contact. 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.

Other mitigation measures

8.4.29 HS2 Ltd will engage with local authorities and community representatives to identify measures aimed at fostering and maintaining good relationships between the workforce and local communities. Any measures identified will be included within the community engagement framework as appropriate.

8.4.30 Winton Equestrian Centre will be compensated within the provisions of the Compensation Code if eligible.

8.4.31 HS2 Ltd is continuing to engage with Oakfield Lodge School and Cheshire East Council to identify reasonably practicable measures to help mitigate potential effects identified in the assessment.

Cumulative effects

8.4.32 The assessment has considered whether the cumulative effects of the Proposed Scheme and other committed developments are likely to give rise to additional health effects. No cumulative health effects have been identified.

8.4.33 There will be no cumulative effects on health as a result of the combination of HS2 Phase 2a and the Proposed Scheme.

8.4.34 Cumulative effects may also occur where a number of individual health effects come together within a location, such that a considerable proportion of the population is likely to experience more than one type of health effect. This will place increased stress on those individuals affected and may exacerbate health outcomes associated with the individual effects.

8.4.35 In Crewe, the construction of the Proposed Scheme will affect the neighbourhood quality, green space and some components of social capital. It is expected that a proportion of the population in central Crewe will experience impacts on two or more health determinants during the construction of the Proposed Scheme, and this may therefore result in a cumulative effect on health.

8.5 Effects arising from operation

Avoidance and mitigation measures

8.5.1 Consideration of potential health issues is an integral part of the planning and design of the Proposed Scheme, alongside consideration of other environmental, community and economic issues. Insofar as reasonably practicable, mitigation measures have been incorporated into the design of the Proposed Scheme with the aim of avoiding or reducing adverse effects on people. The mitigation measures incorporated into the design of the Proposed Scheme in the Hough to Walley's Green area are described in Section 2 and include:

- areas of landscape mitigation planting to provide visual screening for residents of properties along Broughton Road and in Coppenhall Moss; and
- noise fence barriers along the route of the Proposed Scheme to provide acoustic screening for residents of properties along Broughton Road and in Coppenhall Moss.

Assessment of impacts and effects

8.5.2 Impacts on health determinants resulting from the operation of the Proposed Scheme are presented in the health assessment matrix in Volume 5: Appendix HA-001-0MA01. The health assessment criteria are detailed within the SMR. Within the assessment matrix, the assessment criteria are applied to determine which impacts are likely to lead to health and wellbeing effects at population level. These effects are reported in the assessment sections below.

Access to services, health and social care

8.5.3 Ground-borne noise from trains passing through Crewe tunnel will be noticeable for residents at the Bentley Manor Care Home and the Sherborne Court Neurological Centre affecting daytime activities and causing night-time sleep disturbance. In addition, some residents at Bentley Manor Care Home may experience changes to their visual environment due to views of Middlewich Street vent shaft and headhouse. Therefore, permanent changes

to the care home and neurological centre's environments are expected, which may be noticeable for some residents. For those affected, this may lead to a reduction in the wellbeing benefits associated with the care home environment.

Other mitigation measures

8.5.4 HS2 Ltd continues to review the design and mitigation in relation to ground-borne noise effects, and any changes will be brought forward during the passage of the Bill in Parliament.

8.5.5 HS2 Ltd will engage with the owners and operators of Bentley Manor Care Home and Sherborne Court Neurological Centre to identify reasonably practicable measures to help mitigate adverse health effects identified in the assessment.

Cumulative effects

8.5.6 No cumulative effects have been identified.

8.5.7 There will be no cumulative effects on health as a result of the combination of HS2 Phase 2a and the Proposed Scheme.

Monitoring

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

8.5.9 Proposals for monitoring of precursors to health effects, such as air quality and noise, are reported in Sections 5 and 13.

8.5.10 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 health assessment are described in the relevant sections of this Volume 2 report.

9 Historic environment

9.1 Introduction

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

9.1.2 Engagement has been undertaken with Historic England, Cheshire East Council, Cheshire Archaeological Planning Advisory Service, Railway Heritage Trust and Canal & River Trust. The purpose of this engagement has been to discuss the assessment approach, to obtain relevant baseline information and to inform the design development and assessment of the Proposed Scheme.

9.1.3 Appendices and Background Information and Data (BID[72]) reports accompany this section of the report. These are:

- Volume 5: Appendix HE-002-0MA01– Summary gazetteer, impact assessment table and archaeological character areas;
- Volume 5: Appendix HE-003-0MA01 – Historic landscape character areas;
- Volume 5, Map Book HE-01 and HE-02 – Heritage assets within the study area and Map Book HE-03 - Archaeological sub-zones;
- BID HE-001-0MA01 – Historic environment baseline report (including a full gazetteer of heritage assets);
- BID HE-004-0MA01 – Historic environment field survey report (geophysical survey), and Map Book HE-004; and
- BID HE-005-0MA01 – Historic environment remote sensing survey report (aerial photograph and LiDAR[73] assessment), and Map Book HE-005.

9.1.4 Heritage assets have been given a Unique gazetteer identifier (UID), for example MA01_0001. These have been allocated to all heritage assets within the gazetteer and are referenced throughout the ES, BID reports and in map books.

9.1.5 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

[72] High Speed Two Ltd (2022), High Speed Rail (Crewe – Manchester), *Background Information and Data.* Available online at: https://www.gov.uk/government/collections/hs2-phase-2b-crewe-manchester-environmental-statement.

[73] LiDAR (meaning 'light detection and ranging') is a surveying method that measures distance to a target by illuminating the target with pulsed laser light and measuring the reflected pulses with a sensor, this can be used to identify archaeological earthwork evidence.

Proposed Scheme can be found in the Volume 2: MA01 Map Book. The Proposed Scheme is described in Section 2.

9.2 Scope, assumptions and limitations

9.2.1 The general scope, assumptions and limitations for the historic environment assessment are set out in full in Volume 1, Section 8 and the EIA Scope and Methodology Report (SMR)[74], including the method for determining the value of a heritage asset and magnitude of impact.

9.2.2 The assessment focuses on the extent to which the Proposed Scheme will affect designated and non-designated heritage assets. The Proposed Scheme could impact heritage assets through the alteration, demolition or removal of the asset, or as a result of changes within the asset's setting, where setting contributes to the value of the asset.

9.2.3 The study area for the assessment of effects on designated and non-designated heritage assets is the land required for the construction of the Proposed Scheme plus 500m on each side in rural areas. This is referred to in the remainder of this section as the 500m study area.

9.2.4 Designated heritage assets within a study area of up to 2km from the land required for the construction and operation of the Proposed Scheme have been considered in relation to potential effects arising from changes within an asset's setting. This is referred to in the remainder of this section as the 2km study area. However, the 2km study area is not included in reporting for utilities and/or highway improvement works in instances where there is very limited potential for significant effects from those works beyond the 500m study area. This is the case in the Hough to Walley's Green area in relation to the highway improvements to the A500 Shavington Bypass, the A51 Middlewich Road and the A530 Middlewich Road between Nantwich and Crewe.

9.2.5 In areas of bored and mined tunnels, the study area for designated and non-designated assets is 100m from the route of the Proposed Scheme. This is referred to in the remainder of this section as the 100m study area. The built heritage assets that lie within the 10mm settlement contour are identified in Volume 5, HE-002-0MA01.

9.2.6 The historic environment methodology includes the consideration of the relevant interactions with other topics, including ecology and biodiversity, landscape and visual, socio-economics, sound noise and vibration, water resources and flood risk, and in-combination climate change impacts. These interactions have been included in the assessment of baseline conditions, impacts and effects.

9.2.7 Where noise is considered, this is within the context of the way in which sound and noise currently contribute to the heritage value of the assets and is not a reference to absolute

[74] Volume 5: Appendix CT-001-00001, Environmental Impact Assessment Scope and Methodology Report.

noise levels or sound, or the noise or vibration impacts on the health and quality of life of people who live in or visit the area.

9.2.8 In the assessment of the Proposed Scheme, each asset is assessed individually, with consideration given to group heritage value where appropriate. This approach to grouping assets has taken account of stakeholder feedback received as part of consultation on the HS2 Phase 2a ES[75] in 2017. In the HS2 Phase 2a assessment, assets were assessed as, and heritage value assigned to, groups of assets, rather than individual assets. As a result, the heritage value assigned to certain asset groups on HS2 Phase 2a may be higher than the heritage value assigned to individual assets in the Hough to Walley's Green area. These assets are identified in BID HE-001-0MA01.

9.2.9 For the purpose of this assessment, it is generally assumed that heritage assets within the land required for the construction of the Proposed Scheme will be removed. Exceptions to this are linear heritage assets (canals and railways) which although partially located within the land required for the construction of the Proposed Scheme will not be removed.

9.3 Environmental baseline

Existing baseline

9.3.1 A full list of data sources used in establishing baseline conditions is provided in BID HE-001-0MA01. In addition to the desk-based assessment, the following surveys have been undertaken in the Hough to Walley's Green area:

- walkover and site reconnaissance from areas of public access or in locations where site access was granted. This was carried out in order to understand the character of the historic landscape; review the nature, condition and setting of known heritage assets; and identify previously unknown assets;
- desk-top analysis of remote sensing data, including LiDAR and aerial photographs (BID HE-005-0MA01); and
- a programme of non-invasive geophysical survey in areas identified as suitable for this survey method and where access was granted (BID HE-004-0MA01).

Designated assets

9.3.2 Designated heritage assets within the 2km study area are described in Volume 5: Appendix HE-002-0MA01. There is one designated asset located partially within the land required for the construction of the Proposed Scheme: the Warmingham Conservation Area (MA01_0009), which is of moderate value.

[75] High Speed Two Ltd (2017), *High Speed Rail (West Midlands – Crewe), Environmental Statement, Volume 5: Technical Appendices, CA5: South Cheshire, Cultural heritage baseline report (CH-001-005)*. Available online at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/628489/E159_CH-001-005_WEB.pdf.

9.3.3 The assets summarised below are located outside of the land required for the construction of the Proposed Scheme but are partially or wholly within the 2km study area:

- four scheduled monuments of high heritage value comprising three medieval moated sites and a medieval stepped cross base;
- one Grade I listed building of high heritage value, comprising a Jacobean mansion house;
- eleven Grade II* listed buildings, all of high heritage value including country houses, and religious and agricultural structures;
- one hundred and seventeen Grade II listed buildings of moderate heritage value, including country houses, and agricultural, religious, educational and railway structures;
- one conservation area of high heritage value and three conservation areas of moderate heritage value;
- one Grade II* registered park and garden of high heritage value; and
- one Grade II registered park and garden of moderate heritage value.

Non-designated assets

9.3.4 The non-designated heritage assets summarised below lie wholly or partially within the land required for the construction of the Proposed Scheme. Only assets where a significant effect is predicted, as described in Section 9.4 and 9.5, are named below.

9.3.5 There is one non-designated asset of high heritage value located within the land required for the construction of the Proposed Scheme, which comprises the water systems associated with a scheduled moated site. There is also one non-designated asset of moderate heritage value within the land required for the construction of the Proposed Scheme, which comprises the non-designated historic elements of Crewe Railway Station.

9.3.6 There are also 13 non-designated assets of low heritage value within the land required for the construction of the Proposed Scheme. These include a possible prehistoric enclosure; a Roman road; a medieval moat and fishponds; post-medieval farmsteads such as Bridge Farm and former farmstead; Parkers Road (MA01_0157); and Moss Bridge Farm, Parkers Road (MA01_0160); below ground archaeological remains associated with industrial and farming activity such as Archaeological Features at Warmingham Moss (MA01_0430); and a collection of assets associated with transport activity including railway lines, structures and embankments.

9.3.7 The non-designated heritage assets summarised below lie wholly or partially within the 500m study area. There are two non-designated assets of high heritage value, comprising two 19th century cemeteries, and one asset of moderate heritage value, comprising the site of a medieval moated manor house, located within the 500m study area. There are 87 assets of low heritage value within the 500m study area. These assets include: a possible medieval moated site and earthworks; an undated field system; several farms and properties which reflect the rural landscape of the area; a chapel; two cemeteries; the former extent of Crewe Hall Park; one branch canal; 20 assets relating to the Grand Junction Railway including

bridges, workers housing, sidings, embankments, sheds and signal boxes; 28 industrial sites; and six Second World War sites.

Historic environment overview

9.3.8 The bedrock geology of the Hough to Walley's Green area is largely formed of mudstone and siltstone with some halite-bearing units (salt) and sandstone. The superficial geology of the area is formed of glacial tills of sandy, silty clay deposited at the end of the last Ice Age. Along the course of rivers and stream valleys, including the River Weaver and River Wheelock, these deposits are overlain by alluvial clay, sands and gravels. Depressions in the glacial till deposits developed wetland environments containing peat deposits known as mosses. Mosses can contain peat deposits that preserve organic remains such as pollen or insects. This partially survives as Crewe Mosslands Historic Landscape Character Area (HLCA) (MA01_HLCA03).

9.3.9 Evidence for Palaeolithic activity in north-west England is scarce because much of the region was on the edge of or under glacial ice. At the end of the glacial period a dramatic environmental change began in Britain. Climatic warming led to a rise in sea levels and a change in vegetation patterns. At this time, the open landscapes were replaced by forests of beech and pine, and other species such as arctic hare and reindeer gave way to boar and deer. There are no recorded assets of the Palaeolithic period within the study area. However, there remains the possibility that kettle holes may contain paleoenvironmental evidence such as pollen, seeds and faunal evidence preserved in peat deposits.

9.3.10 These changes encouraged the development of Mesolithic hunter-gatherer societies, and the subsequent emergence of the early agricultural societies of the Neolithic period. Evidence from these periods is usually characterised by discoveries of stone or flint tools. A Neolithic stone axe was recovered from Coppenhall Moss and a group of worked flints of late prehistoric date, have also been retrieved from Basford (MA01_0437).

9.3.11 The Bronze Age is defined by the introduction of bronze metalwork, changes in pottery style and the increase of single burials. There is also evidence for continuity from the Neolithic period; people continued to live in small settlements of wooden structures and farm on a subsistence basis. Evidence for agricultural practices, settlement and landscapes of monumental or funerary structures (such as burial mounds or stone graves), typical of the Bronze Age, are absent from the 500m study area.

9.3.12 The Iron Age, like the Bronze Age before, was a continuous evolution of the prehistoric period. A hierarchy emerged in society and by the end of the first millennium BC Cheshire had become the territory of the Cornovii tribe. Iron Age sites in Cheshire include field or settlement enclosures surrounded by ditches. A circular ditched enclosure (MA01_0167), identified on aerial photography south of Minshull Hall, may be an enclosure settlement dating to the Iron Age (or possibly later). The first evidence for Iron Age salt production is identified at sites in the Wheelock and Weaver river valleys. Pottery of a type used in salt production has been widely identified at sites across Cheshire and beyond; however, no evidence for this has been identified in the 500m study area.

9.3.13 Much of Britain came under Roman control after AD 43, but Roman influence only started in Cheshire with the expansion of Roman occupation north of the midlands from AD 70. The Roman fortress of Deva Victrix was established at Chester in AD 74 to AD 75. A network of roads spread out across the county including the Roman road from Nantwich to Middlewich (MA01_0168), also named Margary No. 700. This road ran between the settlements at Middlewich and Nantwich, which were the focus of the salt-making industry. South of Crewe there is a potential salt-working site at Shavington. This is indicated by lead salt pans discovered within fields to the south of the Swill Brook, within the southern extent of the study area.

9.3.14 After the withdrawal of Roman rule in the 5th century the region fragmented into several small kingdoms. Throughout the next five centuries the region was influenced by kingdoms in more powerful neighbouring regions. It became part of unified England by the early 10th century. In the early medieval period, archaeological evidence becomes increasingly scarce and knowledge of the period is largely dependent on documentary sources. No archaeological evidence has been found in the 500m study area for this period.

9.3.15 By the medieval period a pattern of towns and villages in the Hough to Walley's Green area was already in existence. The Domesday Survey completed in 1086 records the settlements of Shavington, Weston, Chorlton, Leighton, Coppenhall, Minshull Vernon and Warmingham, as well as the larger settlements of Nantwich and Middlewich. These settlements typically developed around a church and were usually the focus of the parish. The arrival of the Normans marked a change in political and social organisation of the study area through the adoption of the manorial system. This was the organising principle, where the legal and economic power were vested in a lord of the manor. The focus of these manors was often a hall, many of which were surrounded by moats. Moated sites are built between the 12th to 14th centuries in mid-Cheshire. They include the scheduled moated site, fishpond and connecting channel (MA01_0002) and water systems (MA01_0439) at Minshull Vernon.

9.3.16 At the time of the Domesday Survey, subsistence farming was normal in mid-Cheshire, relying on barley, oats and rye and grazing of livestock. Evidence suggests that the Cheshire plains were still sparsely settled and contained heathland and woodland. The pattern of settlement consisted of hamlets and isolated farmsteads from the 12th century until the post-medieval period. Later farms are likely to have developed from earlier farmsteads such as at Bridge Farm and former farmstead, Parkers Road (MA01_0157) and Moss Bridge Farm, Parkers Road (MA01_0160), both located north of Crewe.

9.3.17 Towards the end of the medieval period and during the post-medieval period the mixed farming economy changed to pastoral agriculture based on dairy farming as cheese and butter were sold to growing towns and cities. As a result, much of the medieval open fields were enclosed and by the early 19th century, only vestiges of the former open arable fields survived. The enclosure of Cheshire's wetlands began in the 18th century including the enclosure of the former mosslands at Coppenhall Moss and Warmingham Moss, north of Crewe. This formed the distinctive east-west linear field patterns of the Crewe North Mossland HLCA (MA01_HLCA03), which reflect former peat cutting boundaries known as

moss-rooms. Commercial peat production began in the late-19th century in Cheshire and agricultural improvements increased the pace of this process.

9.3.18 The pattern of settlement established in the medieval period continued into the post-medieval period and the Hough to Walley's Green area retained its rural character until well into the 19th century. The conservation areas of Weston (MA01_0006), Crewe Green (MA01_0007) and Warmingham (MA01_0009), include these villages that survive on the edge of modern Crewe. On the flat plain north of Crewe, rural settlement took the form of isolated rural farmhouses such as Park House, Middlewich Road (MA01_0109) and Parkfield Farm (MA01_0169). This area of Cheshire contains fewer large country houses than further north, which reflects the poorer nature of the agricultural land and the absence of industry such as salt mining which would have funded affluent building projects.

9.3.19 Until the 17th century timber was the predominant building material within the study area. However, across the post-medieval period improvements in production technology and the ready availability of brick making material locally meant that buildings were increasingly built in brick. Initially brick was used on high status buildings as an innovative new material. This was the case at Crewe Hall (MA01_0033) commissioned by Sir Randolph Crewe in the 17th century. Brick was also often used in conjunction with timber framing as an infill material between the timbers. This can be seen at the 17th century Basford Bridge Cottage (MA01_0014). From the 18th century onwards, brick became the prevailing building material for buildings in Cheshire, replacing timber construction.

9.3.20 Transport links within the Hough to Walley's Green area were improved during the post-medieval period as towns and industry flourished in mid-Cheshire and farms were connected to urban markets. The Shropshire Union Canal was formed of several existing canals, and the Middlewich Branch (MA01_0181) was one of the last lengths to be completed between 1827 and 1833. Road improvements saw the A530 Nantwich to Middlewich Road turnpiked in 1835 in order to make it suitable for carriages. The present town of Crewe only came into being with the construction of the Grand Junction Railway (MA01_0179), which was completed in 1837. The Grand Junction Railway was later absorbed into the London North Western Railway Company in 1846. In 1867 a new railway station was built (MA01_0038) and the town continued to develop around the railway including the construction of workers housing, hotels, engine sheds and repair shops.

9.3.21 The railway system was nationalised after the Second World War. The line that is now known as the West Coast Main Line (WCML) was modernised and electrified in stages from 1959 to 1974. The most notable change in the Hough to Walley's Green area during the 20th century was the expansion of the town of Crewe on its outer fringes. This expansion subsumed the rural fringes to the north and south of the town which changed the former rural landscape. The introduction of new infrastructure south of Crewe including the A500 Shavington Bypass, intensified development on the fringes of Weston, Chorlton and Shavington.

Future baseline

Construction (2025)

9.3.22 Volume 5: Appendix CT004-00000 provides details of the developments in the Hough to Walley's Green area that are assumed to have been implemented by 2025. The following committed developments of relevance to historic environment that would materially alter the future baseline during construction in this area, are set out in Table 23.

Table 23: Committed developments of relevance to historic environment during construction

Map book reference[76]	Planning reference	Description	How this is considered in the assessment
MA01/169	n/a	Allocation site for residential development to support the expansion of the new sustainable neighbourhood at Leighton West. The site will deliver around 500 homes.	Informing future baseline.
MA01/170	16/2373N	Location: Land at Flowers Lane, Leighton, Crewe. Outline permission for the construction of up to 400 dwellings, with garaging, parking, public open space and landscaping, new vehicle access and pedestrian accesses, highways work, foul and surface water drainage, infrastructure and all ancillary works.	Informing future baseline.
n/a	n/a	HS2 Phase 2a West Midlands to Crewe.	Informing future baseline. Considered in cumulative effects.

9.3.23 Implementation of land allocation MA01/169 and committed development MA01/170 in Leighton 600m to the west of the route of the Proposed Scheme will result in the loss of approximately 24 hectares of the Crewe Mosslands HLCA (MA01_HLCA03). It will affect the heritage value of the HCLA and its sensitivity. As such, these committed developments have been included as part of the future baseline and considered within this assessment.

9.3.24 HS2 Phase 2a will be under construction by 2025 and will result in new rail infrastructure to the west of the WCML south of Crewe. It will also involve the extension and alteration of station platforms and the construction of new footbridges and lift shafts, within the setting of the 1867 buildings at Crewe Railway Station (MA01_0038). All archaeological work and demolition during HS2 Phase 2a will be completed prior to implementation of the Proposed Scheme. This will inform the assessment of heritage value and impact for these assets. As such, HS2 Phase 2a has been included as part of the future baseline for these assets and considered within this assessment.

[76] Volume 5, Planning Data/Committed Development Map Book: Maps CT-13-301 to CT-13-304a.

9.3.25 The combined effects of HS2 Phase 2a and the Proposed Scheme, against a baseline without either phase, have been considered. The effects arising as a result of the combination of the HS2 Phase 2a and the Proposed Scheme during construction are reported under cumulative effects.

Operation (2038)

9.3.26 Volume 5: Appendix CT-004-00000 also provides details of the committed developments in the Hough to Walley's Green area that are assumed to have been implemented by 2038. The committed developments set out in Table 24 would materially alter the future baseline for historic environment during operation of the Proposed Scheme in this area.

Table 24: Committed developments relevant to historic environment during operation

Map book reference[38]	Planning reference	Description	How this is considered in the assessment
n/a	n/a	HS2 Phase 2a West Midlands to Crewe.	Informing future baseline.

9.3.27 HS2 Phase 2a will be in operation by 2038 and will result in new rail infrastructure to the west of the WCML, altering the future baseline the Proposed Scheme is assessed against. As such, this committed development has been included as part of the future baseline and considered within this assessment.

9.4 Effects arising during construction

Avoidance and mitigation measures

9.4.1 The design of the Proposed Scheme has sought to avoid adverse effects on heritage assets within the land required for construction insofar as reasonably practicable.

9.4.2 Section 8 of the draft Code of Construction Practice[77] 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;
- 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; and
- the use of appropriate equipment and methods to limit ground disturbance and settlement, followed by monitoring, protection and remediation.

[77] Volume 5: Appendix CT-002-00000, Draft Code of Construction Practice.

9.4.3 Landscape earthworks will reduce the effect of changes to the character of the Crewe Mosslands HLCA (MA01_HLCA03).

Assessment of impacts and effects

9.4.4 Impacts on all heritage assets described above have been assessed and are set out in the Impact Assessment Table (Volume 5: Appendix HE-002-0MA01). Only impacts on heritage assets resulting in significant effects are described in the assessment set out below. Effects on Historic Landscape Character Areas are set out in Volume 5: Appendix HE-003-0MA01, and again only the significant effects are described below.

Temporary effects

9.4.5 The temporary construction works, such as excavations and earthworks for construction compounds, storage areas, and diversions of existing roads and services, have the potential to affect heritage assets during the construction period. Heritage assets could be affected as a result of changes within the assets' settings, where setting contributes to the heritage value of the asset. The duration of the activities giving rise to the temporary effect described below are set out in the indicative construction programme in Section 2.3.

9.4.6 No significant effects are expected to occur in the Hough to Walley's Green area as a result of temporary impacts on designated or non-designated heritage assets.

Permanent effects

9.4.7 Permanent construction phase 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 that affect the contribution made by setting to the asset's heritage value.

9.4.8 The following significant effects will occur as a result of permanent physical impacts on heritage assets within the land required for the construction of the Proposed Scheme.

9.4.9 The archaeological features at Warmingham Moss (MA01_0430) are a non-designated asset of low heritage value, located within the land required for the construction of the Proposed Scheme. The asset includes features of possible archaeological origin detected by geophysical survey. The heritage value of the asset is derived from its archaeological interest and potential to yield information about post-medieval and possibly earlier industrial activity within Warmingham Moss. There may also be some limited potential for earlier palaeoenvironmental remains to survive in this location. The archaeological remains will be removed to enable the establishment of the Warmingham Moss southbound viaduct and Warmingham Moss satellite compound. This will constitute a high impact resulting in a moderate adverse significant effect.

9.4.10 Bridge Farm and former farmstead, Parkers Road (MA01_0157) is a non-designated asset of low heritage value, located within the land required for the construction of the Proposed

Scheme. The asset includes a 19th century two storey brick farmhouse (now a house) which occupies the site of an earlier farmstead. The asset does not include the 20th century outbuildings, kennel block, garage and single storey structures. The heritage value of the asset lies in its historic and archaeological interest associated with the late 19th century farmhouse and the former early 19th century farmstead, which provide a physical record of historic farming practices. The farmhouse will be demolished and the archaeological remains associated with the former farmstead will be removed to enable the establishment of the Crewe tunnel north main compound. This will constitute a high impact resulting in a moderate adverse significant effect.

9.4.11 Moss Bridge Farm, Parkers Road (MA01_0160) is a non-designated asset of low heritage value, located within the land required for the construction of the Proposed Scheme. The asset comprises an early to mid-19th century two storey brick farmhouse (now a house) and garden which occupies the site of a former 19th century outbuilding. It does not include the collection of 20th century single storey outbuildings which form the Winton Equestrian Centre. The heritage value of the asset lies in its historic and archaeological interest associated with the late 19th century farmhouse and former outbuilding, which provide a physical record of historic farming practices. The farmhouse will be demolished and the archaeological remains associated with the former outbuilding will be removed to enable the construction of Crewe tunnel north portal (retained cutting). This will constitute a high impact resulting in a moderate adverse significant effect.

9.4.12 The following significant effects will occur as a result of permanent physical impacts on historic landscape character areas within the land required for the construction of the Proposed Scheme.

9.4.13 Crewe Mosslands HLCA (MA01_HLCA03) is of moderate heritage value. It is partially within the land required for the Proposed Scheme. It comprises the former mosslands north of Crewe, which were enclosed between 1790s and 1820s. The area includes five separately identified mosses namely Warmingham, Minshull, Leighton, Coppenhall and Maplin's (also named Merbury). The HLCA derives its heritage value because it retains elements of its historic rural landscape. This includes medieval field systems around Coppenhall Moss and distinctive linear fields, known as moss-rooms around Moss Farm, which represent traces of former post-medieval peat cutting activity. The WCML has led to some localised reorganisation of earlier fields and the expansion of Crewe has introduced residential development along the southern extent of the HLCA. This includes committed developments MA01/169 and MA01/170, which are new residential housing developments on the edge of Crewe within the south-western extent of HLCA. Despite this the HLCA has remained predominantly rural in character. Crewe Northern Connection will interrupt long range views across the surrounding level plain. This will add another element of modern railway infrastructure into the flat topography of this landscape but will be partly mitigated by landscape earthworks. The new infrastructure will also remove the distinct linear field boundaries of the former moss rooms. The presence of the Proposed Scheme will change the character, affect the legibility of the historic landscape and adversely impact the heritage

value of the HLCA. This will constitute a medium impact and a moderate adverse significant effect.

Other mitigation measures

9.4.14 Potential opportunities for further mitigation measures will continue to be considered through detailed design to reduce further the significant effects described above where practicable. These may include the identification of:

- suitable locations for advance planting, to reduce the effects of changes within the assets' setting where setting contributes to the heritage value of the asset; and
- locations where the physical impacts on heritage assets can be reduced through the detailed design of the works.

Summary of likely residual significant effects

9.4.15 The temporary effects of construction activity on the setting of heritage assets have been considered. However, as these effects result from temporary construction activities they are restricted to the duration of those activities and are reversible.

9.4.16 Specific mitigation measures have been incorporated as set out above and taken into account during assessment. Therefore, the residual effects are the same as those reported under permanent construction phase effects.

Cumulative effects

9.4.17 The following cumulative effects on heritage assets during construction have been identified in the Hough to Walley's Green area.

9.4.18 Basford Bridge Cottage (MA01_0014) is an asset of moderate heritage value. The construction of HS2 Phase 2a will cause changes to the setting of this asset, resulting from: the demolition of the existing Newcastle Road overbridge; the closure of an adjoining section of Newcastle Road; the use of construction traffic routes; and the establishment and operation of the Chorlton cutting and Creamery Bridge satellite compounds. These changes constitute a temporary medium adverse impact and a moderate adverse significant effect[78].

9.4.19 Basford Bridge Cottage will experience an additional temporary change to its setting as a result of the Proposed Scheme. This change in setting will be as a result of use of construction traffic routes during construction of the Crewe tunnel south portal, approximately 200m north-west of the asset. This will constitute a temporary minimal adverse impact and minor adverse effect, which is not significant. The combination of HS2

[78] High Speed Two Ltd (2017), *High Speed Rail (West Midlands – Crewe), Environmental Statement, Volume 2: Community Area report, CA5: South Cheshire*. Available online at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/627569/E17_Volume_2_CA5_South_Cheshire_WEB.pdf.

Phase 2a and the Proposed Scheme will, however, result in a temporary medium adverse impact and a moderate adverse cumulative effect, which is significant.

9.4.20 The 1867 buildings at Crewe Railway Station (MA01_0038), an asset of moderate heritage value, will experience a number of permanent non-structural changes as reported in the HS2 Phase 2a ES[79] and AP2 ES[80]. These changes include the extension and alteration of station platforms to accommodate new footbridges, lift shafts and passenger evacuation routes. This will change its setting and adversely impact its heritage value. This will constitute a medium impact and a moderate adverse significant effect.

9.4.21 The 1867 buildings at Crewe Railway Station (MA01_0038) will also experience a potential permanent impact as a result of the Proposed Scheme, owing to its inclusion in the 10mm settlement contour associated with Crewe tunnel. This will constitute a minimal impact and minor adverse effect, which is not significant. The combination of HS2 Phase 2a and the Proposed Scheme will therefore result in a permanent medium impact and a moderate adverse cumulative effect, which is significant.

9.5 Effects arising from operation

Avoidance and mitigation measures

9.5.1 Some of the design measures, as shown on the Map Series CT-06 within the Volume 2: MA01 Map Book, could reduce the operational impacts and effects on heritage assets:

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

Assessment of impacts and effects

9.5.2 The assessment considers the Proposed Scheme once operational; all effects are permanent.

[79] High Speed Two Ltd (2017), *High Speed Rail (West Midlands – Crewe), Environmental Statement, Volume 2: Community Area report, CA5: South Cheshire*. Available online at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/627569/E17_Volume_2_CA5_South_Cheshire_WEB.pdf.

[80] High Speed Two Ltd (2019), *High Speed Rail (West Midlands – Crewe), Supplementary Environmental Statement 2 and Additional Provision 2 Environmental Statement, Volume 2: Community Area report, CA5: South Cheshire*. Available online at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/775955/J14_HS2_Phase_2a_AP2_ES_Volume_2_CA5_South_Cheshire.pdf.

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

9.5.4 Impacts on heritage assets arising from changes in their settings due to the presence of the Proposed Scheme are reported as permanent construction effects. These effects are not repeated but will continue throughout the operation of the Proposed Scheme.

9.5.5 It is predicted that there will be no additional significant effects on these assets during operation.

Other mitigation measures

9.5.6 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 additional planting and noise fencing will be considered as part of the detailed design process.

Summary of likely residual significant effects

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

Cumulative effects

9.5.8 No significant cumulative effects on heritage assets during operation have been identified in the Hough to Walley's Green area. This includes as a result of the combination of HS2 Phase 2a and the Proposed Scheme.

Monitoring

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

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

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 Hough to Walley's Green 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, either from a scientific, historical, mining and mineral exploitation or mineral resources point of view including geological Sites of Special Scientific Interest (SSSI) and Local Geological Sites (LGS), and areas of designated mineral resources. Consideration is also given to petroleum (including gas) prospects and licensing.

10.1.2 Engagement has been undertaken with Cheshire East Council (CEC), the Environment Agency, the Animal and Plant Health Agency (APHA) and local geological interest groups. The purpose of this engagement has been to discuss the Proposed Scheme and potential effects and obtain relevant baseline information. Engagement will continue as part of the development of the Proposed Scheme.

10.1.3 Details of baseline information, conceptual site models (CSM) and risk assessments are outlined in Volume 5: Appendix LQ-001-0MA01. Baseline data relevant to land quality are presented on Maps LQ-01-300 to LQ-01-304a (in the Volume 5, Land quality Map Book).

10.1.4 Maps showing the location of the key environmental features (Map Series CT-10), key construction (Map Series CT-05) and key operational (Map Series CT-06) features of the Proposed Scheme can be found in the Volume 2: MA01 Map Book.

10.1.5 Land contamination issues are closely linked with those involving water resources and waste. Issues regarding water 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).

10.1.6 The Proposed Scheme is described in Section 2.

10.1.7 All distances, lengths and area measurements in this section are approximate.

10.2 Scope, assumptions and limitations

10.2.1 The scope, assumptions and limitations for the land quality assessment are set out in Volume 1, Section 8 and the EIA Scope and Methodology Report (SMR)[81].

10.2.2 In accordance with the SMR, a risk-based approach was undertaken to identify contamination that may have an impact in relation to construction of the Proposed Scheme. To support this, a desk-based assessment has been undertaken for the study area, defined

[81] Volume 5: Appendix CT-001-00001, Environmental Impact Assessment Scope and Methodology Report.

as the land required for the construction of the Proposed Scheme plus a 250m buffer. In the case of groundwater abstractions, this buffer is increased to 1km.

10.2.3 For major above ground utilities, a pre-screening exercise has been completed to determine where these may break ground, or otherwise interact with land quality. In such cases, these are considered in the land quality assessment.

10.2.4 The majority of new and diverted minor utilities will be laid in the boundaries of existing highways within normal road construction layers and soils below. These have been considered in the context of the CSM approach. The lack of contact with nearby potentially contaminated sites, the usual approach to ensuring services are protected from contamination by design and choice of materials and the absence of sensitive receptors within the roadways, reduces the risk of an impact occurring. The potential impacts 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.

10.2.5 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.

10.2.6 The location of the Proposed Scheme was viewed from points of public access initially. In addition, and where permission could be obtained, visits to some potentially key sites have been undertaken to verify desktop information. The details of site visits are provided in Background Information and Data (BID) LQ-002-0MA01[82].

10.2.7 A CSM approach has been used to provide an understanding of the sources and 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.

10.2.8 The minerals assessment is based upon the mineral resources[83] identified in published mineral plans, and existing planning or licensed areas. Any inference of minerals provided by geological maps/reports is excluded (except where these are covered by a published mineral plan).

10.2.9 The geoconservation assessment is based upon local authority and publicly available local geological trust records.

[82] High Speed Two Ltd (2022), High Speed Rail (Crewe – Manchester), *Background Information and Data, Land quality baseline data*, BID LQ-002-0MA01. Available online at: https://www.gov.uk/government/collections/hs2-phase-2b-crewe-machester-environmental-statement.

[83] Defined in the SMR as 'mineral body including aggregates, salt, coal and other hydrocarbons, Petroleum Extraction and Development Licence (PEDLs), Shale Prospective Area (SPA)'.

10.3 Environmental baseline

Existing baseline

10.3.1 Baseline data have been collected from a range of sources including Ordnance Survey mapping, the British Geological Survey (BGS), Coal Authority, Oil and Gas Authority (OGA), CEC, Public Health England, Network Rail, the Environment Agency, Natural England and the APHA records, as well as online sources such as local geological trusts. Further details are given in Volume 5: Appendix LQ-001-0MA01 and BID LQ-002-0MA01, and presented on Maps LQ-01-301 to LQ-01-304a (Volume 5, Land quality Map Book).

Geology

10.3.2 This section describes the underlying ground conditions within the Hough to Walley's Green area. Recent changes in lithostratigraphic classifications by the BGS have been incorporated where appropriate[84].

10.3.3 Table 25 provides a summary of the geology (made ground, superficial and bedrock units) in the study area.

Table 25: Summary of the geology underlying the land quality study area

Category	Geology	Distribution	Formation description	Aquifer classification
Made ground	Made ground	There are likely to be substantial deposits of made ground across the majority of the study area. The depth and nature of fill or reworked ground will depend on historical land uses. There is evidence of historical and more recent authorised landfilling within the area. The BGS geological mapping[85] identifies 'Made Ground (undivided) - Artificial Deposit' to be present associated with the existing railway land from 230m south of the A500 Shavington Bypass to central Crewe.	Artificial ground comprising variable deposits of reworked natural and man-made materials	Not designated
Superficial	Alluvium	Located along the base of the valleys of the Swill Brook, Cheer Brook, Cheney Brook, Gresty Brook, Wistaston Brook, Valley Brook, Leighton Brook, the River Wheelock and Hoggins Brook.	Organic rich clay, silt, sand and gravel	Secondary A
Superficial	River terrace deposits	Present in an isolated strip in the valley of Gresty Brook and an area to the north of Nantwich.	Sand and gravel	Secondary A

[84] British Geological Survey (2014), *Lithostratigraphy of the Pennine Coal Measures.* Available online at: http://www.bgs.ac.uk/lexicon/lexicon.cfm?pub=PMCM.

[85] British Geological Survey (2019), *BGS Geology 50k (DiGMapGN-50) WMS, superficial deposits and bedrock geology*. Available online at: https://www.bgs.ac.uk/products/digitalmaps/digmapgb_50.html.

Category	Geology	Distribution	Formation description	Aquifer classification
Superficial	Glaciofluvial deposits	Present in the area surrounding Weston and Hough, to the south of Crewe and the A500 Shavington Bypass, and in Warmingham.	Sand and gravel	Secondary A
Superficial	Glaciofluvial sheet deposits	Located in the study area to the east of Crewe Station.	Sand and gravel	Secondary A
Superficial	Glacial till	Located across the majority of the study area with the exception of the area to the south of the A500 Shavington Bypass.	Sandy silty clay with gravel. Locally may contain near-surface organic (peaty) deposits	Secondary (undifferentiated)
Bedrock	Mercia Mudstone Group - Wilkesley Halite Member	Located at the southern extent of the study area to Casey Bridge, around Nantwich, and in the east of the study area from Sydney to the north-eastern extent of the study area.	Halite with mudstone	Unproductive strata
Bedrock	Mercia Mudstone Group - Sidmouth Mudstone Formation	Located from Casey Bridge to the northern extent of the study area.	Mudstone, siltstone and sandstone	Secondary B

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

10.3.5 Eight farm burial or pyre sites associated with the 1967/8 and 2001 outbreaks of foot and mouth disease (FMD) are known to be present within the Hough to Walley's Green area based on local authority and APHA records. Such records confirm the farm associated with the burials rather than the exact location of such burials. Older unrecorded sites may also be present from the 1967/8 outbreak. Similarly, anthrax infected cattle burial sites may be present, generally relating to burials over 50 to 100 years ago. However, no records have been found of such burials in the study area. In all cases the records do not provide an exact location for the burial or pyre sites and other unrecorded sites may be present.

Radon

10.3.6 Radon is a radioactive gas formed by the radioactive decay of naturally occurring uranium in rocks and soils. The occurrence of radon gas is shown in the BGS Radon Potential Dataset[86].

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

[86] British Geological Survey (2020), *Radon Potential Dataset*. Available online at: http://www.bgs.ac.uk/radon/hpa-bgs.html. This dataset underpins Miles J.C.H. et al. (2007), *Indicative Atlas of Radon in England and Wales*. Available online at: www.ukradon.org/information/ukmaps.

Groundwater

10.3.8 Four aquifer designations have been identified within the study area, as defined by the Environment Agency. These are as follows:

- the river terrace deposits, alluvium, glaciofluvial deposits and the glaciofluvial sheet deposits are designated as Secondary A aquifers;
- the Sidmouth Mudstone Formation underlying the majority of the study area is designated as a Secondary B aquifer;
- glacial till is designated as a Secondary (Undifferentiated) aquifer; and
- the Wilkesley Halite Member, which underlies the study area to the south of Crewe, is designated as Unproductive Strata.

10.3.9 There are no Source Protection Zones (SPZ) associated with licensed public water supplies, or licensed or unlicensed groundwater abstractions in the land quality study area of 1km from the land required for construction of the Proposed Scheme in the Hough to Walley's Green area.

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

Surface water

10.3.11 The route of the Proposed Scheme will cross a number of main rivers, as described in Section 15, Water resources and flood risk. Further information on the main rivers and watercourses, including unnamed streams, tributaries, drains, ponds and culverts located within the study area are described in Volume 5: Appendix WR-003-0MA01.

10.3.12 Table 26 sets out the surface water abstractions and designations in the land quality study area of 250m from the land required for construction of the Proposed Scheme in the Hough to Walley's Green.

Table 26: Surface water designations and abstractions in the land quality study area

Feature	Details
Surface water abstractions	One at Church Farm, Warmingham for the purpose of general agriculture.
Private water supplies from surface water sources	None
Environment Agency Drinking Water Protected Area – Surface water Safeguard Zone	None

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

Current and historical land use

10.3.14 Current potentially contaminative land uses within the study area include one landfill site, one waste disposal facility and 158 industrial and commercial sites.

10.3.15 Historical land uses identified within the study area with the potential to have caused contamination include six landfill sites, 10 shallow mining sites (comprising brick, clay and sand extraction) and 198 industrial and commercial sites. Infilled pits and ponds may have been filled with a variety of waste materials but have not been licensed.

10.3.16 Table 27 to Table 29 summarise the key current and historical contaminative land uses in the Hough to Walley's Green area. These are categorised into:

- landfill sites;
- mining and mineral sites; and
- industrial, commercial and other sites identified with a high risk of potential contamination.

Table 27: Current and historical landfill sites located within the study area

Name and area reference	Location	Description
British Railways Tip, Tommy's Lane, Crewe (historical landfill) MA01-67	The landfill is located above the route of the Proposed Scheme in tunnel, approximately 200m north of Crewe Station.	Closed landfill. The Environment Agency has indicated they do not hold information on the licensing of the landfill or the wastes deposited. Anecdotally thought to have accepted construction, demolition and building wastes. It has since been partially redeveloped for warehousing and office space. Boreholes in the area indicate that the wastes typically extended to less than 4m below ground level (bgl) although up to 8.8m bgl was recorded in some areas of the site. The Environment Agency historical landfill reference is EAHLD17784.
Warmingham (Hilltop Farm) Brinefield (active waste disposal facility) MA01-221	The landfill is located partially within land required for the construction of the Proposed Scheme, approximately 600m east of the route of the Proposed Scheme to the west of Warmingham.	Active landfill recorded as taking other wastes (construction, demolition, dredgings), operated by British Salt. Waste is deposited in worked salt caverns at depth. Caverns are typically 100m to 150m in diameter at depths of between 200m to 350m below ground level). The Environment Agency landfill reference is EAHLD18038.
Maw Green landfill site, Maw Green Road, Crewe (active landfill) MA01-366	The landfill is located partially within land required for the Proposed Scheme, approximately 1km east of the route of the Proposed Scheme to the north-east of Crewe.	Active landfill. Environment Agency records indicate that waste has been deposited since 1985 and the site is still active. Wastes deposited include inert, industrial, commercial, household and special wastes as well as liquid sludge. It is reported by the Environment Agency to have gas and leachate controls. The Environment Agency historical landfill reference is EAHLD18025.

Name and area reference	Location	Description
Pyms Lane Phase 2 and Rolls Royce Tip (historical landfill) MA01-368	The landfills are located partially within land required for the Proposed Scheme, approximately 2.3km west of the route of the Proposed Scheme to the north of Pyms Lane.	Closed landfills. The Environment Agency has indicated that Pyms Lane landfill accepted mixed solid waste, including inert, industrial, commercial, household and special waste between 1957 and 1986. The Rolls Royce Tip accepted inert waste between 1945 and 1983. The Environment Agency holds no information on licences for either site. The Environment Agency historical landfill references are EAHLD17191 (Pyms Lane) and EAHLD17194 (Rolls Royce Tip).
Crewe Borough Council, Refuse Disposal Works, Pyms Lane Tip, Crewe (historical landfill) MA01-370	The landfill is located partially within land required for the Proposed Scheme, approximately 2km west of the route of the Proposed Scheme to the north of Pyms Lane.	Closed landfill. The Environment Agency has indicated that this landfill site accepted mixed solid waste between 1928 and 1982, including inert, industrial, commercial, and household waste, as well as accepting liquid sludge waste. The Environment Agency holds no information on licences for this site. The Environment Agency landfill reference for the site is EAHLD17189.

Table 28: Current and historical mining and mineral sites located within the study area

Name and area reference	Location	Description
Brick Works, Crewe MA01-132	Located above the route of the Proposed Scheme in tunnel, in the location of the current Cumberland Arena.	Brick field, shown on mapping between 1874 and 1899 but workings still marked until 1958. Now a public recreation ground.
Brick field, Crewe MA01-148	Located 160m east of Crewe Cemetery and Crematorium, 25m east of land required for the construction of the Proposed Scheme.	Brick field, active between 1874 and 1899. Since redeveloped to residential housing.
Britannia Brick Works, Crewe MA01-168	Located 240m north of Crewe Cemetery and Crematorium, 210m south of land required for the construction of the Proposed Scheme.	Brick field, active between 1898 and 1953. Pits have since been infilled, now public open space.

Table 29: Current and historical industrial, commercial and other sites identified with a high risk of potential contamination located within the study area

Name and area reference	Location	Description
Railway land and associated infrastructure MA01-09, MA01-21, MA01-23, MA01-80, MA01-205	Through central Crewe.	Current railways as well as historical works and depots associated with the railway. Infrastructure present since 1874.

Name and area reference	Location	Description
Works industrial estates, depots and coal wharf in Crewe MA01-35, MA01-136, MA01-141	Through central Crewe.	Current industrial estate and depot comprising industrial units, warehousing, tanks, electrical substations and former coal wharf redeveloped to open space in the 1950s.
Former gas works/gasometer with tanks in central Crewe MA01-84, MA01-69	In Grand Junction Retail Park and east of the A5019 Mill Street.	Former gas works and gasometer with tanks present between late 19th century and middle 20th century. Redeveloped into Grand Junction Retail Park and warehousing.
Fuel storage and petrol filling station (various) MA01-37, MA01-42, MA01-53, MA01-98, MA01-126, MA01-137, MA01-180	Various around central Crewe.	Historical and current tanks and petrol filling stations marked on mapping.
Mound of unknown material MA01-184	Alongside existing West Coast Main Line. To the north-west of Coppenhall.	Existing area of raised topography that first appeared on mapping in 1909. Approximately 0.5ha in size.

10.3.17 Contaminants commonly associated with sites in Table 27, Table 28 and Table 29 could include metals, semi-metals, asbestos, organic and inorganic compounds. In addition, infilled pits and landfills could give rise to landfill gases, such as methane or carbon dioxide, and leachate.

Other regulatory data

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

10.3.19 In the Hough to Walley's Green area this includes:

- one Control of Major Accident Hazards (COMAH) site at Warmingham Brinefield;
- six significant pollution incidents;
- one incident on the substantiated pollution incident register, resulting in a significant impact on water;
- fourteen active discharge consents to surface water located within the study area;
- two active discharge consents to groundwater located within the study area; and
- six LWS located within the study area, including four located within, or partially within, the land required for the construction of the Proposed Scheme.

10.3.20 Further details of relevant regulatory data in the Hough to Walley's Green area is provided in Section 5 of BID LQ-002-0MA01.

10.3.21 Further information on ecological designations in the Hough to Walley's Green area is provided in Section 7, Ecology and biodiversity.

Mineral resources

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

Minerals plans

10.3.23 Cheshire County Council was responsible for the overall minerals and waste local plans for the study area. The Cheshire Replacement Minerals Local Plan[87] was adopted in June 1999 and sets out the policies aimed at controlling mineral related developments within the Cheshire East and Cheshire West and Chester Boroughs up to the year 2006. No further revisions of the plan were published by Cheshire County Council prior to its dissolution in 2009. No replacement plans have been published by CEC to date, although it is noted that the Minerals and Waste Development Plan document of the new Cheshire East Local Plan is currently in preparation.

10.3.24 The Cheshire Mineral Resource Information map[88] presents the extent of all mineral extraction planning permissions and brinefields.

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

Sand and gravel deposits

10.3.26 There are several recorded quarries within the study area, namely: sand quarries in glaciofluvial sheet deposits in the south of the study area around Hough and Willaston; and in the very north of the study area around Church Minshull to the north-west and Moston in the north-east. Clay and shale quarries in the Sidmouth Mudstone Formation located in the area north of the A500 Shavington Bypass, to the north of the centre of Crewe, and in the very north of the study area around Lea Green.

10.3.27 However, there are no quarries in the land required for the construction of the Proposed Scheme and no minerals designations associated with sand, gravel and clay in the study area.

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

[88] Norton, GE. et al (2006), *Mineral Resources Information for National, Regional and Local Planning: Cheshire (comprising Cheshire and the Boroughs of Halton and Warrington)*. British Geological Survey Commissioned Report CR/05/090N.

Salt

10.3.28 The Proposed Scheme will be adjacent to two brine extraction areas within the existing Warmingham Brinefield, namely the Hill Top Farm, Warmingham brine extraction permission, and the Hole House Farm brine extraction permission, immediately to the east of Hill Top Farm. The Wilkesley Halite Member is used for salt extraction in the study area.

10.3.29 The following resource designations are recorded in the study area:

- a preferred extension to the Warmingham Brinefield underlying the route of the Proposed Scheme, in the area to the south-west of Warmingham;
- a preferred extension to the Warmingham Brinefield underlying the route of the Proposed Scheme at the northern extent of the Hough to Walley's Green area, to the north-west of Warmingham; and
- the consented Parkfield Farm extension to Warmingham Brinefield which has planning permission for seven salt caverns located underlying land required for construction of the Proposed Scheme.

Coal

10.3.30 Shallow coal (located at less than 50m depth) is not recorded as a resource in the study area.

10.3.31 Deep coal (in some cases, located at more than 1.2km depth) is recorded as a resource in the study area. However, available records from the Coal Authority show that the Proposed Scheme will not be located in areas of recorded current or historical underground coal mining activities. As a low value resource, without a specific designation (e.g. MSA), coal is not considered further as part of the assessment.

10.3.32 The study area is not located within a Coal Mining Reporting Area or Development High Risk Area.

Petroleum Exploration and Development Licences/Hydrocarbons

10.3.33 The OGA indicates that study area of the Hough to Walley's Green area includes three PEDL areas: PEDL 292, PEDL 293, and PEDL 295. The PEDL areas are associated with extraction wells for conventional oil and gas. However, none of the extraction wells associated with the PEDL are located in the study area. The study area is also within a shale prospective area (SPA).

Geoconservation resources

10.3.34 No geological SSSI or LGS sites have been identified within the study area. Therefore, no assessment of geoconservation resources has been undertaken.

Receptors

10.3.35 The sensitive receptors that have been identified within the study area are summarised in Table 30. A definition of receptor sensitivity is given in the SMR.

Table 30: Summary of sensitive receptors

Issue	Receptor type	Receptor description	Receptor sensitivity
Land contamination	People	Residents of existing properties, and users of nurseries, schools, study centres, play areas, parks and public open space.	High
Land contamination	People	Employees and visitors at commercial areas, retail parks and areas, and hotels.	Moderate
Land contamination	People	Workers at and visitors to industrial premises.	Low
Land contamination	Groundwater	Secondary A aquifers (river terrace deposits, alluvium and glaciofluvial sheet deposits).	Moderate
Land contamination	Groundwater	Secondary (Undifferentiated) aquifer (glacial till), and Secondary B aquifer (Sidmouth Mudstone Formation).	Low
Land contamination	Surface waters	Valley Brook (WFD status moderate).	Moderate
Land contamination	Surface waters	Gresty Brook, Basford Brook, Wistaston Brook (WFD status low) and springs.	Low
Land contamination	Ecological receptors	LWS (Mere Gutter with Basford Brook, Crewe Swift Colony, Mossbridge Marsh, Mossbridge Marsh Veteran Tree, Spring Plantation Grassland and Worsley Covert).	Low
Land contamination	Built environment	Underground structures and buried services.	Low
Impacts on mineral and petroleum (gas) sites (severance and sterilisation)	Mineral sites	Consented extensions to existing brinefields.	Very High
Impacts on mineral and petroleum (gas) sites (severance and sterilisation)	Mineral sites	Preferred extensions to existing brinefields. PEDL (areas 292, 293, and 295) across the whole of the study area.	High
Impacts on mineral and petroleum (gas) sites (severance and sterilisation)	Mineral sites	SPA.	Medium

Future baseline

10.3.36 Volume 5: Appendix CT-004-00000 provides details of the developments in the Hough to Walley's Green area.

10.3.37 In addition to the committed developments outlined in Volume 5: Appendix CT-004-00000, the route of the Proposed Scheme will cross the consented Parkfield Farm extension to

Warmingham Brinefield which has planning permission for seven salt caverns located underlying land required for construction of the Proposed Scheme.

10.3.38 Development of the caverns within the Parkfield Farm area has not taken place at the time of writing. No information relating to planned date of minerals extraction at this planned extension is known.

10.3.39 On this basis the extension is considered not to have been completed by construction or operation of the Proposed Scheme.

Construction (2025)

10.3.40 Volume 5: Appendix CT-004-00000 provides details of the developments in the Hough to Walley's Green area that are assumed to have been implemented by 2025. The following committed developments of relevance to land quality during construction in this area are set out in Table 31.

Table 31: Committed developments of relevance to land quality during construction

Map book reference[89]	Planning reference	Description	How this is considered in the assessment
MA01/031	15/1537N	Location: Basford East, Crewe. Proposed mixed-use development comprising residential use, commercial use, and a local centre comprising health centre and community facility on existing fields.	Informing future baseline.
MA01/170 MA01/169	16/2373N	Location: land at Flowers Lane, Leighton, Crewe. Proposed large residential development with associated infrastructure and green space, access routes and drainage on existing fields.	Informing future baseline.
MA01/263	18/5040N	Location: Mill Street and Lockitt Street, Crewe. Proposed new commercial units and residential properties in a commercial area.	Informing future baseline.
n/a	n/a	HS2 Phase 2a West Midlands to Crewe.	Does not influence the future baseline.

10.3.41 Implementation of committed developments MA01/031, MA01/170 and MA01/263 will likely result in the introduction of residential human health receptors and residential properties to the study area and partially within land required for the Proposed Scheme. As such, these committed developments have been included as part of the future baseline and are considered in this assessment.

[89] Volume 5, Planning Data/Committed Development Map Book: Maps CT-13-301 to CT-13-304a.

10.3.42 HS2 Phase 2a will be under construction by 2025. It is not considered that the construction of HS2 Phase 2a will inform the future baseline conditions for land quality in the Hough to Walley's Green area.

Operation (2038)

10.3.43 Volume 5: Appendix CT-004-00000 provides details of the developments in the Hough to Walley's Green area that are assumed to have been implemented by 2038.

10.3.44 There are no additional committed developments of relevance to land quality during operation of the Proposed Scheme, other than those already listed as relevant to construction.

10.3.45 The combined effects of HS2 Phase 2a and the Proposed Scheme, against a baseline without either phase, have been considered. There will be no significant cumulative effects as a result of the combination of HS2 Phase 2a and the Proposed Scheme.

10.4 Effects arising during construction

Avoidance and mitigation measures

10.4.1 The construction assessment takes into account the mitigation measures described in the draft Code of Construction Practice (CoCP)[90]. 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, 11, 13, 14 and 15);
- methods to control spillage and prevent contamination of adjacent areas (sections 5, 11 and 16);
- the management of human exposure for both construction workers and people living and working nearby (sections 5, 7, 11, 13 and 14);
- methods for the storage and handling of excavated materials (both contaminated and uncontaminated) (sections 6, 7, 11 and 15);
- management of any unexpected contamination found during construction (sections 11 and 15);
- a post-remediation permit to work system (Section 11);
- storage requirements for hazardous substances such as oil (sections 5, 11 and 16);

[90] Volume 5: Appendix CT-002-00000, Draft Code of Construction Practice.

- traffic management to ensure that there is a network of designated site haul routes to reduce compaction/degradation of soils (sections 5, 6 and 14);
- methods to monitor and manage flood risk and other extreme weather events which may affect land quality during construction (sections 5 and 16); and
- methods to manage discovery of unknown animal burial pits (Section 6).

10.4.3 The CoCP will require that prior to and during construction, a programme of further detailed investigations, which may include both desk based and site based work, takes place in order to confirm the full extent of areas of contamination. It also requires a risk assessment to be undertaken to determine what, if any, site specific remediation measures are required to allow the Proposed Scheme to be constructed safely and to prevent harmful future migration of contaminants. The investigation and assessment of potentially contaminated sites will be undertaken in accordance with Environment Agency's Land Contamination Risk Management (LCRM) framework[91], based on CLR11[92] and British Standards BS10175[93] and BS8576[94].

10.4.4 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 UK[95]. The preferred option will then be developed into a remediation strategy.

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

Assessment of impacts and effects

10.4.6 Construction of the Proposed Scheme in this area will require earthworks, utility diversions, deep foundations, tunnelling, ground stabilisation and other activities, including the construction of the various viaducts and road infrastructure works. These aspects of the

[91] Environment Agency (2020), *Land Contamination Risk Management (LCRM)*. Available online at: https://www.gov.uk/government/publications/land-contamination-risk-management-lcrm.

[92] Environment Agency (2004), *CLR11 Model Procedures for the Management of Land Contamination*. Available online at: http://webarchive.nationalarchives.gov.uk/20140328084622/http://cdn.environment-agency.gov.uk/scho0804bibr-e-e.pdf.

[93] British Standards Institution (2011), *BS10175+A2:2017 Investigation of Potentially Contaminated Sites*.

[94] British Standards Institution (2013), *BS8576:2013 Guidance on Investigations for Ground Gas.*

[95] Sustainable Remediation Forum UK (2010), *A Framework for Assessing the Sustainability of Soil and Groundwater Remediation.*

Proposed Scheme, along with other construction features, are shown on the CT-05 Map Series in the Volume 2: MA01 Map Book.

Land contamination

10.4.7 In line with the assessment methodology, as set out in the SMR, an initial screening process has been undertaken to identify areas of current or historical contaminative use within the study area and to consider which of these areas might pose contaminative risks in relation to the Proposed Scheme. This includes areas with extensive historical salt mining activities. 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. All areas assessed are shown on Maps LQ-01-300 to LQ-01-304a (Volume 5, Land quality Map Book) and those considered as potentially posing a risk in relation to the Proposed Scheme are labelled with a reference number.

10.4.8 In the Hough to Walley's Green area, 18 sites remain following initial screening to go through to detailed risk assessment and require CSM. The majority of the areas that have undergone the more detailed risk assessments are historical or current landfills, industrial, mining and commercial sites.

10.4.9 CSM 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 within the land required for the construction of the Proposed Scheme;
- the vertical profile of the Proposed Scheme in the vicinity of the site;
- the presence of underlying sensitive groundwater aquifers (Principal or Secondary A) or nearby watercourses; and
- the presence of adjacent residential properties or sensitive ecological receptors.

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

10.4.11 A simple summary of the baseline CSM is provided in Table 32. A more detailed assessment of baseline risk is provided in Volume 5: Appendix LQ-001-0MA01. The baseline risks quoted are those before any mitigation is applied. The assessed baseline risk is based on the information provided at the time of the assessment. Where limited information is available, the assessment is based on precautionary, worst case assumptions and may, therefore, report a higher risk than that which actually exists. A screening assessment of the effects of contamination has been completed by comparing the detailed CSM developed for potential contaminated areas at baseline with construction and post-construction stages. For clarity, 'on-site' means within the land required for the construction of the Proposed Scheme and 'off-site' refers to land beyond this boundary, but within the study area.

10.4.12 Not all sites referenced in Table 27 to Table 29 have been taken further in the assessment following the initial screening. Professional judgement or evidence of redevelopment have

been used to discount sites that were not considered to require more detailed assessment. These sites include:

- the former gas works within the Grand Junction Retail Park (MA01-84, MA01-69) and the British Railways Tip, Tommy's Lane, Crewe (historical landfill) (MA01-67), as the Proposed Scheme is in tunnel in the Mercia Mudstone beneath the sites; and
- the Pyms Lane tips (MA01-368 and MA01-370) and Maw Green landfill site (MA01-366) as only shallow utilities works are proposed within the highway boundary in the vicinity of these sites.

Table 32: Summary of baseline CSM for sites which may pose a contaminative risk in relation to the Proposed Scheme

Category	Site group/ID	Human health risk	Groundwater risk	Surface water risk	Ecosystem risk	Buildings risk
On-site	Railway land. MA01-205	Low to moderate/low	Low	N/A	Very low	Very low to low
On-site	Works. MA01-35	Low to moderate/low	Low	N/A	N/A	Low
On-site	Farm. MA01-190	Low to moderate/low	Low	N/A	N/A	Low
On-site	Historical infilled land. MA01-184	Low to moderate/low	Low	N/A	N/A	Very low to low
Off-site	Tanks, likely for fuel storage, petrol filling stations and power stations. MA01-37, MA01-137, MA01-180	Low to moderate/low	Low	N/A	N/A	Low
Off-site	Former and current works, garages, coal wharf, depot and scrapyards. MA01-09, MA01-28, MA01-136, MA01-139, MA01-141, MA01-146	Low to moderate/low	Low to moderate/low	Low	Very low	Low
Off-site	Cemetery. MA01-149	Very low to low	Low to moderate/low	N/A	N/A	Low
Off-site	Railway land. MA01-21, MA01-230, MA01-234, MA01-235	Low to moderate/low	Low to moderate/low	Low	Very low	Very low to low

N/A means receptor/pathway not present

Temporary effects

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

10.4.14 Where there is no change between the main baseline risk and the main construction risk, the temporary effect significance is deemed to be neutral 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 off-site (i.e. outside the area required for construction).

10.4.15 A worsening risk at the 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.

10.4.16 All of the sites set out in Table 32 have been assessed for the change in impact associated with the construction stage of the work and were found to have no significant effects.

10.4.17 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.

10.4.18 The application of the measures set out in the draft CoCP makes it unlikely that there will be significant adverse effects, but it is considered that there may still be some temporary minor adverse effects during the construction period from ground disturbance in these areas. These temporary minor adverse impacts at the construction stage are not regarded as significant in line with the methodology set out in the SMR.

10.4.19 Construction compounds located in this study area could include the storage of potentially hazardous substances, such as fuels and lubricating oils, and may also be used for temporary storage of potentially contaminated soils. Control and mitigation measures are contained within the draft CoCP include measures to manage the risks associated with the storage of such materials resulting in no significant effects.

Permanent effects

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

10.4.21 The magnitude of the permanent effects and their significance have been determined by assessing the change in risk between the main baseline risk and the main post-construction risk. Therefore, where there is no change between the main baseline risk and the main post-construction risk, the permanent effect significance is deemed to be neutral even if the risk is assessed to remain as high. This will be the case where the construction of the Proposed Scheme will not alter the risks from an existing potentially contaminated site that is outside

the land required for the construction of the Proposed Scheme. As noted above, a worsening will result in negative effects and an improvement will result in positive effects.

10.4.22 All of the sites set out in Table 32 have been assessed for the change in impact associated with the post-construction stage of the work and were found to have no significant effects.

10.4.23 Where remediation is carried out on sites identified within the land required for the construction of the Proposed Scheme, there will in most instances, be overall minor beneficial effects, which are not considered to be significant. Additional site-specific permanent remediation measures, which would focus on source removal, pathway breakage or receptor protection, will be developed during the detailed design stage if required. These measures will make sure risks to human health and property from gas and vapours in the ground will be controlled to an acceptable level.

Mineral resources

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

10.4.25 The route of the Proposed Scheme will cross a planning permission for underground salt extraction and a preferred extension to the controlled brinefield (Warmingham Brinefield at Hill Top Farm). These minerals sites are located within the land required for the construction of the Proposed Scheme from the north-west of Coppenhall Moss to the north of the study area.

Temporary effects

10.4.26 The following section outlines the potential temporary effects arising during the construction of the Proposed Scheme.

10.4.27 Temporary adverse effects may occur where construction compounds will be located within the proposed mineral extraction area. In such cases, there will be a temporary sterilisation of the resource during construction works, but this is not considered to represent a significant effect and the resource will not be lost permanently.

Salt deposits

10.4.28 There are no construction compounds located in the preferred extensions to Warmingham Brinefield and the consented Parkfield Farm extension to Warmingham Brinefield and therefore there will be no temporary effects on salt deposits.

Petroleum Exploration and Development Licences/Hydrocarbons

10.4.29 The land required for the construction of the Proposed Scheme intersects an area underlain by three PEDLs and the Bowland Shale prospective area, all licensed by the OGA. The effect

of construction of the Proposed Scheme on the identified PEDLs and SPA will be negligible. The PEDLs identify hydrocarbons resources present deep underground, specifically, potential sources of shale gas. The construction of the Proposed Scheme is unlikely to place a constraint on future exploitation of potential sources of shale gas.

Summary of temporary effects

10.4.30 Table 33 sets out a summary of the temporary effects identified for mineral resources.

Table 33: Summary of temporary effects for mineral resources

Site name	Status	Description	Sensitivity/ value	Magnitude of impact	Effect and significance (Y/N)
Parkfield Farm extension to Warmingham Brinefield	Mineral site	Consented extension to the controlled brinefield at Warmingham.	Very high	Negligible	Negligible (N)
PEDL 292, PEDL 293, PEDL 295	PEDL	Petroleum exploration and development licence areas.	High	Negligible	Negligible (N)
Shale gas	SPA	SPA for Shale gas	Medium	Negligible	Negligible (N)

10.4.31 There will be negligible temporary effects on the mineral resources, which are not significant.

Permanent effects

10.4.32 The following section outlines the potential permanent effects resulting from the construction of the Proposed Scheme.

Salt deposits

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

10.4.34 The Parkfield Farm extension to Warmingham Brinefield has planning permission for seven salt caverns. The route of the Proposed Scheme could impact on the viability of four of these caverns. This could represent a moderate impact (as a result of major loss of this resource), on a very high sensitivity receptor resulting in a moderate adverse effect, which is significant.

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

Petroleum Exploration and Development Licences/Hydrocarbons

10.4.36 The effects of the Proposed Scheme on the identified PEDL and SPA will be negligible as it is unlikely that the Proposed Scheme would place a constraint on future exploitation of potential sources of shale gas or other forms of hydrocarbon resource. This is due to the

large extent of the PEDL and SPA, and the limited area of land that would restrict potential well locations.

Summary of permanent effects

10.4.37 Table 34 sets out a summary of the permanent effects identified for mineral resources.

Table 34: Summary of permanent effects for mineral resources

Mineral resource	Status	Description	Sensitivity/ value	Magnitude of impact	Effect and significance (Y/N)
Parkfield Farm extension to Warmingham Brinefield	Mineral site	Consented extension to the controlled brinefield at Warmingham.	Very high	Moderate	Moderate adverse (Y)
Warmingham Brinefield preferred extensions	Mineral site	Preferred extensions to the controlled brinefield at Warmingham.	High	Minor	Minor adverse (N)
PEDL 292, PEDL 293, PEDL 295	PEDL	Petroleum exploration and development licence areas	High	Negligible	Negligible (N)
Shale gas	SPA	SPA for Shale gas	Medium	Negligible	Negligible (N)

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

10.4.39 However, there will be a moderate adverse effect on the proposed salt caverns associated with the Parkfield Farm extension to Warmingham Brinefield, which is significant.

Geoconservation sites

10.4.40 No geoconservation areas such as SSSI or LGS are present in the study area.

Other mitigation measures

10.4.41 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. These measures will ensure that risks to people, property and environmental receptors from contaminants in the ground 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 ground gas and leachate.

10.4.42 Mitigation of the effects on salt and brine mineral resources will need to be agreed between HS2 and the mineral resource owner/operator. No mitigation of the effects of other mineral resources are required.

Summary of likely residual significant effects

10.4.43 On a precautionary basis, significant residual adverse effects have been identified with respect to sterilisation of the salt resources associated with the Parkfield Farm extension to Warmingham Brinefield. For all other sites, and based on the information currently available and with the application of the mitigation measures detailed above, no likely significant residual effects are anticipated with respect to land quality.

10.4.44 Where remediation at contaminated land sites is undertaken there may be significant beneficial residual effects.

Cumulative effects

10.4.45 Volume 5: Appendix CT-004-00000, sets out the committed developments that have been considered in the assessment of cumulative effects.

10.4.46 Based upon the review of committed development sites, it is assessed that there will be no significant cumulative effects arising from the construction of the Proposed Scheme with respect to land quality.

10.4.47 There will be no significant cumulative effects during construction with respect to land quality as a result of the combination of HS2 Phase 2a and the Proposed Scheme.

10.5 Effects arising from operation

10.5.1 Users of the Proposed Scheme (i.e. rail passengers) will be 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 to be 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 will include Cowley Way vent shaft auto-transformer station and Crewe tunnel north portal auto-transformer station. Fuel and oil storage tanks, auto-transformer stations and substations can, in principle, be a source of contamination through accidental discharge or leaks of coolant. However, in common with other modern infrastructure development, secondary containment appropriate to the level of risk will be included in the installed design.

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

Other mitigation measures

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

Summary of likely residual significant effects

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

Cumulative effects

10.5.7 There will be no significant cumulative effects during operation with respect to land quality, including cumulative effects as a result of the combination of HS2 Phase 2a and the Proposed Scheme.

Monitoring

10.5.8 Volume 1, Section 9 sets out the general approach to environmental monitoring during operation of the Proposed Scheme. 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. During the operational phase, monitoring works for groundwater and landfill gas will continue, where required. Monitoring requirements may include water quality, air quality and/or landfill bulk and trace gases, depending on the site being considered.

11 Landscape and visual

11.1 Introduction

11.1.1 This section of the report presents the assessment of the likely significant landscape and visual effects within the Hough to Walley's Green area. It summarises the baseline conditions found within and around the route of the Proposed Scheme and describes the likely impacts and significant effects during construction and operation on landscape and visual receptors.

11.1.2 The operational assessment section refers not just to the running of the trains, vehicles on roads and any associated lighting but also the presence of the new permanent infrastructure associated with the Proposed Scheme.

11.1.3 Engagement with Cheshire West and Chester Council (CWCC), Cheshire East Council (CEC) and Canal & River Trust has been undertaken. The purpose of this engagement has been to discuss the assessment methodology, the extent of the landscape and visual study area, the extent of the landscape character boundaries and the locations of visual assessment and verifiable photomontage viewpoints.

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-001-0MA01, which comprises the following:

- Part 1: Engagement with technical stakeholders;
- Part 2: Landscape character assessment;
- Part 3: Visual assessment;
- Part 4: Assessment matrices; and
- Part 5: References.

11.1.5 The Proposed Scheme is described in Section 2. The Volume 2: MA01 Map Book shows the locations of key environmental features (Map Series CT-10) and the key construction (Map Series CT-05) and operational (Map Series CT-06) features of the Proposed Scheme. It also shows the locations of landscape and visual impact mitigation measures (Map Series CT-06), viewpoints that will be significantly affected at the construction (Map Series LV-03) and operation (Map Series LV-04) phases and landscape character areas (LCA) that will be significantly affected at the construction and operation phases (Map Series LV-02).

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

11.2 Scope, assumptions and limitations

11.2.1 The scope, key assumptions and limitations for the landscape and visual assessment are set out in full in Volume 1 (Section 8) and the EIA Scope and Methodology Report (SMR)[96].

11.2.2 Surveys were undertaken during the following periods to inform the landscape and visual assessment:

- summer surveys from July to September in 2017, 2018, 2019 and 2020; and
- winter surveys in February and March in 2018, 2019, 2020 and 2021.

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

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

11.2.5 Landscape and visual receptors within approximately 1.5km of the centre line of the Proposed Scheme have been assessed as part of the study area. Where important receptors fall just beyond the ZTV, professional judgement has been used in recording and assessing these. Long distance views of up to 2km have been considered at settlement edges, such as at Warmingham and Bradfield Green.

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

11.2.7 Professional judgements on landscape value are provided in the baseline descriptions and judgements on susceptibility of the landscape to the Proposed Scheme and overall

[96] Volume 5, Appendix CT-001-00001, Environmental Impact Assessment Scope and Methodology Report.

landscape sensitivity are provided as part of the assessment of effects on each significantly affected LCA.

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

11.2.9 It has been assumed that all vegetation within the land required for construction of the Proposed Scheme will be removed during construction unless stated otherwise. This excludes areas included only for the purpose of mitigation planting. Removed vegetation will be reinstated insofar as is reasonably practicable and would provide screening and integration benefits by year 15.

11.2.10 It has also been assumed that with respect to utilities and utility decommissioning, it is likely that the majority of existing vegetation can be retained. Vegetation will be removed along new utility lines, based on easement guidance from specific utility companies. All vegetation removed during utilities construction work will be reinstated insofar as is reasonably practicable. The assessment has been based on the assumption that any reinstatement planting will provide integration benefits by year 15. Works associated with underground utilities within highways will follow the principles set out in the draft Code of Construction Practice (CoCP)[97] and existing street trees and property boundary vegetation will be retained insofar as is reasonably practicable.

11.3 Environmental baseline

Existing baseline

Landscape baseline

11.3.1 The study area extends from the village of Hough, on the rural southern fringe of Crewe, to Walley's Green in the north of the area. It is a lowland agricultural landscape of generally flat or gently undulating farmland surrounding the urban extents of Crewe. Typical of much of the Cheshire landscape, it forms part of a wider lowland plain broadly separated by sandstone ridges and crossed by shallow river valleys that converge north and west towards Northwich and the Mersey Estuary.

11.3.2 The landscape character of the Cheshire plain owes much to its glacial origins, with an underlying geology rich in rock salt covered by a thick layer of glacial till and clay soils. Increases in wealth from the 12th century onwards were based on pastoral agriculture including dairy farming, accompanied by the growth of the salt industry in market towns including Nantwich and Middlewich. Medieval and post-medieval industrial activity from salt extraction led to further urban expansion of these centres, while the agricultural landscape visible today comprises a mixture of medieval and post-medieval field enclosure, the latter

[97] Volume 5, Appendix CT-002-00000, Draft Code of Construction Practice.

being of medium and large fields that were enclosed for dairy farming during the agricultural revolution. Isolated 17th century farmhouses reflect this pattern of land enclosure.

11.3.3 The construction of the Shropshire Union Canal in the late 18th century for the transport of pottery, coal and salt played a significant part in the industrial transformation. The later advent of rail led to the urban expansion of Crewe as a settlement at a major railway junction in the 1840s. Rail corridors, particularly the West Coast Main Line (WCML), are a feature of the open landscapes surrounding the town, bisecting the agricultural landscape and its pattern of field enclosure.

11.3.4 The southern urban fringe of Crewe includes the settlements of Weston, Willaston and Shavington. Much of the area comprises degraded urban fringe farmland close to the A500 Shavington Bypass, along with commercial development and infrastructure associated with the WCML. Between Crewe Road and the Basford Hall Sorting Sidings, areas of housing and commercial development have been recently constructed on areas of former farmland. To the south of the A500 Shavington Bypass, the landscape retains a more rural character with small, well established villages and scattered or isolated dwellings and farmsteads.

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

11.3.6 The northern, urban fringe of Crewe, which includes the settlements of Coppenhall, Maw Green and Barrows Green, gives way abruptly to a flat and open agricultural landscape of former mosslands. This area retains elements of its historic rural landscape and includes medieval field systems around Coppenhall Moss and distinctive linear field enclosures with a mix of managed or overgrown and fragmented hedges. The construction of the WCML has led to some localised reorientation of earlier field boundaries, with the expansion of Crewe introducing new residential development across its northern fringe.

11.3.7 The landscape transitions north to a pattern of larger field enclosure with managed hedgerows and mature individual trees giving the impression of a well-wooded landscape, despite woodland cover being relatively scarce. The rivers Weaver and Wheelock flow northwards across the landscape, with the recessed valley form of the River Weaver and its widely meandering, wooded stream courses being prominent to the west. Large farmhouses are locally prominent with a dispersed settlement pattern of hamlets and scattered, often distinctive, individual residential properties. The A530 Middlewich Road and WCML both run in a north-south direction across this largely pastoral landscape.

11.3.8 The Crewe and Nantwich Circular Walk long distance route connects Crewe to the Shropshire Union Canal (Middlewich Branch) to the west. This branch of the canal forms part of the Four Counties Ring tourist boating circuit. National Cycle Route 451 runs from the centre of Crewe and eastwards to Haslington and National Cycle Route 551 runs between Shavington and Weston to the south of Crewe.

11.3.9 The LCA have been determined as part of an integrated process of environmental characterisation, informed by a review of historic mapping, historic landscape characterisation datasets and the outcome from other topics including ecological assessments. Use has been made of published landscape character assessments and a wide range of supporting GIS data, aerial photography and Ordnance Survey mapping, plus desk study and fieldwork. Landscape character assessments reviewed include the relevant National Landscape Character Areas[98] and the Landscape Character Assessment(s) for CWCC[99] and CEC[100].

11.3.10 These published LCA have been adapted for this assessment to provide LCA of an appropriate, consistent scale. Minor amendments have been made to some published LCA boundaries to reflect existing conditions, as verified on site, or to draw out specific aspects susceptible to change from the Proposed Scheme.

11.3.11 For the purposes of this assessment, the study area for the Hough to Walley's Green area has been subdivided into 12 LCA. Full descriptions of these LCA are provided in Volume 5, Appendix LV-001-0MA01.

11.3.12 Ten of the 12 LCA will not be significantly affected by the Proposed Scheme due to their relative distance from, or sensitivity to this type of development, and/or due to the Proposed Scheme being in tunnel beneath Crewe between Hough and Leighton.

11.3.13 A summary of the remaining two LCA that will be significantly affected within the Hough to Walley's Green area is shown in Figure 10 and Figure 11 and described below.

11.3.14 The Wimboldsley Plain LCA and Crewe Fringe Mosslands covers parts of both the Hough to Walley's Green area and the adjacent Wimboldsley to Lostock Gralam area (MA02). As the Proposed Scheme is located mostly within the Hough to Walley's Green area, the Wimboldsley Plain LCA, along with Crewe Fringe Mosslands, will be significantly affected by the Proposed Scheme and is described below.

[98] 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.

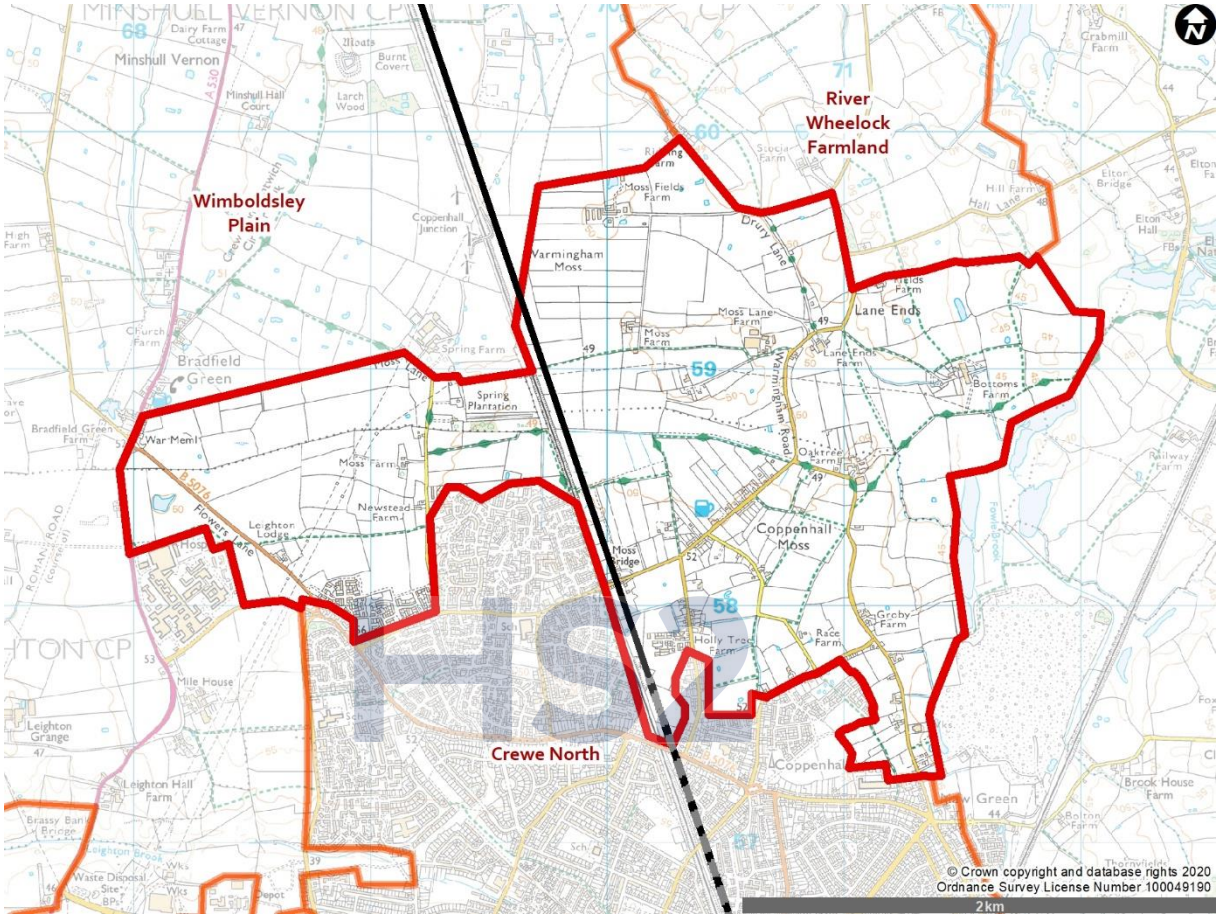
[99] Bayou Bluenvironment Ltd and The Planning & Environment Studio Ltd (2016), *A landscape strategy for Cheshire West and Chester Borough.* Available online at: https://www.cheshirewestandchester.gov.uk/documents/planning-and-building-consultancy/total-environment/landscape-assessment/CWaC_LandscapeStrategyPart1_Final_March2016.pdf.

[100] LUC (2018), *Cheshire East Landscape Character Assessment.* Available online at: https://www.cheshireeast.gov.uk/environment/heritage_natural_environment/landscape/landscape_character_assessment.aspx.

Significantly affected landscape character areas

Crewe Fringe Mosslands

Figure 10: Crewe Fringe Mosslands



11.3.15 The Crewe Fringe Mosslands LCA is a predominantly flat, agricultural landscape of arable and pastoral farmland forming the northern hinterland of Crewe. It is an area of former mosslands, covered by the five separately identified mosses of Warmingham, Minshull, Leighton, Coppenhall and Maplin's. The field pattern ranges from distinct, east-west linear arrangements of enclosure at Warmingham to a mix of linear enclosure and medieval field pattern around Coppenhall Moss. Field boundaries vary from well-maintained to poorly managed and gapped hedges, often with frequent mature trees, creating a loose sense of enclosure.

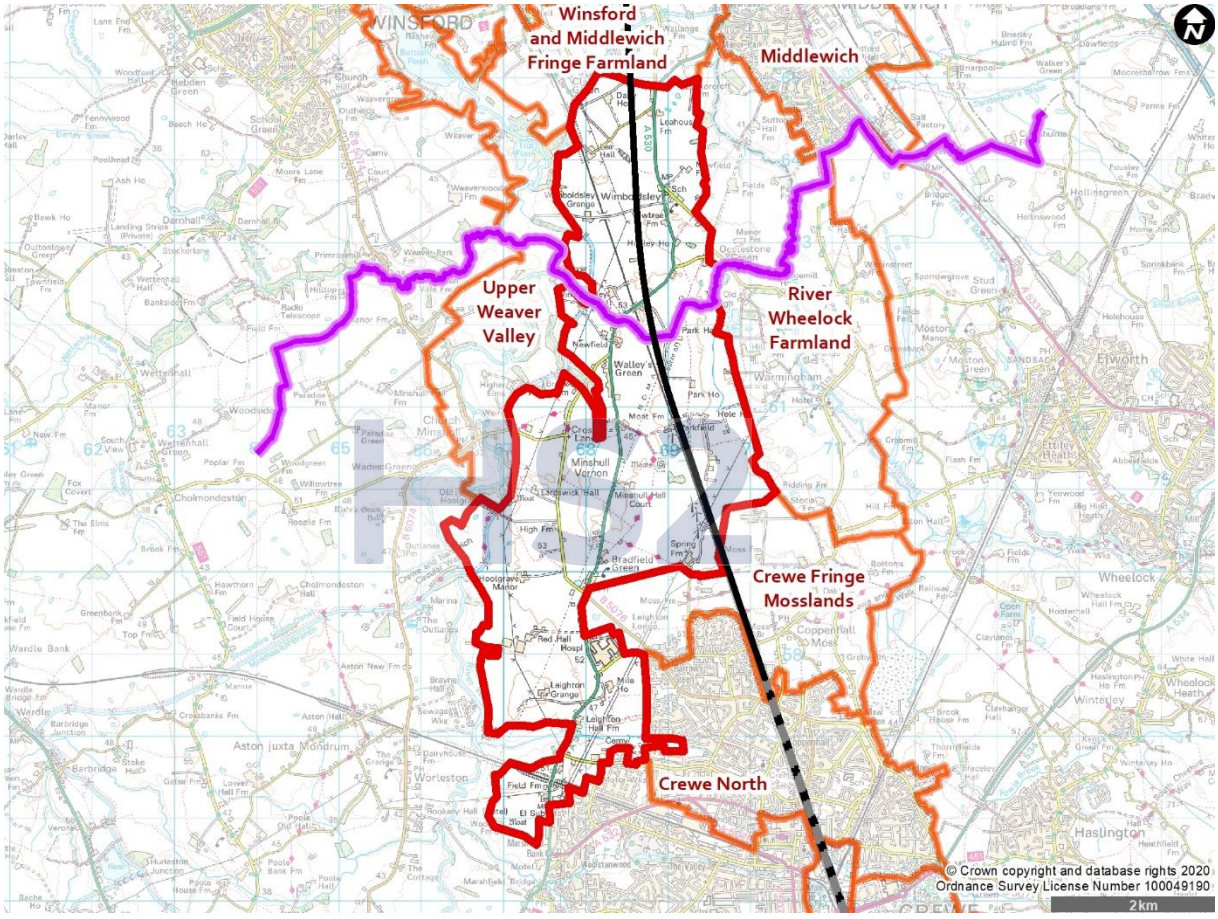
11.3.16 The WCML is orientated south-north across the open farmland to the north of Crewe. Historic built development at Coppenhall Moss broadly follows the line of Warmingham Road, including properties of varying age constructed of red brick and white painted render. Traditional red brick farmhouses with brick and steel farm buildings are scattered across the area. In contrast, the residential expansion of Crewe has replaced areas of former mossland at Leighton, with defined woodland buffers that create a distinct settlement edge. Residential expansion continues to encroach on the mossland bordering Crewe, with new housing developments occupying former agricultural land near Moss Lane, Broughton Road

and Stoneley Road. The area is well served by local footpaths, with the promoted Crewe and Nantwich Circular Walk running east-west across the area.

11.3.17 The Crewe Fringe Mosslands LCA is assessed as having a **medium-low** landscape value based on the variable quality of the urban fringe farmland, the presence of the WCML and encroachment by residential expansion with a limited sense of place.

Wimboldsley Plain

Figure 11: Wimboldsley Plain



11.3.18 The Wimboldsley Plain LCA straddles both the Hough to Walley's Green area and the Wimboldsley to Lostock Gralam area (MA02). It is a predominantly flat agricultural landscape, situated between the rivers Weaver and Wheelock. The plain is characterised by medium and large fields of a semi-regular pattern, typically bounded by well-maintained hedges with mature trees dating from the post-medieval period. Some of the larger fields have resulted from the agglomeration of several smaller fields. Large isolated field trees and occasional small copses punctuate the open farmland, often coinciding with marl pits or ponds. The incised valley of the River Weaver to the west is well-wooded and distinctive in character from the plain. Eastwards, towards the River Wheelock, the landform becomes undulating with a tighter and more irregular pattern of hedged fields and frequent mature trees.

11.3.19 The settlement pattern is one of scattered properties and hamlets, the latter including Bradfield Green, Walley's Green and Wimboldsley, all located along the A530 Middlewich Road/Nantwich Road. Large, individual estate houses and farms are characteristic. The Shropshire Union Canal (Middlewich Branch) located along the margins of the Weaver Valley, is a historic feature, now valued for its recreational use. Locally prominent infrastructure includes the WCML on embankment, the A530 Nantwich Road and several overhead power lines, all running broadly north-south across the plain. Such infrastructure detracts locally from an otherwise rural, tranquil and generally unlit landscape. The flat terrain combines with a succession of field hedgerows and trees to limit wider visibility at eye level, while the hills of the Peak District and ridge of the Peckforton Hills form distant backdrops.

11.3.20 The Wimboldsley Plain LCA is assessed as having a **medium** landscape value based on its intact and largely agricultural landscape, its historic built components and the recreational qualities associated with the Shropshire Union Canal (Middlewich Branch).

Visual baseline

11.3.21 A summary description of the distribution and types of receptors most likely to be affected is provided below. The viewpoints are numbered to identify their locations and are shown on the viewpoint location maps (see Volume 2: MA01 Map Book, Map Series LV-03 and LV04). In each case, the middle number (xxx.**xx**.xxx) identifies the type of receptor that is present in this area – 1: Protected views (none within this area), 2: Residential, 3: Recreational[101], 4: Transport, 5: Hotels/healthcare/schools and 6: Employment.

11.3.22 Filtered views across rural landscapes are experienced by residents on the northern and southern fringes of Crewe, as well as those living in smaller settlements including Hough, Basford, Weston, Coppenhall Moss, Minshull Vernon and Walley's Green. Residents in properties in Crewe have contained views across neighbouring residential areas and rail corridors. Views are also experienced from individual, often large, farmhouses and estate houses throughout the East Lowland plain north of Crewe and properties along the A530 Middlewich Road and rural lanes. Residents views comprise open or filtered views across rural landscapes from urban fringe locations, villages, hamlets and isolated properties.

11.3.23 Views experienced by recreational users of the Shropshire Union Canal (Middlewich Branch) comprising the Cheshire Ring Canal Walk, Four Counties Ring and Cheshire Ring tourist boating circuits are often restricted by boundary hedges and canal side vegetation. There are occasional open views across the low-lying agricultural landscape of the Weaver Valley. Views from the National Cycle Routes 451, 551 and Regional Cycle Route 70 are open across the rural fringe agricultural landscape to the south of Crewe and contained when within the urban context of the town. Views from the Crewe and Nantwich Circular Walk and the Cheshire Way range from middle and near distance views from the fringe settlements and

[101] 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.

undulating agricultural landscape to the south of the town to open, wide ranging views across the Cheshire Plain landscape north of Crewe.

Future baseline

Construction (2025)

11.3.24 Volume 5, Appendix CT-004-00000 provides details of the developments in the Hough to Walley's Green area that are assumed to have been implemented by 2025. The following committed developments of relevance to landscape and visual during construction in this area are set out in Table 35.

Table 35: Committed developments of relevance to landscape and visual during construction

Map book reference[102]	Planning reference/ Allocation reference	Description	How this is considered in the assessment
MA01/155	15/1552N	Location: land south of Fairview Avenue, Meadow Avenue, Mere Road, East Road, Weston. Outline planning application: Residential development for up to 99 dwellings (Use Class C3), with public open space, vehicular access and associated infrastructure	Informing future baseline
MA01/170	16/2373N	Location: land at Flowers Lane, Leighton, Crewe. Outline application for the construction of up to 400 dwellings with garaging; parking; public open space; landscaping; new vehicle and pedestrian accesses; highway works, foul and surface water drainage infrastructure and all ancillary works	Informing future baseline
MA01/210	15/0366N	Location: land to the east of Broughton Road, Crewe, Cheshire, CW1 4NS. Outline application: Erection of up to 129 homes with associated highways and open amenity space, landscaping and ecological protection zone	Informing future baseline
MA01/033	15/1537N	Location: land at Basford East, Crewe. Outline planning application (with all matters reserved) for a mixed-use development comprising residential use (Use Class C3) (up to 325 residential dwellings); employment use (Use Class B1), local centre comprising health centre and community facility (Use Class D1), food/non-food retail (Use Class A1), public house/restaurant (Use Class A4/A3) and associated works including construction of a new access road with access from the	Informing future baseline

[102] Volume 5, Planning Data/Committed Development Map Book: Maps CT1-3-301 to CT-13-304a.

Map book reference[102]	Planning reference/ Allocation reference	Description	How this is considered in the assessment
		Crewe Green Link Road South, creation of footpaths and provision of public open space and landscaping.	
MA01/324	19/2545N	Location: land at Basford East, Crewe. Approval of all reserved matters following outline approval 15/1537N for the infrastructure works at Basford East	Informing future baseline
MA01/325	19/2489N	Location: Basford West Development Site, Plot 1 Crewe Commercial Park, Jack Mills Way, Shavington, Cheshire. Full application for the erection of two units totalling 12,615 sqm (135,784 sqft) for Use within B1(b) (Research and Development), B1(c) (Light industry), B2 (General Industrial) and B8 (Storage and Distribution), with ancillary office use, associated car parking, service areas, fencing and landscaping at Basford West Strategic Site at Jack Mills Way, Crewe	Informing future baseline
n/a	n/a	HS2 Phase 2a West Midlands to Crewe	Informing future baseline Considered in cumulative effects

11.3.25 The following committed developments have been included as part of the future baseline and considered within this assessment:

- residential developments MA01/210 and MA01/170 will potentially introduce new visual receptors into the study area. These are outline planning applications and the detailed designs were not available at the time of writing. It is assumed that the scale of the developments is likely to be in keeping with adjacent property heights and densities;
- residential development MA01/155, MA01/033 and related MA01/324 for a mixed-use development including up to 325 residential dwellings are considered unlikely to introduce new visual receptors due to the presence of intervening vegetation and landform; and
- MA01/325 for erection of office and light industry units will potentially alter the landscape character within the study area.

11.3.26 HS2 Phase 2a will be under construction by 2025. The presence of construction equipment (such as cranes and vehicles) as well as movement, lights and noise associated with construction and the emerging built form of HS2 Phase 2a will be visible in the landscape and from viewpoints on Newcastle Road and Casey Lane (viewpoints 300-02-005, 300-02-006 and 301-02-006). HS2 Phase 2a has been included as part of the future baseline and considered within this assessment.

11.3.27 The combined effects of HS2 Phase 2a and the Proposed Scheme, against a baseline without either phase, have been considered. The effects arising as a result of the combination of the

HS2 Phase 2a and the Proposed Scheme during construction are reported under cumulative effects.

Operation (2038)

11.3.28 Volume 5, Appendix CT-004-00000 provides details of the additional developments in the Hough to Walley's Green area that are assumed to have been implemented by 2038.

Table 36: Committed developments of relevance to landscape and visual during operation

Map book reference[103]	Planning reference/ Allocation reference	Description	How this is considered in the assessment
n/a	n/a	HS2 Phase 2a West Midlands to Crewe	Informing future baseline. Considered in cumulative effects.

11.3.29 HS2 Phase 2a will be operational by 2038. The presence of large-scale infrastructure and train movements will affect landscape character and visual amenity. HS2 Phase 2a will be visible in the landscape and from viewpoints on Newcastle Road and Casey Lane (viewpoints 300-02-005, 300-02-006 and 301-02-006). HS2 Phase 2a has been included as part of the future baseline and considered within this assessment.

11.3.30 The combined effects of HS2 Phase 2a and the Proposed Scheme, against a baseline without either phase, have also been considered. The effects arising as a result of the combination of the HS2 Phase 2a and the Proposed Scheme during operation are reported under Cumulative effects.

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 from many locations and will have the potential to give rise to significant temporary effects that cannot practicably be mitigated. Such effects 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 presence of compounds, main earthworks and structure works.

11.4.2 The effects associated with the peak construction stage in this area are generally considered to be medium-term, based on the indicative construction programme in Section 2.3. 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.

[103] Volume 5, Planning Data/Committed Development Map Book: Maps CT-13-301 to CT-13-304a.

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

Avoidance and mitigation measures

11.4.4 Measures that have been incorporated into sections 12 and 14 of the draft CoCP to avoid or reduce landscape and visual effects, where reasonably practicable, during construction include the following:

- avoidance of unnecessary tree and vegetation removal, and protection of existing trees in accordance with BS 5837: Trees in relation to design, demolition and construction[104];
- 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 should they die as a consequence of nearby construction works.

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

Assessment of temporary impacts and effects

11.4.6 The most apparent changes to the landscape and to the views experienced by visual receptors during construction will relate to the presence of construction plant, compounds and soils and material storage and stockpiling. Key construction activities that will give rise to the most apparent changes to landscape and visual receptors are: the removal of trees and hedgerows, the demolition of buildings, the closure and diversion of highways and public rights of way (PRoW), power lines and utilities, the excavation of cuttings and tunnel portals, the construction of vent shafts, auto-transformer stations, embankments, box structures, viaducts and overbridges.

11.4.7 Non-significant effects are reported in Volume 5, Appendix LV-001-0MA01.

Landscape assessment

11.4.8 The LCA set out in Table 37 will be significantly affected during construction of the Proposed Scheme.

[104] British Standards Institution (2012), *BS 5837:2012 Trees in relation to design, demolition and construction – Recommendations*, British Standard. Available online at: https://beta.bathnes.gov.uk/sites/default/files/2020-01/BS5837%202012%20Trees.pdf.

Table 37: Summary description and assessment of effects on LCA

Location	
Crewe Fringe Mosslands The Crewe Fringe Mosslands LCA of **medium-low** value will be directly affected by the construction activity associated with Crewe north cutting and Crewe tunnel north portal and major utility diversion works. The area will accommodate Crewe tunnel north main compound and Warmingham Moss satellite compound and additionally will be influenced by Moss Lane satellite compound located near Spring Farm to the immediate north of the LCA. Localised changes to landform will result from large-scale earthworks and the introduction of temporary material stockpiles. Construction activities and processes including plant noise, crane movements, lighting and construction traffic vehicles along construction traffic routes including Warmingham Road and Groby Road will impact upon this rural fringe landscape. Due to the presence of existing railway infrastructure, the variable quality of rural fringe farmland and the progressive residential expansion to the north of Crewe, the landscape has a **medium-low** susceptibility to change resulting from the Proposed Scheme. The removal of mature hedgerow trees, woodland areas and the introduction of construction works will result in a **high** magnitude of change to the landscape. The **high** magnitude of change for the Crewe Fringe Mosslands LCA and its **medium-low** sensitivity will result in a **moderate** adverse significant effect.	Level of effect: **Moderate** adverse (significant)
Wimboldsley Plain The Wimboldsley Plain LCA spans the Hough to Walley's Green area and the Wimboldsley to Lostock Gralam area (MA02). The effects arising from construction activity located in the Wimboldsley to Lostock Gralam area (MA02) (comprising Crewe North Rolling Stock Depot (RSD), Crewe North infrastructure maintenance base – rail (IMB-R), reception tracks, the A530 Nantwich Road realignment and Clive Green Lane realignment) are also reported here. The Wimboldsley Plain LCA of **medium** value will be directly affected by large scale construction works for the Proposed Scheme, including Warmingham Moss viaducts (part of the Crewe Northern Connection), Parkfield access realignment, major utility diversions, Crewe North RSD, Crewe North IMB-R, and the A530 Nantwich Road and Clive Green Lane realignments. The LCA will accommodate Moss Lane satellite compound and be influenced by Warmingham Moss satellite compound (immediately south of the LCA). Changes to landform will result from large-scale earthworks and temporary material stockpiles. Activities including plant noise, crane movements, lighting and construction traffic along the A530 Nantwich Road and Clive Green Lane (located in the Wimboldsley to Lostock Gralam area (MA02)) will affect the tranquillity of this predominantly agricultural landscape and will be at considerable variance with the existing character. Due to the **medium** scenic value with relatively low levels of tranquillity together with the presence of detracting features, the landscape has a **medium** susceptibility to change arising from the Proposed Scheme. The removal of mature hedgerow trees and the introduction of construction works will result in a **high** magnitude of change to the landscape. The **high** magnitude of change for the Wimboldsley Plain and its **medium** sensitivity will result in a **major** adverse significant effect.	Level of effect: **Major** adverse (significant)

Visual assessment

Introduction

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

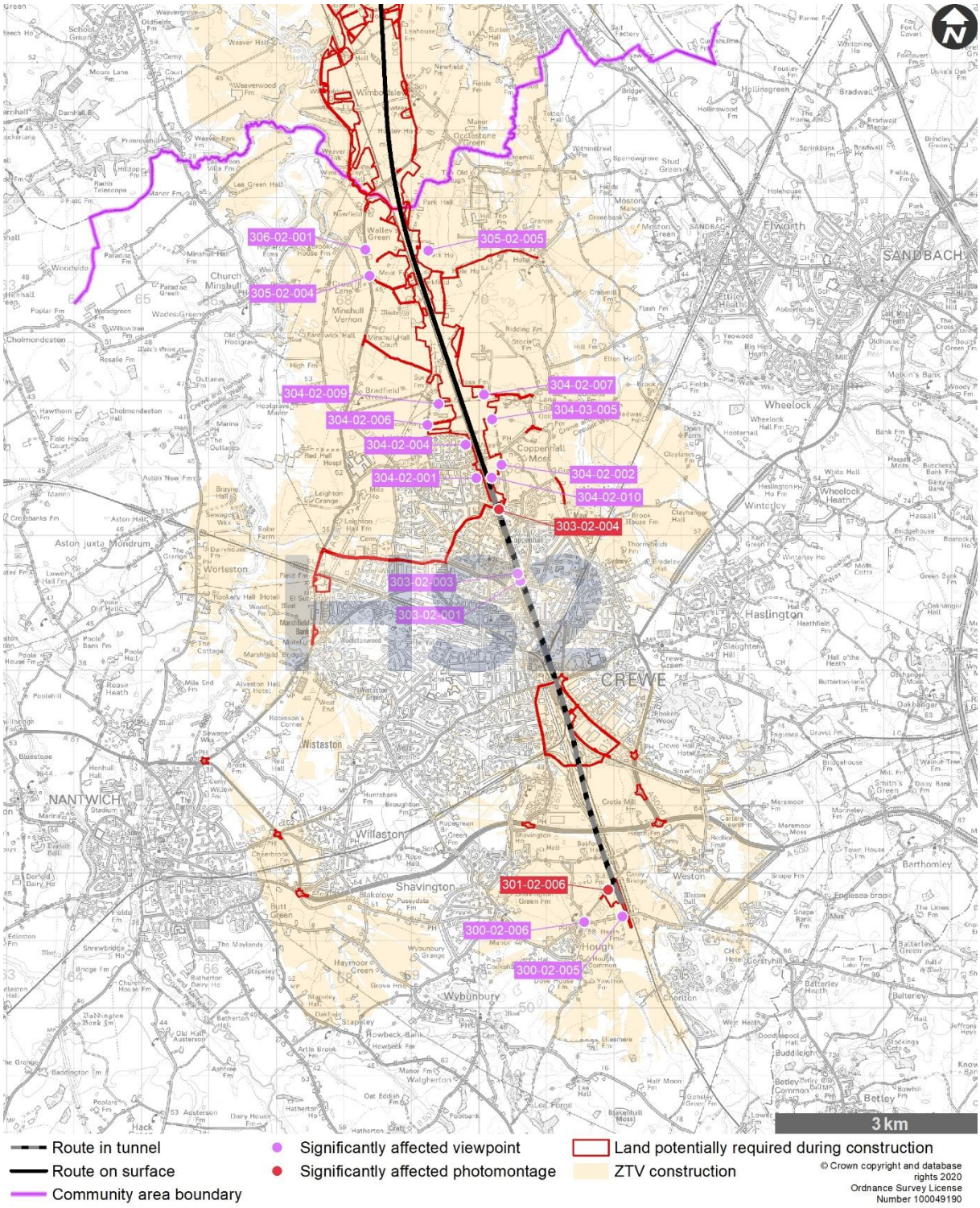
present in a view, will be in leaf. Where visual receptors are predicted to experience significant effects at night-time arising from additional lighting, these are also presented in this section.

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

11.4.11 The visual assessment has identified locations where continuous night working and/or overnight working during construction will result in significant effects on visual receptors (summarised in Table 38 and described in detail in Volume 5, Appendix LV-001-0MA01, Part 3).

11.4.12 Table 38 describes the construction phase potentially significant visual effects. Viewpoint locations are shown in Map Series LV-03 in the Volume 2: MA01 Map Book.

Table 38: Construction phase significant visual effects



View north from Newcastle Road (Medium-high sensitivity receptors) (VP 300-02-005)	
Residents of **high** susceptibility and with **medium** value views will experience a noticeable change to the composition of near-distance and middle-distance views of construction works, which will be partially screened by intervening garden and field boundary vegetation. Plant and equipment accessing Crewe tunnel south satellite compound from the realigned Newcastle Road from the south and Casey Lane in the north will be visible, seen beyond intervening garden and field boundary vegetation. The Proposed Scheme will be in cutting, with upper elements screened by a combination of earthworks and retaining structures and by realigned Newcastle Road on embankment in the near distance. The combination of the above will result in a **medium** magnitude of visual change. The **medium** magnitude of visual change and **medium-high** sensitivity will result in a **moderate** adverse significant effect.	Level of effect: **Moderate** adverse (significant)

View north-east from Newcastle Road, Hough (High sensitivity receptors) (VP 300-02-006)	
Residents on Newcastle Road and Back Lane, users of footpath Chorlton 8/1 and Cheshire cycleway route 70 of **high** susceptibility, all with **medium** value views will experience a noticeable change to the composition of near and middle-distance views. There will be visibility of construction traffic along Newcastle Road, realigned Newcastle Road and Casey Lane. Taller elements within Crewe tunnel south portal satellite compound and construction activities for Crewe tunnel south portal and portal building will be visible in the far distance, seen against the skyline, though partly screened by the embankments of the realigned Newcastle Road. The combination of the above will result in a **medium** magnitude of visual change. The **medium** magnitude of visual change and **high** sensitivity will result in a **moderate** adverse significant effect.	Level of effect: **Moderate** adverse (significant)

View south-east from Casey Lane (High sensitivity receptors) (VP 301-02-006)	
Residents and users of Footpaths Basford 7/1, 8/1 and 10/2 of **high** susceptibility, all with **medium** value views, will experience a substantial change to the composition of near-distance views. Large-scale construction works will be visible, including construction activity within Crewe tunnel south portal satellite compound. The compound will be visible across the majority of near-distance views. Construction activity for Crewe tunnel portal building and rescue area will be seen in the middle distance. The construction compound will be visible immediately beyond Casey Lane. The combination of the above will result in a **high** magnitude of visual change. The **high** magnitude of visual change and **high** sensitivity will result in a **major** adverse significant effect. A photomontage illustrating this scenario is included Volume 5, Appendix LV-001-001, Part 3.	Level of effect: **Major** adverse (significant)
Night-time effects: The presence of night-time lighting for Crewe tunnel south portal satellite compound and construction of Crewe tunnel south portal building will introduce additional localised light sources in the near-distance of the view. This will result in a substantial increase in the prominence and extent of artificial lighting within the rural and predominantly unlit area. The controls on light spill set out in the draft CoCP will limit the change these new light sources introduce to the wider view. At night, there will be a **high** magnitude of visual change and **major** adverse effect.	Level of effect: **Major** adverse (significant)

View north from public open space bordering the B5076 Middlewich Street (Medium-high sensitivity receptors) (VP 303-02-001) and view south-east from public open space bordering the B5076 Middlewich Street (Medium-high sensitivity receptors) (VP 303-02-003).	
Residents on Middlewich Street, Audley Street West and at Bentley Manor Care Home and users of the public open space of **high** susceptibility and railway users of lower susceptibility, all with **medium** value views will experience a substantial change to the composition of near distance views. Middlewich Street vent shaft satellite compound will be visible, displacing the existing context of view. Construction activity for Middlewich Street vent shaft and headhouse will be partially visible. Occupants of the Bentley Manor Care Home and residential properties will experience near distance views of construction activity and of construction traffic entering the compound from the B5076 Middlewich Street. The compound will occupy the near and middle distance in views against an existing skyline of overhead line equipment and the mature vegetation bordering Crewe Crematorium. There will be some minor loss of vegetation at the southern boundary of the compound. The combination of the above will result in a **high** magnitude of visual change. The **high** magnitude of visual change and **medium-high** sensitivity will result in a **major** adverse effect.	Level of effect: **Major** adverse (significant)
Night-time effects: The presence of night-time lighting for Middlewich Street vent shaft satellite compound and construction activity in relation to the Middlewich Street vent shaft will introduce lighting elements which will result in a noticeable increase in the prominence and extent of artificial lighting in the view. The controls on light spill set out in the draft CoCP will limit the change these new light sources introduce to the wider view. At night, there will be a **medium** magnitude of visual change and a **moderate** adverse effect.	Level of effect: **Moderate** adverse (significant)

View north-west from Bradfield Road, Crewe (High sensitivity receptors) (VP 303-02-004)	
Residents on Broughton Road of **high** susceptibility and with **medium** value views will experience a substantial change to the composition of near-distance views. Large-scale construction works will be visible, including construction of Crewe tunnel north portal and Crewe north portal cutting (retained cutting). The proximity of Crewe tunnel north main compound will be visible across the majority of view, resulting in a substantial change. The associated loss of hedgerow and trees will further increase visibility of the existing WCML. The combination of the above will result in a **high** magnitude of visual change. The **high** magnitude of change and **high** sensitivity will result in **major** adverse (significant) effect. A photomontage illustrating this scenario is included Volume 5, Appendix LV-001-001, Part 3.	Level of effect: **Major** adverse (significant)
Night-time effects: The presence of night-time lighting for Crewe tunnel north main compound and construction activity in relation to Crewe tunnel north porous portal will introduce localised new lighting elements resulting in a noticeable increase in the prominence and extent of artificial lighting in the view. The controls on light spill set out in the draft CoCP will limit the change these new light sources introduce to the wider view. At night there will be a **medium** magnitude of visual change and a **moderate** adverse effect.	Level of effect: **Moderate** adverse (significant)

View east from Somerley Close, Leighton, Crewe (Medium-high sensitivity receptors) (VP 304-02-001)	
Residents and users of Footpath Crewe 13/1 that for the most part runs parallel with the alignment of WCML of **high** susceptibility, both with **medium** value views, will experience a noticeable change to the composition of middle-distance views. Large scale construction works will be visible, including the construction of Crewe tunnel north portal building and Crewe north portal cutting (retained cutting). The Crewe tunnel north main compound will be visible to residents and footpath users, with a noticeable loss of existing vegetation within the compound. However, the compound will be sited beyond WCML and views will be heavily filtered by existing mature vegetation on the western boundary of the railway. Properties on Conway Close will have more open views, over rear gardens and the WCML, towards the construction compound. Construction works in relation to Parkers Road Overbridge and the demolition of nearby properties will be evident to residents and users of Footpath Crewe 13/1 adjoining Parkers Road, with oblique and partially filtered views. The combination of the above will result in a **medium** magnitude of visual change. The **medium** magnitude of visual change and **medium-high** sensitivity will result in a **moderate** adverse (significant) effect.	Level of effect: **Moderate** adverse (significant)

View west from Broughton Road, Coppenhall, Crewe (High sensitivity receptors) (VP 304-02-002) and view south-west from Maplins Moss Place, Coppenhall, Crewe (High sensitivity receptors) (VP 304-02-010).	
Residents on Broughton Road and Maplins Moss Place of **high** susceptibility and with **medium** value views will experience a substantial change to the composition of near distance views. Large scale construction works will be visible, including the construction of Crewe tunnel north portal building and Crewe north portal cutting (retained cutting). The Crewe tunnel north main compound and associated construction activities will be visible in the near distance and across the majority of the view. The removal of hedgerows and trees will increase visibility towards the existing WCML. The demolition of buildings at Bridge Farm and construction works for Parkers Road Overbridge, including the loss of roadside and embankment vegetation, will be apparent in the far-distance of the view. The combination of the above will result in a **high** magnitude of visual change. The **high** magnitude of visual change and the **high** sensitivity will result in a **major** adverse (significant) effect.	Level of effect: **Major** adverse (significant)
Night-time effects: The presence of night-time lighting for Crewe tunnel north main compound and construction activity in relation to Crewe tunnel north porous portal will introduce new lighting elements. There will be a noticeable increase in the prominence and extent of artificial lighting in the near-distance illuminating otherwise dark fields and in the context of well-lit residential areas beyond the WCML. The controls on light spill set out in the draft CoCP will limit the change these new light sources introduce to the wider view. At night there will be a **medium** magnitude of visual change and a **moderate** adverse effect.	Level of effect: **Moderate** adverse (significant)

View east from Bleasdale Road, Leighton, Crewe (Medium-high sensitivity receptors) (VP 304-02-004)	
Residents on Bleasdale Road and between Parkers Road and Thornfields and footpath users of Crewe Footpath 12/2 and 12/1 of **high** susceptibility, all with **medium** value views will experience a noticeable change to the composition of near and middle distance views. Large scale construction works will be visible, including Coppenhall Moss cutting, Warmingham Moss northbound WCML embankment and Coppenhall Moss north embankment, Footpath	Level of effect: **Moderate** adverse (significant)

View east from Bleasdale Road, Leighton, Crewe (Medium-high sensitivity receptors) (VP 304-02-004)	
Crewe 29/1 accommodation overbridge and Parkers Road Overbridge. Users of Footpath Crewe 12/2 and 12/1 will experience sequential views along the western margin of the WCML. Temporary material stockpiles, the loss of existing vegetation and the demolition of buildings at Moss Bridge Farm will be evident to residents and footpath users. The stockpiles will be sited beyond the WCML with views of them filtered by existing mature vegetation alongside the western boundary of the WCML. Oblique and partially filtered views of the construction of Parkers Road Overbridge will be evident to residents and footpath users closer to Parkers Road. The removal of existing woodland will afford open near-distance views from the surfaced Footpath Crewe 29/1 northwards towards the construction works associated with Footpath Crewe 29/1 accommodation overbridge. Views from properties along Perry Fields will be partially filtered by existing vegetation although construction of Footpath Crewe 29/1 accommodation overbridge will be visible above the tree canopies. The combination of the above will result in a **medium** magnitude of visual change. The **medium** magnitude of visual change and **medium-high** sensitivity will result in a **moderate** adverse (significant) effect.	

View west from Footpath Crewe 28/1 (Crewe and Nantwich Circular Walk), Coppenhall Moss (High sensitivity receptors) (VP 304-03-005)	
Users of Footpaths Crewe 28/1, 29/1 and 30/1 of **high** susceptibility and with **medium** value views will experience a substantial change to the composition of near and middle distance views. Large scale construction works will be visible, including the construction of Footpath Crewe 29/1 accommodation overbridge, Warmingham Moss southbound viaduct and Warmingham Moss northbound viaduct, Coppenhall Moss north embankment, Warmingham Moss southbound embankments 1 and 2. Major utility works, Warmingham Moss satellite compound, temporary material stockpiles and the conveyor[105] together with vehicular movements will be visible in the middle-distance. The removal of hedgerows and skyline vegetation will increase the visibility of the WCML. Construction works will be viewed widely across the skyline. Temporary activity relating to habitat creation will be evident in the near distance. The combination of the above will result in a **high** magnitude of visual change. The **high** magnitude of visual change and **high** sensitivity will result in a **major** adverse (significant) effect.	Level of effect: **Major** adverse (significant)

View east from Moss Lane, Crewe and Nantwich Circular Walk (High sensitivity receptors) (VP 304-02-006) and view east from Footpath Minshull Vernon 2/1, east of Moss Lane (High sensitivity receptors) (VP 304-02-009)	
Residents on Moss Lane and users of Leighton Footpath 7/1, Crewe Footpath 12/1 and Minshull Vernon 2/1 of **high** susceptibility and with **medium** value views will experience a substantial change to the composition of middle distance views. Large scale construction works will be visible, including the construction of Footpath Crewe 29/1 accommodation overbridge, Warmingham Moss southbound WCML embankment, Warmingham Moss northbound WCML embankment, Warmingham Moss southbound viaduct, Warmingham Moss northbound viaduct, Coppenhall Moss south embankment and landscape earthworks. Major utility works, site haul routes and movements, Warmingham Moss satellite compound,	Level of effect: **Major** adverse (significant)

[105] Excavated material from the Crewe tunnel will be transported via a covered conveyor of approximately 5km, running along and parallel to the route of the Proposed Scheme, from the tunnel face to the Crewe North RSD area in the Wimboldsley to Lostock Gralam area (MA02).

View east from Moss Lane, Crewe and Nantwich Circular Walk (High sensitivity receptors) (VP 304-02-006) and view east from Footpath Minshull Vernon 2/1, east of Moss Lane (High sensitivity receptors) (VP 304-02-009)	
temporary material stockpiles and the conveyor together with vehicular movements will be visible in the middle distance. Clearance of some hedgerow and vegetation along the horizon will be evident, along with the demolition of the WCML footbridge for Footpath Minshull Vernon 2/1 and Footpath Warmingham 16/2. Construction works will be visible across the majority of the view and on the skyline, although along Moss Lane these will be interrupted by existing hedgerow and woodland planting in the near and middle distance. The combination of the above will result in a **high** magnitude of visual change. The **high** magnitude of visual change and **high** sensitivity will result in a **major** adverse (significant) effect.	
Night-time effects: Moss Lane satellite compound, Warmingham Moss satellite compound and construction activity in relation to Warmingham Moss north and southbound viaducts and modifications to WCML will introduce new lighting elements within a predominantly rural and unlit area. The controls on light spill set out in the draft CoCP will limit the change these new light sources introduce to the wider view. At night there will be a **medium** magnitude of visual change and a **moderate** adverse (significant).	Level of effect: **Moderate** adverse (significant)

View west from Footpath Warmingham 16/2 at Moss Farm, Coppenhall Moss (High sensitivity receptors) (VP 304-02-007)	
Residents of Moss Farm and Moss Fields Farm, and residential properties along Moss Lane and footpath users of **high** susceptibility and with **medium** value views will experience a substantial change to the composition of near and middle-distance views. Large scale construction works will be visible, including Footpath Crewe 29/1 accommodation overbridge, Warmingham Moss northbound and southbound viaducts, Coppenhall Moss north embankment, Warmingham Moss southbound embankment no. 1 and Warmingham Moss southbound embankment no. 2. Major utility works, Warmingham Moss satellite compound, areas of temporary material stockpiles and the conveyor, together with vehicular movements will be visible in the middle distance. The removal of hedgerows and vegetation along the horizon will increase the visibility of the WCML. Construction works will be viewed widely across the skyline. The combination of the above will result in a **high** magnitude of visual change. The **high** magnitude of visual change and **high** sensitivity will result in a **major** adverse (significant) effect.	Level of effect: **Major** adverse (significant)
Night-time effects: Residents at Moss Farm, Moss Fields Farm and along Moss Lane will experience a noticeable change to views at night. The presence of night-time lighting at Warmingham Moss satellite compound and Moss Lane satellite compound and construction activity for Coppenhall Moss north embankment, Warmingham Moss southbound embankment no. 1 and No. 2 will introduce localised lighting elements in the middle-distance to the west. This will result in a noticeable increase of artificial lighting in the view. The controls on light spill set out in the draft CoCP will limit the extent of change from these new light sources. At night there will be a **medium** magnitude of visual change and a **moderate** adverse (significant) effect.	Level of effect: **Moderate** adverse (significant)

View east from Moat House Farm, A530 Middlewich Road (High sensitivity receptors) (VP 305-02-004)	
Residents of Moat House Farm and residential properties on the A530 Middlewich Road at Walleys Green and users of Footpath Minshull Vernon 12/2, 12/3 and 13/1 of **high** susceptibility and with **medium** value views will experience a noticeable change to the composition of middle-distance views. Large scale construction works will be visible including Footpath Minshull Vernon 8/1 accommodation overbridge, visible beyond the outbuildings of Moat House Farm and the WCML. Further northwards and towards Wimboldsley, the landform will progressively screen construction activity. The lane running from the A530 Middlewich Road at Moat House Farm towards Parkfield Farm will be reconstructed as a maintenance access road for two balancing ponds. Large scale construction works will be visible including Footpath Minshull Vernon 8/1 accommodation overbridge, visible beyond the outbuildings of Moat House Farm spanning the WCML and the Proposed Scheme. The loss of individual field trees, hedgerow trees and copses during construction will be noticeable in the middle distance but will not substantially alter the characteristics of the view. Views from properties along the A530 Middlewich Road towards the construction works will be largely filtered by intervening hedges, hedgerow trees and field trees, while visibility for occupants of Moat House Farm will be further screened or interrupted by outbuildings. Removal of trees adjacent to the access track east of Moat House farm will be noticeable for footpath users. Footpath Minshull Vernon 13/1 will be temporarily diverted. The combination of the above will result in a **medium** magnitude of visual change. The **medium** magnitude of visual change and **high** sensitivity will result in a **moderate** adverse (significant) effect.	Level of effect: **Moderate** adverse (significant)

View west from Footpath Minshull Vernon 8/1 at Park House Farm (High sensitivity receptors) (VP 305-02-005)	
Residents of Park House Farm, Park Hall Farm, Parkfield Farm and users of Footpath Minshull Vernon 8/1 of **high** susceptibility and with **medium** value views will experience a substantial change to the composition of near and middle-distance views. Large scale construction works will be visible, including the construction of Footpath Minshull Vernon 8/1 accommodation overbridge and Crewe North IMB-R. In addition, there will be views towards construction works for the A530 Nantwich Road realignment and overbridge with Crewe North RSD beyond (all located within the Wimboldsley to Lostock Gralam area (MA02)) from Park Hall Farm. Construction activity will be visible across the majority of the view, parallel with and east of the WCML beyond intervening hedges and hedgerow trees. Earthworks for construction of Footpath Minshull Vernon 8/1 accommodation overbridge will be visible in near and middle-distance views from Parkfield and Park House Farms. The removal of hedgerows and copses will be noticeable, and the works will alter the appearance of the middle distance and skyline as seen from Footpath Minshull Vernon 8/1. The combination of the above will result in a **high** magnitude of visual change. The **high** magnitude of visual change and **high** sensitivity will result in a **major** adverse (significant) effect.	Level of effect: **Major** adverse (significant)

View east from Walley's Green (High sensitivity receptors) (VP 306-02-001)	
Residents of A530 Middlewich Road of **high** susceptibility and with **medium** value views will experience a noticeable change to the composition of middle-distance views. Large scale construction works will be visible, including construction of Footpath Minshull Vernon 8/1 accommodation overbridge, the A530 Nantwich Road realignment and A530 Nantwich Road overbridge. Construction activity will run parallel with and just beyond the existing WCML	Level of effect: **Moderate** adverse (significant)

View east from Walley's Green (High sensitivity receptors) (VP 306-02-001)	
alignment. Earthworks for the construction of Footpath Minshull Vernon 8/1 accommodation overbridge will be visible, along with temporary material stockpiles situated towards the A530 Nantwich Road realignment. Views will be partially filtered through roadside vegetation, intervening hedges, hedgerow trees and field trees. Oblique, long distance views towards construction of A530 Nantwich Road overbridge will be filtered through mature woodland bordering the watercourse to the north of Newfield Hall Farm. The combination of the above will result in a **medium** magnitude of visual change. The **medium** magnitude of visual change and **high** sensitivity will result in a **moderate** adverse (significant) effect.	

Other mitigation measures

11.4.13 No other mitigation measures are considered reasonably practicable during construction. Not all landscape and visual effects can be mitigated due to the visibility of construction activity and the sensitivity of surrounding receptors.

11.4.14 However, consideration will be given during the detailed design stage to where mitigation planting can be established early in the construction programme to help achieve landscape integration or visual screening at an earlier time.

Summary of likely residual significant effects

11.4.15 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 by surrounding residents, and users of PRoW and main roads within the study area.

11.4.16 The significant effects that will remain after implementation of construction phase mitigation are summarised below:

- major adverse effects in relation to one LCA;
- moderate adverse effects in relation to one LCA;
- major adverse visual effects at 10 representative residential viewpoint locations;
- moderate adverse visual effects at six representative residential viewpoint locations;
- major adverse visual effects at one recreational viewpoint locations;
- major adverse night-time effects at one representative residential viewpoint location; and
- moderate adverse night-time visual effects at eight representative residential viewpoint locations.

Cumulative effects

Cumulative landscape effects

11.4.17 As reported in HS2 Phase 2a ES Volume 5, CA5 South Cheshire, LV-001-005, construction of HS2 Phase 2a will directly affect the Shavington/Crewe Outer Fringe Lower Farms and Woods LCA and Blakenhall Lower Farms and Woods LCA. Construction of the HS2 Phase 2a scheme, including the HS2 spurs, Crewe South cutting, Newcastle Road realignment and overbridge, modifications to the WCML and the presence of satellite compounds, materials stockpiles and movement of construction vehicles, will result in a **major adverse** significant effect on the LCA.

11.4.18 Shavington/Crewe Outer Fringe Lower Farms and Woods LCA will also be directly affected as a result of construction of the Proposed Scheme. Construction works including Crewe tunnel south porous portal, portal building and telecommunications site and the Crewe south portal satellite compound will be partially screened by road embankments and screening earthworks associated with HS2 Phase 2a. The Proposed Scheme will result in a **minor adverse** non-significant effect on this LCA.

11.4.19 The construction activity for the Proposed Scheme will not directly affect the Blakenhall Lower Farms and Woods LCA resulting in a **negligible effect**.

11.4.20 The combination of HS2 Phase 2a and the Proposed Scheme during construction will therefore result in a **major adverse** cumulative effect on the Shavington/Crewe Outer Fringe Lower Farms and Woods LCA and Blakenhall Lower Farms and Woods LCA, which is significant.

Cumulative visual effects

11.4.21 The following representative viewpoint locations were assessed in the HS2 Phase 2a ES and have also been assessed for the Proposed Scheme. The corresponding Phase 2a and Proposed Scheme assessment viewpoint references referred to in this cumulative assessment are set out below:

- representative viewpoint location on Newcastle Road: Phase 2a viewpoint 026.02.022 and Proposed Scheme viewpoint 300-02-005;
- representative viewpoint location on Newcastle Road, near Hough: Phase 2a viewpoint 026.02.028 and Proposed Scheme viewpoint 300-02-006;
- representative viewpoint location on Casey Lane: Phase 2a viewpoint 027.02.004 and Proposed Scheme viewpoint 301-02-006; and
- representative viewpoint location on Weston Lane: Phase 2a viewpoint 027.02.013 and Proposed Scheme viewpoint 301-02-007.

11.4.22 As reported in HS2 Phase 2a ES Volume 5, CA5 South Cheshire, LV-001-005, construction of HS2 Phase 2a, including the Newcastle Road realignment, overbridge and associated earthworks, the presence and use of satellite compounds and movement of construction

vehicles, will result in a **major adverse** significant effect on residents at the following viewpoints: viewpoint 026.02.022; viewpoint 026.02.028; viewpoint 027.02.004 and viewpoint 027.02.013.

11.4.23 During construction of the Proposed Scheme, views of the Proposed Scheme experienced by residents on Newcastle Road (viewpoint 300-02-005: view north from Newcastle Road and viewpoint 300-02-006: view north-east from Newcastle Road, Hough) will be partially screened by a combination of earthworks, structures and the Newcastle Road realignment which will be constructed as part of Phase 2a, resulting in a **moderate adverse** significant effect. Residents on Casey Lane and footpath users (viewpoint 301-02-006: view south-east from Casey Lane) will experience a substantial alteration to existing views due to the proximity of construction activity within Crewe tunnel south portal satellite compound, which will result in a high magnitude of change and **major adverse** significant effect. Residents on Weston Lane and footpath users (viewpoint 310-02-007: view south-east from Weston Lane, Basford) will perceive changes in far-distance views due to construction activity associated with Crewe tunnel south portal satellite compound, filtered by intervening vegetation and properties on Casey Lane resulting in a low magnitude of change and **minor adverse** effect.

11.4.24 The combination of HS2 Phase 2a and the Proposed Scheme during construction will result in a **major adverse** cumulative effect at representative viewpoint locations at Newcastle Road, Newcastle Road, Hough, Casey Lane and Weston Lane, which is significant.

11.4.25 In addition, Crewe tunnel south portal satellite compound, which will be used during construction of HS2 Phase 2a scheme, will continue to be used for construction of the Proposed Scheme. This will extend the period of time the views of construction activities are experienced by representative viewpoint locations at Newcastle Road, Newcastle Road, Hough, Casey Lane and Weston Lane by six years and nine months.

11.4.26 No significant night-time effects were identified in the Phase 2a assessment at the viewpoints in the location where Phase 2a will interface with the Proposed Scheme.

11.4.27 The assessment of the Proposed Scheme has identified a major adverse effect night-time effect at viewpoint 301-02-006: View south-east from Casey Lane as a result of the proximity to Crewe tunnel south portal satellite compound.

11.4.28 At night, the combination of HS2 Phase 2a and the Proposed Scheme during construction will result in a **major adverse** cumulative effect at the representative viewpoint location at Casey Lane, which is significant.

11.5 Permanent effects arising from operation

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

Avoidance and mitigation measures

11.5.2 The operational assessment of impacts and effects is based on year 1 (2038), year 15 (2053) and year 30 (2068) of the Proposed Scheme. A process of iterative design and assessment has been employed, and is ongoing, to avoid or reduce adverse effects during the operation of the Proposed Scheme. Measures that will be integrated into the design of the Proposed Scheme include:

- the Proposed Scheme will partly be in tunnel as it passes through the Hough to Walley's Green area, for just over half its length;
- design of engineering and landscape earthworks for embankments, viaducts and structures such as Coppenhall Moss south embankment and Coppenhall Moss north embankment, Warmingham Moss southbound WCML embankment and Warmingham Moss northbound WCML embankment and with Footpath Minshull Vernon 8/1 accommodation overbridge. The design of earthworks for these elements of the Proposed Scheme seek to tie them into their wider landscape context and to mitigate views of structures and overhead line equipment from sensitive receptors, where reasonably practicable. Earthworks design also takes account of the relationship to surrounding land uses and management, such as agriculture;
- woodland habitat creation in areas of loss, using the same species composition and planting types (and appropriate planting density) where reasonably practicable, to provide habitat connectivity, enhanced landscape/green infrastructure connectivity (such as at Spring Plantation north of Leighton and Burnt Covert/Larch Wood near Minshull Vernon) as well as connectivity of historic landscape features, where reasonably practicable, and to soften embankments and viaduct abutments;
- hedgerow replacement and restoration in areas of loss to restore connectivity and landscape pattern, where reasonably practicable (such as at Warmingham Moss) and using an appropriate palette of hedgerow types and species to tie the Proposed Scheme mitigation into the wider landscape character; compensation for loss of field ponds with new wetlands, ecological ponds and biodiversity wetland features and wetland enhancement at Warmingham Moss and Minshull Vernon; and
- mitigation planting to help integrate the Proposed Scheme into the surrounding landscape. This will be applicable along embankments such as Coppenhall Moss south embankment to provide additional screening of train movements, overhead line equipment and viaduct structures.

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:

- Crewe tunnel south portal and Crewe tunnel south portal building;
- Cowley Way vent shaft and headhouse, and Cowley Way vent shaft auto-transformer station;

- Middlewich Street vent shaft and headhouse;
- the extension of Parkers Road Overbridge;
- engineering and landscape earthworks for embankments, viaducts and structures including Warmingham Moss southbound viaduct, Warmingham Moss northbound viaduct, Coppenhall Moss south embankment and Coppenhall Moss north embankment, Warmingham Moss southbound WCML embankment and Warmingham Moss northbound WCML embankment;
- Footpath Crewe 29/1 accommodation overbridge; and
- Footpath Minshull Vernon 8/1 accommodation overbridge.

11.5.4 Elements within the Wimboldsley to Lostock Gralam area (MA02), which will directly affect LCA and viewpoints within the Hough to Walley's Green area, include:

- A530 Nantwich Road overbridge;
- A530 Nantwich Road auto-transformer station;
- Crewe North RSD;
- diverted 132kV overhead line to the west of the WCML;
- Clive Green telecommunications site;
- Clive Green Lane overbridge; and
- Crewe North IMB-R.

11.5.5 Non-significant effects are reported in Volume 5, Appendix LV-001-0MA01.

Landscape assessment

11.5.6 The LCA described in Table 39 will be significantly affected during operation of the Proposed Scheme.

Table 39: Operational phase significant landscape effects

Location	
Wimboldsley Plain	
The Wimboldsley Plain LCA spans both the Hough to Walley's Green area and the adjoining Wimboldsley to Lostock Gralam area (MA02). Impacts associated with the operation of the Proposed Scheme in the Wimboldsley to Lostock Gralam area (MA02) on this LCA are described here. Year 1: The LCA will be directly affected due to the presence of the Proposed Scheme, Warmingham Moss northbound and southbound viaducts (part of Crewe Northern Connection) and the large built structures of Crewe North RSD and Crewe North IMB-R. The Warmingham Moss southbound and northbound viaducts, A530 Nantwich Road overbridge (located in the Wimboldsley to Lostock Gralam area (MA02)) will introduce substantial alterations to the character of the area. These structures will be elevated above the WCML, making the Proposed Scheme a prominent component of the landscape. Earthworks will partially screen train movements along the Proposed Scheme, sidings within Crewe North RSD and existing train movements associated with the WCML. However, mitigation planting will not integrate the Proposed Scheme by year 1. Whilst the Proposed Scheme will run parallel with the WCML	Level of effect: **Major** adverse (significant)

Location	
throughout the LCA, the Proposed Scheme will be at considerable variance with the character of the existing landscape. Due to the **moderate** scenic value, its recreational use and the presence of detracting features, the landscape has a **medium** susceptibility to change arising from the Proposed Scheme. The introduction of large-scale infrastructure and landform modifications will result in a **high** magnitude of change to the landscape. The **high** magnitude of change for the Wimboldsley Plain and its **medium** sensitivity will result in a **major** adverse significant effect.	
Year 15: Structures associated with the viaducts of Crewe Northern Connection, and with Crewe North RSD, and realignments of the A530 Nantwich Road and Clive Green Lane will be more integrated into the local landscape setting as mitigation planting matures by the summer of year 15. However, the large buildings and activity of Crewe North RSD and Crewe North IMB-R will remain evident and uncharacteristic. Although the Proposed Scheme infrastructure will be filtered by mitigation planting, Warmingham Moss northbound and southbound viaducts and train movements will remain as obvious elements in the landscape. There will remain a **high** magnitude of change, with a **major** adverse effect.	Level of effect: **Major** adverse (significant)
Year 30: The maturity of mitigation planting will further integrate the Proposed Scheme, although train movements will remain visible across Warmingham Moss northbound and southbound viaducts and the large and uncharacteristic built structures and activity of Crewe North RSD, that contrasts with the predominantly agricultural landscape, and will still be evident. There will remain a **high** magnitude of change, with a **major** adverse effect.	Level of effect: **Major** adverse (significant)

Visual assessment

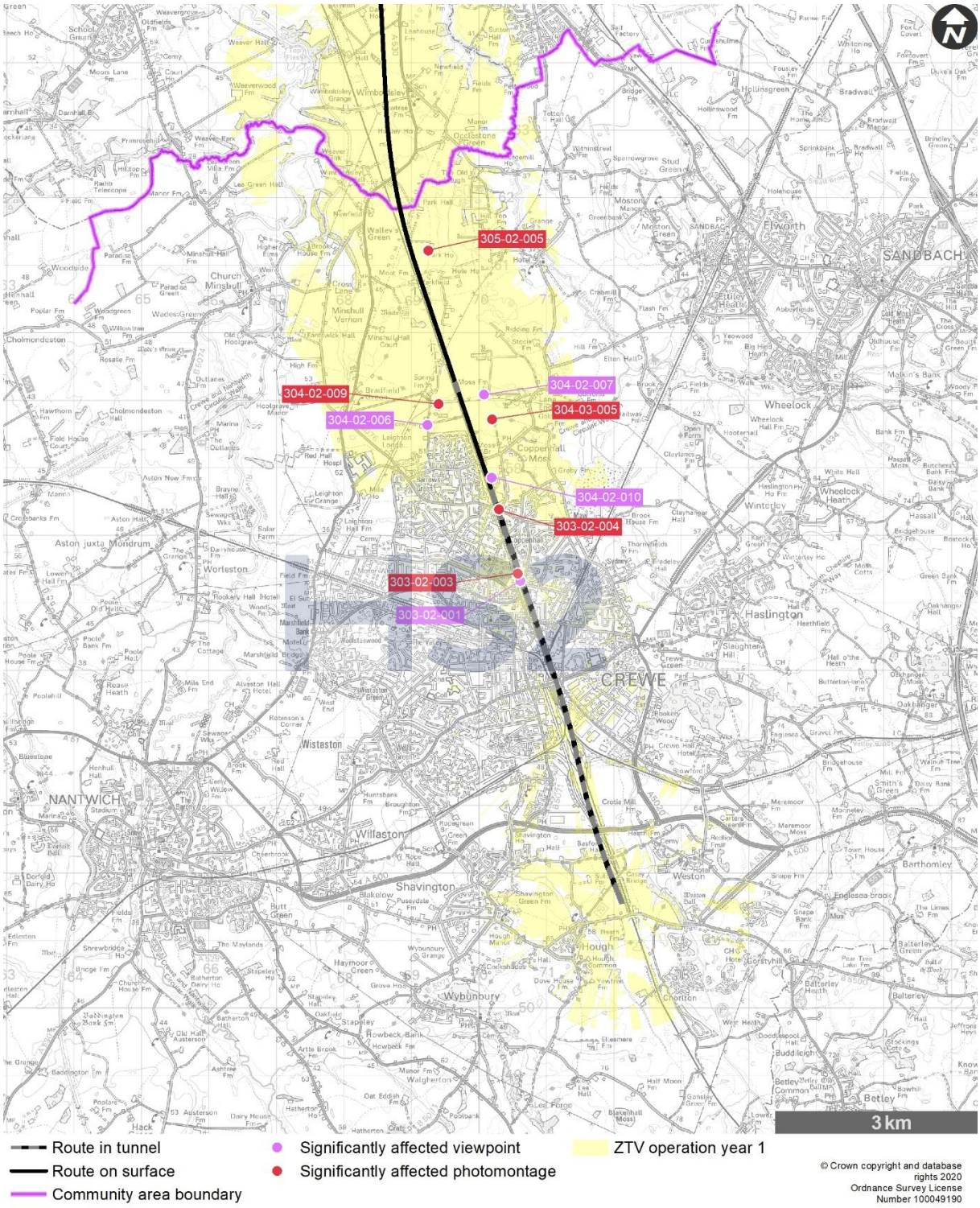
Introduction

11.5.7 The following section describes the likely significant effects on visual receptors during operation in the winter and summer of year 1 and in the summer of both year 15 and year 30. The year 1 assessment includes the winter period, in line with best practice guidance, to ensure a robust assessment. 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. Where visual receptors are predicted to experience significant effects at night-time arising from additional lighting, these are also presented in this section.

11.5.8 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.

11.5.9 The assessment has not identified any locations within this study area where additional lighting during operation will result in significant visual effects at night. Table 40 identifies the locations where the operation of the Proposed Scheme will potentially result in significant effects. Viewpoint locations are shown in Map Series LV-04 in the Volume 2: MA01 Map Book.

Table 40: Operation phase significant visual effects



View north from public open space bordering B5076 Middlewich Street (medium-high sensitivity receptors) (VP 303-02-001) and view south-east from public open space bordering B5076 Middlewich Street (medium sensitivity receptors) (VP 303-02-003)	
Year 1 – winter and summer: Residents on Middlewich Street, Audley Street West and at Bentley Manor Care Home and users of the public open space of **high** susceptibility and footpath users of lower susceptibility, all with **medium** value views will experience a noticeable change to the composition of near distance views. The Middlewich Street vent shaft and headhouse will be visible, together with the re-instatement of grass, tree and shrub planting which will help to integrate the building into the urban fabric and define pedestrian circulation routes. However, the nature of views will change from those across a small area of open space to an area with Middlewich Street vent shaft headhouse, its associated rescue area, parking and perimeter security fencing and reduced areas of greenspace. The immature mitigation planting will not provide any screening by year 1. The combination of the above will result in a **medium** magnitude of visual change. The **medium** magnitude of visual change and **medium-high** sensitivity will result in a **moderate** adverse significant effect. A photomontage illustrating this scenario at VP 303-02-003 is included in Volume 5, Appendix LV-001-0MA01, Part 3.	Level of effect: **Moderate** adverse (significant)
Year 15: The growth of mitigation planting will provide further visual screening and integration of the Middlewich Street vent shaft and headhouse, notably to the surrounding perimeter fencing, parking and rescue areas. The headhouse will be partially screened from the footpath and from the curtilage of properties bordering the B5076 Middlewich Street, although the profile of the headhouse will be part of the local urban skyline. The magnitude of visual change will remain **medium**, resulting in a **moderate** adverse effect.	Level of effect: **Moderate** adverse (significant)
Year 30: Effects will reduce to non-significant for year 30 due to the growth and maturity of the landscape mitigation planting (reported in detail in Volume 5).	Level of effect: Non-significant

View north-west from Bradfield Road, Crewe (high sensitivity receptors) (VP 303-02-004)	
Year 1 – winter and summer: Residents on Broughton Road of high susceptibility and with medium value views will experience a noticeable change to the composition of near-distance views. There will be views to Crewe north portal cutting (retained cutting), Crewe tunnel north portal building and rescue area and Crewe tunnel portal auto-transformer station. Views to train movements from properties bordering Broughton Road will be restricted by the location of the Proposed Scheme in cutting and the presence of a noise fence barrier. Crewe tunnel north portal building and Crewe tunnel north portal auto-transformer station will be noticeable components within the view. Reinstatement planting and mitigation planting around the Crewe tunnel north portal building and alongside the Crewe north portal cutting (retained cutting) will not provide any additional screening or integration at year 1. The combination of the above will result in a medium magnitude of visual change. The **medium** magnitude of visual change and **high** sensitivity will result in a **moderate** adverse significant effect. A photomontage illustrating this scenario is included Volume 5, Appendix LV-001-001, Part 3.	Level of effect: **Moderate** adverse (significant)
Year 15 and year 30: Effects will reduce to non-significant for year 15 and remain so for year 30 due to the growth and maturity of the landscape mitigation planting (reported in detail in Volume 5).	Level of effect: Non-significant

View south-west from Maplins Moss Place, Coppenhall, Crewe (high sensitivity receptors) (VP 304-02-010)	
Year 1 – winter and summer: Residents of Maplins Moss Place of high susceptibility and with **medium** value views will experience a change to the composition of near and middle-distance views. Crewe north portal cutting (retained cutting) will be visible in the near distance to the west and Crewe tunnel north portal building in the middle distance to the south. Viewed from apartments, the majority of the near-distance will be occupied by the noise fence barrier bordering the cutting, and in the distance the loss of existing vegetation removed during construction will allow open views to the WCML. The immaturity of mitigation planting will mean that it will not provide any additional screening or integration at year 1. The combination of the above will result in a **medium** magnitude of visual change. The **medium** magnitude of visual change and the high sensitivity will result in a moderate adverse significant effect.	Level of effect: **Moderate** adverse (significant)
Year 15 and year 30: Effects will reduce to non-significant for year 15 and remain so for year 30 due to the growth and maturity of the landscape mitigation planting (reported in detail in Volume 5).	Level of effect: Non-significant

View west from Footpath Crewe 28/1 (Crewe and Nantwich Circular Walk), Coppenhall Moss (high sensitivity receptors) (VP 304-03-005) and view west from Footpath Warmingham 16/2 at Moss Farm, Coppenhall Moss (high sensitivity receptors) (VP 304-02-007)	
Year 1 – winter and summer: Residents of Moss Farm and Moss Fields Farm, and residential properties along Moss Lane and users of Footpaths Crewe 28/1, 29/1 and 30/1 and Footpath Warmingham 16/2 of **high** susceptibility and with **medium** value views will experience a substantial change to the composition of near and middle-distance views. Warmingham Moss southbound viaduct, Warmingham Moss northbound viaduct, Warmingham Moss southbound embankment No. 2 and Footpath Crewe 29/1 accommodation overbridge will be visible. The visibility of the Proposed Scheme, along with train movements and the presence of overhead line equipment, will change the skyline across a large proportion of the view. However, ground level train movements associated with the Proposed Scheme and viewed in association with existing train movements along the WCML will be partially screened by mitigation earthworks. Immature mitigation planting will not provide any screening or integration by year 1. Although the existing WCML is an existing component of the landscape, the Proposed Scheme will introduce embankments and viaduct structures as raised elements on the skyline, increasing the visibility of rail infrastructure beyond that currently experienced. The combination of the above will result in a **high** magnitude of visual change. The **high** magnitude of visual change and **high** sensitivity will result in a **major** adverse significant effect. A photomontage illustrating this scenario at VP 304-03-005 is included in Volume 5, Appendix LV-001-0MA01, Part 3.	Level of effect: **Major** adverse (significant)
Year 15 – summer: Maturing mitigation planting on mitigation earthworks will help to soften the appearance of Warmingham Moss southbound viaduct, Warmingham Moss northbound viaduct and Warmingham Moss southbound embankment No.2. The planting will also help to integrate the Proposed Scheme into views across the landscape by further filtering views to train movements and overhead line equipment. Mitigation planting will also filter views to the WCML. However,	Level of effect: **Moderate** adverse (significant)

View west from Footpath Crewe 28/1 (Crewe and Nantwich Circular Walk), Coppenhall Moss (high sensitivity receptors) (VP 304-03-005) and view west from Footpath Warmingham 16/2 at Moss Farm, Coppenhall Moss (high sensitivity receptors) (VP 304-02-007)	
the viaducts, train movements and overhead line equipment will remain evident across much of the view. The magnitude of visual change will reduce to be **medium** resulting in a **moderate** adverse significant effect.	
Year 30 – summer: Only the upper parts of Warmingham Moss northbound and southbound viaducts will be visible in the near and middle distance, as the mature landscape planting will partially filter views to the lower sections of Warmingham Moss northbound viaduct. The magnitude of visual change will remain **medium** resulting in a **moderate** adverse significant effect.	Level of effect: **Moderate** adverse (significant)

View east from Moss Lane, Crewe and Nantwich Circular Walk (high sensitivity receptors) (VP 304-02-006) and View east from Minshull Vernon Footpath 2/1, east of Moss Lane (high sensitivity receptors) (VP 304-02-009)	
Year 1 – winter and summer: Residents on Moss Lane and users of Leighton Footpath 7/1 and Crewe Footpath 12/1 of **high** susceptibility and with **medium** value views will have near and middle-distance views. Warmingham Moss southbound viaduct and Warmingham Moss northbound viaduct, along with train movements and the presence of overhead line equipment will be visible, which will interrupt the skyline across much of the view. Ground level train movements along the Proposed Scheme will be partially screened by mitigation earthworks and will have a beneficial effect in screening existing WCML train movements. Although the WCML is an existing component of the landscape, the Proposed Scheme will introduce additional railway infrastructure including viaducts, embankments and earthworks into the landscape, resulting in an increased visibility of such elements beyond that currently experienced. Due to its immaturity, the mitigation planting will not provide any screening by year 1. The combination of the above will result in a **high** magnitude of visual change. The **high** magnitude of visual change and **high** sensitivity will result in a **major** adverse significant effect. A photomontage illustrating VP 304-02-009 is included Volume 5, Appendix LV-001-0MA01, Part 3.	Level of effect: **Major** adverse (significant)
Year 15 – summer: The maturing of landscape mitigation planting on mitigation earthworks will help to screen the appearance of the Warmingham Moss southbound viaduct and Warmingham Moss northbound viaduct. The planting will also help to integrate the Proposed Scheme into the landscape by partly filtering train movements and overhead line equipment on the Proposed Scheme and indirectly that of the WCML. However, the train movements and overhead line equipment on Warmingham Moss northbound and Warmingham Moss southbound viaducts will remain evident across much of the view. The magnitude of visual change will reduce to **medium** resulting in a **moderate** adverse significant effect.	Level of effect: **Moderate** adverse (significant)
Year 30 – summer: Residents and footpath users will have views to the upper parts of Warmingham Moss northbound viaduct and Warmingham Moss southbound viaduct in the middle distance. The greater maturity of mitigation planting will partially filter views to the lower sections of Warmingham Moss northbound viaduct, and sections at grade.	Level of effect: **Moderate** adverse (significant)

View east from Moss Lane, Crewe and Nantwich Circular Walk (high sensitivity receptors) (VP 304-02-006) and View east from Minshull Vernon Footpath 2/1, east of Moss Lane (high sensitivity receptors) (VP 304-02-009)	
The magnitude of visual change will remain **medium** resulting in a **moderate** adverse significant effect.	

View west from Footpath Minshull Vernon 8/1 at Park House Farm (high sensitivity receptors) (VP 305-02-005)	
Year 1 – winter and summer: Residents of Park House Farm, Park Hall Farm, Parkfield Farm and footpath users of **high** susceptibility and with **medium** value views will experience a noticeable change to the composition of near and middle distance views across open farmland to Footpath Minshull Vernon 8/1 accommodation overbridge and Crewe North IMB-R. The Proposed Scheme, although similar in appearance to the WCML, will be visible across much of the view, running parallel to, and to the east of, the WCML. Footpath Minshull Vernon 8/1 accommodation overbridge will appear on the skyline close to Parkfield Farm, while A530 Nantwich Road overbridge will be visible on the skyline to the north (this being located within the adjacent Wimboldsley to Lostock Gralam area (MA02)). In summer months, the intervening vegetation will filter views to the Proposed Scheme and will reduce the visibility of overhead line equipment and train movements from Parkfield Farm. Footpath Minshull Vernon 8/1 accommodation overbridge will remain partially visible. The immaturity of mitigation planting means that it will not provide any screening or integration in the summer of year 1. The combination of the above will result in a **medium** magnitude of visual change. The **medium** magnitude of visual change and **high** sensitivity will result in a **moderate** adverse significant effect. A photomontage illustrating this scenario is included Volume 5, Appendix LV-001-0MA01, Part 3.	Level of effect: **Moderate** adverse (significant)
Year 15 and year 30: Effects will reduce to non-significant for year 15 and remain so for year 30 due to the growth and maturity of the landscape mitigation planting (reported in detail in Volume 5).	Level of effect: Non-significant

Other mitigation measures

11.5.10 The permanent effects of the Proposed Scheme on landscape and visual receptors have been reduced through integration of the measures described in this section. Effects in year 1 may also be further reduced through establishing planting early or in advance of the main construction programme.

Summary of likely residual significant effects

11.5.11 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 at year 15 of operation:

- major adverse effects in relation to one LCA;
- moderate adverse visual effects at five representative residential viewpoint locations; and
- moderate adverse visual effects at one recreational viewpoint locations.

Cumulative effects

Cumulative landscape effects

11.5.12 As reported in HS2 Phase 2a ES Volume 5, CA5 South Cheshire, LV-001-005, the presence and operation of HS2 Phase 2a will introduce new large-scale structures and earthworks into the local landscape that will be uncharacteristic components of the Shavington/Crewe Outer Fringe Lower Farms and Woods LCA and Blakenhall Lower Farms and Woods LCA. This will result in **moderate adverse** effects in year 1, which will be significant. Effects will reduce to **minor adverse** (non-significant) at year 15 and year 60[106] due to the effectiveness of the mitigation planting.

11.5.13 The presence and operation of the Proposed Scheme, including Crewe tunnel south portal, portal building and telecommunications mast will be present in the context of structures that form part of Phase 2a as well as the existing railway corridor, and will result in **negligible** effects in year 1, which will be non-significant. Effects will remain **negligible** at year 15 and year 30.

11.5.14 At year 1, the combination of HS2 Phase 2a and the Proposed Scheme during operation will result in a **moderate adverse** cumulative effect on the Shavington/Crewe Outer Fringe Lower Farms and Woods LCA and Blakenhall Lower Farms and Woods LCA, which is significant. From year 15 onwards, the effect on the LCA from the combination of HS2 Phase 2a and the Proposed Scheme during operation will reduce to **minor adverse**, which is non-significant.

Cumulative visual effects

11.5.15 As reported in HS2 Phase 2a ES Volume 5, CA5 South Cheshire, LV-001-005, the presence and operation of HS2 Phase 2a will be visible across a large proportion of the view in proximity to viewpoints 026.02.022, 026.02.028, 027.02.004 and 027.02.013.

11.5.16 In winter of year 1 of operation of HS2 Phase 2a, the outlook from viewpoint 026.02.022 will be substantially altered, resulting in **major** adverse significant effects. Effects will reduce to **minor** adverse (non-significant) at year 15 and **negligible** at year 60 due to the effectiveness of the mitigation planting.

11.5.17 In winter of year 1 of operation, at viewpoints 026.02.028 and 027.02.004, the new landforms will appear as uncharacteristic features in the view, resulting in **moderate** adverse significant effects. Effects will reduce to **negligible** (non-significant) at year 15 and year 60 due to the effectiveness of the mitigation planting.

11.5.18 In winter of year 1 of operation, at viewpoint 027.02.013 the realigned WCML and extended freight lines to Basford Hall sidings will be visible but not prominent, resulting in a **minor**

[106] HS2 Phase 2a ES addressed effects to year 60; the methodology for the landscape and visual topic for the Proposed Scheme addresses effects to year 30.

adverse (non-significant) effect. Effects reduce to **negligible** at year 15 and year 60 due to the effectiveness of the mitigation planting.

11.5.19 The presence and operation of the Proposed Scheme in year 1, including Crewe tunnel south portal, portal building and telecommunications mast, will be viewed in the context of the structures that form part of Phase 2a as well as the existing railway corridor and filtered by intervening vegetation. As a result, there will be a **minor** adverse effect at viewpoint 300-02-005, viewpoint 300-02-006, viewpoint 301-02-006 and 301-02-007, which is non-significant. Effects will reduce to **negligible** (non-significant) at year 15 and year 30 due to the effectiveness of the mitigation planting.

11.5.20 In winter in year 1 of operation, the combination of HS2 Phase 2a and the Proposed Scheme will result in a **major** adverse cumulative effect at representative viewpoint location at Newcastle Road and **moderate** adverse cumulative effect at representative viewpoint locations at Newcastle Road, Hough and Casey Lane, which is significant. From Weston Lane, the combination of HS2 Phase 2a and the Proposed Scheme will result in a **minor** adverse cumulative effect at the representative viewpoint location, which is non-significant. From year 15 onwards, the cumulative effect of operation of HS2 Phase 2a and the Proposed Scheme at these representative viewpoint locations will reduce to non-significant due to the effectiveness of the mitigation planting.

Monitoring

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

11.5.22 There are no area-specific requirements for monitoring landscape and visual mitigation during the operation of the Proposed Scheme in the Hough to Walley's Green area.

12 Socio-economics

12.1 Introduction

12.1.1 This section reports on the environmental baseline, likely economic and employment impacts as well as significant effects during construction and operation of the Proposed Scheme within the Hough to Walley's Green area. The assessment considers existing businesses, community organisations, local employment and local economies, including planned growth and development.

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

12.1.3 The socio-economic effects on employment at a route-wide level are reported in Volume 3, Route-wide effects (Section 12). Maps showing the location of the key environmental features (Map Series CT-10) and the key construction (Map Series CT-05) and operational (Map Series CT-06) features of the Proposed Scheme can be found in the Volume 2: MA01 Map Book. The Proposed Scheme is described in Section2.

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 EIA Scope and Methodology Report (SMR)[107]. The assessment of in-combination effects draws upon the findings of other technical disciplines (e.g. air quality, sound, noise and vibration, landscape and visual and traffic and transport).

- It is assumed that existing business resources can be retained within areas of land required for some utility works including the raising or lowering of pylons, the re-stringing of cables, utility decommissioning or the provision of access routes to such works. On the basis of this assumption, no direct assessment has been undertaken in relation to the following business resources: GIST on Cowley Way; and
- Units 1-5 on Cowley Way (five resources).

[107] Volume 5: Appendix CT-001-00001, Environmental Impact Assessment Scope and Methodology Report.

12.3 Environmental baseline

Existing baseline

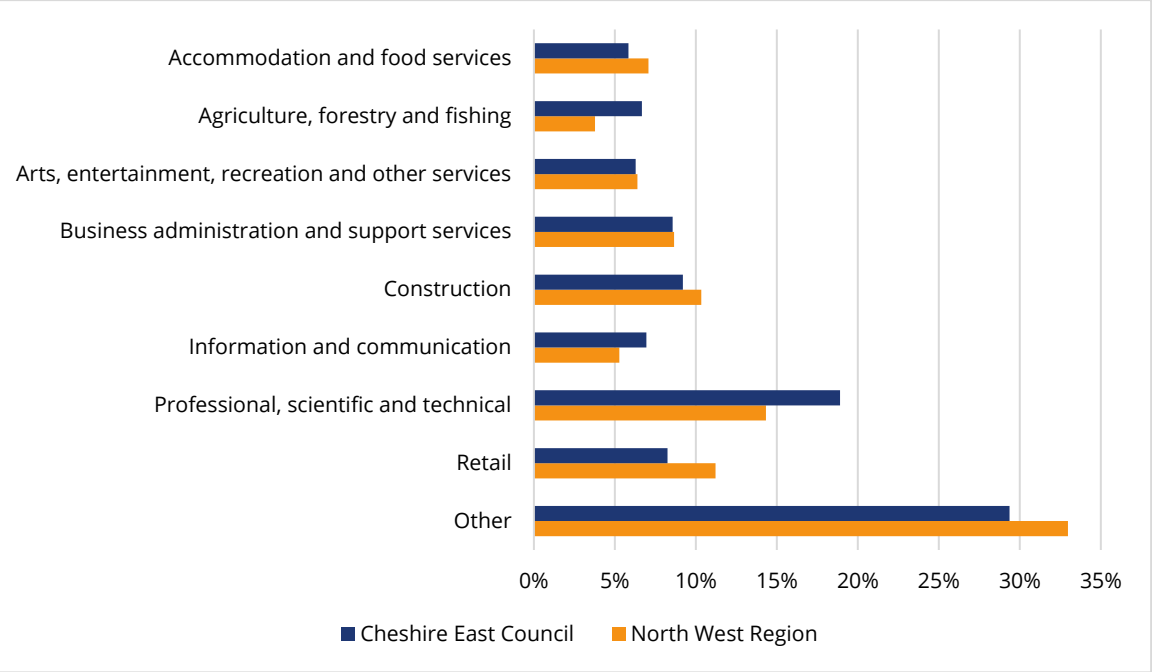
Study area description

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

Business and labour market

12.3.2 Within the CEC administrative area there is a wide spread of business types reflecting a diverse range of commercial activities. In 2020 the professional, scientific and technical sector accounted for the largest proportion of businesses (19%), with construction the second largest (9%), followed by business administration and support services (9%) and retail (8%), as shown in Figure 12. For comparison within the North West region, the largest sectors were professional, scientific and technical (14%) and retail (11%), followed by construction (10%) and business administration and support services (9%)[108].

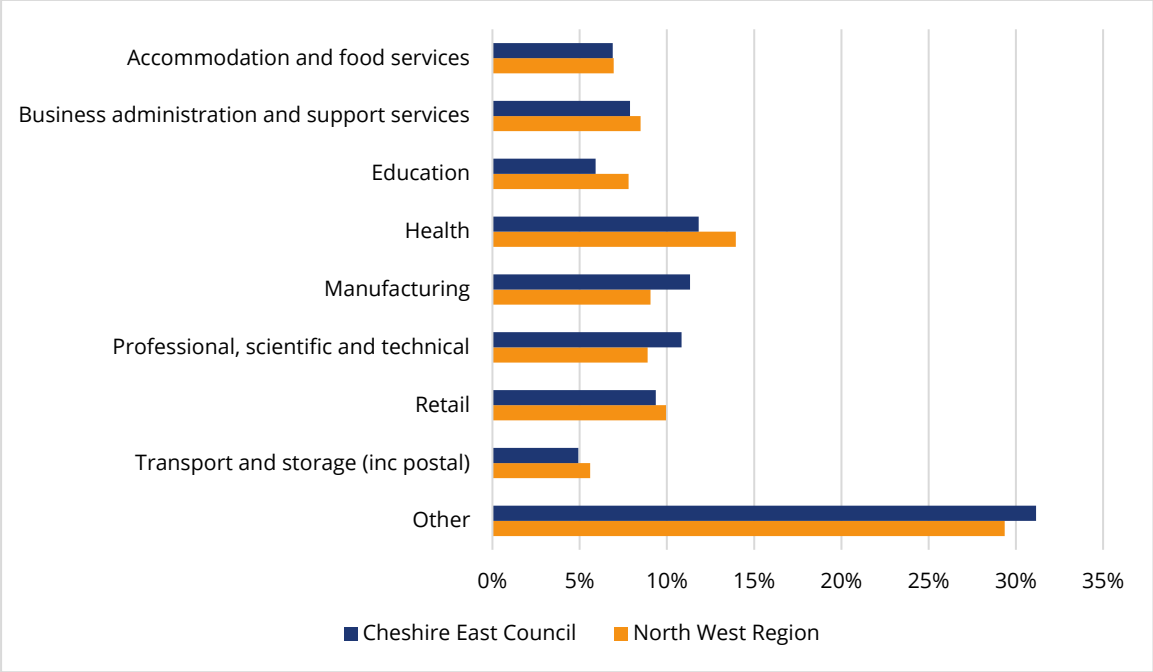
Figure 12: Business sector composition in the Cheshire East Council area and the North West region



[108] Office for National Statistics (2020), *UK Business Counts - local units by industry and employment size band*. Available online at: http://www.nomisweb.co.uk/datasets/idbrlu.

12.3.3 In 2019[109], approximately 203,000 people worked in the CEC area. According to the Office for National Statistics Business Register and Employment Survey 2019, the top four sectors in terms of share of employment were: health (12%); manufacturing (11%); professional, scientific and technical (11%); and retail (9%). These compare with the top four sectors for the North West region, which were: health (14%); retail (10%); manufacturing (9%); and professional, scientific and technical (9%), as shown in Figure 13.

Figure 13: Employment by industrial sector in the Cheshire East Council area and the North West region



12.3.4 According to the Annual Population Survey (2020)[110], the employment rate[111] within the CEC area was 76% (171,300 people), which was higher than that recorded for both the North West region (74%) and England (76%). In 2020, unemployment in the CEC area was 3.9%, which was lower than that recorded both for the North West region (4.3%) and England (4.8%).

12.3.5 The Annual Population Survey (2020) also shows that 42% of CEC residents aged 16-64 were qualified to National Vocational Qualification Level 4 (NVQ4) and above, which compares to that recorded for the North West region (39%) and England (43%), while 4.5% of residents had no qualifications, which was lower than that recorded both for the North West region (7.5%) and England (6.2%).

[109] Office for National Statistics (2019), *Business Register and Employment Survey* . Available online at: http://www.nomisweb.co.uk/datasets/newbres6pub. This number includes both residents and non-residents of CEC who work within its boundaries.

[110] Office for National Statistics (2020), *Annual Population Survey*. Available online at: http://www.nomisweb.co.uk/datasets/apsnew. This number includes the jobs held by residents of CEC irrespective of where they work.

[111] The proportion of working age (16-64 year olds) residents that are in employment.

Property

12.3.6 A review of employment land in 2012[112] identified a need by 2030 for up to 323.7ha of additional employment land in the CEC area. It was estimated that CEC had an identified employment land supply of 272.4ha across the borough. The employment land shortfall compared to identified supply was up to 51.3ha to 2030. While there was a potential shortfall of employment land, Crewe was identified as having one of the largest office land supplies in the CEC area and having sufficient employment land available. It had both industrial and office space available to the market, including at Crewe Business Park.

12.3.7 The importance of providing a portfolio of readily available and market responsive employment land to support growth has been highlighted in the 2017 Cheshire and Warrington LEP Strategic and Economic Plan[113].

12.3.8 Based on the latest available data from the Estates Gazette (February 2021), the average vacancy rate for industrial and warehousing property in the CEC area has been assessed as 14.7% based on marketed space against known stock[114].

12.3.9 Based upon the latest available data from the Estates Gazette (February 2021) the average vacancy rate for office space in the CEC area[115] is 12.1%.

Future baseline

Construction (2025)

12.3.10 Volume 5: Appendix CT-004-00000 provides details of the developments in the Hough to Walley's Green area that are assumed to have been implemented by 2025. The following committed developments of relevance to socio-economics that would materially alter the future baseline during construction of the Proposed Scheme in this area, are set out in Table 41.

[112] Ove Arup and Partners Ltd (2012), *Cheshire East Employment Land Review.* Based on upper range covering 2009-2030. This includes a 30% flexibility factor, which acts as a buffer to ensure that future land supply is flexible enough to provide a range and choice of land to meet demand and in case there are issues such as sites no longer being delivered.

[113] Cheshire and Warrington Local Enterprise Partnership (2017), *Strategic Economic Plan: Cheshire and Warrington Matters*. Available online at: https://www.warrington.gov.uk/sites/default/files/2019-10/appendix_10_-_cheshire_and_warrington_strategic_economic_plan_-_extract.pdf.

[114] Vacant space is based on marketed space identified from Estates Gazette data (EGi) (February 2021).

[115] Based on marketed space identified from Estates Gazette data (EGi) (February 2021).

Table 41: Committed developments of relevance to socio-economics during construction

Map book reference[116]	Planning reference	Description	How this is considered in the assessment
MA01/033	15/1537N	Location: land at Basford East, Crewe. Outline planning application (with all matters reserved) for a mixed-use development comprising residential use (Use Class C3) (up to 325 residential dwellings); employment use (Use Class B1), local centre comprising health centre and community facility (Use Class D1), food/non-food retail (Use Class A1), public house/restaurant (Use Class A4/A3) and associated works including construction of a new access road with access from the Crewe Green Link Road South, creation of footpaths and provision of public open space and landscaping.	Informing future baseline.
MA01/127	17/4011N	Location: Bentley Motors Ltd, Pyms Lane, Crewe, Cheshire, CW1 3PL. Hybrid Planning Application for - Outline planning application (with all matters reserved except for means of access and layout for Production and Manufacturing Facility 2) for the erection of two no. production and manufacturing facilities; two covered links connecting one of the production and manufacturing facilities with Bentley's existing manufacturing facility; an engine test bed facility together with associated car parking, landscaping and associated infrastructure. Full planning application for the erection of a gatehouse, security fencing, pedestrian turnstile and associated turning facilities to the west of the existing Bentley Motors site on Pyms Lane; the erection of a gatehouse, security fence, pedestrian turnstile, bin store, reconfiguration of visitor parking and associated turning facilities to the east of the existing Bentley Motors site on Pyms Lane; the erection of a gatehouse, security fence, cycle store, pedestrian turnstile and associated turning facilities together with a further gate on Sunnybank Road.	Informing future baseline. Will not be implemented.
MA01/130	16/0341N	Location: Bentley Motors Ltd, Pyms Lane, Crewe, CW1 3PL. Demolition of existing on-site buildings and structures, the construction of a five-storey engineering technical centre comprising offices at the front of the building and warehousing at the rear, the construction of a two-storey design centre comprising offices and a workshop together with associated works.	Informing future baseline.
MA01/188	18/3099N	Location: Middlewich Road, Minshull, Vernon. Change of use of an existing agricultural building and land to Commercial Use (B1 and B8) (Office and Storage Use).	Informing future baseline. Considered in cumulative effects.

[116] Volume 5: Planning Data/Committed Development Map Book: Maps CT-13-300 to CT-13-304a.

Map book reference[116]	Planning reference	Description	How this is considered in the assessment
MA01/286	18/0228N	Location: Bentley Motors Ltd, Pyms Lane, Crewe, CW1 3PL. Construction of two 7200 sqm, four storey office blocks and related external works.	Informing future baseline.
MA01/332	19/3526N	Location: Plot 5, Basford West Development Site, Crewe Road, Crewe. Reserved Matters application for appearance, landscaping and layout on outline application 14/0378N for erection of a building for use within class B2 and B8.	Informing future baseline.
MA01/381	18/4123N	Location: Weston Hall, commercial complex, Main Road, Weston. Change of use of buildings and areas of hardstanding to B8 (Storage & Distribution) use, replacement of redundant buildings and erection of new buildings and areas of hardstanding for B8 (Storage & Distribution) use, ancillary offices, and associated works.	Informing future baseline.
MA01/397	19/3796N	Location: Brightstar Twenty Uk, Weston Road, Crewe, CW1 6BU. Change of use from existing storage and distribution (Class B8) to a flexible employment use comprising light industrial use or storage and distribution (Classes B1c or B8).	Informing future baseline.
n/a	n/a	HS2 Phase 2a West Midlands to Crewe.	Informing future baseline. Considered in cumulative effects.

12.3.11 Implementation of committed developments MA01/033, MA01/127, MA01/130, MA01/188, MA01/286, MA01/332, MA01/381 and MA01/397 could result in approximately 8,200 additional jobs, altering the future baseline against which the Proposed Scheme is assessed. As such, these committed developments have been included as part of the future baseline and considered within this assessment.

12.3.12 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.

12.3.13 HS2 Phase 2a will be under construction by 2025. The construction and operation of the Phase 2a scheme will result in employment, altering the future baseline against which the Proposed Scheme is assessed. As such, HS2 Phase 2a has been included as part of the future baseline and considered within this assessment.

12.3.14 The combined effects of HS2 Phase 2a and the Proposed Scheme, against a baseline without either phase, have been considered. There will be no significant socio-economic cumulative effects as a result of the combination of HS2 Phase 2a and the Proposed Scheme.

Operation (2038)

12.3.15 Volume 5: Appendix CT-004-00000 also provides details of the developments in the Hough to Walley's Green area that are assumed to have been implemented by 2038. No additional committed developments of relevance for socio-economics have been identified that would materially alter the future baseline in this area. There will be no significant socio-economic cumulative effects as a result of the combination of HS2 Phase 2a and the Proposed Scheme.

12.4 Effects arising during construction

Avoidance and mitigation measures

12.4.1 The draft Code of Construction Practice (CoCP)[117] includes a range of provisions that will help mitigate socio-economic effects associated with construction within this area, including:

- reducing nuisance through the sensitive layout of construction sites (Section 5);
- consulting businesses located close to hoardings on the design, materials used and construction of the hoarding, to reduce impacts on access to and visibility of their premises (Section 12);
- applying best practicable means during construction works to reduce noise (including vibration) at sensitive receptors (including local businesses) (Section 13);
- monitoring and managing flood risk and other extreme weather events that may affect socio-economic resources during construction (Section 16);
- site specific traffic management measures including requirements relating to the movement of traffic from business and commercial operators of road vehicles, including goods vehicles (Section 14); and
- maintaining access to businesses for the duration of construction works where reasonably practicable (Section 14).

Assessment of impacts and effects

Temporary effects

In-combination effects

12.4.2 No non-agricultural businesses have been identified within the Hough to Walley's Green area that are expected to experience significant in-combination effects as a result of the Proposed Scheme.

[117] Volume 5: Appendix CT-002-00000, Draft Code of Construction Practice.

Isolation

12.4.3 Businesses within the Hough to Walley's Green area may experience significant isolation effects as a result of construction of the Proposed Scheme. As a consequence, this could lead to a loss of trade for the affected businesses.

12.4.4 Construction works will require the vehicular closure of Parkers Road, between Broughton Road and Bleasdale Road, where it intersects the Proposed Scheme, for one year and three months. One business in this area will experience disruption as a result of construction works. The ability of The White Lion public house to attract customers may be impaired by increased journey length for customers arriving by vehicle from Coppenhall, north Crewe, who will be diverted by 4.4 km, along Mablins Lane, the B5076 North Street/Bradfield Road, Remer Street and Groby Road. Access for non-motorised users will be maintained via a temporary footbridge. For the reasons stated above, the disruption as a result of the Proposed Scheme is considered to represent a temporary moderate adverse significant isolation effect on this business.

Construction employment

12.4.5 There will be one main civil engineering compound (Crewe tunnel north main compound), and five civil engineering satellite compounds in the Hough to Walley's Green area, all of which will continue to be used as railway systems compounds following the completion of civil engineering works. Up to 5,900 person years of construction employment opportunities will be created at these sites[118], broadly equivalent to 590 full time jobs[119]. Depending on the skill levels required and the skills of local people, these jobs are potentially accessible to residents in the locality and to others living further afield. The impact of the direct construction employment creation has been considered as part of the route-wide assessment (see Volume 3, Route-wide effects).

12.4.6 Direct construction employment could lead to opportunities for local businesses to supply the Proposed Scheme or to benefit from expenditure of construction workers. The impact of indirect construction employment creation has been considered as part of the route-wide assessment (see Volume 3, Route-wide effects).

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

[118] 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.

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

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 Overall, four resources in the study area will experience direct impacts as a result of the Proposed Scheme. These are as follows:

- Crewe Truck Stop and Cafe on Cowley Way (two resources);
- an equestrian centre on Parkers Road; and
- Bentley Motors Ltd (MA01/127) on Pyms Lane.

12.4.10 The resources listed above are those that are anticipated to experience job losses or displacement as a result of construction of the Proposed Scheme. Additionally, land required for the construction of the Proposed Scheme will directly impact other business resources. These businesses are not listed above, as the effect upon them is not expected to result in job losses or displacement.

12.4.11 Two of the resources are subject to potentially significant effects on business activities and employment. These resources are listed in Table 42.

Table 42: Resources which will potentially experience significant direct effects

Resource	Description of business activity
Crewe Truck Stop and Cafe on Cowley Way	Cafe and secure lorry park
Bentley Motors Ltd (MA01/127) on Pyms Lane	Car manufacturer

12.4.12 The magnitude of impact focuses on the number of jobs that will be affected by the Proposed Scheme, either through displacement or possible job loss. It also considers the implications of this impact in relation to the scale of economic activity and opportunity in the area.

12.4.13 The following factors were taken into account when considering the sensitivity of resources:

- availability of alternative, suitable premises;
- size of the local labour market;
- skill levels and qualifications of local people; and
- levels of unemployment.

12.4.14 Taking account of the sensitivity of the resource and the magnitude of impact, the significance of the resultant effects is set out in Table 43.

Table 43: Significance of effects

Resource	Impact magnitude	Sensitivity	Significance of effect
Crewe Truck Stop and Cafe on Cowley Way	Medium	Medium	Moderate adverse - significant
Bentley Motors Ltd (MA01/127) on Pyms Lane	High	High	Major adverse - significant

12.4.15 The construction of the Proposed Scheme will require the acquisition of land and buildings. An overview of the resources expected to be significantly affected has been included below.

12.4.16 The construction of Cowley Way vent shaft will require the demolition of the shower and toilet block and temporary acquisition of approximately 73% and the permanent acquisition of approximately 48% of the HGV parking spaces for Crewe Truck Stop and Cafe on Cowley Way. The sensitivity of these resources is assessed as medium. Whilst the cafe will not be demolished, the demolition of the shower and toilet block and the loss of this amount of parking is likely to reduce the viability of the businesses. The magnitude is medium, based on the number of jobs located at the site. The effect is assessed to be moderate adverse and will therefore be significant.

12.4.17 Construction of two new underground Scottish Power electricity cables within Pyms Lane will require the permanent acquisition of land with existing planning permission. Committed development MA01/127 for Bentley Motors Ltd comprises: the erection of two production and manufacturing facilities; two covered links connecting one of the production and manufacturing facilities with Bentley Motors Ltd existing manufacturing facility; and an engine test bed facility together with associated car parking. Approximately 25% of the land associated with the Production and Manufacturing Facility 2 will be required for these utility works. Discussions with Bentley Motors Ltd are ongoing, with the aim to limit the impact of the Proposed Scheme on this committed development. Hence, a precautionary approach has been taken to the assessment in assuming that none of the committed development will be able to be delivered as a result of the Proposed Scheme.

12.4.18 The sensitivity of the resource is assessed as high given the importance of the manufacturing facility. The magnitude is high, based on the number of new jobs associated with the committed development. The effect is assessed to be major adverse and will therefore be significant. For the purposes of the socio-economic assessment, it is assumed that the other committed developments for Bentley Motors Ltd (MA01/130 and MA01/286) can be implemented as consented alongside the Proposed Scheme.

12.4.19 Across all of the employment areas reviewed, it is estimated that as a worst-case scenario that 890 jobs[120] will either be displaced or possibly lost within the Hough to Walley's Green

[120] Employment within businesses has been estimated through a combination of sources, for example, surveys of businesses, the Experian employment dataset, employment floor space and the Homes and Communities Agency (HCA) Employment Densities Guide 3rd Edition (2015). The estimate is calculated using standard employment density ratios and estimates of floor areas and may vary significantly from actual employment at the sites.

area. The impact on the local economy from the relocation or loss of jobs is considered to be minor in the context of the total number of people employed in the CEC area (approximately 203,000 jobs) and the scale of economic activity and opportunity in the area.

Other mitigation measures

12.4.20 Businesses displaced by the Proposed Scheme will be compensated in accordance with the Compensation Code. HS2 Ltd recognises the importance of businesses displaced from their existing premises being able to relocate to suitable alternative premises and will, therefore, offer additional support over and above statutory requirements to facilitate this process[121,122]. Businesses with an interest in land that is either being acquired or possessed temporarily may also be eligible for compensation in accordance with the Compensation Code.

12.4.21 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.

12.4.22 The nominated undertaker will seek to deliver appropriate signage to inform users of the continued operation of The White Lion public house, subject to securing all relevant consents.

Summary of likely residual significant effects

12.4.23 Likely significant residual effects are shown in Volume 5, Socio-economics Map Book: Maps SE-01-301 to SE-01-304a. The Proposed Scheme will require loss of land at Crewe Truck Stop and Cafe on Cowley Way and prevents construction of a committed development for Bentley Motors Ltd. The loss of these resources will result in adverse residual significant effects.

12.4.24 During construction of the Proposed Scheme, The White Lion public house will experience temporary adverse residual significant isolation effects as a result of a road closure.

Cumulative effects

12.4.25 No significant cumulative temporary or permanent effects during construction have been identified. There will be no significant cumulative effects on socio-economic receptors as a result of the combination of HS2 Phase 2a and the Proposed Scheme.

[121] High Speed Two Ltd (2022), *Phase 2b Western Leg Information Paper C7: Business relocation.*

[122] High Speed Two Ltd (2022), *Phase 2b* Western Leg *Information Paper C8: Compensation code for compulsory purchase.*

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

Businesses

12.5.2 No resources are expected to experience significant direct socio-economic effects during the operation of the Proposed Scheme.

In-combination effects

12.5.3 Businesses within the Hough to Walley's Green area may experience a number of effects as a result of the operation of the Proposed Scheme, for example, air quality, landscape and visual, or noise and vibration impacts. Taken in-combination, these multiple residual effects could amount to a significant change in the ambiance at these businesses leading to a possible loss of trade for the following affected businesses. Durations of in-combination effects have been identified where information on the duration of contributing effects is provided in the relevant source assessments above. The assessment of in-combination effects draws upon: Section 5, Air quality; Section 11, Landscape and visual; Section 13, Sound, noise and vibration.

12.5.4 Bentley Manor Care Home, located in Crewe, may experience significant ground-borne noise (permanent) and visual (through to year 15) residual effects during the operational phase of the Proposed Scheme. The sensitivity of this establishment is assessed to be high as users are considered to be susceptible to changes in the local environment and setting and this is likely to discourage customers of the residential care home. Given the duration of effects and the high level of sensitivity, the Proposed Scheme is assessed to have a significant adverse in-combination effect on this business.

Isolation

12.5.5 No non-agricultural businesses have been identified within the Hough to Walley's Green area that are expected to experience significant isolation effects as a result of the Proposed Scheme.

Operational employment

12.5.6 Operational employment will be created at locations along the route including stations, train crew facilities and infrastructure/maintenance depots. There will be no operational employment created within the Hough to Walley's Green area. Within the adjacent

Wimboldsley to Lostock Gralam area (MA02) to the north, there will be Crewe North rolling stock depot north-east of Walley's Green, creating 350 HS2-related jobs. These employment opportunities will be accessible to residents in the locality.

12.5.7 Direct operational employment created by the Proposed Scheme could also lead to indirect employment opportunities for local businesses in terms of supplying the project or benefiting from expenditure of directly employed workers on goods and services.

12.5.8 Some of these employment opportunities will be accessible to residents in the locality and, given the transport accessibility within the local area, to residents living further afield.

12.5.9 The impact of operational employment creation has been assessed as part of the route-wide assessment (see Volume 3).

Other mitigation measures

12.5.10 HS2 Ltd continues to review the design and mitigation in relation to ground-borne noise effects, and any changes will be brought forward during the passage of the Bill in Parliament.

12.5.11 No further mitigation measures have been identified for socio-economic receptors.

Summary of likely residual significant effects

12.5.12 Likely significant residual effects are shown on Volume 5, Socio-economic Map Book: Maps SE-01-301 to SE-01-304a. The Proposed Scheme will result in one residual significant in-combination effect on Bentley Manor Care Home.

Cumulative effects

12.5.13 No significant cumulative effects on socio-economic receptors have been identified in the Hough to Walley's Green area during operation. There will be no significant cumulative effects on socio-economic receptors as a result of the combination of HS2 Phase 2a and the Proposed Scheme.

Monitoring

12.5.14 There are no area-specific requirements for monitoring socio-economic effects during the operation of the Proposed Scheme in the Hough to Walley's Green area. Where there are likely residual significant effects at Bentley Manor Care Home, the specific operational monitoring requirements in relation to ground-borne noise and landscape and visual effects, which will contribute to the in-combination effect, are described in the relevant topic sections.

13 Sound, noise and vibration

13.1 Introduction

13.1.1 This section reports the assessment of the noise and vibration likely significant effects arising from the construction and operation of the Proposed Scheme within the Hough to Walley's Green area on:

- 'residential receptors': people, primarily where they live, in terms of individual dwellings and on a wider community basis including any shared community open areas; and
- 'non-residential receptors' such as:
  - community facilities including schools, hospitals, places of worship and 'quiet areas'; and
  - commercial properties such as hotels.

13.1.2 'Shared community open areas' are amenity spaces that the Planning Practice Guidance[123] 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.

13.1.3 Non-residential receptors with multiple uses were assessed either based on the most noise sensitive use or were subject to multiple assessments as appropriate.

13.1.4 Quiet areas are defined in the EIA Scope and Methodology Report (SMR)[124] as:

- areas designated under Local Plans as being prized for their tranquillity;
- areas designated under Local Plans or Neighbourhood Development Plans as Local Green Spaces; and
- areas identified as Quiet Areas through implementation of the Environmental Noise (England) Regulations[125, 126].

[123] Ministry of Housing, Communities and Local Government (2019), *National Planning Practice Guidance – Noise*. Available online at: https://www.gov.uk/guidance/noise--2.

[124] Volume 5: Appendix CT-001-00001, Environmental Impact Assessment Scope and Methodology Report.

[125] *Environmental Noise (England) Regulations 2006 (SI 2006/2238).* London, Her Majesty's Stationary Office. Available online at: https://www.legislation.gov.uk/uksi/2006/2238.

[126] *Environmental Noise (England) (Amendment) Regulations 2009 (SI 2009/1610).* London, Her Majesty's Stationary Office. Available online at: https://www.legislation.gov.uk/uksi/2009/1610.

13.1.5 The methodology for the assessment of likely significant noise and vibration effects was developed in line with Government noise policy[127], planning policy, planning practice guidance on noise[123] and EIA Regulations as described in the SMR.

13.1.6 Engagement has been undertaken with Cheshire East Council (CEC) with respect to the sound, noise and vibration assessment. The purpose of this engagement has been twofold. Firstly, engagement has been undertaken on a route-wide basis covering matters including process, scope, method, approach to baseline and mitigation strategy. Secondly, local engagement has been undertaken to obtain relevant information regarding residential and non-residential receptors, existing baseline sound levels and to discuss the development of the mitigation to be included in the Proposed Scheme. Officers from local authorities have been invited to attend and witness baseline sound measurements. Where appropriate, relevant information identified by the authorities has been taken into account in the assessment.

13.1.7 More detailed information regarding the sound, noise and vibration assessment for the Hough to Walley's Green area is available in the relevant appendices in Volume 5:

- Sound, noise and vibration, route-wide assumptions and methodology (Appendix SV-001-00000);
- Sound, noise and vibration baseline and construction assessment (Appendix SV-002-0MA01); and
- Sound, noise and vibration operation assessment (Appendix SV-003-0MA01).

13.1.8 Maps showing the location of the key environmental features (Map Series CT-10) and the key construction (Map Series CT-05) and operational (Map Series CT-06) features of the Proposed Scheme can be found in the Volume 2: MA01 Map Book. Mapping to support the sound, noise and vibration assessment is presented in Map Series SV-05 (Volume 2: MA01 Map Book) and Map Series SV-02, SV-03, SV-08 and SV-09 (Volume 5, Sound, noise and vibration Map Book).

13.1.9 The assessment of likely significant effects from noise and vibration on agricultural, community, ecological, health, heritage and socio-economic receptors and the assessment of tranquillity are presented in Section 4, Agriculture, forestry and soils; Section 6, Community; Section 7, Ecology and biodiversity; Section 8, Health; Section 9, Historic environment; Section 12, Socio-Economic; and Section 11, Landscape and visual of this report respectively. The Proposed Scheme is described in Section 2.

[127] Department for Environment, Food and Rural Affairs (2010), *Noise Policy Statement for England*. Available online at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/69533/pb13750-noise-policy.pdf.

13.2 Scope, assumptions and limitations

13.2.1 The approach to assessing sound, noise and vibration and identifying envisaged mitigation is outlined in Volume 1 (Section 8 and Section 9) and the SMR.

13.2.2 In this assessment 'sound' is used to describe the acoustic conditions that people experience as a part of their everyday lives. Noise is taken as unwanted sound and hence adverse effects are noise effects.

13.2.3 Effects can either be temporary from construction or permanent from the operation of the Proposed Scheme. These effects may be direct, resulting from the construction or operation of the Proposed Scheme, and/or indirect, resulting from changes in traffic patterns on existing roads or railways that result from the construction or operation of the Proposed Scheme.

13.2.4 It is likely that the majority of receptors adjacent to the Proposed Scheme in the Hough to Walley's Green area are not currently subject to appreciable vibration[128]. The predicted vibration levels at all receptors as a result of the Proposed Scheme have, therefore, been assessed using specific absolute thresholds, below which receptors will not be affected by vibration, rather than vibration change criteria. Further information is provided in Volume 1 (Section 8).

13.3 Environmental baseline

Existing baseline

13.3.1 The Hough to Walley's Green area is characterised as a predominantly urban setting due to the presence of the large town of Crewe. There are also a mix of small towns, villages, hamlets and isolated residential properties in the areas surrounding Crewe that are characterised as being in a predominantly rural setting. The sound environment is generally dominated by local and distant road traffic, trains and local neighbourhood sources, with natural and agricultural sounds plus distant overhead aircraft also contributing.

13.3.2 There are several main roads that contribute to the sound environment within the Hough to Walley's Green area: the A531 Main Road/Newcastle Road, which runs through Betley, Chorlton and Weston and Basford; the A500 Shavington Bypass, which runs through Barthomley, Weston and Basford, Shavington and Willaston; the A534 Nantwich Road/Crewe Road, which runs through Crewe connecting Willaston and Sandbach; the A5020 University Way, which connects the A500 Shavington Bypass to the A534 Nantwich Road in Crewe; the A532 Weston Road to Coppenhall Lane, which runs through Crewe; the A5019 Mill Street/Vernon Way and the A5078 Oak Street/Dunwoody Way, which connect the A534

[128] Further information is available in the Volume 5: Appendix SV-001-00000, Sound, noise and vibration. methodology, assumptions and assessment report and the Volume 5: Appendix CT-001-00001, Environmental Impact Assessment Scope and Methodology Report.

Nantwich Road to the A532 West Street in the west of Crewe; and the A530 Middlewich Road/Nantwich Road, which connects Nantwich to Middlewich.

13.3.3 A number of railways also contribute to the sound environment within the Hough to Walley's Green area. These railways include: the West Coast Main Line (WCML) running in a south to north direction; the Crewe to Derby Line, running in a west to east direction; the Crewe to Shrewsbury Line running in an east to west direction; the Crewe to Manchester Line running in a south-west to north-east direction; and the North Wales Coast Line running in a south-east to north-west direction.

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

13.3.5 Further information on the existing baseline, including baseline sound levels and baseline monitoring results, is provided for the Hough to Walley's Green area in Volume 5: Appendix SV-002-0MA01.

Future baseline

13.3.6 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 dominates and hence the expected growth in traffic is likely to continue to increase ambient sound levels.

13.3.7 The future operational baseline takes account of proposed and likely noise reduction provided in Important Areas identified in Defra's Noise Action Plans for agglomerations[129], roads[130] or railways[131]. Following engagement with Highways England, trunk roads likely to be resurfaced under future routine maintenance programmes before the opening of the Proposed Scheme are assumed to have a low noise surface. Airborne noise levels from railways in Important Areas are assumed to be controlled to the level, where necessary, where there is no Noise Action Plan requirement to investigate further mitigation. Map

[129] Department for Environment, Food and Rural Affairs (2019), *Noise Action Plan: Agglomerations (Urban Areas).* Available online at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/813663/noise-action-plan-2019-agglomerations.pdf.

[130] Department for Environment, Food and Rural Affairs (2019), *Noise Action Plan: Roads (including major roads).* Available online at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/813666/noise-action-plan-2019-roads.pdf.

[131] Department for Environment, Food and Rural Affairs (2019), *Noise Action Plan: Railways (including major railways).* Available online at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/813664/noise-action-plan-2019-railways.pdf.

Series SV-05 (Volume 2: MA01 Map Book) shows the noise Important Areas located in the Hough to Walley's Green area. Further information is reported for the Hough to Walley's Green area in Volume 5: Appendix SV-002-0MA01.

13.3.8 Committed developments involving sound or vibration sensitive uses within the relevant study area have been included within the assessment and are reported for the Hough to Walley's Green area in Volume 5: Appendix SV-002-0MA01[132]. Where applicable, noise or vibration significant effects on these committed developments are discussed in sections 13.4 and 13.5. The committed developments reported in sections 13.4 and 13.5 are summarised in Table 44.

Table 44: Committed developments relevant to sound, noise and vibration

Map book reference[133] (SNV Assessment location ref.)	Planning reference	Description	How this is considered in the assessment
MA01/210 (610514, 610750)	15/0366N	Location: Land to the East of, Broughton Road, Crewe, Cheshire, CW1 4NS Erection of up to 129 homes with associated highways and open amenity space, landscaping and ecological protection zone	Informing future baseline (construction).
MA01/143 (610738)	16/4783N	Location: 2B, Bradfield Road, Crewe New house on land adjoining 2 & 2A Bradfield Road	Informing future baseline (operation).
MA01/145 (610162)	20/0162N	Location: Park Hall Farm, Nantwich Road, Minshull Vernon, CW10 0LP Proposal to divide the existing dwelling to form two separate dwellings	Informing future baseline (operation).

13.3.9 HS2 Phase 2a will be under construction by 2025 and operational by 2038. It is considered that the construction of HS2 Phase 2a will not change the future baseline sound conditions for the Hough to Walley's Green area. In addition, there are no receptors that fall within the sound or vibration study areas for both HS2 Phase 2a and the Proposed Scheme. Therefore there will be no cumulative effects as a result of the construction or operation of Phase 2a of the Proposed Scheme. The combined effects of HS2 Phase 2a and the Proposed Scheme, against a baseline without either phase, have been considered. There will be no significant cumulative effects as a result of the combination of HS2 Phase 2a and the Proposed Scheme.

Construction (2025)

13.3.10 The assessment of noise from construction activities assumes a future construction baseline year of 2025, which represents the period immediately prior to the start of the construction

[132] Volume 5: Appendix CT-004-0MA01 provides details of all of the developments assumed to be implemented.

[133] Volume 5, Planning Data/Committed Development Map Book: Maps CT-13-301 to CT-13-304a.

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 2018 and the future construction baseline year.

Operation (2038)

13.3.11 The operational assessment is based upon the absolute sound level and/or predicted change in sound levels that will result from operation of the Proposed Scheme. The future operational baseline is the sound environment that would exist in 2038 without the Proposed Scheme. This is presented in Table 1 in Volume 5: Appendix SV-002-0MA01.

13.3.12 The majority of receptors adjacent to the Proposed Scheme are not currently subject to appreciable vibration. As a reasonable worst case, it has been assumed that no change in baseline vibration levels will occur between the existing baseline year of 2018 and the future operational baseline year.

13.4 Effects arising during construction

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, in Volume 1 (Section 8) and in the draft Code of Construction Practice (CoCP)[134].

13.4.2 The following construction 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:

- activities to support construction of Crewe tunnel portals (including erection of each tunnel boring machine (TBM), support for the TBM as it excavates, excavated material handling, installation of the tunnel lining and tunnel fit-out) will require 24-hour working; and
- works at the vent shafts (Cowley Way and Middlewich Street), including concrete pours.

13.4.3 Piling and vibratory compaction is likely to result in short-term appreciable ground-borne vibration at a small number of receptors, 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-002-0MA01.

[134] Volume 5: Appendix CT-002-00000, Draft Code of Construction Practice.

13.4.4 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.

Avoidance and mitigation measures

13.4.5 The assessment assumes the implementation of the principles and management processes set out in the noise and vibration section of the draft CoCP (Section 13), which are:

- best practicable means (BPM) as defined by the Control of Pollution Act 1974 (CoPA) and Environmental Protection Act 1990 (EPA), which will be applied during construction activities to minimise noise (including vibration) at neighbouring residential properties and other sensitive receptors (including local businesses and quiet areas designated by the local authority);
- as part of BPM, mitigation measures are applied in the following order:
  - noise and vibration control at source: for example, the selection of quiet and low vibration equipment, review of construction methodology to consider quieter methods, location of equipment on-site, control of working hours, the provision of acoustic enclosures and the use of less intrusive alarms, such as broadband vehicle reversing warnings;
  - screening: for example, local screening of equipment or 2.4m high perimeter hoarding or the use of temporary stockpiles; and
  - where, despite the implementation of BPM, the noise exposure exceeds the criteria defined in the draft CoCP, noise insulation or ultimately temporary re-housing will be offered at qualifying properties.
- lead contractors will seek to obtain prior consent from the relevant local authority under Section 61 of the CoPA for the proposed construction works. The consent application will set out BPM measures to minimise construction noise and vibration, including control of working hours, and provide a further assessment of construction noise and vibration, including confirmation of noise insulation/temporary re-housing provision;
- contractors 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.

13.4.6 In addition to this mitigation, to avoid or reduce likely community significant effects, taller screening (provided by solid temporary hoarding, temporary stockpiles, screening close to activities or other means to provide equivalent noise reductions), as described in the draft CoCP, has been assumed at the following construction compounds or land required for construction of the Proposed Scheme:

- Crewe tunnel south portal satellite compound near Hough (north facing and west facing boundaries of the construction compound);
- Cowley Way vent shaft satellite compound near Crewe (south);
- Middlewich Street vent shaft satellite compound near Crewe (centre). Site hoarding along the north and east facing boundaries of the construction compound may need to be up to 6m high;
- Crewe tunnel north main compound near Coppenhall (west facing and east facing boundaries of the construction compound);
- west of the WCML, extending from Parkers Road Overbridge to Aysgarth Avenue in Crewe; and
- along the boundary of the land required for the construction of the Proposed Scheme, between Aysgarth Avenue and Magecroft in Crewe.

13.4.7 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 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 re-housing.

13.4.8 Qualification for noise insulation and, where appropriate, 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 where appropriate 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

13.4.9 Taking account of the avoidance and mitigation measures set out in the previous paragraphs, the following 48 residential properties are forecast to experience noise above the eligibility criteria for noise insulation, but below the eligibility criteria for temporary re-housing, as defined in the HS2 noise insulation and temporary re-housing policy[135]. The locations of these dwellings are indicated on Map Series SV-03 (Volume 5, Sound, noise and vibration Map Book):

- Weaverbank Cottage, Nantwich Road (assessment location ref.: 610164);
- Newfield Cottage, Nantwich Road (assessment location ref.: 610407);

[135] Further information is provided in High Speed Two Ltd (2022), *Phase 2b Western Leg Information Paper E13: Control of construction noise and vibration*.

- 27 properties at Broughton Road (assessment location ref.: 610075 and 610083), including Nos. 3, 5, 13, 21, 27, 35 to 41 and 53 to 87 Broughton Road; and
- 19 properties at Maplins Moss Place located near Broughton Road (assessment location ref.: 610509), including Plot 38 (flats 1 to 12) and Nos. 77, 79, 81, 83, 85, 99 and 101.

13.4.10 For construction, the threshold for eligibility for noise insulation is 75dB during the day, 65dB during the evening and 55dB during the night-time measured outdoors as specified in the draft CoCP. Where the baseline ambient noise level is greater than the noise insulation threshold level, the ambient noise level is used as the noise insulation threshold level.

13.4.11 The mitigation measures, including noise insulation for the 48 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

13.4.12 The avoidance and mitigation measures to be implemented during construction will reduce airborne construction noise adverse effects on receptors and communities. Residual temporary noise or vibration effects are identified later in this section.

13.4.13 In locations with lower existing sound levels[136], construction noise effects are likely to be caused by changes to noise levels outside dwellings relative to existing sound levels. These may be considered by 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.

13.4.14 The temporary adverse effects on the residential areas identified in Table 45 including shared open areas, are considered to be significant on a community basis. The duration of impact is the period where the relevant assessment category is exceeded. The predicted monthly construction noise level will vary throughout this period and as a guide the typical and highest monthly noise levels at the closest properties in the community identified are presented in the 'cause' column of this table.

[136] Further information is presented in Volume 5, Appendix SV-001-00000.

Table 45: Direct adverse construction effects on residential communities and shared open areas that are considered to be significant on a community basis

Significant effect number (and map reference)[137]	Type of significant effect	Time of day	Location	Cause (construction activities)[138]	Assumed approximate duration of impact
MA01-C-C1 (SV-03-302)	Construction vibration	Daytime	Coppenhall: approximately 45 dwellings in the vicinity of the B5076 Middlewich Street.	Vibratory rollers associated with site setup are predicted to cause a moderate vibration impact at properties near to the boundary of the Crewe tunnel north main compound.	Up to three months.
MA01-C-C2 (SV-03-303)	Construction noise and vibration and traffic noise	Daytime, evening and night-time	Coppenhall: approximately 250[139] dwellings in the vicinity of Broughton Road.	During the daytime, general site works, earthworks and bored tunnel works in the vicinity of Crewe tunnel north portal. The typical and highest monthly noise levels will be approximately 55dB to 70dB and 60dB to 80dB[140]. During the evening and night-time, general site works and bored tunnel works in the vicinity of Crewe tunnel north portal. The typical and highest monthly noise levels will be approximately 45dB to 60dB and 50dB to 65dB[140]. Vibratory rollers associated with site setup are predicted to cause a moderate vibration impact at properties near to the boundary of the Crewe tunnel north main compound[141].	Noise for up to five years and six months during the daytime; up to two years and four months during the evening; and up to two years and six months during the night-time. Vibration for up to six months during the daytime.
MA01-C-C3 (SV-03-303)	Construction noise	Daytime	Crewe (north): approximately 45 dwellings in the vicinity of Wareham Drive.	Earthworks and overbridge construction works in the vicinity of Crewe tunnel north portal. The typical and highest monthly noise levels will be approximately 60dB to 65dB and 65dB to 75dB[140].	Noise for up to six months.

[137] See Volume 5: Appendix SV-002-0MA01 MA01 Sound, noise and vibration report and Volume 5, Map Book SV-03.

[138] The construction activity giving rise to the highest predicted noise or vibration level is reported. Multiple construction activities may give rise to typical noise levels and the approximate duration of impact.

[139] Approximately 15 properties are predicted to experience a combined impact from off-site construction traffic activities.

[140] Equivalent continuous sound level at the facade, $L_{pAeq, 0700-1900}$.

[141] Not all dwellings impacted by vibration. See Volume 5: Appendix SV-002-0MA01 MA01 Sound, noise and vibration report for further details.

Significant effect number (and map reference)[137]	Type of significant effect	Time of day	Location	Cause (construction activities)[138]	Assumed approximate duration of impact
MA01-C-C4 (SV-03-303)	Construction noise	Daytime	Leighton: approximately 20 dwellings in the vicinity of Perry Fields.	Earthworks associated with construction of Footpath Crewe 29/1 overbridge and associated offline culvert. The typical and highest monthly noise levels will be approximately 60dB and 70dB[140].	Up to five months.

Residential receptors: indirect effects

13.4.15 Construction traffic is likely to cause adverse noise effects on residential receptors along Sydney Road between Crewe Green Roundabout and the railway overbridge. Approximately 25 dwellings located immediately adjacent to the road are forecast to experience an increase in road traffic noise levels during the typical and peak months of around 1dB and 2dB $L_{pAeq,0700-2300}$ respectively, due to additional construction vehicles using this route in an area currently exposed to high levels of sound. This is considered to be a likely significant effect on a community basis at the dwellings on this road, denoted as MA01-C-C5 in Volume 5: Appendix SV-002-0MA01. 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.

13.4.16 Construction traffic is likely to cause adverse noise effects on residential receptors along Landsdowne Road between Sydney Road and Coleridge Way. Approximately 100 dwellings located immediately adjacent to the road are forecast to experience an increase in road traffic noise levels during the typical and peak months of around 1dB and 4dB $L_{pAeq,0700–2300}$ respectively, due to traffic diverting away from construction routes on nearby roads. This is considered to be a likely significant effect on a community basis at the dwellings on this road, denoted as MA01-C-C6 in Volume 5: Appendix SV-002-0MA01. 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.

13.4.17 Construction traffic is likely to cause adverse noise effects on residential receptors along Limetree Avenue between Elm Drive and Acer Avenue. Approximately 70 dwellings located immediately adjacent to the road are forecast to experience a change in road traffic noise levels during the typical and peak months of around 2dB and 9dB $L_{pAeq,0700–2300}$ respectively, due to traffic diverting away from construction routes on nearby roads. This is considered to be a likely significant effect on a community basis at the dwellings on this road, denoted as MA01-C-C7 in Volume 5: Appendix SV-002-0MA01. 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.

13.4.18 Construction traffic is likely to cause adverse noise effects on residential receptors along Broughton Road. Approximately 70 dwellings located immediately adjacent to the road are forecast to experience an increase in road traffic noise level during the peak months of around 3dB $L_{pAeq,0700–2300}$ due to additional construction vehicles using this route. This includes approximately 15 properties associated with committed development reference MA01/210. This is considered to be a likely significant effect on a community basis at the dwellings on this road, denoted as MA01-C-C8 in Volume 5: Appendix SV-002-0MA01. In combination with the adverse noise effect caused by construction traffic, approximately 20 dwellings located immediately adjacent to the road are forecast to experience direct adverse construction noise effects on a community basis, three of which are also forecast to

experience direct adverse vibration effects, denoted as MA01-C-C2[142] in Volume 5: Appendix SV-002-0MA01. This temporary adverse effect from combined construction site noise and vibration and traffic noise 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.

13.4.19 Construction traffic is likely to cause adverse noise effects on residential receptors along the A530 Middlewich Road between the B5076 Flowers Lane and St Peter's Church. Approximately 30 dwellings located immediately adjacent to the road are forecast to experience an increase in road traffic noise levels during the peak months of around 4dB $L_{pAeq,0700–2300}$, due to additional construction vehicles using this route. This is considered to be a likely significant effect on a community basis at the dwellings on this road, denoted as MA01-C-C9 in Volume 5: Appendix SV-002-0MA01. 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

13.4.20 The assessment has identified the following non-residential receptors where the predicted airborne noise levels exceed both the relevant screening criteria and the noise change criterion (typically a change of greater than 3dB[143] compared with the existing baseline sound level):

- Car Parts Retail (lower sensitivity offices), Cowley Way, Crewe (assessment location ref.: 610003);
- Gist Engineering (lower sensitivity offices), Weston Road, Crewe (assessment location ref.: 610273);
- Bentley Car Scheme (lower sensitivity offices), Swansway House, Weston Road, Crewe (assessment location ref.: 610274);
- Scope House Business Centre (offices), Weston Road, Crewe (assessment location ref.: 610275);
- Cemetery Lodge (offices), Market Close, Crewe (assessment location ref.: 610740);
- Orbitas Bereavement Services (offices), Market Close, Crewe (assessment location ref.: 610041);
- Crewe Cemetery and Crematorium (place of worship), Market Close, Crewe (assessment location ref.: 610532);
- Oakfield Lodge School, Warmingham Road, Crewe[144] (assessment location ref.: 610130 and 610678); and
- Spring Farm Business Park (offices), Moss Lane, Crewe (assessment location ref.: 610138).

[142] Approximately 20 properties are predicted to experience a combined impact from on-site construction activities.

[143] The exception is where the use and sensitivity of the receptor or land use is very sensitive to noise and have been included in the detailed assessment where there is a change less than 3dB. Further information can be found in Volume 5: Appendix SV-002-0MA01.

[144] Including new school buildings contained within committed development ref. 18/0976N.

13.4.21 The assessment has identified the following non-residential receptor where the predicted vibration levels exceed the relevant vibration screening criterion: Bentley Manor Care Home, Sherborne Road, Crewe (assessment location ref.: 610046).

13.4.22 These locations are identified in the Hough to Walley's Green area, as shown in Map Series SV-03 (Volume 5, Sound, noise and vibration Map Book). At each of the non-residential receptors identified above 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.

13.4.23 Car Parts Retail comprises an industrial unit and associated offices. The receptor is located to the south of Weston Road and is approximately 50m to the north-west of the land required for the construction of Cowley Way vent shaft. Car Parts Retail is a large industrial clad building with windows on the south-eastern façade, which are double glazed. It is assumed that the building occupants rely on opening the windows for ventilation. The offices have been assessed against the criteria for lower sensitivity offices. The predicted daytime monthly construction noise level is above the screening criterion defined in the SMR for lower sensitivity office use[145] for a period of three years and 11 months. The highest predicted daytime monthly construction noise level is 10dB above the screening criterion defined in the SMR. The typical predicted monthly daytime construction noise level is 3dB above the screening criterion defined in the SMR. Car Parts Retail is identified, on the basis of a precautionary assessment, as being subject to a likely significant adverse effect (denoted by MA01-C-N1 in Table 6 of Volume 5: Appendix SV-002-0MA01). This temporary adverse effect may take the form of activity disturbance to office users.

13.4.24 Gist Engineering comprises an industrial unit and associated offices. The receptor is located to the south of Weston Road and is approximately 50m to the south-east of the land required for the construction of Cowley Way vent shaft. Gist Engineering is a small building with industrial cladding and a part-brick north-west façade. It is assumed that the windows on the north-west façade are double glazed and that the building occupants rely on opening the windows for ventilation. The offices have been assessed against the criteria for lower sensitivity offices. The predicted daytime monthly construction noise level is above the screening criterion defined in the SMR for lower sensitivity office use[145] for a period of two years and nine months. The highest predicted daytime monthly construction noise level is 5dB above the screening criterion defined in the SMR. The typical predicted monthly daytime construction noise level is equivalent to the screening criterion defined in the SMR. Gist Engineering is identified, on the basis of a precautionary assessment, as being subject to a likely significant adverse effect (denoted by MA01-C-N2 in Table 6 of Volume 5: Appendix SV-002-0MA01). This temporary adverse effect may take the form of activity disturbance to office users.

13.4.25 Bentley Car Scheme comprises a car dealership/maintenance garage and associated offices. The receptor is located to the south of Weston Road and is approximately 50m to the east of

[145] 65dB $L_{pAeq,0700-2300}$ (façade) during the day, based on Category A of the BS5228 ABC method.

the land required for the construction of Cowley Way vent shaft. Swansway House is a brick building adjoining a larger industrial clad building and the windows on the western façade are double glazed. It is assumed that the building occupants rely on opening the windows for ventilation. The offices have been assessed against the criteria for lower sensitivity offices. The predicted daytime monthly construction noise level is above the screening criterion defined in the SMR for lower sensitivity office use[145] for a period of six months. The highest predicted daytime monthly construction noise level is 3dB above the screening criterion defined in the SMR. The typical predicted monthly daytime construction noise level is below the screening criterion defined in the SMR. Swansway House is identified, on the basis of a precautionary assessment, as being subject to a likely significant adverse effect (denoted by MA01-C-N3 in Table 6 of Volume 5: Appendix SV-002-0MA01). This temporary adverse effect may take the form of activity disturbance to office users.

13.4.26 Scope House Business Centre comprises office accommodation for several small to medium sized businesses. The receptor is located off Cowley Way and is approximately 70m to the north-east of the land required for the construction of Cowley Way vent shaft. Scope House is a brick building and the windows on the south-western façade are double glazed sash windows. It is assumed that the building occupants rely on opening the windows for ventilation. The offices have been assessed against the office criteria. The predicted daytime monthly construction noise level is above the screening criterion defined in the SMR for office use[146] for a period of four years and nine months. The highest predicted daytime monthly construction noise level is 10dB above the screening criterion defined in the SMR. The typical predicted monthly daytime construction noise level is 5dB above the screening criterion defined in the SMR. Scope House Business Centre is identified, on the basis of a precautionary assessment, as being subject to a likely significant adverse effect (denoted by MA01-C-N4 in Table 6 of Volume 5: Appendix SV-002-0MA01). This temporary adverse effect may take the form of activity disturbance to office users.

13.4.27 Cemetery Lodge is a building owned by CEC with the first floor used as office accommodation relating to the day-to-day operation of Crewe Cemetery. The receptor is located off Market Close situated in the south-east corner of the cemetery grounds and is approximately 60m to the west of the land required for the construction of Middlewich Street vent shaft. Cemetery Lodge is a brick building and the windows on the eastern façade are double glazed sash windows. It is assumed that the building occupants rely on opening the windows for ventilation. Cemetery Lodge has been assessed against the office criteria. The predicted daytime monthly construction noise level is above the screening criterion defined in the SMR for office use[146] for a period of 10 months. The highest predicted daytime monthly construction noise level is 7dB above the screening criterion defined in the SMR. The typical predicted monthly daytime construction noise level is 3dB above the screening criterion defined in the SMR. Cemetery Lodge is identified, on the basis of a precautionary assessment, as being subject to a likely significant adverse effect (denoted by MA01-C-N5 in

[146] 55dB $L_{pAeq,0700-2300}$ (free-field) during the day which is equivalent to 58dB $L_{pAeq,0700-2300}$ (façade).

Table 6 of Volume 5: Appendix SV-002-0MA01). This temporary adverse effect may take the form of activity disturbance to office users.

13.4.28 Orbitas Bereavement Services (offices) provide burial, cremation and support services for Crewe Crematorium. The receptor is located off Market Close situated in the south-east corner of the cemetery grounds and is approximately 85m to the west of the land required for the construction of Middlewich Street vent shaft. Orbitas Bereavement Services is a brick building and the windows on the eastern façade are double glazed. It is assumed that the building occupants rely on opening the windows for ventilation. Orbitas Bereavement Services has been assessed against the office criteria. The predicted daytime monthly construction noise level is above the screening criterion defined in the SMR for office use[146] for a period of two years and 11 months. The highest predicted daytime monthly construction noise level is 6dB above the screening criterion defined in the SMR. The typical predicted monthly daytime construction noise level is 2dB above the screening criterion defined in the SMR. Orbitas Bereavement Services is identified, on the basis of a precautionary assessment, as being subject to a likely significant adverse effect (denoted by MA01-C-N6 in Table 6 of Volume 5: Appendix SV-002-0MA01). This temporary adverse effect may take the form of activity disturbance to office users.

13.4.29 The Crewe Cemetery and Crematorium (place of worship) is located off Market Close towards the centre of the cemetery grounds. The receptor is approximately 240m to the west of the land required for the construction of Middlewich Street vent shaft. Currently, the crematorium holds routine services throughout the week during daytime periods. The crematorium is a brick building and the windows on the eastern façade are assumed to be double glazed. It is also assumed that the building occupants rely on opening the windows for ventilation. The crematorium has been assessed against the criteria for places of worship. The predicted daytime monthly construction noise level is above the screening criterion defined in the SMR for places of worship use[147] for a period of seven months. The highest predicted daytime monthly construction noise level is 4dB above the screening criterion defined in the SMR. The typical predicted monthly daytime construction noise level is below the screening criterion defined in the SMR. The Crewe Cemetery and Crematorium is identified, on the basis of a precautionary assessment, as being subject to a likely significant adverse effect (denoted by MA01-C-N7 in Table 6 of Volume 5: Appendix SV-002-0MA01). This temporary adverse effect from construction site noise may take the form of activity disturbance to users of the crematorium.

13.4.30 Bentley Manor Care Home is a two-storey building, which is a residential nursing home for elderly residents requiring physical or mental support. The receptor is located off the B5076 Middlewich Street, approximately 15m north of Middlewich Street vent shaft satellite compound. Bentley Manor Care Home has been assessed against the residential criteria. The typical predicted daytime monthly construction vibration level at this building is below the criterion defined in the SMR for this use[148]. The highest predicted daytime monthly

[147] 50dB $L_{pAeq,0700-2300}$ (free-field) during the day which is equivalent to 53dB $L_{pAeq,0700-2300}$ (façade).

[148] A vibration dose value of 0.2m/s$^{1.75}$ VDV.

construction vibration level at this building is 0.36m/s$^{1.75}$ above the screening criterion defined in the SMR for this use for a period of up to three months. The Bentley Manor Care Home is identified, on the basis of a precautionary assessment, as being subject to a likely significant adverse effect (denoted by MA01-C-N8 in Table 6 of Volume 5: Appendix SV-002-0MA01) due to vibration. This temporary adverse effect from construction site vibration may take the form of activity disturbance to residents of the care home.

13.4.31 Oakfield Lodge School is a pupil referral unit and provides alternative education for children who are unable to attend mainstream school. The receptor is located off Warmingham Road and is situated approximately 750m to the east of the land required for the construction of Coppenhall Moss cutting. The classrooms of both the existing building and the newly constructed building have been assessed against the education facility criteria, and the outside activity areas against the external amenity criteria. The existing school is a brick building with double glazed windows and the new building is a combination of brick and insulated lightweight cladding with double glazed windows. Lightweight temporary school buildings at the site have been demolished as part of the works. The new building contains classrooms on the southern facades facing the Proposed Scheme. It is assumed that the building occupants rely on opening the windows for ventilation. The predicted daytime monthly construction noise level is above the screening criterion defined in the SMR for educational use[149] for a period of three years and seven months. The highest predicted daytime monthly construction noise levels at the school buildings are 4dB above the screening criterion defined in the SMR. The predicted typical monthly daytime construction noise level is equivalent to the screening criterion defined in the SMR. The highest and typical predicted daytime monthly construction noise levels in outdoor activity areas are below the criterion defined in the SMR for external amenity space[150]. Oakfield Lodge School is identified, on the basis of a precautionary assessment, as being subject to a likely significant adverse effect (denoted by MA01-C-N9 in Table 6 of Volume 5: Appendix SV-002-0MA01). This temporary adverse effect from construction site noise may take the form of activity disturbance to students and people visiting or working at the school.

13.4.32 Spring Farm Business Park comprises office accommodation for several small to medium sized businesses. The receptor is located off Moss Lane and is approximately 70m to the west of the land temporarily required for Moss Lane satellite compound. Spring Farm Business Park is a brick building and the windows on the south-eastern façade are double glazed. It is assumed that the building occupants rely on opening the windows for ventilation. The offices have been assessed against the office criteria. The predicted daytime monthly construction noise level is above the screening criterion defined in the SMR for office use[146] for a period of eight years and nine months. The highest predicted daytime monthly construction noise level is 8dB above the screening criterion defined in the SMR. The predicted typical monthly daytime construction noise level is 4dB above the screening criterion defined in the SMR. Spring Farm Business Park is identified, on the basis of a

[149] 50dB $L_{pAeq,0700-2300}$ (free-field) during the day which is equivalent to 53dB $L_{pAeq,0700-2300}$ (façade).

[150] 55dB $L_{pAeq,0700-2300}$ (free-field) during the day which is equivalent to 58dB $L_{pAeq,0700-2300}$ (façade).

precautionary assessment, as being subject to a likely significant adverse effect (denoted by MA01-C-N10 in Table 6 of Volume 5: Appendix SV-002-0MA01). This temporary adverse effect from construction site noise may take the form of activity disturbance to office users.

Non-residential receptors: indirect effects

13.4.33 The assessment of construction noise and vibration indicates that significant indirect effects are unlikely to occur on non-residential receptors in the Hough to Walley's Green area.

Other mitigation measures

13.4.34 No other mitigation measures are proposed in this area.

Summary of likely residual significant effects

13.4.35 The proposed avoidance and mitigation measures will reduce construction noise and vibration inside all individual dwellings from the construction activities such that residents will not be significantly affected[151].

13.4.36 The measures will also reduce the construction noise and vibration effects on the acoustic character in the majority of residential communities. Despite these measures, the noise effects on the acoustic character in the following local residential community areas are considered likely to be significant:

- Coppenhall (vibration only);
- Crewe (north); and
- Leighton (noise only).

13.4.37 Noise and vibration from specific construction activities and construction traffic has also been identified as resulting in a significant residual temporary effect on the local residential community area of Coppenhall.

13.4.38 Construction traffic is likely to cause significant noise effects on adjacent residential properties on:

- Sydney Road between Crewe Green Roundabout and railway overbridge;
- Landsdowne Road between Sydney Road and Coleridge Way;
- Limetree Avenue between Elm Drive and Acer Avenue;
- Broughton Road; and
- A530 Middlewich Road between B5076 Flowers Lane and St Peter's Church.

13.4.39 Noise from specific construction activities has been identified as resulting in significant residual temporary effects on the non-residential buildings at:

[151] Refer to Volume 5: Appendix SV-001-00000.

- Car Parts Retail, Cowley Way;
- Gist Engineering, Cowley Way;
- Bentley Car Scheme, Cowley Way;
- Scope House Business Centre, Weston Road;
- Cemetery Lodge, Market Close;
- Orbitas Bereavement Services, Market Close;
- Crewe Cemetery and Crematorium, Market Close;
- Oakfield Lodge School, Warmingham Road; and
- Spring Farm Business Park, Moss Lane.

13.4.40 Vibration from specific construction activities has been identified as resulting in significant residual temporary effects on Bentley Manor Care Home.

13.4.41 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

13.4.42 This assessment has considered the potential cumulative construction noise effects of the Proposed Scheme and other committed developments[152]. The combined effects of HS2 Phase 2a and the Proposed Scheme, against a baseline without either scheme, have been considered.

13.4.43 There will be no significant cumulative noise effects as a result of the combination of HS2 Phase 2a and the Proposed Scheme.

13.5 Effects arising from operation

Assumptions and limitations

Local assumptions

13.5.1 The assessment of the effects of noise and vibration from the operation of the Proposed Scheme is based on the envisaged design as described in Section 2.2 of this report and in Volume 1 (Sections 4 and 8) and the highest likely train flows, assuming the service pattern including Phase One and Phase Two services. The expected passenger service frequency for the Proposed Scheme is described in Volume 1 (Section 4) and is outlined below for the Hough to Walley's Green area.

[152] Refer to Volume 5: Appendix CT-004-00000, Planning data.

13.5.2 For the purpose of the operation sound, noise and vibration assessment it is assumed that passenger services in this area will start around 05:00. Services will increase to nine trains per hour in each direction on the route of the Proposed Scheme. This number of services is generally assumed to operate throughout the day then decrease as trains are stabled with services typically finishing by midnight. The number of trains takes account of HS2 Phase One, Phase 2a and the Proposed Scheme in operation, and other services using HS2 as a result of connections to other conventional lines, including Northern Powerhouse Rail (NPR). The services are assumed to have an operating speed of 200mph (330kph) for 90% of services and 225mph (360kph) for 10% of services. Further information is presented in Volume 1 (Section 8).

Local assumptions – WCML reception tracks

13.5.3 The WCML reception tracks will enable conventional compatible trains to access the proposed Crewe North RSD. The Crewe North RSD will also provide access to the Crewe North IMB-R. Both Crewe North RSD and IMB-R will be located in the Wimboldsley to Lostock Gralam area (MA02) to the north. Further information regarding local assumptions related to the Crewe North RSD and IMB-R is provided in Volume 2: Community Area report Wimboldsley to Lostock Gralam (MA02), Section 2 and Section 13.

Avoidance and mitigation measures

13.5.4 The development of the Proposed Scheme has sought to reduce noise impact as far as reasonably practicable.

13.5.5 Envisaged avoidance and mitigation measures that apply route-wide are described in Volume 1 (Section 9).

Ground-borne noise and vibration

13.5.6 Significant ground-borne noise or vibration effects from the operational railway will be reduced or avoided through the design of the track and track-bed.

Airborne noise

13.5.7 Through the procurement process for the trains and the track, the use of proven international technology will enable the railway to be quieter than implied by current minimum UK[153] and European standards[154]. HS2 trains will include reduction of aerodynamic noise from the pantograph that otherwise would occur above 186mph

[153] Department for Transport (2021), *National Technical Specification Notice (NTSN), Rolling Stock – Noise (NOI).* Available online at: https://www.gov.uk/government/publications/railway-interoperability-national-technical-specification-notices-ntsnshttps://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/945203/NTSN_rolling_stock__noise__NOI_.odt.

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

(300kph) with current pantograph designs. The reduction in aerodynamic noise draws on proven technology in use in East Asia. Overall, it is assumed that proven international technology would reduce noise emissions by approximately 3dB at 225mph (360kph) compared to the current minimum UK and European standards.

13.5.8 The Proposed Scheme incorporates noise barriers, in the form of either landscape earthworks and/or noise fence barriers to avoid or reduce significant adverse airborne noise effects. The assessment has been based on the assumption that noise fence barriers are acoustically absorbent on the railway side and are located approximately 5m from the outer rail on surface sections and approximately 3m from the outer rail on viaducts.

13.5.9 In the Hough to Walley's Green area, noise barriers have been incorporated into the Proposed Scheme to avoid or reduce adverse effects due to airborne noise at Leighton, Crewe.

13.5.10 The envisaged noise barrier locations based upon the currently available information are shown on Map Series SV-05 (Volume 2: MA01 Map Book) and described in Section 2.2.

13.5.11 In other specific locations along the route of the Proposed Scheme, where there are no noise barriers envisaged, airborne noise will be reduced by landscape earthworks provided to avoid or reduce significant visual effects and engineering structures such as cuttings and safety fences on viaducts and tunnels. The location of the landscape earthworks and relevant engineering structures is shown on Map Series SV-05 (Volume 2: MA01 Map Book).

13.5.12 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-001-00000.

13.5.13 As required by statute, noise insulation measures would be offered for qualifying buildings as defined in the Noise Insulation (Railways and Other Guided Transport Systems) Regulations 1996[155] and the Noise Insulation Regulations 1975[156] ('the NI Regulations'). Additionally, HS2 Ltd will apply criteria, to provide the same mitigation as defined in 'the NI Regulations' at residential buildings where noise from the use of the Proposed Scheme measured outside a dwelling exceeds the Interim Target defined by the World Health Organization's Night Noise Guidelines for Europe[157] or the maximum noise level criteria[158] defined in the SMR. Noise insulation is designed to avoid residents experiencing any residual significant effect on health and quality of life from resulting noise inside their dwelling.

13.5.14 Noise can be generated at exits from tunnels due to pressure waves created inside the tunnel as the train enters. This is a well understood phenomenon and is mitigated by

[155] *The Noise Insulation (Railways and Other Guided Transport Systems) Regulations 1996*. Her Majesty's Stationery Office, London.

[156] *The Noise Insulation Regulations 1975*. Her Majesty's Stationery Office, London. Available online at: www.legislation.gov.uk/uksi/1975/1763/contents/made.

[157] World Health Organization (2010), *Night Noise Guidelines for Europe*.

[158] Dependent on the number of train passes.

appropriate design and construction techniques. Porous tunnel portals, tunnels and vent shafts will be designed to avoid any significant airborne noise effects caused by the trains entering the tunnel.

Assessment of impacts and effects

Residential receptors: direct effects – individual dwellings

Ground-borne noise and vibration

13.5.15 HS2's policy with respect to control of ground-borne noise and vibration is set out in information papers for HS2 Phase One[159] and HS2 Phase 2a[160]; similar provisions will apply to the Proposed Scheme. The nominated undertaker will take all reasonably practicable steps to construct, operate and maintain the Proposed Scheme so that the level of ground-borne noise and vibration predicted in all reasonably foreseeable circumstances does not exceed the Significant Observed Adverse Effect Levels (SOAEL) identified in the SMR (Volume 5: Appendix CT-001-00001).

13.5.16 At the current stage of design of the Proposed Scheme, and taking a precautionary approach to the assessment, 35 residential properties have been identified above the proposed Crewe tunnel where ground-borne noise has the potential to exceed the relevant SOAEL. These properties, which are shown on Map series SV-02 (Volume 5, Sound, noise and vibration Map Book), are:

- 3, 5 and 13 Broughton Road, Crewe (assessment location ref.: 610600, 610601);
- 1, 3, 4 and 6 Chapelmere Court, Crewe (assessment location ref.: 610615 and 610619);
- 1, 2, 3, 4, 9, 7, 11, 12, 13, 14, 16, 18, 24, 26, 35 and 37 Hazel Grove, Crewe (assessment location ref.: 610625, 610626, 610623, 610620, 610614, 610610, 610607, 610604); and
- 179, 181 and even numbers from 286 to 304 Broad Street, Crewe (assessment location ref.: 610629, 610632).

13.5.17 In the absence of proposed mitigation to control the ground-borne noise levels within these properties to a level below SOAEL, a likely significant adverse effect on an individual property basis has been identified.

13.5.18 HS2 Ltd continues to review the design and mitigation in line with their policy on ground-borne noise, and any changes to the design which reduce effects will be brought forward during passage of the Bill in Parliament.

[159] HS2 Limited Information Paper E21 (2017), *Control of Ground-Borne Noise and Vibration from the Operation of Temporary and Permanent Railways.*

[160] HS2 Limited Information Paper E10 (2017), *Control of Ground-Borne Noise and Vibration from the Operation of Temporary and Permanent Railways.*

Airborne noise

13.5.19 Taking account of the avoidance and mitigation measures incorporated into the Proposed Scheme, the assessment has identified two dwellings, close to the Proposed Scheme, where noise levels are predicted to exceed the daytime trigger threshold set out in the NI Regulations[161]. It is, therefore, anticipated that these buildings are likely to qualify for noise insulation under the Regulations. The dwellings indicated on Map Series SV-02 (Volume 5, Sound, noise and vibration Map Book) are:

- Parkfield Farm, Middlewich Road, Minshull Vernon (assessment location ref.: 610148); and
- Weaverbank Cottage, Nantwich Road, Minshull Vernon, Middlewich (assessment location ref.: 610164).

13.5.20 The assessment has identified 21 additional dwellings close to the Proposed Scheme where the daytime forecast noise level does not exceed the threshold set in the NI Regulations but the predicted night-time noise level exceeds the WHO's Interim Target of 55dB, or the maximum noise level as a train passes exceeds the relevant criteria[162]. It is anticipated that these buildings will also be offered noise insulation as described previously in the avoidance and mitigation measures section. These dwellings are indicated on Map Series SV-02 (Volume 5, Sound, noise and vibration Map Book):

- Bradfield Road, Crewe and committed development (Planning ref.: MA01/143 (assessment location ref.: 610738);
- 27, 29, 31, 33, 35, 37, 39, 41, 43 and 45 Conway Close, Crewe (assessment location ref.: 610082);
- 23 and 25 Conway Close, Crewe (assessment location ref.: 610085);
- 12, 15, 17, 26, 28 and 30 Padstow Close, Crewe (assessment location ref.: 610085);
- Park Hall Farm, Wimboldsley, Middlewich and committed development MA01/145 (assessment location ref.: 610162); and
- Newfield Cottage, Nantwich Road, Minshull Vernon, Middlewich (assessment location ref.: 610407).

13.5.21 The mitigation measures, set out in the previous section, including noise insulation, will reduce airborne noise inside all dwellings such that it will not reach a level where it will significantly affect residents.

[161] Equivalent to a daytime free-field level of 65dB $L_{pAeq,0700\text{-}2300}$.

[162] 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).

Residential receptors: direct effects – communities

13.5.22 The proposed mitigation measures in the Hough to Walley's Green area will avoid or reduce adverse effects due to airborne noise on the majority of receptors, and in the following communities:

- Coppenhall Moss; and
- Leighton, Crewe.

13.5.23 The proposed mitigation measures in the Hough to Walley's Green area will avoid or reduce adverse effects due to ground-borne noise on the majority of receptors in Crewe.

13.5.24 Taking account of the envisaged mitigation, Map Series SV-05 (Volume 2: MA01 Map Book) shows the long-term 40dB[163] night-time and the 50dB daytime sound level contours. In general, below these levels adverse effects are not expected.

13.5.25 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 (Volume 2: MA01 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 context[164], there may be a significant effect when assessed on a community basis[165].

13.5.26 Approximately 15 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.

13.5.27 The assessment of operational noise and vibration indicates that significant direct adverse effects on residential communities due to airborne noise are unlikely to occur in this area.

13.5.28 In this study area, the direct adverse effect on the acoustic character of the area of the residential communities identified in Table 46 due to ground-borne noise is considered to be significant on a community basis.

[163] Defined as the equivalent continuous sound level from 23:00 to 07:00 or $L_{pAeq,night}$.

[164] Further information is provided in Volume 5, Appendices SV-001-00000 and SV-003-0MA01.

[165] Further information is contained in Volume 1.

Table 46: Direct adverse operational effects on residential communities and shared open areas that are considered significant on a community basis

Significant effect number[166] and Map reference	Source of significant effect	Time of day	Location and details
MA01-O-C1 (SV-05-302)	Ground-borne noise and vibration increase from new train services	Daytime and night-time	Crewe Approximately 265 dwellings[167] in the vicinity of Earle Street, Brierley Street, Broughton Road, North Street, North Stafford Street, Thomas Street, Wallis Street, Henry Street, Middlewich Street, Ridgeway Street, Audley Street, Sheppard Close, Sherbourne Road, Broad Street Cranbourne Road, Greenacres, Crossway, Lime Street, Hazelmere Way, Basford Road, Broad Street, Hazel Grove, Churchmere Drive and Chapelmere Court. Forecast ground-borne noise and vibration from the railway is likely to cause an adverse effect on the acoustic character within the properties as a result of: • low ground-borne noise impacts at approximately 30 properties; • medium ground-borne noise and minor vibration impacts at approximately 200 properties; and • high ground-borne noise and minor to moderate vibration impacts at approximately 35 properties.

13.5.29 In this study area, the direct beneficial effect on the acoustic character of the area of the residential community identified in Table 47 due to airborne noise is considered to be significant on a community basis.

Table 47: Direct beneficial effects on residential communities and shared open areas considered significant on a community basis

Significant effect number[168] and Map reference	Source of significant effect	Time of day	Location and details
MA01-O-C2 (SV-05-303)	Airborne noise decrease from new train services	Daytime and night-time	Leighton, Crewe Approximately 75 dwellings in the vicinity of Bowland Croft, Wharfdale Avenue, Haweswater Avenue, Buttermere Drive, Bleasdale Road, Aysgarth Avenue and Perry Fields. Forecast decreases in sound from railways (including reduction in noise from the existing WCML) is likely to cause a moderate noise decrease affecting the acoustic character of the area around the properties. There are no shared open spaces identified as being affected in this community.

[166] See Map Series SV-05 (Volume 2: MA01 Map Book).

[167] HS2 Ltd continues to review the design and mitigation in line with their policy on ground-borne noise, and any changes to the design which reduce effects will be brought forward during passage of the Bill in Parliament.

[168] See Map Series SV-05 (Volume 2: MA01 Map Book).

Residential receptors: indirect effects

13.5.30 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

Ground-borne noise and vibration

13.5.31 The assessment has identified ground-borne noise levels greater than the relevant impact screening criteria at the following non-residential receptors in the Hough to Walley's Green area, as shown in Map Series SV-02 (Volume 5, Sound, noise and vibration Map Book). At each of the non-residential receptors identified, an assessment has been undertaken to determine if this impact will result in a significant effect using the significance criteria defined in Section A of Volume 5: Appendix SV-001-00000.

13.5.32 Best Western Crewe Arms Hotel (assessment location ref.: 610663) provides hotel accommodation together with meeting, conference and wedding facilities. Ground-borne noise is predicted to exceed the impact screening criteria, as defined in the SMR, of 40dB L_{pASmax} for hotels by 3dB. Ground-borne noise predictions indicate potential for daytime activity disturbance and night-time sleep disturbance of residents of the hotel resulting from operational ground-borne noise. Considering the magnitude of the impacts from ground-borne noise on daytime and night-time activities, Best Western Crewe Arms Hotel is identified, on the basis of a precautionary assessment, as being subject to a likely significant adverse effect denoted by MA01-O-N1 on Map Series SV-05 (Volume 2: MA01 Map Book).

13.5.33 Eurosales Centre and Eurocard Centre (assessment location ref.: 610664) are commercial office facilities. Ground-borne noise is predicted to exceed the impact screening criteria, as defined in the SMR, of 40dB L_{pASmax} for offices by 3dB. Considering the magnitude of the impacts from ground-borne noise on daytime activities, Eurosales Centre and Eurocard Centre are identified, on the basis of a precautionary assessment, as being subject to a likely significant adverse effect denoted by MA01-O-N2 on Map Series SV-05 (Volume 2: MA01 Map Book).

13.5.34 ChuffChuff (assessment location ref.: 610667) is a multi-use venue for fitness, music, creative arts and dance, which provides workspace for community groups and commercial purposes. Ground-borne noise is predicted to exceed the impact screening criteria, as defined in the SMR, of 30dB L_{pASmax} for recording studios by 14dB and the impact screening criteria of 40dB L_{pASmax} for teaching facilities by 4dB. Considering the magnitude of the impacts from ground-borne noise on daytime activities, ChuffChuff is identified, on the basis of a precautionary assessment, as being subject to a likely significant adverse effect denoted by MA01-O-N3 on Map Series SV-05 (Volume 2: MA01 Map Book).

13.5.35 Cooperative Funeral Services (assessment location ref.: 610680) is a funeral director including office space. Ground-borne noise is predicted to exceed the impact screening criteria, as defined in the SMR, of 40dB L_{pASmax} for offices by 3dB. Considering the magnitude

of the impact from ground-borne noise on daytime activities, Cooperative Funeral Services is identified, on the basis of a precautionary assessment, as being subject to a likely significant adverse effect denoted by MA01-O-N4 on Map Series SV-05 (Volume 2: MA01 Map Book).

13.5.36 Bentley Manor Care Home (assessment location ref.: 610666) provides residential care for elderly residents requiring physical or mental support. Ground-borne noise is predicted to exceed the impact screening criteria, as defined in the SMR, of 40dB L_{pASmax} for healthcare facilities by 2dB and the residential Lowest observed adverse effect level of 35dB L_{pASmax} by 7dB. Considering the magnitude of the impacts from ground-borne noise on daytime activities and night-time sleep disturbance, Bentley Manor Care Home is identified, on the basis of a precautionary assessment, as being subject to a likely significant adverse effect denoted by MA01-O-N5 on Map Series SV-05 (Volume 2: MA01 Map Book).

13.5.37 Sherborne Court Neurological Centre (assessment location ref.: 610646) is a residential specialist healthcare facility that serves adults of all ages with mental health conditions and physical disabilities. Ground-borne noise is predicted to exceed the impact screening criteria, as defined in the SMR, of 40dB L_{pASmax} for healthcare facilities by 3dB and the residential Lowest observed adverse effect level of 35dB L_{pASmax} by 8dB. Considering the magnitude of the impacts from ground-borne noise on daytime activities and night-time sleep disturbance, and potential additional sensitivity of residents to noise, Sherborne Court Neurological Centre is identified, on the basis of a precautionary assessment, as being subject to a likely significant adverse effect denoted by MA01-O-N6 on Map Series SV-05 (Volume 2: MA01 Map Book).

13.5.38 The assessment of effects on non-residential receptors has been undertaken on a reasonable worst-case basis. Further information can be found in Volume 5: Appendix SV-003-0MA01. The non-residential receptors, where direct significant effects are likely, are summarised in Table 48.

Table 48: Likely significant noise or vibration effects on non-residential receptors arising from operation of the Proposed Scheme

Significant effect number[169] and Map reference	Type of significant effect and source	Time of day	Location and details
MA01-O-N1 (SV-05-302)	Activity disturbance and sleep disturbance of residents of the hotel resulting from operational ground-borne noise.	Day and night-time	Best Western Crewe Arms Hotel, Nantwich Road, Crewe
MA01-O-N2 (SV-05-302)	Activity disturbance of workers in the offices resulting from operational ground-borne noise.	Daytime	Eurocard Centre and Eurosales Centre, Herald Park, Herald Drive, Crewe

[169] See Map Series SV-05 (Volume 2: MA01 Map Book).

Significant effect number[169] and Map reference	Type of significant effect and source	Time of day	Location and details
MA01-O-N3 (SV-05-302)	Activity disturbance of people using arts and dance studios resulting from operational ground-borne noise.	Daytime	ChuffChuff, Middlewich Street, Crewe
MA01-O-N4 (SV-05-302)	Activity disturbance of workers in the office resulting from operational ground-borne noise.	Daytime	Cooperative Funeral Services, Middlewich Street, Crewe
MA01-O-N5 (SV-05-302)	Activity disturbance and sleep disturbance of residents of the care home resulting from operational ground-borne noise.	Day and night-time	Bentley Manor Care Home, Sherborne Road, Crewe
MA01-O-N6 (SV-05-302)	Activity disturbance and sleep disturbance of residents of the specialist healthcare facility resulting from operational ground-borne noise.	Day and night-time	Sherborne Court Neurological Centre, Sherborne Road, Crewe

Airborne noise

13.5.39 The assessment has not identified any airborne sound levels greater than the screening criteria and typically a change of greater than 3dB[170] compared to the future baseline sound level at non-residential receptors in the Hough to Walley's Green area.

Non-residential receptors: indirect effects

13.5.40 The assessment of operational noise and vibration indicates that significant indirect effects are unlikely to occur on non-residential receptors in this area.

Other mitigation measures

13.5.41 No other mitigation measures are included in the design at this stage.

Summary of likely residual significant effects

13.5.42 At the majority of individual residences, the proposed mitigation measures will reduce operational airborne noise inside all dwellings such that it does not reach a level where it will

[170] The exception is where the use and sensitivity of the receptor or land use is very sensitive to noise and have been included in the detailed assessment where there is a change less than 3dB. Further information can be found in Volume 5: Appendix SV-001-00000.

significantly affect residents, and therefore, no likely residual significant effects are identified.

13.5.43 Significant residual adverse effects are likely to remain for 35 individual residential properties in Crewe, due to ground-borne noise. HS2 Ltd continues to review the design and mitigation in relation to ground-borne noise effects, and any changes will be brought forward during the passage of the Bill in Parliament.

13.5.44 At the community level, the envisaged mitigation, including landscape earthworks and noise mitigation, described in this section, and presented in Map Series SV-05 (Volume 2: MA01 Map Book), will substantially reduce the potential airborne sound impacts and noise effects that would otherwise arise from the Proposed Scheme. Significant residual adverse effects are likely to remain due to increased ground-borne noise and vibration levels for occupants of approximately 265 residential properties in the vicinity of the following locations in Crewe (labelled MA01-O-C1 on Map SV-05-302): Earle Street, Brierley Street, Broughton Road, North Street, North Stafford Street, Thomas Street, Wallis Street, Henry Street, Middlewich Street, Ridgeway Street, Audley Street, Sheppard Close, Sherbourne Road, Broad Street Cranbourne Road, Greenacres, Crossway, Lime Street, Hazelmere Way, Basford Road, Broad Street, Hazel Grove, Churchmere Drive and Chapelmere Court.

13.5.45 Significant beneficial effects are likely to occur due to decreased noise levels for occupants of residential properties at the following locations in Leighton, Crewe (labelled MA01-O-C2 on Map SV-05-303): Bowland Croft, Wharfdale Avenue, Haweswater Avenue, Buttermere Drive, Bleasdale Road, Aysgarth Avenue and Perry Fields.

13.5.46 The assessment has identified a likely residual significant ground-borne noise effect at the following non-residential receptors, identified in map Series SV-05 Volume 2: MA01 Map Book:

- Best Western Crewe Arms Hotel, Nantwich Road, Crewe, identified by MA01-O-N1 on Map SV-05-302;
- Eurosales and Eurocard Centre (offices), Herald Park, Herald Drive, Crewe, identified by MA01-O-N2 on Map SV-05-302;
- ChuffChuff (Dance Studio), Middlewich Street, Crewe, identified by MA01-O-N3 on Map SV-05-302;
- Cooperative Funeral Services (Offices), Middlewich Street, Crewe identified by MA01-O-N4 on Map SV-05-302;
- Bentley Manor Care Home, Sherborne Rd, Crewe, identified by MA01-O-N5 on Map SV-05-302; and
- Sherborne Court Neurological Centre, Sherborne Road, Crewe, identified by MA01-O-N6 on Map SV-05-302.

13.5.47 HS2 Ltd will continue to seek reasonably practicable measures to reduce or avoid these significant adverse effects. HS2 Ltd will continue to engage with stakeholders to fully understand the non-residential receptors that are identified as likely to be affected, their use and the benefit of any identified measures.

Cumulative effects

13.5.48 The airborne noise, ground-borne noise and vibration study areas for the Proposed Scheme either do not overlap with the corresponding study areas from other HS2 Phases, or where they do overlap, do not include any noise or vibration sensitive receptors. Therefore, it is not anticipated that there will be any significant cumulative noise effects during operation of the Proposed Scheme.

Monitoring

13.5.49 Volume 1 (Section 9) sets out the general approach to environmental monitoring during operation of the Proposed Scheme.

13.5.50 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.

13.5.51 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 considers the likely impacts on all forms of transport and the consequential potential significant effects on transport users arising from the construction and operation of the Proposed Scheme through the Hough to Walley's Green 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 and Cheshire East Council (CEC) has been undertaken. An important focus of this engagement has been to obtain relevant baseline information and discuss transport survey requirements and assessment methodology.

14.1.3 A detailed report on traffic and transport impacts within the Hough to Walley's Green area is contained in the Transport Assessment (see Volume 5: Appendices TR-001, 002, 003 and 005).

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: MA01 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 HGV 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 and transport data are set out in Background Information and Data (BID)[171] (see BID TR-004-00001: Transport Assessment policy and data report).

14.1.7 The Proposed Scheme is described in Section 2.

14.2 Scope, assumptions and limitations

14.2.1 The scope, key assumptions and limitations for the traffic and transport assessment are set out in Volume 1 (Section 8) and the EIA Scope and Methodology Report (SMR)[172].

14.2.2 The peak level of construction traffic activity is expected to be 2030 and the opening year to be 2038. The forecasts used in the assessment have been produced prior to the development of a full understanding of the likely impact of COVID-19 on economic growth and travel behaviour. The full impact of COVID-19 is not yet known but is considered likely to

[171] High Speed Two Ltd (2022), High Speed Rail (Crewe – Manchester), *Background Information and Data*. Available online at: https://www.gov.uk/government/collections/hs2-phase-2b-crewe-manchester-environmental-statement.

[172] Volume 5: Appendix CT-001-00001, Environmental Impact Assessment Scope and Methodology Report.

result in lower travel demand in the medium term than the forecasts used in the assessment for background traffic and rail, including HS2.

14.2.3 Consequently, the assessment is considered to overstate travel demand for both construction and operation scenarios and therefore to present a robust case for traffic and transport. This also means that the operational assessment for 2046 is likely to include a level of growth more representative of 2048 or later, representing likely impacts at least 10 years post-opening of the Proposed Scheme.

14.2.4 The study area for traffic and transport includes the communities of Crewe, Chorlton, Hough, Shavington, Weston, Basford, Coppenhall Moss, Bradfield Green, Warmingham, Sandbach and Elworth, together with Crewe Station and Sandbach Station.

14.2.5 The study area for traffic and transport also includes all strategic and local roads potentially affected by the Proposed Scheme. The M6 (including junctions 16 and 17) is the only strategic route in this area.

14.2.6 Forecast future transport movements by road, with and without the Proposed Scheme, have been derived from the A500 Crewe Area Wide Transport model. This model has been developed by CEC and covers an area from Stoke-on-Trent in the south, Bunbury in the west, Kidsgrove in the east and the M6 junction 18 in the north. This model represents the average weekday morning (08:00-09:00) and evening (17:00-18:00) peak hours.

14.2.7 Junction assessments for construction have been undertaken against the peak month of construction traffic and include robust assumptions on the level of construction traffic in the peak hours. The assessments also address the impact of highway interventions. The effects identified are considered to be a reasonable worst case.

14.2.8 Where the effects vary through the construction programme the highest magnitude significant effects are reported. Where there are both adverse and beneficial effects at different times, the highest magnitude adverse and highest magnitude beneficial are both reported.

14.3 Environmental baseline

Existing baseline

14.3.1 Existing conditions in the study area have been determined through site visits, traffic and transport surveys, liaison with Highways England and CEC (including provision of information on public transport, public rights of way (PRoW) and accident[173] data) and desktop analysis.

[173] The term accident in this report refers to injury related collisions reported to/recorded by the police. These data, known as STATS19, relate only to personal injury accidents on public roads that are reported to the police, and subsequently recorded, using the STATS19 accident reporting form.

Surveys

14.3.2 Traffic surveys, comprising junction turning counts, manual classified counts, queue length surveys and automatic traffic counts, were undertaken in November 2017 with additional surveys undertaken in February 2018, July 2018 and November 2019. These data have been supplemented by existing traffic data from other sources, including from Highways England and CEC. Assessment of the data indicates that the weekday peak hours in the area are generally 08:00-09:00 and 17:00-18:00 which correspond to the Proposed Scheme assessment hours.

14.3.3 PRoW surveys were undertaken in August 2017 to establish their nature and usage by non-motorised users (pedestrians, cyclists and equestrians). The surveys included PRoW and roads that will be crossed by the route of the Proposed Scheme, and any additional PRoW and roads that may be affected by the Proposed Scheme. The majority of the PRoW surveys were undertaken during the weekend, at times when recreational use is expected to be highest, but where routes are likely to be used for non-leisure uses such as commuting, surveys were undertaken on a weekday.

Strategic and local highway network

14.3.4 The M6 is the only strategic route in this area. The strategic road network in and around the Hough to Walley's Green area is generally busy during peak hours and delays can be experienced.

14.3.5 The local roads include (ordered by road class from south to north):

- A531 Newcastle Road;
- A500 Newcastle Road/Shavington Bypass;
- A51 Nantwich Bypass/Newcastle Road;
- A5020 David Whitby Way/University Way;
- A530 Middlewich Road/Nantwich Road;
- A532 Weston Road/Macon Way/Manchester Bridge/Earle Street/Vernon Way/West Street/Coppenhall Lane;
- A534 Nantwich Road/Crewe Road/Crewe Green Road/Haslington Bypass/Wheelock Bypass/Old Mill Road/Congleton Road;
- A5019 Vernon Way;
- A5078 Oak Street/Dunwoody Way;
- A533 Old Mill Road;
- B5071 Jack Mills Way;
- B5338 Crewe Road;
- B5334 Middlewich Road;
- B5472 Weston Road;
- B5078 Radway Green Road;

- B5077 Crewe Road;
- B5076 Vernon Way/Middlewich Street/North Street/Bradfield Road/Flowers Lane;
- Newcastle Road;
- Casey Lane;
- Sydney Road;
- Remer Street;
- Groby Road;
- Broughton Road;
- Parkers Road; and
- Warmingham Road.

14.3.6 The local road network in this area generally operates well, although some localised delays can be experienced, particularly at peak times.

14.3.7 Relevant accident data for the road network subject to assessment have been obtained from the Department for Transport (DfT)[174]. Data for the three year period from July 2016 to June 2019 have been assessed and any identified clusters (i.e. where there are nine or more accidents in the three year period) have been examined.

14.3.8 One accident cluster was identified within the Hough to Walley's Green area at the A532 Vernon Way/A532 Earle Street/A5019 Vernon Way/Earle Street junction. In total, there were 13 accidents, of which three were classified as serious and 10 were classified as slight.

14.3.9 The route of the Proposed Scheme will cross one road with roadside footways within the Hough to Walley's Green area. This is Parkers Road.

Parking and loading

14.3.10 There is on-street marked and unmarked parking on some roads within the Hough to Walley's Green area that may be impacted by the Proposed Scheme. This includes parking on both sides of the carriageway of the B5076 Middlewich Street and Broughton Road.

14.3.11 There is off-street parking within the Hough to Walley's Green area that may be impacted by the Proposed Scheme. This includes off-street heavy goods vehicle (HGV) parking associated with Crewe Truck Stop and Café located off the A532 Weston Road and off-street parking at McColls convenience store off the B5076 Middlewich Street.

Public transport network

14.3.12 Thirteen bus services operate on 17 roads that will be crossed or could be affected by the route of the Proposed Scheme in the Hough to Walley's Green area. There are also bus stops

[174] Department for Transport (2021), *STATS19 Road Safety Data July 2016 - June 2019*. Available online at: https://www.gov.uk/government/collections/road-accidents-and-safety-statistics.

primarily located to serve the main built-up area. The bus services that could be affected by the Proposed Scheme include:

- A530 Middlewich Road: route 85 (Nantwich - Crewe - Keele University - Newcastle - Hanley); route 31 (Crewe - Leighton Hospital - Winsford/Northwich); route 31A (Crewe - Leighton Hospital - Winsford/Northwich); route 42 (Crewe - Middlewich - Holmes Chapel - Congleton);
- A532 Weston Road: route 85 (Nantwich - Crewe - Keele University - Newcastle - Hanley);
- A532 Manchester Bridge/Earle Street/Vernon Way: route 8 (Wistaston Green - Crewe - Sydney - Elm Drive);
- A532 Merill's Bridge: route 85 (Nantwich - Crewe - Keele University - Newcastle - Hanley);
- A532 Coppenhall Lane: route 85 (Nantwich - Crewe - Keele University - Newcastle - Hanley);
- A532 West Street: route 6 (Leighton Hospital - Crewe - Shavington); route 6E (Leighton Hospital - Crewe - Shavington); route 8 (Wistaston Green - Crewe - Sydney - Elm Drive); route 31 (Crewe - Leighton Hospital - Winsford/Northwich); route 31A (Crewe - Leighton Hospital - Winsford/Northwich); route 85 (Nantwich - Crewe - Keele University - Newcastle - Hanley);
- A534 Crewe Road/Crewe Green Road: route 3 (Crewe - Haslington - Alsager - Tunstall - Hanley); route 37 (Crewe - Sandbach - Winsford/Northwich); route 38 (Crewe - Sandbach - Congleton - Macclesfield);
- A5078 Oak Street: route 39 (Crewe - Wybunbury - Walgherton - Nantwich);
- A5078 Wistaston Road/Dunwoody Way: route 42 (Crewe - Middlewich - Holmes Chapel - Congleton);
- B5076 Middlewich Street: route 8 (Wistaston Green - Crewe - Sydney - Elm Drive);
- B5076 North Street: route 12 (Shavington - Crewe - Leighton Hospital);
- B5076 Bradfield Road: route 12 (Shavington - Crewe - Leighton Hospital); route 317 (Leighton Hospital - Sandbach - Rode Heath - Alsager); route 31 (Crewe - Leighton Hospital - Winsford/Northwich); route 31A (Crewe - Leighton Hospital - Winsford/Northwich); route 6 (Leighton Hospital - Crewe - Shavington); route 6E (Leighton Hospital - Crewe - Shavington);
- B5076 Flowers Lane: route 31 (Crewe - Leighton Hospital - Winsford/Northwich); route 31A (Crewe - Leighton Hospital - Winsford/Northwich); route 42 (Crewe - Middlewich - Holmes Chapel - Congleton);
- Underwood Lane: route 6 (Leighton Hospital - Crewe - Shavington); route 6E (Leighton Hospital - Crewe - Shavington); route 31 (Crewe - Leighton Hospital - Winsford/Northwich); route 31A (Crewe - Leighton Hospital - Winsford/Northwich);
- Sydney Road: route 8 (Wistaston Green - Crewe - Sydney - Elm Drive);
- Remer Street: route 8 (Wistaston Green - Crewe - Sydney - Elm Drive); and
- Parkers Road: route 12 (Shavington - Crewe - Leighton Hospital); route 317 (Leighton Hospital - Sandbach - Rode Heath - Alsager).

14.3.13 National local rail services are accessible via Crewe Station and local rail services are accessible via Sandbach Station within the Hough to Walley's Green area. Crewe Station provides access to local and national services on the West Coast Main Line (WCML), Crewe to Shrewsbury Line, Independent Lines, Crewe to Derby Line, North Wales Coast Line and Crewe to Manchester Line. Sandbach Station provides access to local services on the Crewe to Manchester Line.

Non-motorised users

14.3.14 There are pedestrian footways adjacent to many of the roads in the built-up areas of Crewe, Chorlton, Hough, Shavington, Weston, Basford, Coppenhall Moss, Bradfield Green, Warmingham, Sandbach and Elworth. Roadside footways vary in width and condition within these areas. Where there is no formal roadside footway provision, non-motorised user numbers are generally low.

14.3.15 Three promoted walking routes pass through the Hough to Walley's Green area; the Crewe and Nantwich Circular Walk, Cheshire Ring Canal Walk, and the South Cheshire Walk.

14.3.16 In the Hough to Walley's Green area, National Routes 5, 451 and 551 (part of the National Cycle Network) and Regional Route 70 pass through the area.

14.3.17 The route of the Proposed Scheme will cross the route of five PRoW within the Hough to Walley's Green area. Further PRoW and roadside footways in the Hough to Walley's Green area could be affected by the Proposed Scheme and have been included in the assessment.

14.3.18 The surveys undertaken to inform the assessment showed that the route with the greatest daily usage during the survey day was Footpath Minshull Vernon 2/1 and Footpath Warmingham 16/2, which was used by 32 pedestrians and three cyclists.

Waterways and canals

14.3.19 There are two navigable waterways in the Hough to Walley's Green area; the Shropshire Union Canal (Middlewich Branch) and the Trent and Mersey Canal, which are located to the west and east of the Proposed Scheme respectively. The Shropshire Union Canal (Middlewich Branch) passes through the north-west section of the study area on a south-west to north-east alignment and extends between Barbridge Junction and Middlewich. The Trent and Mersey Canal passes through the north-east section of the study area on a south to north alignment and extends between Shardlow and Runcorn. It is not expected that there will be any effects on these navigable waterways and this topic is not considered further in this assessment.

Air transport

14.3.20 There is no relevant air transport in the Hough to Walley's Green area. Consequently, this topic is not considered further in this assessment.

Future baseline

14.3.21 The future baseline traffic volumes have been calculated for the future years of 2030, 2038 and 2046. These have been used to support the assessment of construction and operation of the Proposed Scheme, reflecting the assumed route-wide construction peak (2030), opening year (2038) and a future assessment year (2046). Growth factors have been checked to ensure that committed developments are appropriately reflected in the growth forecasts. The assumptions underlying committed developments and transport schemes for each assessment year have been discussed with Highways England and CEC and are considered to be appropriately reflected in the traffic forecasts.

14.3.22 There are three committed or recently completed highway schemes in the study area that have been taken into account in the future baseline. These are: the Crewe Green Roundabout improvements scheme; the Sydney Road Bridge improvement scheme; and the A500 Dualling scheme.

14.3.23 The Crewe Green Roundabout improvements scheme was promoted by CEC and opened in 2018. It includes modifications to the existing five-arm signal controlled roundabout and adjacent signal controlled T-junction at Sydney Road/Hungerford Road to form an enlarged roundabout encompassing both junctions and improved pedestrian and cycle facilities. The scheme is included within the A500 Crewe Area Wide Transport model.

14.3.24 Opened in 2019, the Sydney Road Bridge improvement scheme was promoted by CEC. The existing single-lane bridge structure over the WCML was replaced, as part of the scheme, with a wider bridge structure capable of carrying two-way traffic. The scheme was designed to reduce traffic congestion and add to the resilience of the wider network. The scheme is included within the A500 Crewe Area Wide Transport model.

14.3.25 The proposed A500 Dualling scheme comprises upgrading of the section of the A500 between Meremoor Moss roundabout and the M6 junction 16 to dual carriageway standard. The scheme was the subject of a planning application by CEC and was approved in April 2020. At the time of the assessment, the scheme was programmed to commence (subject to final funding approvals) in 2022 and due to be completed by approximately 2024/25. The scheme is included within the A500 Crewe Area Wide Transport model.

14.3.26 In addition, there is a committed improvement scheme for the Sydney Road/Maw Green Road, Remer Street/Sydney Road/Elm Drive and Remer Street/Groby Drive junctions associated with the nearby Coppenhall East residential development (MA01/148 in Volume 5: Appendix CT-004-00000, Planning data). This involves the replacement of the three existing priority T-junctions with a single elongated priority controlled (give-way) roundabout. The timing of delivery of this scheme is uncertain and, consequently, these junctions have been assessed with and without the improvement scheme in place.

14.3.27 It is difficult to forecast how public transport services may change in the future; therefore, unless information on future services is available, it has been assumed that public transport services for the future years of assessment will be the same as those currently operating. Similarly, pedestrian and cycle demand and facilities and parking are assumed to remain

unchanged from the base year. For the Hough to Walley's Green area, there are no known substantial committed changes to the public transport network, parking and pedestrian and cycling facilities.

14.3.28 HS2 Phase 2a received Royal Assent in February 2021 and will be under construction in 2025. The assessment has included the predicted traffic and passenger flows associated with the construction and operation of HS2 Phase 2a as part of the future baseline. The cumulative assessment reports the combined effects of the Proposed Scheme and HS2 Phase 2a compared to a future baseline without either.

Construction

14.3.29 Construction of the Proposed Scheme is expected to commence in 2025 with construction activity continuing to 2038 (although activity in 2038 will be limited to testing and commissioning). Construction activities have been assessed against 2030 baseline traffic flows, irrespective of when they occur during the construction period.

14.3.30 The year 2030 is the common future baseline year and the impact of individual or overlapping activities are considered against this single year.

14.3.31 Future baseline traffic volumes in the peak hours are forecast to grow by an average of 18% by 2030 compared to a baseline year of 2018.

14.3.32 An assessment has been undertaken of the construction traffic volumes and routes associated with HS2 Phase 2a. The assessment indicates that in the future baseline of 2030 there will be minimal construction traffic movements as a result of HS2 Phase 2a that overlap with the Proposed Scheme.

Operation

14.3.33 Future baseline traffic volumes in the peak hours are forecast to grow by an average of 27% by 2038 compared to the baseline year of 2018.

14.3.34 Future baseline traffic volumes in the peak hours are forecast to grow by an average of 47% by 2046 compared to the baseline year of 2018.

14.4 Effects arising during construction

Avoidance and mitigation measures

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

- new highways (roads and PRoW) will be constructed and will be operational prior to the permanent closure of any existing highways, insofar as reasonably practicable;
- the majority of roads crossed by the route of the Proposed Scheme will be maintained or locally diverted during construction;

- 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 roadside footways and PRoW will be provided during construction, insofar as reasonably practicable, where either the existing or final proposed route is not available;
- where reasonably practicable, site haul routes will be created adjacent to the route of the Proposed Scheme to transport construction materials and equipment to reduce 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;
- the use of the local road network will, insofar as reasonably practicable, be limited to use for site set-up, access for surveys and on-going servicing (including refuse collection and general deliveries to compounds) during construction;
- the reuse of excavated material along the route of the Proposed Scheme, insofar as reasonably practicable;
- highway measures including junction improvements, passing places and carriageway widening will be provided, as required, to manage the safe and efficient movement of vehicles on construction HGV routes;
- on-site welfare facilities will be provided, which will reduce daily travel by site workers;
- four borrow pits will be provided in the vicinity of the route of the Proposed Scheme in the Wimboldsley to Lostock Gralam area (MA02) which will reduce the use of local roads in this area for the import of materials; and
- temporary construction sidings at the site of Crewe North rolling stock depot (RSD) in the Wimboldsley to Lostock Gralam area (MA02) will be used to manage the movement of excavated material, mainly from Crewe tunnel, by rail which will reduce the volume and impact of road traffic on local roads and communities.

14.4.2 Section 14 of the draft CoCP includes measures that aim to reduce the adverse impacts and effects on local communities and maintain public access. This includes the impacts of deliveries of construction materials and equipment.

14.4.3 The measures in the draft CoCP include controls on vehicle types, hours of site operation and routes for HGVs to reduce the impact of road-based construction traffic. In order to achieve this, general and site-specific traffic management measures will be implemented during the construction of the Proposed Scheme on or adjacent to public roads and PRoW affected by the Proposed Scheme.

14.4.4 The draft CoCP includes the requirement to develop local traffic management plans in consultation with the highway and traffic authorities and the emergency services. These will consider the local traffic management strategy including consideration of sensitive receptors, such that adverse impacts will be reduced, insofar as reasonably practicable.

14.4.5 Specific measures include core site operating hours of 08:00 to 18:00 on weekdays and 08:00 to 13:00 on Saturdays with site staff and workers generally arriving before the morning peak hour and departing after the evening peak hour. Activities such as major concrete pours may involve extended working hours for reasons of engineering practicability. Tunnelling and directly associated activities may be carried out on a 24-hour, seven days a week basis, with very few workers travelling within the peak traffic hours.

14.4.6 The number of private car trips to and from the construction compounds (both workforce and visitors) will be reduced by encouraging alternative sustainable modes of transport or vehicle sharing. This will be supported by an overarching framework travel plan that will require construction workforce travel plans to be produced that will include a range of potential measures to mitigate the impacts of workers' traffic and transport movements associated with construction of the Proposed Scheme. The travel plans will promote the use of sustainable transport modes as appropriate to the location and types of trip. They will include measures such as: provision of information on and promotion of public transport services; provision of good cycle and pedestrian facilities; liaison with public transport operators; promotion of car sharing; and the appointment of a travel plan coordinator to ensure suitable measures are in place and are effective.

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

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

Assessment of impacts and effects

Temporary effects

14.4.8 The following section considers the impacts on traffic and transport and the likely consequential significant effects resulting from the construction of the Proposed Scheme.

Key construction transport issues

14.4.9 The assessment takes account of all of the impacts of the Proposed Scheme in the Hough to Walley's Green area. The main traffic and transport impacts during the construction period within this area will include:

- construction vehicle movements to and from the various construction compounds;
- road closures, realignments and diversions;

- alternative routes for PRoW and roadside footways; and
- possessions and blockades on the conventional rail network.

14.4.10 The construction assessment has also considered any impacts in the Hough to Walley's Green area that arise from construction of the Proposed Scheme in the adjoining community areas.

14.4.11 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 tunnelling, utility works, earthworks, underpass, viaduct, bridge and highway construction.

14.4.12 Details of the construction compounds are provided in Section 2.3. Table 49 provides details of the compound set up date and the duration of active use. The duration of active use excludes any period where there are no substantial workforce trips or movement of materials to and from the compound.

14.4.13 Table 49 also provides a summary of the HGV and car/light goods vehicle (LGV) access trips at each compound in the peak month of activity and during the busy period. 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. Two-way trips refer to the total number of vehicle movements in both directions (e.g. with 200 westbound vehicles and 100 eastbound, there would be 300 two-way trips). The average daily combined two-way vehicle trips for the busy period is the lower end of the range shown in Table 49 and the average daily combined two-way vehicle trips for the peak month is the upper end of the range shown. The estimated duration of busy period is also provided.

Table 49: Typical vehicle trip generation for construction compounds in the Hough to Walley's Green area

Compound type	Compound name	Indicative start/set up date (years/ quarter)	Estimated duration of active use (years/ months)	Average daily combined two–way car/LGV trips during busy period and within peak month of activity	Average daily combined two–way HGV trips during busy period and within peak month of activity	Estimated duration of busy period (months)
Satellite	Crewe tunnel south portal satellite compound	2029 Q4	4 years	142-216	189-190	6
Satellite	Cowley Way vent shaft satellite compound	2027 Q4	5 years and 3 months	114-254	77-88	4
Satellite	Middlewich Street vent shaft satellite compound	2027 Q3	5 years and 6 months	97-166	59-80	9

Compound type	Compound name	Indicative start/set up date (years/ quarter)	Estimated duration of active use (years/ months)	Average daily combined two–way car/LGV trips during busy period and within peak month of activity	Average daily combined two–way HGV trips during busy period and within peak month of activity	Estimated duration of busy period (months)
Main	Crewe tunnel north main compound	2026 Q3	7 years and 3 months	476-644	196-316	42
Satellite	Warmingham Moss satellite compound	2027 Q2	7 years	365-502	161-220	7
Satellite	Moss Lane satellite compound	2027 Q2	6 years and 9 months	341-458	160-220	8

14.4.14 The locations of the compounds and the associated construction HGV routes are shown in Map Series TR-08 (Volume 5, Traffic and transport Map Book). Table 50 summarises the construction HGV routes to and from each compound to the main road network. For some compounds, Table 50 includes multiple construction HGV routes. This is either because the construction HGV route varies depending on the origin/destination of the trip or because the construction HGV route varies over time to account for changes to the highway network through the construction period.

14.4.15 The average daily combined two-way HGV trips reported in Table 49 represent the total number of HGV movements to and from each compound during the busy period and in the peak month of activity on all of the available construction HGV routes combined. Where multiple construction HGV routes are shown in Table 50, the split of construction traffic between the available construction HGV routes will vary based on the point in the construction programme and the origin/destination of the construction HGV traffic.

Table 50: Construction HGV routes for construction compounds in the Hough to Walley's Green area

Compound name(s)	Access routes to/from compound(s) to main road network
Crewe tunnel south portal satellite compound	• Casey Lane, Newcastle Road and A531 Newcastle Road
Cowley Way vent shaft satellite compound	Route to/from the south: • Cowley Way, A532 Weston Road, A5020 David Whitby Way and A500 Shavington Bypass Route to/from the north: • Cowley Way, A532 Weston Road and A534 Crewe Road
Middlewich Street vent shaft satellite compound	Route to/from the south: • B5076 Middlewich Street, Remer Street, Sydney Road and A5020 University Way • B5076 Middlewich Street, Remer Street, B5076 North Street, B5076 Bradfield Road, B5076 Flowers Lane and A530 Middlewich Road • B5076 Middlewich Street, Vernon Way, A532 West Street, A530 Middlewich Road Route to/from the north: • B5076 Middlewich Street, Remer Street, Sydney Road and A534 Haslington Bypass

Compound name(s)	Access routes to/from compound(s) to main road network
	• B5076 Middlewich Street, Vernon Way, A532 West Street, A530 Middlewich Road
Crewe tunnel north main compound	Route to/from the south: • Warmingham Road, Groby Road, Sydney Road and A5020 University Way • Parkers Road, B5076 Bradfield Road, B5076 Flowers Lane and A530 Middlewich Road (to be used before and after closure of Parkers Road) Route to/from the north: • Warmingham Road, Groby Road, Sydney Road and A534 Haslington Bypass • Parkers Road, B5076 Bradfield Road, B5076 Flowers Lane and A530 Middlewich Road (to be used before and after closure of Parkers Road)
Warmingham Moss satellite compound	Route to/from the south: • On-site construction traffic route, Warmingham Road, Groby Road, Sydney Road and A5020 University Way • On-site construction traffic route, Warmingham Road, Groby Road, Sydney Road and A534 Haslington Bypass • On-site construction traffic route, Parkers Road, B5076 Bradfield Road, B5076 Flowers Lane and A530 Middlewich Road (to be used before and after closure of Parkers Road) On-site construction traffic route, Parkers Road, B5076 Bradfield Road, B5076 Flowers Lane and A530 Middlewich Road (to be used before and after closure of Parkers Road) Route to/from the north: • On-site construction traffic route and A530 Nantwich Road
Moss Lane satellite compound	• On-site construction traffic route and A530 Middlewich Road

14.4.16 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 49.

14.4.17 The effects of construction of the Proposed Scheme on the highway network in the Hough to Walley's Green area have been assessed by undertaking strategic model runs for a number of 'with HS2' construction scenarios, and by comparing the flows and delays against the 2030 future baseline scenario. The assessment is based on the highest volume of construction traffic on each construction HGV route in each construction scenario. Where construction HGV routes will serve more than one construction compound, the assessment is based on the highest combined volume of construction traffic on each section of each construction HGV route in each construction scenario.

14.4.18 In using the strategic model, the impacts and effects have been considered in three scenarios covering the main construction phases. These scenarios ensure that the assessment addresses the different combinations and interactions of advance works, utility works, temporary highway closures and diversions and construction lorry movements through the construction period. The scenarios are:

- scenario 1, peak between 2025 Q1 and 2028 Q4. This corresponds with the construction peak prior to the temporary closure of Parkers Road and includes the commencement of

works on Cowley Way vent shaft and Middlewich Street vent shaft. This scenario equates to 100% of the overall peak in construction traffic across the whole construction period;

- scenario 2, peak between 2029 Q1 and 2030 Q2. This corresponds with the construction peak during the extension of the existing Parkers Road Overbridge and the temporary closure of Parkers Road. This scenario equates to 77% of the overall peak in construction traffic across the whole construction period; and
- scenario 3, peak after 2030 Q2. This corresponds with the construction peak following the reopening of Parkers Road and realignment of Clive Green Lane and includes works associated with the Crewe tunnel north main compound. This scenario equates to 54% of the overall peak in construction traffic across the whole construction period.

14.4.19 The construction works and construction traffic movements associated with the Proposed Scheme differ for each of these scenarios. The assessment considers the impacts in all scenarios and reports the highest magnitude of significant effects, regardless of which scenario they arise in. The most relevant highway interventions and works for each scenario are shown in Table 51.

Table 51: Construction highway interventions by scenario

Type	Intervention	Scenario 1	Scenario 2	Scenario 3
Main works	Parkers Road temporarily closed	Not included	Included	Not included
Main works	Clive Green Lane (Wimboldsley to Lostock Gralam area (MA02)) available to construction traffic	Not included	Not included	Included
Main works	Sydney Road/Maw Green Road, Remer Street/Sydney Road/Elm Drive and Remer Street Groby Road junctions	Included*	Included*	Included*
	Construction HGV traffic assessed as a percentage of peak construction HGV traffic	**100%**	**77%**	**54%**

**While it is considered likely that this improvement scheme will have been completed prior to the commencement of the construction of the Proposed Scheme, due to the uncertainty over the timing of its delivery, these junctions have been assessed both with and without the proposed improvement scheme in place.*

14.4.20 The strategic model has been used to assess these construction scenarios taking account of the construction traffic movements and any road closures, traffic management or changes to junction operations in each scenario. The strategic model outputs for each of these scenarios are only relevant to the assessment of the effects on traffic delays to vehicle occupants and traffic related severance.

Highway network

Strategic and local highway network

14.4.21 The primary HGV access routes for construction vehicles will be the strategic and/or primary road network with the use of the local road network limited, so far as reasonably practicable. The construction HGV routes will also provide access to compounds. Where reasonably practicable, site haul routes alongside the route of the Proposed Scheme will be used to reduce the impact on the local road network. In this area, the main construction HGV routes will be (ordered by road class from south to north):

- M6 (including junctions 16 and 17);
- A500 Newcastle Road/Shavington Bypass (between the M6 junction 16 and the A51 Nantwich Bypass);
- A531 Newcastle Road (between the A500 Shavington Bypass and Newcastle Road);
- A51 Nantwich Bypass (between the A500 Shavington Bypass and the A530 Middlewich Road);
- A530 Middlewich Road/Nantwich Road (between the A51 Newcastle Road and the southern boundary of the Wimboldsley to Lostock Gralam area (MA02);
- A5020 David Whitby Way/University Way (between the A500 Shavington Bypass and the A534 Crewe Green Road);
- A532 Weston Road (between the A5020 David Whitby Way and the A534 Crewe Road);
- A534 Nantwich Road/Crewe Road/Crewe Green Road/Haslington Bypass/Wheelock Bypass/Old Mill Road/Congleton Road (between the A532 Weston Road and the M6 junction 17);
- A533 Old Mill Road (between the A534 Wheelock Bypass and the A534 Old Mill Road);
- A532 Vernon Way/West Street/Coppenhall Lane (between the B5076 Vernon Way and the A530 Middlewich Road);
- B5076 Vernon Way/Middlewich Street (between the A532 Vernon Way and Remer Street);
- B5076 North Street/Bradfield Road/Flowers Lane (between Remer Street and the A530 Middlewich Road);
- Newcastle Road (between Casey Lane and the A531 Newcastle Road);
- Casey Lane (between Newcastle Road and Casey Bridge);
- Sydney Road;
- Remer Street;
- Groby Road;
- Broughton Road;
- Parkers Road; and
- Warmingham Road (between Groby Road and Warmingham Moss satellite compound).

14.4.22 A number of these construction HGV routes will have limited use (i.e. a low level of HGV use generally over a short length of time, for example for site set up or minor works) including the A532 Vernon Way/West Street/Coppenhall Lane (between the B5076 Vernon Way and the A530 Middlewich Road), the B5076 Vernon Way/Middlewich Street (between the A532 Vernon Way and Remer Street) and Warmingham Road (between Groby Road and Warmingham Moss satellite compound).

14.4.23 In addition to changes in traffic flows due to construction traffic, temporary highway closures and diversions or realignments will be required in a number of locations as set out in Section 2.3. The works to construct both temporary and permanent highway diversions/realignments could also result in disruption to highway users. In most cases, these works will be restricted to short-term overnight and/or weekend closures, and are not, therefore, considered significant. The following works will have a longer duration:

- A530 Middlewich Road, Pyms Lane and Underwood Lane – utility works and associated traffic management, including temporary shuttle working with traffic control for a period of nine months;
- Sydney Road/Maw Green Road, Remer Street/Sydney Road/Elm Drive and Remer Street/Groby Road junctions – temporary reconfiguration of the three existing priority T-junctions or, in the event that the committed improvement scheme associated with the nearby Coppenhall East development (MA01/148 in Volume 5: Appendix CT-004-00000, Planning data) has been implemented, temporary reconfiguration of the elongated priority controlled roundabout for a period of up to seven years and three months during the construction phase. This will increase the journey length for vehicle occupants by up to 60m; and
- Parkers Road – temporary closure of a section of Parkers Road between Broughton Road and Bleasdale Road for a period of one year and three months during the construction phase. Traffic will be diverted via Groby Road, Remer Street and the B5076 North Street/Bradfield Road, increasing the journey length for vehicle occupants by up to 2.7km. Non-motorised users will be diverted via a temporary footbridge for a period of one year and three months. On completion of the changes to the existing Parkers Road Overbridge, the road will be reinstated along its existing alignment.

14.4.24 The temporary diversions or realignments will change journey length for vehicle occupants. Many of the diversions or realignments are less than 1km in length and will not result in any significant effects with regard to changes to journey times for vehicle occupants. However, the diversion associated with the temporary closure of Parkers Road will be greater than 1km which will result in a major adverse effect for vehicle occupants, which is significant. The closure of Parkers Road will also affect non-motorised users, which is considered separately below.

14.4.25 The movement of excavated or fill material and construction vehicles accessing construction compounds during the construction of the Proposed Scheme together with temporary road closures and diversions is expected to result in changes in daily traffic flows.

14.4.26 These changes in traffic flow will lead to changes in delays to vehicle occupants and congestion, which are significant. The significant effects with the highest magnitude at each junction will be (ordered by road class from south to north):

- M6 Junction 17/A534 Congleton Road - minor adverse effect during scenarios 1, 2 and 3;
- A500 Shavington Bypass/A51 Newcastle Road/A51 Nantwich Bypass/Cheerbrook Road/Newcastle Road (Cheerbrook Roundabout) - moderate adverse effect during scenario 2;
- A500 Newcastle Road/A500 Shavington Bypass/A531 Newcastle Road/B5472 Weston Road (Meremoor Moss roundabout) - moderate adverse effect during scenario 1;
- A51 Nantwich Bypass/A534 Crewe/B5338 Crewe Road/Park Road - major adverse effect during scenarios 1 and 2;
- A500 Shavington Bypass/A5020 David Whitby Way - minor adverse effect during scenarios 1, 2 and 3;
- A530 Middlewich Road/A51 Nantwich Bypass/B5334 Middlewich Road (Alvaston Roundabout) - moderate adverse effect during scenarios 1 and 2;
- A532 Weston Road/A5020 University Way/A5020 David Whitby Way/B5472 Weston Road/Savoy Road - moderate adverse effect during scenario 2;
- A534/A534 Crewe Green Road/A5020 University Way (Crewe Green roundabout) - moderate adverse effect during scenarios 1, 2 and 3;
- A532 Earle Street/A532 Manchester Bridge/William Street/Grand Junction Way (A532 Earle Street Roundabout) - major adverse effect during scenario 2;
- A532 Vernon Way/A532 Earle Street/A5019 Vernon Way/Earle Street - minor adverse effect during scenario 2;
- A532 West Street/A5078 Dunwoody Way/Bessemer Way - moderate adverse effect during scenarios 1 and 2;
- A534/Crewe Road - moderate adverse effect during scenarios 1 and 3;
- A530 Middlewich Road/B5076 Flowers Lane/Eardswick Lane - major adverse effect during scenarios 1, 2 and 3;
- A534/A533 Old Mill Road - minor adverse effect during scenarios 1, 2 and 3;
- A533 London Road/B5079 Station Road - moderate adverse effect during scenarios 1 and 3;
- A534/Congleton Road - moderate adverse effect during scenarios 1 and 3;
- A533 London Road/Moss Lane - moderate adverse effect during scenarios 1 and 3;
- B5076 Middlewich Street/B5076 North Street/Broad Street/Stoneley Road - moderate adverse effect during scenario 2;
- B5076 Bradfield Road/B5076 North Street/Broughton Road - minor adverse effect during scenario 1;
- B5076 Bradfield Road/Mablins Lane - major adverse effect during scenario 2;
- B5076 Bradfield Road/Parkers Road - major adverse effect during scenarios 1 and 2;

- B5076 Flowers Lane/B5076 Bradfield Road/Minshull New Road/Smithy Lane - major adverse effect during scenario 1 and minor beneficial effect during scenario 2;
- Valley Road/Wistaston Green Road - moderate adverse effect during scenario 2;
- Wistaston Green Road/Capesthorne Road - minor adverse effect during scenarios 1 and 2;
- Badger Ave/Broad Street - minor adverse effect during scenarios 1, 2 and 3;
- Badger Ave/Underwood Lane - moderate adverse effect during scenarios 2 and 3;
- Broad Street/Davenport Street/McLaren Street - minor adverse effect during scenarios 1 and 2;
- Remer Street/Groby Road/Sydney Road/Elm Drive/Maw Green Road (proposed layout) - major adverse effect during scenarios 1, 2 and 3;
- Warmingham Road/Waldron's Lane - moderate adverse effect during scenarios 1 and 3;
- Warmingham Road/Groby Road - major adverse effect during scenarios 1 and 3;
- Warmingham Road/Hall Lane - major adverse effect during scenarios 1 and 3;
- Brookhouse Lane/Eardswick Lane/Cross Lane - minor adverse effect during scenario 1; and
- Forge Mill Lane/Dragons Lane/Tetton Lane/White Hall Lane - moderate adverse effect during scenarios 1 and 3.

14.4.27 Construction of the Proposed Scheme will result in substantial changes in traffic flows (i.e. more than 30% for HGVs or for all vehicles) in some locations, which can lead to changes in traffic-related severance for non-motorised users, which are significant. The significant effects with the highest magnitude in each location are set out in Table 52 and Table 53.

Table 52: Roads with changes in daily all vehicle movements (more than 30%) resulting in significant effects on traffic-related severance for non-motorised users, 2030

Road name	Significant effect	Construction scenario
Back Lane (between Casey Lane and Weston Lane)	Minor adverse	Scenario 3
Cemetery Road (between Whites Lane and Mere Road)	Minor adverse	Scenario 3
Barthomley Road (between Radway Green Road and B5077 Butterton Lane)	Moderate adverse	Scenario 1
Coleridge Way (between Hungerford Road and Wordsworth Drive)	Major adverse	Scenario 2
Shakespeare Drive (between Sydney Road and Laureston Avenue)	Moderate adverse	Scenario 2
Laureston Avenue (between Shakespeare Drive and Wordsworth Drive)	Moderate adverse	Scenario 2
Wordsworth Drive (between Tennyson Avenue and Kipling Way)	Moderate adverse	Scenario 2
Wordsworth Drive (between Kipling Way and Laureston Avenue)	Moderate adverse	Scenario 2
Wordsworth Drive (between Coleridge Way and Tennyson Avenue)	Moderate adverse	Scenario 2
Coleridge Way (between Lansdowne Road and Wordsworth Drive)	Moderate adverse	Scenario 2
Lansdowne Road (between Coleridge Way and Pelican Close)	Moderate adverse	Scenario 2
Lansdowne Road (between Lansdowne Road and Sydney Road)	Moderate adverse	Scenario 2

Road name	Significant effect	Construction scenario
Stamp Avenue (between Greenway and B5076 Middlewich Street)	Moderate adverse	Scenarios 1, 2 and 3
Lime Tree Avenue (between B5076 Middlewich Street and Sycamore Avenue)	Minor adverse	Scenario 2
Lime Tree Avenue (between Sycamore Avenue and Acer Avenue)	Minor adverse	Scenario 2
Clay Lane (between Newtons Lane and Maw Lane)	Moderate adverse	Scenarios 1, 2 and 3
Greenway (between Stamp Avenue and B5076 Middlewich Street)	Moderate adverse	Scenarios 1, 2 and 3
Lime Tree Avenue (between Prunus Road and Elm Drive)	Major adverse	Scenario 2
Elm Drive (between Lime Tree Avenue and Remer Street)	Major adverse	Scenario 2
Lime Tree Avenue (between Acer Avenue and Prunus Road)	Major adverse	Scenario 2
Acer Avenue (between Remer Street and Lime Tree Avenue)	Major adverse	Scenario 2
Selworthy Drive (between B5076 Bradfield Road and Underwood Lane)	Moderate adverse	Scenario 1
Newtons Lane (between Clay Lane and Nesfield Drive)	Major adverse	Scenario 2
Underwood Lane (between Cliffe Road and Newbury Avenue)	Moderate adverse	Scenario 2
Newtons Lane (between Nesfield Drive and Crewe Road)	Moderate adverse	Scenario 2
Underwood Lane (between Newbury Avenue and Pear Tree Avenue)	Moderate adverse	Scenario 2
Stoneley Road (between B5076 Broad Street and Waldron's Lane)	Major adverse	Scenarios 1 and 3
Underwood Lane (between Pear Tree Avenue and B5076 Bradfield Road)	Moderate adverse	Scenario 2
B5076 Bradfield Road (between Underwood Lane and Broughton Road)	Moderate adverse	Scenario 2
B5076 Bradfield Road (between Cliffe Road and Underwood Lane)	Moderate adverse	Scenario 2
Broughton Road (between Maplins Moss Place and Parkers Road)	Major adverse	Scenarios 1, 2 and 3
Parkers Road (between Higher Croft Drive and Parkfield)	Moderate beneficial	Scenario 2
Parkers Road (between Mablins Lane and Broughton Road)	Moderate beneficial	Scenario 2
A530 Middlewich Road (between Eardswick Lane and Brookhouse Lane)	Moderate adverse	Scenario 3
B5074 Over Road/B5074 Swanlow Lane (between Cross Lane and Moor Lane)	Moderate adverse	Scenario 1

Table 53: Roads with changes in daily HGV movements (more than 30%) resulting in significant effects on traffic-related severance non-motorised users, 2030

Road name	Significant effect	Construction scenario
Back Lane (between Casey Lane and Newcastle Road)	Moderate adverse	Scenarios 2 and 3
Newcastle Road (between Casey Lane and Chorlton Lane)	Major adverse	Scenario 3
Casey Lane (between Back Lane and Weston Lane)	Moderate adverse	Scenario 3
A531 Newcastle Road (between Main Road and A500 Shavington Bypass)	Major adverse	Scenario 3

Road name	Significant effect	Construction scenario
A500 Shavington Bypass (between A51 Newcastle Road and B5071 Jack Mills Way)	Moderate adverse	Scenarios 1 and 2
A51 Nantwich Bypass (between A51 Newcastle Road and A534 Crewe Road)	Moderate adverse	Scenarios 1 and 2
A500 Newcastle Road (between A500 Shavington Bypass and M6 junction 16)	Moderate adverse	Scenarios 1 and 2
A500 Shavington Bypass (between A5020 David Whitby Way and A500 Newcastle Road)	Moderate adverse	Scenarios 1 and 2
A5020 David Whitby Way (between A500 Shavington Bypass and B5472 Weston Road)	Major adverse	Scenario 1
A51 Nantwich Bypass (between A534 Crewe Road and A530 Middlewich Road)	Major adverse	Scenario 2
A530 Middlewich Road (between A51 Nantwich Bypass and Colleys Lane)	Major adverse	Scenarios 1 and 2
A5020 University Way (between A534 Crewe Green Road and A532 Weston Road)	Major adverse	Scenario 1
A530 Middlewich Road (between Peach Lane and Wistaston Green Road)	Major adverse	Scenarios 1 and 2
A530 Middlewich Road (between Wistaston Green Road and A532 Coppenhall Lane)	Major adverse	Scenarios 1 and 2
Sydney Road (between Hungerford Road and Shakespeare Drive)	Major adverse	Scenarios 1, 2 and 3
Sydney Road (between Shakespeare Drive and Lansdowne Road)	Major adverse	Scenarios 1, 2 and 3
A530 Middlewich Road (between A532 Coppenhall Lane and Pyms Lane)	Major adverse	Scenarios 1, 2 and 3
Sydney Road (between Herbert Street and Maw Green Road)	Major adverse	Scenarios 1, 2 and 3
B5076 Middlewich Road (between Elm Drive and Stamp Avenue)	Moderate adverse	Scenario 2
B5076 Middlewich Street (between Stamp Avenue and Lime Tree Avenue)	Moderate adverse	Scenario 2
B5076 Middlewich Street (between Lime Tree Avenue and Remer Street)	Moderate adverse	Scenario 2
Sydney Road (between Maw Green Road and Elm Drive)	Major adverse	Scenarios 1 and 2
Remer Street (between Groby Road and Elm Drive)	Major adverse	Scenario 1
A530 Middlewich Road (between Pyms Lane and Middlewich Road)	Major adverse	Scenarios 1 and 2
Remer Street (between Acer Avenue and Groby Road)	Major adverse	Scenario 1
Groby Road (between Remer Street and Stoneley Road)	Major adverse	Scenarios 1, 2 and 3
Remer Street (between B5076 Middlewich Street and Acer Avenue)	Major adverse	Scenario 1
B5076 Middlewich Street (between Broad Street and Remer Street)	Major adverse	Scenario 1
B5076 North Street (between Broughton Road and Broad Street)	Major adverse	Scenario 1
B5076 Bradfield Road (between Underwood Lane and Broughton Road)	Major adverse	Scenario 1
B5076 Bradfield Road (between Selworthy Drive and Mablins Lane)	Major adverse	Scenario 1

Road name	Significant effect	Construction scenario
B5076 Bradfield Road (between Mablins Lane and Cliffe Road)	Major adverse	Scenario 1
B5076 Bradfield Road (between Cliffe Road and Underwood Lane)	Major adverse	Scenario 1
B5076 Bradfield Road (between Parkers Road and Selworthy Drive)	Major adverse	Scenario 1
A530 Middlewich Road (between Middlewich Road and Smithy Lane)	Major adverse	Scenarios 1 and 2
B5076 Bradfield Road (between Parkers Road and B5076 Flowers Lane)	Major adverse	Scenario 1
Parkers Road (between Higher Croft Drive and Parkfield)	Moderate adverse	Scenarios 1 and 3
A530 Middlewich Road (between Smithy Lane and B5076 Flowers Lane)	Major adverse	Scenarios 1 and 2
Parkers Road (between Mablins Lane and Broughton Road)	Major adverse	Scenarios 1 and 3
Groby Road (between Stoneley Road and Warmingham Road)	Major adverse	Scenarios 1, 2 and 3
Warmingham Road (between Broughton Road and Waldron's Lane)	Major adverse	Scenarios 1, 2 and 3
B5076 Flowers Lane (between A530 Middlewich Road and B5076 Bradfield Road)	Major adverse	Scenarios 1 and 3
Warmingham Road (between Waldron's Lane and Groby Road)	Major adverse	Scenarios 1, 2 and 3
A530 Middlewich Road (between B5076 Flowers Lane and Eardswick Lane)	Major adverse	Scenarios 1 and 2
A530 Middlewich Road (between Eardswick Lane and Brookhouse Lane)	Major adverse	Scenarios 1, 2 and 3

14.4.28 Utility works have been included in the assessment where they are major and where the traffic or transport impacts from the works separately, or in combination with other works, will be greater than other construction activities arising within the area. Most utility works are expected to result in only localised traffic and pedestrian diversions, which will be of short-term duration and are not expected to result in significant effects.

Accidents and safety

14.4.29 There will be no significant effects on accidents and safety as there are no locations where there are both accident clusters and substantial changes in traffic during construction.

Parking and loading

14.4.30 The Proposed Scheme will have impacts on parking in the local area. This is likely to result in the following effects, which are significant:

- McColl's convenience store - major adverse effect as a result of the temporary loss of four out of eight parking spaces for a period of five years and two months due to construction of the Proposed Scheme; and
- Crewe Truck Stop and Café - major adverse effect as a result of the temporary loss of 90 out of 124 spaces for a period of five years and three months due to the construction of the Proposed Scheme.

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

14.4.32 Permanent loss of parking is reported under the operational assessment.

Public transport network

14.4.33 Construction of the Proposed Scheme will require temporary bus route diversions and traffic management, with consequential changes in journey times and the need to relocate bus stops. This will result in changes in public transport delays with effects, which are significant, on the users of routes 12 and 317 on Parkers Road as a result of the temporary closure of Parkers Road, resulting in a moderate adverse effect.

14.4.34 There are interfaces with the existing rail network in this area, in particular on the operation of the WCML and its passengers and rail freight services.

14.4.35 The construction of the Proposed Scheme is expected to require a number of rail possessions and blockades over a period of up to four years in this area. Overall, there will be 45 possessions comprising 24 possessions of up to 27 hours and 21 possessions up to 54 hours. In addition, there will be three nine-day blockades on the WCML. The possessions and blockades will be required to enable the construction of scheme elements including the following: Crewe Northern Connection, WCML reception tracks, the extension of the existing Parkers Road Overbridge, Parkers Road temporary footbridge, Footpath Crewe 29/1 accommodation overbridge and Footpath Minshull Vernon 8/1 accommodation overbridge.

14.4.36 Disruption to rail users will be reduced by limiting possessions, where reasonably practicable, to existing maintenance periods. The three blockades and some of the possessions will affect users of the WCML and will be managed through a combination of measures, which could include rail service diversions or replacement bus services, which will reduce the disruption to the travelling public. The WCML will be affected by possessions in the Hough to Walley's Green area, the Wimboldsley to Lostock Gralam area (MA02) and the Risley to Bamfurlong area (MA05). The combined effects of these possessions and blockades are reported in Volume 3, Route-wide effects, Section 14.

14.4.37 HS2 Ltd will work with Network Rail and the train and freight operating companies to ensure that any need for additional possessions can be reduced with good planning and communication (including appropriate advance notice).

Non-motorised users

14.4.38 The construction works associated with the Proposed Scheme will require the temporary closure, diversion or realignment of PRoW and roads in the vicinity of the Proposed Scheme, including, where necessary, around construction compounds. In most cases, these will be of a short duration and/or distance and will not have a significant effect on users. During the temporary closure of Parkers Road, non-motorised users will be diverted via a temporary footbridge for a period of one year and three months which will not have a significant effect on users.

14.4.39 Nonetheless, there will be temporary effects, which are significant, on non-motorised users during construction as a result of changes to journey length and/or hindrances such as substantial changes in levels for non-motorised users due to temporary PRoW and road realignments or diversions at:

- Footpath Crewe 13/1 – minor adverse effect from an increase in journey length of up to 127m;
- Footpath Crewe 12/1 – minor adverse effect from an increase in journey length of up to 273m;
- Footpath Crewe 29/1 – moderate adverse effect from an increase in journey length of up to 720m;
- Footpath Minshull Vernon 17/1 and Footpath Leighton 7/1 – minor adverse effect from an increase in journey length of up to 296m;
- Footpath Minshull Vernon 2/1 and Footpath Warmingham 16/2 – moderate adverse effect from an increase in journey length of up to 2.4km; and
- Footpath Minshull Vernon 13/1 – moderate adverse effect from an increase in journey length of up to 989m.

14.4.40 Permanent diversions to PRoW and roads are reported under the operational assessment.

Permanent effects

14.4.41 Any permanent effects of construction are considered in the assessment of operation for traffic and transport. This is because the impacts and effects of ongoing changes in travel demand and the wider impacts and effects of the operational phase need to be considered together.

Other mitigation measures

14.4.42 The implementation of the measures in the draft CoCP, including travel plans, will help mitigate the transport-related effects during construction of the Proposed Scheme.

14.4.43 No further appropriate traffic and transport mitigation measures have been identified. HS2 Ltd will, however, continue to work with the relevant highway authorities to identify whether further mitigation measures should be provided.

Summary of likely residual significant effects

14.4.44 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.

14.4.45 The construction of the Proposed Scheme will result in changes in journey lengths for vehicle users during the construction period resulting in a temporary major adverse effect, which is significant, on one road.

14.4.46 The most intensive periods of construction of the Proposed Scheme will cause changes in traffic that will result in the following temporary effects, which are significant, through changes in congestion and/or delays for road users:

- major adverse effects at nine junctions;
- moderate adverse effects at 15 junctions;
- minor adverse effects at nine junctions; and
- minor beneficial effects at one junction.

14.4.47 Changes in traffic during the construction period will result in the following temporary effects, which are significant, on traffic-related severance for non-motorised users:

- major adverse effects on 43 roads;
- moderate adverse effects on 31 roads;
- minor adverse effects on three roads; and
- moderate beneficial effects on two roads.

14.4.48 The loss of parking spaces during the construction period will result in temporary major adverse effects, which are significant, at two locations.

14.4.49 Changes in bus journey times resulting in public transport delays during the construction period will result in a temporary moderate adverse effect, which is significant, on one bus corridor.

14.4.50 Changes to journey length for non-motorised users during the construction period will result in the following temporary effects, which are significant:

- moderate adverse effects on users of three PRoW; and
- minor adverse effects on users of three PRoW.

Cumulative effects

14.4.51 The assessment includes the cumulative effects of planned and committed development during construction by taking this into account within the background traffic growth in the future baseline.

14.4.52 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.

The Proposed Scheme and HS2 Phase 2a

14.4.53 The assessment reported above includes construction traffic related to HS2 Phase 2a within the future baseline. In addition, consideration has been given to the combined effects of construction of the Proposed Scheme and HS2 Phase 2a compared to a future baseline without either.

14.4.54 In most cases construction of the Proposed Scheme will be carried out at different times to the construction of HS2 Phase 2a and will use roads that will not be used by HS2 Phase 2a, therefore, there is limited overlap of the impacts of the two schemes. Where there is overlap of construction HGV routes this will not result in any new or different significant effects compared to those reported for the Proposed Scheme in isolation.

14.5 Effects arising from operation

14.5.1 This section presents the likely significant environmental effects of the operation of the Proposed Scheme in 2038 and 2046.

Avoidance and mitigation measures

14.5.2 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 roads on or close to their existing alignments, where reasonably practicable; and
- replacement, diversion or realignment of PRoW.

14.5.3 A depot travel plan for Crewe North RSD, to be located in the adjacent Wimboldsley to Lostock Gralam area (MA02), will be developed and will include measures that aim to reduce the impacts and effects of traffic and transport movements in the Hough to Walley's Green area.

Assessment of impacts and effects

14.5.4 The following section considers the impacts on traffic and transport and the consequential effects resulting from the operational phase of the Proposed Scheme in 2038 and 2046.

Key operation transport issues

14.5.5 The assessment takes account of all of the impacts of the Proposed Scheme in the Hough to Walley's Green area. The main traffic and transport impacts during operation of the Proposed Scheme in this area will be associated with Crewe North RSD and Crewe North Infrastructure Maintenance Base - Rail (IMB-R), which will be located in the adjacent Wimboldsley to Lostock Gralam area (MA02). Crewe North RSD and IMB-R will generate additional vehicle movements due to staff, servicing and operational traffic, which have the potential to affect the Hough to Walley's Green area.

14.5.6 Crewe North RSD is expected to generate fewer than 25 vehicle trips passing through the Hough to Walley's Green area in the weekday peak hours and their effect will not be significant. Crewe North IMB-R is expected to generate infrequent traffic movements and their effect will not be significant.

14.5.7 The operational impacts will, therefore, primarily relate to the permanent diversion, realignment and stopping up of roads, the permanent loss of parking and the permanent diversion or stopping up of PRoW.

Highway network

Strategic and local highway network

14.5.8 The Proposed Scheme will require the permanent realignment of the A530 Nantwich Road in the adjacent Wimboldsley to Lostock Gralam area (MA02).

14.5.9 Parkers Road will be reinstated along its existing alignment following works to extend the existing Parkers Road Overbridge, resulting in no change to journey length.

14.5.10 The diversion of traffic associated with highway changes, including the realignment of the A530 Nantwich Road together with depot-related traffic will lead to flow changes on the highway network. This will not, however, result in any significant effect on congestion or delays in either 2038 or 2046.

14.5.11 A change in traffic levels can result in changes to traffic-related severance for non-motorised road users, particularly pedestrians using or seeking to cross a road. However, there are no predicted substantial changes in traffic and consequently there are no significant effects in relation to traffic-related severance for non-motorised users.

Accidents and safety

14.5.12 There will be no significant effects on accidents and safety as there are no substantial changes in traffic due to the operation of the Proposed Scheme.

Parking and loading

14.5.13 There will be a permanent loss of approximately 59 out of 124 existing HGV parking spaces at the Crewe Truck Stop and Café. This will result in a major adverse effect, which is significant.

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

Public transport network

14.5.15 The Proposed Scheme is not expected to have a significant effect on public transport operations in the Hough to Walley's Green area.

Non-motorised users

14.5.16 There will be permanent widening, realignment, diversion or extension of six PRoW and one road in the Hough to Walley's Green area that will have an impact on journey lengths or introduce hindrances such as substantial changes in levels for non-motorised users.

14.5.17 There will be severance effects, which are significant, on non-motorised users of four of the PRoW as a result of changes in journey lengths and/or hindrances. These are:

- Footpath Crewe 12/1 – minor adverse effect from an increase in journey length of up to 271m;
- Footpath Crewe 29/1 – moderate adverse effect from an increase in journey length of up to 715m;
- Footpath Minshull Vernon 2/1 and Footpath Warmingham 16/2 – moderate adverse effect from an increase in journey length of 1.2km; and
- Footpath Minshull Vernon 13/1 – moderate adverse effect from an increase in distance of up to 1.1km.

Other mitigation measures

14.5.18 No further appropriate traffic and transport mitigation measures have been identified. HS2 Ltd will, however, continue to work with the relevant highway authorities to identify whether further mitigation measures should be provided.

Summary of likely residual significant effects

14.5.19 The residual significant effects during operation remain as described above. The highest magnitude effects are summarised below.

14.5.20 The operation of the Proposed Scheme will result in a major adverse effect, which is significant, due to the permanent loss of parking spaces at one location.

14.5.21 Changes in journey lengths for non-motorised users due to the operation of the Proposed Scheme will result in the following effects, which are significant:

- moderate adverse effects on the users of three PRoW; and
- minor adverse effects on the users of one PRoW.

Cumulative effects

14.5.22 The assessment includes cumulative effects of planned and committed development during operation, by taking into account background traffic growth in the future baseline.

The Proposed Scheme and HS2 Phase 2a

14.5.23 The assessment reported above includes traffic associated with operation of HS2 Phase 2a within the future baseline. In addition, consideration has been given to the combined effects of construction of the Proposed Scheme and HS2 Phase 2a compared to a future baseline without either.

14.5.24 Traffic associated with operation of the Proposed Scheme will not use any roads that will also be used by HS2 Phase 2a and as a result there is no overlap in the impacts of the two

schemes. Consequently, operation of the Proposed Scheme will not have any additional cumulative effects as a result of the combined impact of the operation of the Proposed Scheme with HS2 Phase 2a.

Monitoring

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

14.5.26 A depot travel plan will detail monitoring of travel associated with operation of Crewe North RSD, located within the adjacent Wimboldsley to Lostock Gralam area (MA02).

14.5.27 There are no other area-specific monitoring requirements currently proposed for traffic and transport.

15 Water resources and flood risk

15.1 Introduction

15.1.1 This section provides a description of the current baseline for water resources and flood risk in the Hough to Walley's Green area. The likely impacts and significant effects identified arising from the construction and operation of the Proposed Scheme on surface water and groundwater bodies and their associated water resources are reported. The likely impacts and significant effects of the Proposed Scheme on flood risk and land drainage are also reported.

15.1.2 Engagement has been undertaken with:

- the Environment Agency;
- Natural England;
- Cheshire East Council (CEC), which is the Lead Local Flood Authority (LLFA);
- Canal & River Trust; and
- United Utilities Group plc (the local water and sewerage undertaker).

15.1.3 The purpose of this engagement has been to obtain relevant baseline information and to discuss the Proposed Scheme and potential impacts and effects. The engagement has informed the assessments, including that for Sandbach Flashes Site of Special Scientific Interest (SSSI). The design has been developed in response to engagement with Natural England to address the potential impact on the SSSI of drainage discharges from the Proposed Scheme.

15.1.4 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: MA01 Map Book.

15.1.5 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 Map Book.

15.1.6 Detailed information on the water resources and flood risk issues specific to the Hough to Walley's Green area are contained in the Volume 5 appendices. These comprise:

- Appendix WR-003-0MA01, Water resources assessment; and
- Appendix WR-005-0MA01, Flood risk assessment.

15.1.7 Volume 5 also includes a detailed route-wide, stand-alone Water Framework Directive (WFD) compliance assessment (Appendix WR-001-00000) and a draft route-wide water resources and flood risk operation and maintenance plan (Appendix WR-007-00000).

15.1.8 In addition, the following documents are provided as Background Information and Data (BID)[175]:

- BID WR-004-0MA01, Water resources baseline; and
- BID WR-002-00001, Water Framework Directive compliance assessment baseline data.

15.1.9 Volume 3, Water resources and flood risk (Section 16) covers the following at a route-wide level:

- the risk to water resources associated with accidents or spillages from trains during operation of the Proposed Scheme;
- a summary of how the Proposed Scheme aims to demonstrate compliance with the statutory requirements of the WFD; and
- route-wide flood risk issues related to alignment of the Proposed Scheme with the Sequential Test and Exception Test policies in the National Planning Policy Framework (NPPF)[176].

15.1.10 The Proposed Scheme is described in Section 2.

15.1.11 All distances, lengths and area measurements in this section are approximate.

15.2 Scope, assumptions and limitations

15.2.1 The scope, assumptions and limitations for the water resources and flood risk assessment are set out in Volume 1, Section 8 and the EIA Scope and Methodology Report (SMR)[177].

15.2.2 Unless indicated otherwise, the spatial scope of the assessment (the study area) is based upon the identification of surface water and groundwater features within 1km of the route of the Proposed Scheme, as described in Section 2.2 of this report. In the Hough to Walley's Green area, the study area has been extended to include Bottoms Flash and Groby's Flash, which form the southern-most unit of the 14 units that make up the Sandbach Flashes SSSI.

15.2.3 This assessment is based on desk study information, including information provided to date by consultees and stakeholders, as well as surveys of accessible water features.

15.2.4 A precautionary approach has been used in the assessment to identify impacts and effects where there is limited information. 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. Where this precautionary approach indicates the

[175] High Speed Two Ltd (2022), HS2 Phase 2b (Crewe – Manchester), *Background Information and Data*. Available online at: https://www.gov.uk/government/collections/hs2-phase-2b-crewe-manchester-environmental-statement.

[176] Ministry of Housing, Communities and Local Government (2019), *National Planning Policy Framework.* Available online at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/779764/NPPF_Feb_2019_web.pdf.

[177] Volume 5: Appendix CT-001-00001 Environmental Impact Assessment Scope and Methodology Report.

requirement for mitigation, preliminary mitigation is described, which may include further data collection and/or assessment.

15.2.5 Details of the assessment of flood risk for this area can be found in Volume 5: Appendix WR-005-0MA01, Flood risk assessment.

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 hydrological impacts on biological receptors such as aquatic fauna and flora are referred to in the Volume 5: Appendix WR-003-0MA01, Water resources assessment and the Volume 5: Appendix WR-001-00000, WFD compliance assessment. Where these impacts have the potential to result in significant effects, these are described in Section 7, Ecology and biodiversity, together with any other mitigation required.

15.2.8 Impacts from existing land contamination, which lead to significant effects on groundwater quality, are presented in Section 10, Land quality.

15.3 Environmental baseline

Existing baseline - water resources

Surface water

15.3.1 All surface water bodies in the study area fall within the Weaver Gowy management catchment of the North West river basin district (RBD).

15.3.2 The current river basin management plan[178] identifies the chemical and ecological status of surface water bodies, and the quantitative and chemical status of groundwater bodies within this RBD.

The statutory objective of the WFD[179] is to achieve 'good status' for all designated water bodies. The purpose of the WFD compliance assessment[180] is to demonstrate that the Proposed Scheme does not result in a deterioration in current water body status, and that water bodies are not prevented from achieving status objectives.

15.3.3 Specialist field surveys have been undertaken, where access has been available. Receptor values have been adjusted to reflect the outputs from these surveys, in close consultation with the Environment Agency. In the absence of field surveys, surface water bodies, other

[178] Environment Agency (2015), *Water for life and livelihoods Part 1: North West river basin district: River basin management plan*.

[179] *The Water Environment (Water Framework Directive) (England and Wales) Regulations 2017 (SI 2017 No. 407)*. London, Her Majesty's Stationary Office. Available online at: https://www.legislation.gov.uk/uksi/2017/407/contents/made.

[180] Volume 5: Appendix WR-001-00000, Water Framework Directive compliance assessment.

than minor ditches or ponds, have been identified within this assessment as being of either moderate, high or very high value on a precautionary basis.

15.3.4 Summary information relating to the surface water bodies potentially affected by the Proposed Scheme within the study area is provided in Table 54. The receptor value attributed to each individual water body is based on the methodologies set out in the SMR. The feature locations are indicated by the grid coordinates on the relevant Volume 5, Water resources and flood risk Map Book: Map Series WR-01, at the point closest to the Proposed Scheme.

Table 54: Surface water body receptors

Water body name and location	Type (at point closest to Proposed Scheme)[181]	Q95 value (m^3/s)[182]	Receptor value	Parent WFD water body name and identification number[183]	Current WFD status/ Objective[184]	Crossed by the Proposed Scheme?
Swill Brook WR-01-301 - B4	Ordinary watercourse	0.009	Moderate	Wistaston Brook GB112068055280	Bad/good by 2027	No
Basford Brook WR-01-301 - B6	Main river	0.06	Moderate	Wistaston Brook GB112068055280	Bad/good by 2027	No
Cheer Brook CT-06-303-L4 – A2[185]	Main river	0.005	Moderate	Wistaston Brook GB112068055280	Bad/good by 2027	No
Tributary of Swill Brook 1 WR-01-301 - C5	Ordinary watercourse	<0.002	Moderate	Wistaston Brook GB112068055280	Bad/good by 2027	No
Tributary of Basford Brook 4 WR-01-301 - C6	Ordinary watercourse	0.003	Moderate	Wistaston Brook GB112068055280	Bad/good by 2027	No
Tributary of Gresty Brook 1 WR-01-301 - C5	Ordinary watercourse	<0.002	Moderate	Wistaston Brook GB112068055280	Bad/good by 2027	No
Tributary of Gresty Brook 3 WR-01-301 - D5	Ordinary watercourse	<0.002	Moderate	Wistaston Brook GB112068055280	Bad/good by 2027	No

[181] The term 'minor ditch' has been used to denote a small trench or drain that has been constructed for the purpose of draining water from the land or roads and is isolated from the wider river network.

[182] This is the flow within the watercourse that is exceeded for 95% of the time. The Q95 has been provided as an indication of watercourse size, but is only one of several criteria used to inform receptor value. Other criteria include the WFD watercourse classification which takes into account the value of any habitat which the watercourse supports. Details are provided in the Volume 5: Appendix CT-001-00001, Environmental Impact Assessment Scope and Methodology Report.

[183] The Environment Agency has attributed each surface water and groundwater body a unique water body identification (ID) number.

[184] Status and objectives are based on those set out in the 2015 river basin management plan. The 2015 RBMP is the most up to date and will be updated in 2021.

[185] WR-01 maps do not extend to show the Cheer Brook, reference provided is to the Volume 2: Map Book: Map Series CT-06.

Water body name and location	Type (at point closest to Proposed Scheme)[181]	Q95 value (m^3/s)[182]	Receptor value	Parent WFD water body name and identification number[183]	Current WFD status/ Objective[184]	Crossed by the Proposed Scheme?
Gresty Brook WR-01-301 - D4	Main river	0.06	High	Wistaston Brook GB112068055280	Bad/good by 2027	Yes
Tributary of Gresty Brook 2 WR-01-301 - C7	Ordinary watercourse	0.002	Moderate	Wistaston Brook GB112068055280	Bad/good by 2027	No
Valley Brook WR-01-301 - D10	Main river	0.01	High	Valley Brook (Englesea Brook to Weaver) GB112068055310	Moderate/good by 2027	Yes
Leighton Brook WR-01-301 - H1	Ordinary watercourse	<0.002	Moderate	Weaver (Marbury Brook to Dane) GB112068060460	Poor/good by 2027	No
Groby Road Drain WR-01-301 -H7	Minor ditch	<0.002	Low	Fowle Brook GB112068055400	Poor/good by 2027	Yes
Broughton Road Drains WR-01-301 - H6	Minor ditch	<0.002	Low	Fowle Brook GB112068055400	Poor/good by 2027	Yes
Parkers Road Drain WR-01-301 - I6	Minor ditch	<0.002	Low	Fowle Brook GB112068055400	Poor/good by 2027	Yes
Tributary of Fowle Brook 1 WR-01-301 - I5	Ordinary watercourse	<0.002	Low	Fowle Brook GB112068055400	Poor/good by 2027	Yes
Hoggins Brook WR-01-302a - D6	Ordinary watercourse	0.003	Low	Wheelock (Fowle Brook to Dane) GB112068055380	Poor/good by 2027	Yes
Tributary of River Weaver 1 WR-01-302a - D4	Ordinary watercourse	<0.002[186]	Moderate	Weaver (Marbury Brook to Dane) GB112068060460	Poor/good by 2027	No

Abstractions and permitted discharges (surface water)

15.3.5 Table 55 sets out the surface water abstractions and permitted discharges located within 1km of the Proposed Scheme in the Hough to Walley's Green area.

[186] Assumed Q95 based on catchment size. Not possible to fully calculate flow value.

Table 55: Surface water abstraction and permitted discharges in the study area

Feature	Details	Value
Licensed surface water abstractions	None	None
Registered private unlicensed surface water abstractions	None	None
Consented discharges to surface water	Twelve, of which one is within the land required for the construction of the Proposed Scheme	Low

15.3.6 Private unlicensed surface water abstractions comprise those for quantities of less than 20m^3 per day. There is no obligation to register private water supplies, but available records have been obtained from the local authorities. Unregistered private surface water supplies may be present. Private water supplies are assumed to be high value receptors unless details obtained from supply owners indicated otherwise.

15.3.7 The number of abstractions and permitted discharges listed in Section 10, Land quality may be different to that stated here, due to different definitions of spatial scope. This is because the water resources and flood risk study area comprises all land within 1km of the alignment of the Proposed Scheme, whereas the default land quality study area comprises all land within 250m from the land required for the construction of the Proposed Scheme. The default study areas may be extended where the potential for pathways to more remote receptors exists.

Groundwater

15.3.8 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.

15.3.9 The geology of the study area, including distribution and formation description, is described in Section 10, Land quality. The aquifer classification, WFD status and receptor value of the superficial and bedrock hydrogeology is summarised in Table 56 (for superficial deposits) and Table 57 (for bedrock). Unless stated otherwise, the geological groups listed will all be crossed by the Proposed Scheme. The current overall status of, and objective for, the WFD groundwater body is as stated in the current river basin management plan. Where the Environment Agency has not assigned an individual water body ID to a unit, it has been assumed that it is connected to the overlying water body.

Table 56: Summary of geology and hydrogeology in the study area – superficial deposits

Geology	Aquifer classification	WFD body (ID) and current overall status	WFD status objective	Receptor value
Alluvium	Secondary A	Weaver and Dane Quaternary Sand and Gravel aquifer (GB41202G991700) Poor	Good by 2027	Moderate
River terrace deposits	Secondary A	Weaver and Dane Quaternary Sand and Gravel aquifer	Good by 2027	Moderate

Geology	Aquifer classification	WFD body (ID) and current overall status	WFD status objective	Receptor value
		(GB41202G991700) Poor		
Lacustrine deposits Not crossed by the route of the Proposed Scheme	Unproductive	Not assessed by the Environment Agency	Not assessed by the Environment Agency	Low
Glaciofluvial deposits	Secondary A	Weaver and Dane Quaternary Sand and Gravel aquifer (GB41202G991700) Poor	Good by 2027	Moderate
Glaciofluvial sheet deposits	Secondary A	Weaver and Dane Quaternary Sand and Gravel aquifer (GB41202G991700) Poor	Good by 2027	Moderate
Glacial till	Secondary (Undifferentiated)	Weaver and Dane Quaternary Sand and Gravel aquifer (GB41202G991700) Poor	Good by 2027	Moderate

Table 57: Summary of geology and hydrogeology in the study area - bedrock

Geology	Aquifer classification	WFD body (ID) and current overall status	WFD status objective	Receptor value
Mercia Mudstone Group – Sidmouth Mudstone Formation	Secondary B	Not assessed by the Environment Agency	Not assessed by the Environment Agency	Moderate
Mercia Mudstone Group – Sidmouth Mudstone Formation - Wilkesley Halite Member	Unproductive	Not assessed by the Environment Agency	Not assessed by the Environment Agency	Low

Superficial deposit aquifers

15.3.10 The basis of the receptor values attributed to the superficial deposit aquifers present within the study area, as shown in Table 56, is outlined briefly as follows:

- alluvium, river terrace deposits, glaciofluvial deposits and glaciofluvial sheet deposits are classified as Secondary A aquifers. These aquifers may be capable of supporting water supplies at a local rather than regional scale and may also form an important source of baseflow to watercourses. They have, therefore, been classified as moderate value receptors;
- glacial till is classified as a Secondary (Undifferentiated) aquifer and may supply baseflow to watercourses or store and yield limited amounts of groundwater. It has, therefore, been classified as a moderate value receptor; and
- lacustrine deposits are classified as unproductive strata. They have therefore been classified as a low value receptor.

Bedrock aquifers

15.3.11 The basis of the receptor values attributed to the bedrock aquifers present within the study area, as shown in Table 57, is outlined briefly as follows:

- the Sidmouth Mudstone Formation of the Mercia Mudstone Group is classified as a Secondary B aquifer and 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 bedrock formation. It has, therefore, been classified as a moderate value receptor; and
- the Wilkesley Halite Member of the Sidmouth Mudstone Formation (Mercia Mudstone Group) is classified as unproductive. It is unlikely to provide baseflow to rivers or support groundwater abstraction and has, therefore, been classified as a low value receptor.

WFD status of groundwater bodies

15.3.12 A summary of the 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 56. The value attributed to each of these receptors is also indicated.

15.3.13 The bedrock units in the study area are not formally designated as WFD groundwater bodies but may be hydraulically connected to the overlying WFD superficial aquifers.

Abstraction and permitted discharges (groundwater)

15.3.14 Table 58 sets out the groundwater abstraction and permitted discharges located within 1km of the Proposed Scheme in the Hough to Walley's Green area.

Table 58: Groundwater abstraction and permitted discharges in the study area

Feature	Details	Value
Source Protection Zones (SPZ) associated with licensed public water supplies	None	None
Private licensed groundwater abstractions	None	None
Registered unlicensed private groundwater abstractions	None	None
Consented discharges to groundwater	Two sewage discharges to groundwater via soakaways	Low

Groundwater – surface water interactions

15.3.15 A desk-based assessment using Ordnance Survey maps and detailed river network data provided by the Environment Agency identified eight features within the study area that have the potential to be springs or sinks. Further details on these features can be found in BID WR-004-0MA01. Access was possible to inspect seven of these features. The value of these features has been determined based on consideration of the feature's importance as a water resource as well as any ecological, heritage, cultural or community asset importance. Of the seven features inspected:

- one feature was identified as a buried stream feeding into a small marsh, which is acting as a groundwater collect, before discharging into Basford Brook. This feature is supporting a low value stream but is maintaining an undesignated habitat. It has, therefore, been assessed as a moderate value receptor; and
- six features were identified to be culverts and not groundwater features.

15.3.16 The remaining potential spring feature is assumed to be a high value receptor on a precautionary basis. This feature is not located within the land required for construction of the Proposed Scheme.

15.3.17 There are 21 ponds within the land required for the construction of the Proposed Scheme. Where there is the potential for the Proposed Scheme to have significant effects on these features, the assessment of effects, and any mitigation required, is presented in Section 7, Ecology and biodiversity.

Water dependent habitats

15.3.18 There is one nature conservation site within the study area that is potentially groundwater dependent. Moss Bridge Marsh Local Wildlife Site (LWS) is located partially within the land required for the construction of the Proposed Scheme, close to the centre of the Hough to Walley's Green area near Coppenhall Moss. It is unclear if the site is groundwater or surface water (rainfall) fed and it has been included in the assessment on a precautionary basis.

15.3.19 There is one nature conservation site within the study area that is potentially surface water dependent. Sandbach Flashes SSSI consists of 14 distinct units and these units are dependent on periodic flooding to maintain the habitat. Tributary of Fowle Brook 1 rises from within the land required for the construction of the Proposed Scheme, before it flows into the southern-most of the 14 constituent units of Sandbach Flashes SSSI known as Bottoms Flash and Groby's Flash.

15.3.20 A more detailed description of the ecology of these sites is provided in Volume 5 reports relating to ecology and biodiversity.

Existing baseline – flood risk and land drainage

15.3.21 The Environment Agency's Flood map for planning (rivers and sea)[187] has been used to scope the baseline flood risk for flooding from main rivers. These maps 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). The Risk of Flooding from Surface Water map[188] has been used

[187] Environment Agency (2021), *Flood map for planning*. Available online at: https://flood-map-for-planning.service.gov.uk.

[188] Environment Agency (2021), *Check the long term flood risk for an area in England*. Available online at: https://flood-warning-information.service.gov.uk/long-term-flood-risk/.

to scope ordinary watercourses and surface water flood risks. All of these flood zones are shown in Map Series WR-01 in Volume 5, Water resources and flood risk Map Book.

15.3.22 Infrastructure failure flood risks have been scoped using the Environment Agency Risks of flooding from reservoirs national dataset[188]. The British Geological Survey (BGS) Susceptibility to groundwater flooding dataset[189] 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:

- CEC Preliminary Flood Risk Assessment (PFRA) (2011)[190];
- CEC Strategic Flood Risk Assessment (SFRA) (2013)[191]; and
- CEC Local Flood Risk Management Strategy (LFRMS) (2017)[192].

15.3.24 Historical flood investigation reports published by the LLFA, under Section 19 of the Flood and Water Management Act[193], relevant to this area have been reviewed (see Volume 5: Appendix WR-005-0MA01 – Flood risk assessment for further details). None of these reports include details of any historical flooding within the study area.

River flooding

15.3.25 The study area includes areas of floodplain (Flood Zone 2 and 3) associated with Gresty Brook, Valley Brook and Hoggins Brook. The Proposed Scheme will pass beneath the Gresty Brook and Valley Brook floodplains in a tunnel. Therefore, the flood risk to these areas will not be affected and is not reported further in this document. Table 59 shows all relevant watercourses within the study area with receptors that would potentially be affected by any changes in the level and extent of flooding. The value of these receptors, based on the definitions in Section 21 of the SMR, is also indicated. The location description and figure/coordinate is the location at which the source intersects the Proposed Scheme, as indicated by the grid coordinates on the relevant Volume 5, Water resources and flood risk Map Book: Map Series WR-01.

[189] British Geological Survey (2021), *Susceptibility to groundwater flooding dataset*. Available online at: http://www.bgs.ac.uk/products/hydrogeology/groundwaterFlooding.html.

[190] Jacobs (2011), *Cheshire East Council Preliminary Flood Risk Assessment (PFRA)*. Available online at: http://www.cheshireeasthighways.org/Uploads/Cheshire_East_PAR.pdf.

[191] JBA Consulting (2013), *Cheshire East Council Strategic Flood Risk Assessment*. Available online at: https://www.cheshireeast.gov.uk/pdf/planning/spatial-planning/researchand-evidence/strategic-flood-assessment/cheshire-east-council-sfra-final-report-v4.0.pdf.

[192] Cheshire East Council (2017), *Cheshire East Local Flood Risk Management Strategy (LFRMS) Draft for Public Consultation*. Available online at: https://moderngov.cheshireeast.gov.uk/ecminutes/documents/s59547/Local%20Flood%20Risk%20Management%20Strategy%20-%20app%202.pdf.

[193] *Section 19: Local Authorities: Investigations of the Flood and Water Management Act 2010*. London, Her Majesty's Stationary Office. Available online at: http://www.legislation.gov.uk/ukpga/2010/29/contents.

Table 59: River flood risk sources and receptors

Source	Location description and figure/coordinate	Receptor potentially affected	Receptor value/sensitivity to flooding
Hoggins Brook	Hoggins Brook WR-02-301 - I5	Residential properties along Lambourn Drive and Perry Fields.	High
Hoggins Brook	Hoggins Brook WR-02-301 - I5	Roads north of Parkers Road.	Moderate
Hoggins Brook	Hoggins Brook WR-02-301 - I5	Solar farm site close to Moss Lane (currently under development).	Very high

Surface water flooding

15.3.26 There are no areas that are susceptible to surface water flooding within the study area.

Artificial water bodies

15.3.27 Flooding from artificial water bodies may occur due to failure of an impounding structure, such as a dam or canal embankment. There are no artificial water bodies with potential implications for flood risk within the study area.

Groundwater flooding

15.3.28 Information related to historical incidents of groundwater flooding in the Hough to Walley's Green area is provided within the CEC SFRA[191] and LFRMS[192]. The SFRA and LFRMS state that there is no history of groundwater flooding within the CEC area.

15.3.29 The BGS susceptibility to groundwater flooding dataset indicates that there is some potential for groundwater flooding to occur at Crewe along the alignment of the Proposed Scheme due to the nature of the superficial deposits (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 (2025)

15.3.31 Volume 5: Appendix CT-004-00000 provides details of the developments in the Hough to Walley's Green area that are assumed to have been implemented by 2025. The committed

development relevant to water resources and flood risk during construction in this area is set out in Table 60.

Table 60: Committed developments of relevance to water resources and flood risk during construction

Map book reference[194]	Planning reference	Description	How is this considered in the assessment
n/a	n/a	HS2 Phase 2a West Midlands to Crewe.	Does not influence the future baseline.

15.3.32 HS2 Phase 2a will be under construction by 2025. It is not considered that the construction of HS2 Phase 2a will inform the future baseline conditions for water resources and flood risk in the Hough to Walley's Green area.

15.3.33 The combined effects of HS2 Phase 2a and the Proposed Scheme, against a baseline without either phase, have been considered. There will be no significant cumulative effects as a result of the combination of HS2 Phase 2a and the Proposed Scheme.

15.3.34 No additional committed developments have been identified in this study area that will materially alter the baseline conditions in 2025 for water resources and flood risk.

Operation (2038)

15.3.35 Volume 5: Appendix CT-004-00000 provides details of the developments in the Hough to Walley's Green area that are assumed to have been implemented by 2038. The committed development relevant to water resources and flood risk during operation in this area is set out in Table 61.

Table 61: Committed developments of relevance to water resources and flood risk during operation

Map book reference [194]	Planning reference	Description	How is this considered in the assessment
n/a	n/a	HS2 Phase 2a West Midlands to Crewe.	Does not influence the future baseline.

15.3.36 HS2 Phase 2a will be in operation by 2038. It is not considered that the operation of HS2 Phase 2a will inform the future baseline conditions for water resources and flood risk in the Hough to Walley's Green area.

15.3.37 The combined effects of HS2 Phase 2a and the Proposed Scheme, against a baseline without either phase, have been considered. There will be no significant cumulative effects as a result of the combination of HS2 Phase 2a and the Proposed Scheme.

15.3.38 No additional committed developments have been identified in this study area that will materially alter the baseline conditions in 2038 for water resources and flood risk.

[194] Volume 5, Planning Data/Committed Development Map Book: Maps CT-13-301 to CT-13-304a.

Climate change

15.3.39 Detailed analysis of the potential impacts of climate change on the Proposed Scheme has been undertaken and is reported in Volume 3, 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.

15.3.40 Although no definitive guidance is available, climate change may also affect future surface water and groundwater resources. However, any such changes are unlikely to alter the significance of the 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 appropriate and reasonably practicable, to limit the potential effects. Section 16 of the draft Code of Construction Practice (CoCP)[195] includes a range of mitigation measures 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

15.4.2 The avoidance of sensitive receptors has reduced the risks associated with the Proposed Scheme not complying with the requirements of the WFD. Examples of this strategy include:

- avoidance of channels and floodplain areas, where reasonably practicable – the alignment of the Proposed Scheme will avoid passing along river or stream valleys and their associated floodplains. Instead it will pass over these larger watercourses on viaducts spanning the floodplain, with piers set back from the channel;
- avoidance, where reasonably practicable, of water dependent habitats, including natural springs that can play a key role in the hydrology and hydrogeology of such ecosystems; and
- avoidance, where reasonably practicable, of major public water supplies and smaller licensed and unlicensed abstractions of surface water and groundwater.

15.4.3 The presence of any unregistered private water supplies, their function and the means of protecting or if necessary replacing them would be discussed with any landowners potentially affected by the Proposed Scheme.

[195] Volume 5: Appendix CT-002-00000, Draft Code of Construction Practice.

15.4.4 The temporary works shown on Map Series CT-05 in the Volume 2: MA01 Map Book have been informed by a detailed consideration of the water resources constraints and have sought to avoid sensitive features wherever reasonably practicable.

15.4.5 Watercourse realignments are proposed at Hoggins Brook (total length of 1.43km, including 340m of culvert).

15.4.6 Realignments will be designed to have equivalent hydraulic capacity to the existing channel, as far as reasonably practicable. Where such watercourses are natural channels, appropriate design features will be incorporated to replicate, and where reasonably practicable, enhance their hydromorphological condition. The hydromorphological condition reflects the extent to which water flow, sediment composition and movement, continuity (in rivers) and the structure of physical habitats departs from that expected of a natural river or stream system. The design of these realignments will be developed in general accordance with the Environment Agency and the LLFA, with due consideration of WFD status objectives. The design of the Proposed Scheme will also ensure that existing drainage outfalls can be adapted to discharge into the new channel.

15.4.7 Watercourse diversions, which would result in changes in flow regime within discrete sections of channel, have been avoided wherever reasonably practicable. There are no diversions proposed within this study area.

15.4.8 For watercourses that are not in their natural condition, where reasonably practicable the watercourse diversion design will incorporate measures to improve their hydromorphological condition. The design of these diversions will be developed in consultation with the Environment Agency and the LLFA, with due consideration of WFD status objectives.

15.4.9 Infrastructure required within or in proximity to an existing channel (including bridge abutments, intermediate piers and outfalls) will be designed to reduce impacts on the natural hydromorphology of watercourse channels, as far as is reasonably practicable.

15.4.10 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.

15.4.11 Method statements will be required for all watercourse crossings and channel realignments required for site haul routes. The method statements will describe how potential changes to flood risk, water quality and channel hydromorphology will be managed during the establishment, use and decommissioning of all site haul routes.

15.4.12 Permanent culverts proposed on the smaller watercourse crossings within the Hough to Walley's Green area include those on Hoggins Brook including:

- Coppenhall Moss culvert: 295m in length;
- Footpath Crewe 29/1 offline culvert: 35m in length; and
- Warmingham Moss offline culvert: 10m in length.

15.4.13 The design of these culverts will be developed in general accordance with Construction Industry Research and Information Association (CIRIA) and Environment Agency guidance and in consultation with Environment Agency specialists. The design has sought to mitigate the impact on the hydromorphology of the affected watercourses, as follows:

- drop inlet culverts and inverted siphons have been avoided;
- culvert lengths have been made as short as 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.

15.4.14 The wider issues associated with these culverts, and as far as reasonably practicable how their design will ensure no deterioration in the status of any of the relevant water body's WFD quality elements, is considered within the Volume 5: Appendix WR-001-00000, WFD compliance assessment. Any mitigation required in response to significant ecological effects of these culverts is set out in Section 7, Ecology and biodiversity.

15.4.15 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 remove potential pollution pathways. If boreholes are to be decommissioned and replaced with alternatives, the contractors will follow the latest industry standard. This principle will also be applicable to springs potentially affected by the Proposed Scheme, although additional measures may be required to mitigate temporary construction impacts. Wherever a spring is to be covered or displaced by design elements then additional mitigation measures may be applied to relocate the spring, where reasonably practicable.

15.4.16 Measures will be introduced, as required, to mitigate the temporary and permanent effects on groundwater flows and water quality during excavation and construction of foundations, tunnels, vent shafts and cuttings as far as is reasonably practicable. The types of measure that could be adopted include:

- installation of cut-off structures (impermeable barriers preventing water flow) around excavations;
- ensuring cut-off structures are driven to sufficient depths to meet an underlying strata or zone of lower permeability;
- promoting groundwater recharge, such as discharging pumped water to recharge trenches around excavations to maintain baseline groundwater and surface water conditions;
- incorporating passive bypasses within the design, which could comprise a 'blanket' of permeable material, such as gravel, placed around temporary structures allowing groundwater to bypass the below-ground works, without a rise in groundwater levels on the upstream side; and
- the tunnel boring machines (TBMs) will be operated in a closed face mode when tunnelling within water bearing strata and the tunnel linings will be designed to reduce leakage rates as far as is reasonably practicable, thereby reducing the requirements for dewatering and drainage.

15.4.17 The exact requirements will be refined and method of mitigation will be designed following ground investigation at foundations, tunnels, vent shafts and cutting locations where appropriate.

15.4.18 For major utilities, the following specific measures are considered in addition to the above points:

- trenchless crossing techniques will be used wherever reasonably practicable for main rivers/sensitive watercourses and key designations to reduce the impact on these features;
- where temporary watercourse diversions are required, during the reinstatement the watercourse will be returned to its natural course and condition where reasonably practicable after work is complete, with due consideration to its WFD status objectives; and
- at watercourse crossings hard bank reinforcement will be avoided where reasonably practicable.

15.4.19 No borrow pits are proposed in the Hough to Walley's Green area.

Flood risk and land drainage

15.4.20 The design of the Proposed Scheme will, as far as reasonably practicable, mitigate permanent impacts on flood risk and land drainage, as follows:

- the temporary works shown on Map Series CT-05 in the Volume 2: MA01 Map Book have been informed by a detailed consideration of the 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 alignment of the Proposed Scheme will cross watercourses, structures will be designed to accommodate flood flows up to and including the 1 in 100 (1%) annual probability flood with an allowance for climate change;
- runoff from the footprint of the infrastructure could occur more rapidly post-construction due to steeper slope angles and the permeability (or compacted nature) of the newly-created surfaces. The drainage systems will be designed to ensure that there will be no significant increases in flood risk, during storms up to and including the 1 in 100 (1%) annual probability design event, with an allowance for climate;
- balancing ponds for new sections of highway and railway drainage have been sized on a precautionary basis, pending more detailed information about the permeability and runoff characteristics of existing and proposed ground surfaces;
- where the Proposed Scheme will pass in cutting, drainage measures will be provided to limit overland flow into the cutting. This overland flow along with seepage and runoff from the cuttings will, where reasonably practicable, 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.

15.4.21 The nominated undertaker will, as far as reasonably practicable, ensure that flood risk is managed throughout the construction period, 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 the draft CoCP, include:

- having regard to the requirement for construction activities to avoid any increases in flood risk to vulnerable receptors;
- preparation of flood risk assessments and method statements for temporary works, including construction 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; and
- 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.

15.4.22 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 any impacts on existing land drainage systems are managed appropriately.

15.4.23 For major utilities, the following specific measures are considered in addition to the above points:

- trenchless crossing techniques will be used wherever practicable for main rivers/sensitive watercourses to reduce the impact of temporary watercourse diversions on flood risk; and
- at watercourse crossings hard bank reinforcement and piers in floodplains will be avoided where reasonably practicable.

Assessment of impacts and effects

15.4.24 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 included in the design has focused on reducing permanent impacts resulting from the presence of the Proposed Scheme to as low a level as is reasonably practicable.

Temporary effects – Water resources

Surface water

15.4.25 Potential temporary impacts on surface water quality, due to site runoff and increased pollution risk, are a key concern during construction and have the potential to affect abstractions and the water environment more generally. However, the practices outlined in the draft CoCP are considered adequate to mitigate any impacts, such that there are unlikely to be any significant effects.

15.4.26 Construction compounds may have substantial water demands that may require approval through the protective provisions in the Bill for abstractions to augment other supply options. The assessment will include location-specific engagement with the Environment Agency and other water undertakers on the availability of water at that location. The Environment Agency will be able to impose conditions on any abstractions approved so that no significant effects are likely to arise. In this case, in the Hough to Walley's Green area, the

available Environment Agency Abstraction Licensing Strategy (ALS)[196] information suggests that there will not be restrictions on obtaining water supplies from surface water sources.

15.4.27 Where construction highway drainage is discharged to local watercourses, assessments for determining whether routine runoff and spillage risk are likely to have detrimental impacts on water quality are carried out using the Highways England Water Risk Assessment Tool (HEWRAT)[197]. The assessments have identified a potential moderate impact on Basford Brook relating to increased traffic on David Whitby Way. There is no data on background concentrations in Basford Brook. Therefore, on a precautionary basis it is assumed that background concentrations in the watercourse could be sufficient to lead to an exceedance of EQS relating to this highways discharge. For this moderate value watercourse this results in a moderate adverse effect, which is significant.

Groundwater

Aquifers

15.4.28 Cowley Way and Middlewich Street vent shafts, Crewe tunnel (including the south and north portals) and Coppenhall Moss cutting in the study area will intersect the glaciofluvial deposits Secondary A and glacial till Secondary (Undifferentiated) aquifers and the Mercia Mudstone Group Secondary B aquifer. Whilst there are likely to be minor localised impacts, the implementation of the measures outlined in the draft CoCP is likely to mean that any effects on the overall status of these aquifers will not be significant.

15.4.29 Where foundations, tunnels, vent shafts or cuttings could affect local receptors, such as groundwater abstractions or springs, this is reported in the sections below.

15.4.30 The construction of the Proposed Scheme will require dewatering activities to take place, which will be subject to approval under protective provisions in the Bill. The assessment covers the dewatering activities associated with Cowley Way and Middlewich Street vent shafts, Crewe tunnel (including the south and north portals) and Coppenhall Moss cutting. As well as assessing the specific impacts of these activities on potential water receptors, an evaluation of water resource policy in this area, using the Environment Agency's available Abstraction Licensing Strategy (ALS), has been carried out. Owing to the nature of the aquifers in the Weaver and Dane catchment, there are no Groundwater Management Units (GWMU) managed as part of the ALS. Restrictions may apply to consents where groundwater availability is limited or to protect the environment (such as surface water flows and water dependent habitats) and are assessed on a case by case basis. This could lead to restrictions on obtaining approvals for these dewatering activities. Engagement with the Environment

[196] Environment Agency (2020), *Weaver and Dane abstraction licensing strategy.* Available online at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/938206/Weaver-and-Dane-abstraction-licensing-strategy.pdf.

[197] Highways England (2020), *Design Manual for Roads and Bridges (DMRB), LA 113 Road Drainage and the Water Environment Revision 1 (formally HD 45/09)*. Available online at: https://www.standardsforhighways.co.uk/dmrb/search/d6388f5f-2694-4986-ac46-b17b62c21727.

Agency will be undertaken in relation to each of the dewatering locations. The Environment Agency will be able to impose conditions on any approved dewatering activities so that no significant adverse effects are likely to arise.

Abstractions

15.4.31 The assessment has not identified any temporary significant effects on groundwater abstractions.

Groundwater – surface water interactions

15.4.32 The assessment has not identified any temporary significant effects on groundwater – surface water interactions.

Water dependent habitats

15.4.33 The assessment has not identified any temporary hydrological impacts on water dependent habitats in the study area.

Temporary effects – Flood risk and land drainage

15.4.34 The assessment has not identified any temporary significant effects on flood risk.

Permanent effects – Water resources

15.4.35 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 and is present in the area.

Surface water

15.4.36 Where highway drainage is discharged to local watercourses, assessments for determining whether routine runoff and spillage risk are likely to have detrimental impacts on water quality are carried out using the HEWRAT. The assessment has not identified any significant effects on surface water quality in this area.

Groundwater

Aquifers

15.4.37 Implementation of the avoidance and mitigation measures will ensure that there are no permanent significant effects related to the impact of the Cowley Way and Middlewich Street vent shafts, Crewe tunnel (including the south and north portals) and Coppenhall Moss cutting on the aquifers intercepted by the Proposed Scheme.

15.4.38 Where the impacts of the Proposed Scheme on the aquifers could affect additional local receptors that rely on the groundwater resource, for example springs and abstractions, the

impacts on these have been assessed and where effects are significant, they are described below.

Abstractions

15.4.39 The assessment has not identified any permanent significant effects on groundwater abstractions.

Groundwater – surface water interactions

15.4.40 The assessment has not identified any permanent significant effects on groundwater – surface water interactions.

Water dependent habitats

15.4.41 Moss Bridge Marsh LWS is located at the furthest extent of the radius of dewatering influence of Coppenhall Moss cutting. Therefore, there may be a reduction in groundwater flow as a result of a reduction in the contributing groundwater catchment. The reduced groundwater flow contribution may lead to a minor localised reduction in groundwater levels at the site, assessed as a minor hydrological impact.

15.4.42 The potential for hydrological impacts to result in local ecological effects is assessed in Volume 5, Ecology register of local level effects, and for any significant effects, mitigation is identified in Section 7, Ecology and biodiversity.

Permanent effects – Flood risk and land drainage

15.4.43 The assessment has not identified any permanent significant effects on flood risk.

Summary of significant effects

15.4.44 On a precautionary basis the Proposed Scheme is anticipated to result in the following significant effect which requires other mitigation: a temporary moderate adverse effect on water quality in Basford Brook due to water quality changes from highways drainage on David Whitby Way.

Other mitigation measures

15.4.45 Mitigation measures are required to address the potential impacts of highways drainage on water quality in Basford Brook. During the passage of the Bill further investigations, such as monitoring and analysis of the bioavailability of metals and dilution, will be carried out, where reasonably practicable, to identify whether additional mitigation measures are required. If mitigation is required these will be designed in consultation with the Environment Agency and other stakeholders to mitigate any significant effects on water quality. On a precautionary basis, until such time as these investigations are carried out, a residual significant effect will remain.

Summary of likely residual significant effects

15.4.46 On a precautionary basis, it is anticipated that significant residual effects will remain on water quality in Basford Brook relating to highways discharges from David Whitby Way (temporary moderate adverse effect).

Cumulative effects

15.4.47 The combined effects of HS2 Phase 2a and the Proposed Scheme, against a baseline without either phase, have been considered. There will be no significant cumulative effects as a result of the combination of HS2 Phase 2a and the Proposed Scheme.

15.5 Effects arising from operation

Avoidance and mitigation measures

15.5.1 The principal issue of concern during operation of the Proposed Scheme is the potential for accidental spillages to occur that could result in the release of contaminants into the water environment. This issue has been assessed on a route-wide basis in Volume 3, 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-007-00000.

15.5.2 The design takes into account the policies in the NPPF and will ensure that the Proposed Scheme is safe from flooding without increasing flood risk elsewhere, as outlined in the Volume 5: Appendix WR-005-0MA01, Flood risk assessment. Evidence of application of the Sequential Test and Exception Tests in the NPPF is provided on a route-wide basis in Volume 3.

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 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 5: Appendix WR-001-00001. This describes how 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 The assessment indicates that 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 The combined effects of HS2 Phase 2a and the Proposed Scheme, against a baseline without either phase, have been considered. There will be no significant cumulative effects as a result of the combination of HS2 Phase 2a and the Proposed Scheme.

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 operation of the Proposed Scheme.

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