HS2

October 2018

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

Working Draft Environmental Statement

Volume 2: Community Area report

MA03: Pickmere to Agden and Hulseheath

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Department for Transport

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

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Preface

The working draft Environmental Statement

This report forms part of Volume 2 of the working draft Environmental Statement (ES) for Phase 2b of High Speed Two (HS2). The purpose of the working draft ES is to provide the public and other stakeholders with an opportunity to review and comment on preliminary environmental information for Phase 2b of HS2, which is based on a stage in the ongoing design development and environmental assessment process. Nothing included at this stage is intended to limit the form of the final scheme that will be presented in the hybrid Bill and formal ES in light of further scheme development and the ongoing discussions with stakeholders such as Transport for the North and Midlands Connect. Consultation on the working draft ES is being undertaken to help inform the ongoing design and environmental assessment in advance of producing a statutory formal ES. The formal ES will accompany the deposit of the hybrid Bill for Phase 2b of HS2.

Phase 2b comprises the section of the proposed HS2 rail network, from Crewe to Manchester (and a connection onto the West Coast Main Line (WCML)) (the western leg), and from the West Midlands to Leeds (and a connection onto, and part electrification of, the Midland Main Line (MML) and a connection onto the East Coast Main Line (ECML)) via the East Midlands and South Yorkshire (the eastern leg). Collectively, this is referred to in this working draft ES as the 'Proposed Scheme'. The working draft ES describes the Proposed Scheme and reports its likely significant environmental effects and the measures proposed to mitigate those effects, based on a stage in the ongoing design and environmental assessment.

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

The hybrid Bill for Phase 2a of the HS2 network, between the West Midlands and Crewe, was the subject of an ES deposited in July 2017, followed by a subsequent ES deposited with an Additional Provision to that Bill in March 2018. The Phase 2a Bill is expected to receive Royal Assent in 2019.

Consultation on the working draft Environmental Statement

The public has an opportunity to comment on this working draft ES. The period of public consultation is taking place during October 2018 – December 2018; the first day of the consultation period being the date the Secretary of State for Transport formally announces the consultation and the publication of the working draft ES documents on www.gov.uk/hs2.

Structure of the HS2 Phase 2b working draft Environmental Statement

This report forms part of Volume 2 of the working draft ES for Phase 2b of HS2. The working draft ES describes the design of the Proposed Scheme and reports the likely significant environmental effects of the construction and operation of the Proposed Scheme and proposed mitigation and monitoring measures, based on a stage in the ongoing design and environmental assessment process. The report will be updated for the formal ES to reflect further work on the design, assessment and mitigation and monitoring measures between now and when the hybrid Bill is deposited. The structure of the working draft ES is shown in Figure 1.

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

The working draft ES comprises the following documents:

Non-technical summary

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

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

Glossary of terms and list of abbreviations

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

Volume 1: Introduction and methodology

This provides:

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

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

Volume 2: Community area reports and map books

These cover the following community areas:

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

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

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

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

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

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

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

Volume 3: Route-wide effects

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

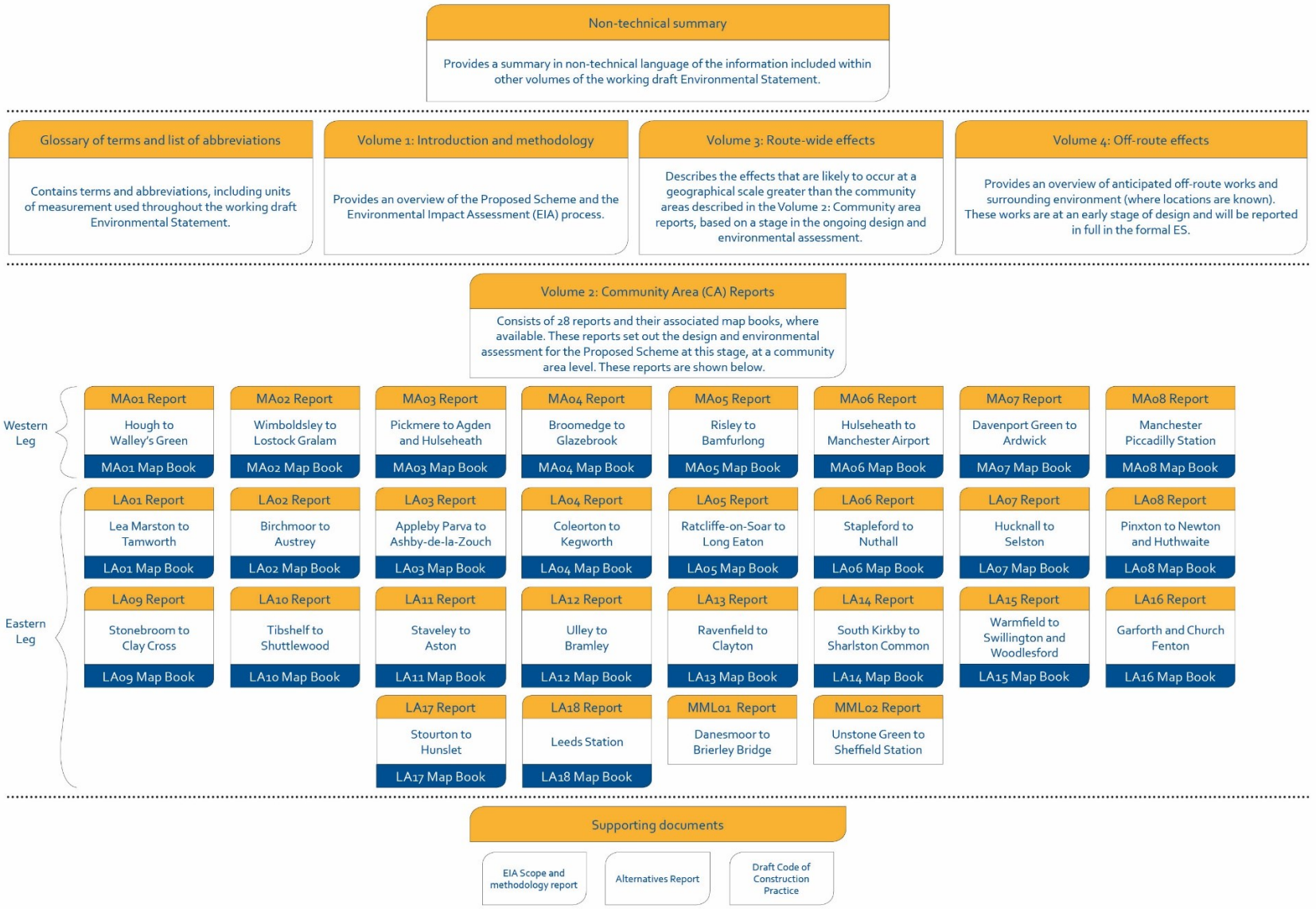
Volume 4: Off-route effects

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

Supporting documents

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

Figure 1 Structure of the working draft Environmental Statement



1 Introduction

1.1 Introduction to HS2

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

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

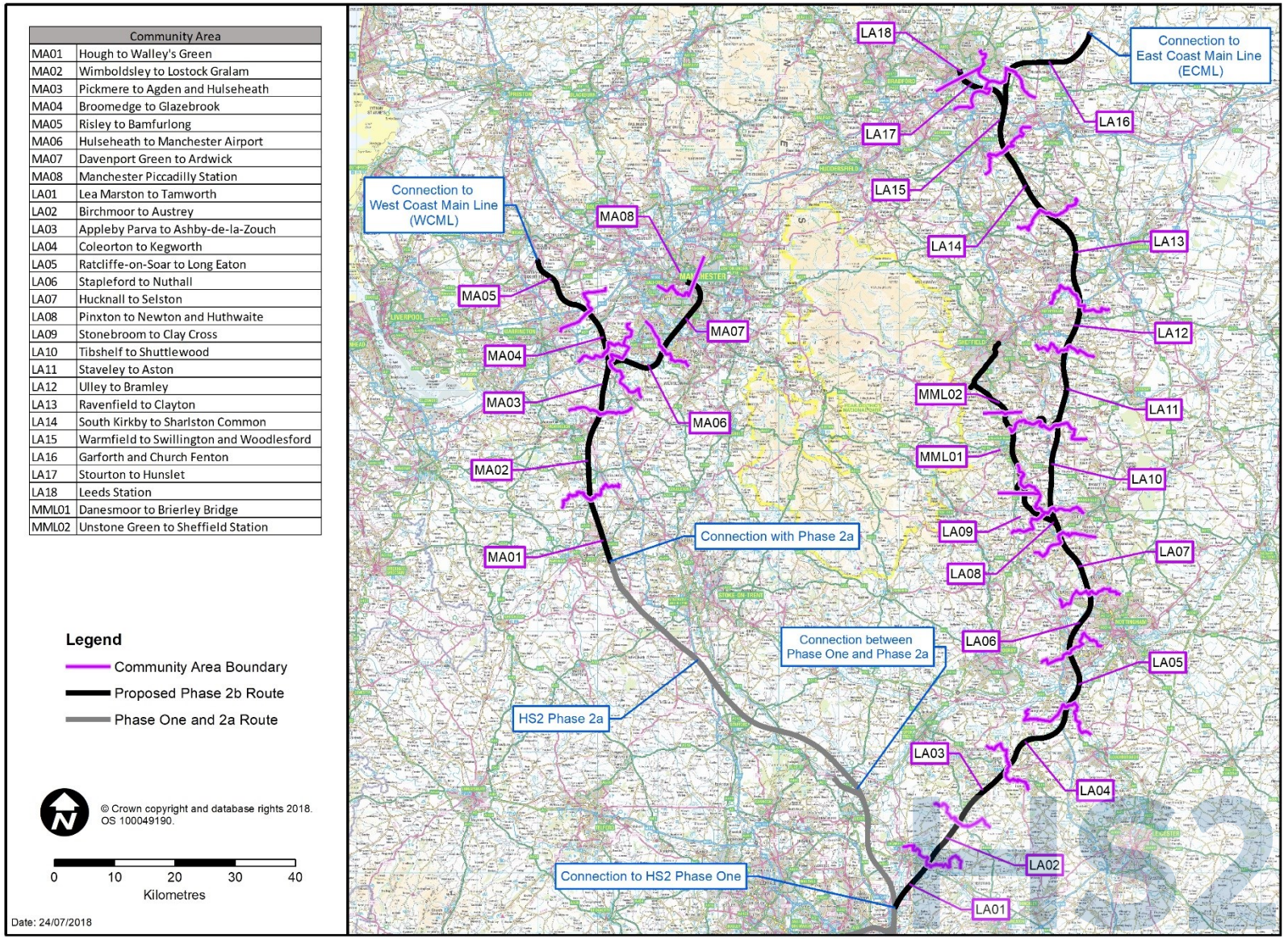
1.1.3 Phase Two of HS2 will extend the route from Phase One in the West Midlands to the north-west to Manchester (approximately 80km (50 miles) with connections to the West Coast Main Line (WCML) at Crewe and Golborne, and to the north-east to Leeds with a connection to the Erewash Valley Line and Midland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

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

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

1.1.6 For environmental assessment and community engagement purposes, the Proposed Scheme has been divided into 28 community areas (CA). These are shown in Figure 2. This CA report relates to the Pickmere to Agden and Hulseheath area (CA number MA03) which is located on the western leg of the Proposed Scheme.

Figure 2: HS2 Phase 2b route and community areas



1.2 Purpose of this report

1.2.1 This working draft ES sets out the preliminary environmental information and the key features of a point in time design for the Proposed Scheme. It provides a description of the design of the Proposed Scheme, environmental baseline information, and the likely impacts (and where practicable, the significant effects) of the construction and operation of the Proposed Scheme on the environment within the Pickmere to Agden and Hulseheath area. The report also describes the proposed mitigation measures that have been identified, at this stage, to avoid, reduce or manage the likely significant adverse effects of the Proposed Scheme on the environment within the area, along with proposed monitoring measures.

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

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

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

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

1.3 Structure of this report

1.3.1 This report is divided into the following sections:

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

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

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

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

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

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

1.3.4 The maps relevant to the Pickmere to Agden and Hulseheath area are provided in a separate corresponding document entitled Volume 2: MA03 Map Book, which should be read in conjunction with this report.

1.3.5 The Proposed Scheme described in this report is that shown on the Map Series CT-05 (construction) and CT-06 (operation) (Volume 2: MA03 Map Book). There is some flexibility during detailed design to alter the horizontal and vertical alignments and

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

other details within the limits shown on the plans and sections submitted to Parliament and as set out in the Bill, and this flexibility is included within the scope of the environmental assessment. Further explanation is provided in Volume 1, Section 1.

1.3.6 In addition to the environmental topics covered in Sections 4 to 15 of this report, electromagnetic interference is addressed in Volume 1 and climate change, major accidents and natural disasters, and waste and material resources are addressed in Volume 3 on a route-wide basis.

2 Overview of the area and description of the Proposed Scheme

2.1 Overview of the area

General

2.1.1 The Pickmere to Agden and Hulseheath area covers an approximately 10km long section of the Proposed Scheme (referred to as the HS2 main line). A junction would be provided at approximately three quarters through this main line section, connecting to an approximately 1.6km-long spur into Manchester (referred to as the HS2 Manchester spur). The Proposed Scheme in the area passes through the parishes of Tabley Inferior, Pickmere, Tabley Superior, Mere, High Legh and Agden, within the local authority areas of Cheshire West and Chester Council (CWCC) and Cheshire East Council (CEC). The boundary between Tabley Inferior parish and Plumley parish forms the southern boundary of this section. The northern boundary of this section on the HS2 main line lies in Agden parish, whilst the northern boundary of the HS2 Manchester spur lies on the boundary between High Legh parish and Millington parish.

2.1.2 As shown in Figure 3, the Wimboldsley to Lostock Gralam area (MA02) lies to the south and the Broomedge to Glazebrook area (MA04) lies to the north on the HS2 main line, the Hulseheath to Manchester Airport area (MA06) lies to the east on the HS2 Manchester spur (MA06).

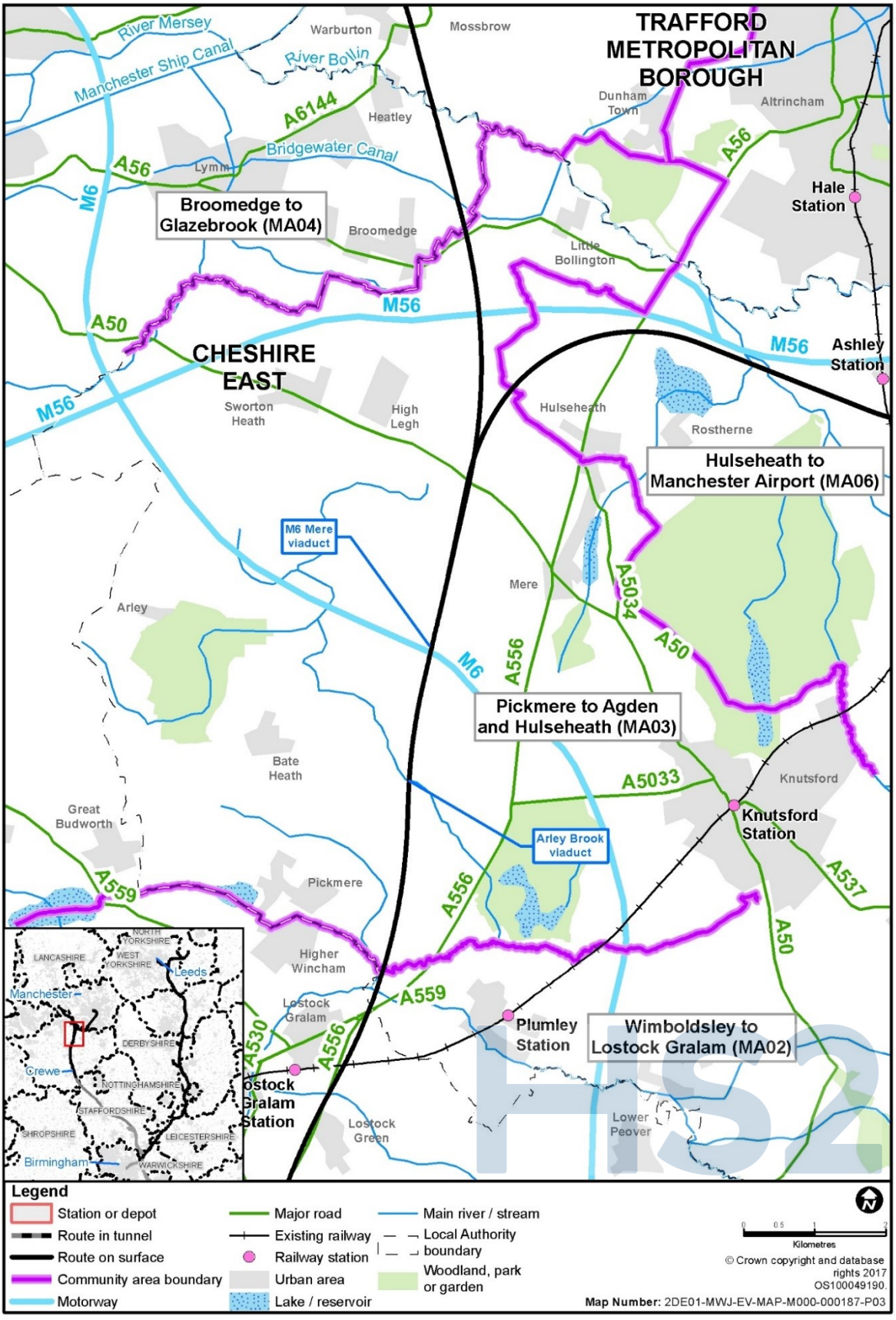
Settlement, land use and topography

2.1.3 The Pickmere to Agden and Hulseheath area is predominately rural in character, with several villages, hamlets and scattered farmsteads and dwellings. The village of Pickmere lies within the southern part of the area, and the town of Knutsford lies in the south-east. Hoo Green, High Legh and Mere lie within the central part of the area. The HS2 main line would pass Agden in the northern part of the area, whilst the HS2 Manchester spur would continue from Hoo Green to Hulseheath, in the north-western part of the area.

2.1.4 The main land use in the Pickmere to Agden and Hulseheath area is agriculture use. There are two ancient woodlands along the area's southern boundary – Leonards and Smoker Woods.

2.1.5 The topography in the Pickmere to Agden and Hulseheath area is generally flat with small areas of steeper land around woodlands and water bodies. The lowest points are around the River Bollin in the north-eastern part of the area at approximately 13m above Ordnance Datum (AOD). The highest point is at the village of High Legh at approximately 75m AOD.

Figure 3: Community area context map



Key transport infrastructure

2.1.6 Principal highways within the Pickmere to Agden and Hulseheath area include the M6 and the M56. The M6 passes through the area on a south-east to north-west alignment. The M56 runs in an east to west alignment, with junction 8 to the north-east of High Legh.

2.1.7 Other major highways in the Pickmere to Agden and Hulseheath area include the A50, which connects Stoke-on-Trent to Warrington and the A56 Lymm Road, which lies in the northern part of the area.

2.1.8 A section of Bridgewater Canal, close to Agden Brook, is located at the north-east section of the area. The Mid-Cheshire railway line runs in a north-east direction through Knutsford Station, which is located in the eastern part of the area. This railway line provides connections from Knutsford to Mobberley, Ashley and Manchester.

2.1.9 The route would cross several public rights of way (PRoW) including local access roads, bridleways and public footpaths, which provide important links between scattered dwellings, farms and villages. These PRoW include the North Cheshire Way, promoted PRoW[4], which is a long distance walking route, the Bridgewater Canal towpath and the National Cycle Network Regional Route 70, a 280km cycle route through Cheshire.

Socio-economic profile

2.1.10 The area falls within the CWCC and CEC administrative areas.

2.1.11 Within the CWCC area, the professional, scientific and technical sector accounts for the largest proportion of businesses at 19%[5]. Retail is the second largest sector at 10% and the business administration and support sector contributes 9%.

2.1.12 According to the Annual Population Survey (2016)[6], the employment rate within the CWCC area was 73% (147,700 people) and unemployment in the CWCC area was 3.2% (5,000 people).

2.1.13 The survey also shows that 40% of CWCC residents aged 16-64 were qualified to National Vocational Qualification Level 4 (NVQ4) and above, while 9% of residents had no qualifications.

2.1.14 Within the CEC area there is a wide spread of business types, which reflects a diverse range of commercial activities. The professional, scientific and technical sector accounts for the largest proportion of businesses (20%[5]), the business administration and support services sector is the second largest (10%) followed by construction and retail, both (8%).

[4] A "promoted PRoW" refers to those PRoW which are "promoted" destinations in their own right as a recreational resource
[5] Office for National Statistics; (2017); UK Business Count – Local Units. Available online at: https://www.nomisweb.co.uk
[6] Annual Population Survey (2016), *NOMIS*. Available online at https://www.nomisweb.co.uk

2.1.15 According to the Annual Population Survey (2016[6]), the employment rate within the CEC area was 76% (170,900 people) and unemployment in the CEC area was 4.5% (8,000 people).

2.1.16 The survey also shows that 39% of CEC residents aged 16-64 were qualified to NVQ4 and above, while 6% of residents had no qualifications.

Notable community facilities

2.1.17 The main concentrations of community facilities are in the town of Knutsford and the larger villages of Pickmere and High Legh. Tabley, Mere and Hoo Green are smaller villages and hamlets, which provide a smaller number of local services.

2.1.18 The town of Knutsford, located across the eastern extent of the Pickmere to Agden and Hulseheath area is the settlement with the largest concentration of community facilities in the area. These include Tatton Park, Dunham Massey, Sanctuary Moor, Knutsford Academy and Knutsford Leisure Centre.

2.1.19 Notable community facilities within the village of Pickmere include the Pickmere and Wincham Methodist Church and the Red Lion public house.

2.1.20 Community facilities in High Legh include High Legh Village Hall, High Legh Primary School, St John's Church, High Legh Park Golf Club and High Legh Bowling Club.

2.1.21 Community facilities in Tabley include Tabley House, which is a Grade I listed stately home located east of the route of the Proposed Scheme that supports people with a range of different needs including those living with dementia. In Tabley's surrounding area is the Cheshire Showground. The showground hosts the annual Royal Cheshire Show, an important event for the Cheshire farming community, and several other events throughout the year.

2.1.22 Mere is a village located east of the route of the Proposed Scheme on the banks of The Mere (a local lake). Notable community facilities within this area include the Mere Golf Resort and Spa and the Mere Day Nursery.

2.1.23 Community facilities in Hoo Green are limited, but include the Kilton Inn public house.

Recreation, leisure and open space

2.1.24 The Pickmere to Agden and Hulseheath area is a predominantly rural area, characterised by woodland, open space, watercourses and farmland. There are two promoted PRoW in the area, including the North Cheshire Way which passes north of Knutsford, and the Bridgewater Canal towpath which passes north east of A56 Lymm Road. There are also recreational cycle routes in this area, which include Regional Route 70 of the National Cycle Network.

2.1.25 Other open spaces and recreational facilities in the area include the Cheshire Showground, Dunham Massey Hall, Heyrose Golf Club, Mere Golf and Country Club, High Legh Park Golf Club, and fishing and sailing facilities at the Mere.

Policy and planning context

Planning framework

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

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

- Adopted Cheshire West and Chester Local Plan (Part One) Strategic Policies 2010-2030 (2015)[7];
- Adopted Cheshire East Local Plan Strategy 2010-2030 (2017)[8];
- Adopted Macclesfield Borough Local Plan 2004-2011 (saved policies) (2004) [9];
- Adopted Cheshire Replacement Waste Local Plan 2007 (saved policies) (2007)[10];
- Adopted Cheshire Replacement Minerals Local Plan 1999 (saved policies) (1999)[11]; and
- Adopted Cheshire East Local Transport Plan Strategy 2011-2026 (2011)[12].

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

Committed development

2.1.29 Committed developments are defined as developments with planning permission and sites allocated for development, or safeguarded for minerals in adopted development plans, on or close to the land required for the Proposed Scheme. Allocations in the submission draft of the Cheshire West Local Plan (Part Two) Land Allocations and Detailed Policies have also been included as committed developments.

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

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

[7] Cheshire West and Chester Local Plan (Part One) Strategic Policies 2010-2030 (Adopted 2015). Available online at: http://inside.cheshirewestandchester.gov.uk/policies_plans_and_strategies/planning_policy/local_plan/local_plan__part_one
[8] Cheshire East Local Plan Strategy 2010-2030 (Adopted 2017). Available online at: http://www.cheshireeast.gov.uk/planning/spatial_planning/cheshire_east_local_plan/local-plan-strategy/local_plan_strategy.aspx
[9] Macclesfield Borough Local Plan 2004 – 2011 (saved policies) (Adopted 2004). Available online at: http://www.cheshireeast.gov.uk/planning/spatial_planning/saved_and_other_policies/macclesfield_local_plan/macclesfield_local_plan.aspx
[10] Cheshire Replacement Waste Local Plan 2007 (Adopted 2007). Available online at: http://www.cheshireeast.gov.uk/planning/spatial_planning/saved_and_other_policies/cheshire_waste_local_plan/cheshire_waste_local_plan.aspx
[11] Cheshire Replacement Minerals Local Plan 1999 (Adopted 1999). Available online at: http://www.cheshireeast.gov.uk/planning/spatial_planning/saved_and_other_policies/cheshire_minerals_local_plan/cheshire_minerals_local_plan.aspx
[12] Cheshire East Local Transport Plan Strategy 2011-2026 (Adopted 2011). Available online at: http://www.cheshireeast.gov.uk/public_transport/local_transport_plan/local_transport_plan.aspx

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

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

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

Ongoing design development

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

- review of the proposed lengths and heights of viaducts and other river crossing structures and associated replacement floodplain storage areas;
- refinement of the realignment of roads and PRoW crossing the Proposed Scheme;
- refinement of drainage features required for rail and highways;
- refinement of maintenance access routes, access to balancing ponds;
- additional environmental features required to mitigate likely significant environmental effects;
- accommodation works and crossings of the route of the Proposed Scheme for private means of access;
- temporary and permanent utility diversions;
- refinement of construction compound locations and site haul routes; and
- refinement of locations of auto-transformer stations, auto-transformer feeder stations and grid supply points.

2.2 Description of the Proposed Scheme

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

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

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

Overview

2.2.4 The Proposed Scheme through the Pickmere to Agden and Hulseheath area has two main components:

- the HS2 main line: the route of the Proposed Scheme, continuing from the northern boundary of the Wimboldsley to Lostock Gralam area (MA02) and travelling northwards towards the Broomedge to Glazebrook area (MA04); and
- the HS2 Manchester spur: the route of the Proposed Scheme, a spur diverging from the HS2 main line and continuing towards the Hulseheath to Manchester Airport area (MA06).

2.2.5 The HS2 main line through the Pickmere to Agden and Hulseheath area would be approximately 10km in length, extending from Lostock Gralam to Broomedge. The HS2 Manchester spur would diverge from the HS2 main line near Hoo Green and continue for 1.6km in length within the Pickmere to Agden and Hulseheath area.

2.2.6 The HS2 main line and HS2 Manchester spur are illustrated on maps CT-06-316b to CT-06-322a in the Volume 2: MA03 Map Book.

2.2.7 All dimensions in the sections below are approximate.

HS2 main line

2.2.8 In the Pickmere to Agden and Hulseheath area, the HS2 main line would be carried on the following features:

- viaducts for a total length of 180m (Smoker Brook viaduct, Arley Brook viaduct and M6 Mere viaduct);
- cuttings for a total length of 3.7km (Hoo Green cutting, Mere cutting, High Legh cutting and Agden cutting); and
- embankments for a total length of 6.6km (Pickmere embankment, Heyrose embankment, Over Tabley embankment and Lymm embankment).

2.2.9 The HS2 main line is described in three separate sections below.

Smoker Brook viaduct to Arley Brook viaduct

2.2.10 The HS2 main line would connect to the Wimboldsley to Lostock Gralam area (MA02) approximately 670m north of the A556 Chester Road and continue north towards Arley Brook. The route would enter this section on the Smoker Brook viaduct before passing onto the Pickmere embankment and continuing onto the Arley Brook viaduct.

2.2.11 This section of route is illustrated on maps CT-06-316b to CT-06-318 in the Volume 2: MA03 Map Book.

2.2.12 The key features of the 2.6km section would include:

- a section of the Smoker Brook viaduct, 30m in length and up to 14m in height in this section, continuing from the Wimboldsley to Lostock Gralam area (MA02) (see Volume 2: Map CT-06-316b, F5);
- Pickmere embankment, 2.5km in length, 66m in width and up to 11m in height, with associated landscape earthworks to the east and landscape mitigation planting on both sides of the HS2 main line to help integrate the HS2 main line into the surrounding landscape (see Volume 2: Map CT-06-316b G5 to J4, Map CT-06-317, A6 to J7, and Map CT-06-318, A3 to B3);
- a balancing pond for railway drainage to the east of the HS2 main line, 100m north of Smoker Brook, partially located within an area of landscape mitigation planting, with access via a new access track off the A556 Chester Road (see Volume 2: Map CT-06-316b, G5);
- three ecological mitigation ponds within an area of grassland habitat creation to the west of the HS2 main line to provide replacement habitat (see Volume 2: Map CT-06-316b, H4 to I4);
- three ecological mitigation ponds within an area of grassland habitat creation to the east of the Hs2 main line to provide replacement habitat (see Volume 2: Map CT-06-316b, I5 to J5 and Map CT-06-317, A7);
- realignment of the Pickmere Footpath 5 10m north of its current alignment for 70m, crossing the HS2 main line on the Pickmere Footpath 5 accommodation underbridge. The existing Pickmere Footpath 5 would be closed where it would cross the route of the Proposed Scheme (see Volume 2: Map CT-06-317, A7 to B6);
- Pickmere Footpath 5 accommodation underbridge, 24m in length and up to 7m above existing ground level (see Volume 2: Map CT-06-317, B6);
- Milley Lane auto-transformer station, 46m by 24m, on the eastern side of the HS2 main line, 400m north of Pickmere Footpath 5. Access would be provided via a new access road from the existing Flittogate Farm access to the north (see Volume 2: Map CT-06-317, C7 to D7);
- realignment of Tabley Inferior Footpath 2 and 3, 80m south of its current alignment for 280m, crossing the HS2 main line on the Tabley Inferior Footpath 2 and 3 overbridge. The existing Tabley Inferior Footpath 2 and 3 would be closed where it would cross the route of the Proposed Scheme (see Volume 2: Map CT-06-317, E7 to F6);
- Tabley Inferior Footpath 2 and 3 accommodation overbridge, 44m in length and up to 12m in height, with associated landscape mitigation planting to the east and west. The overbridge would provide pedestrian and vehicular access for Flittogate Farm on both sides of the HS2 main line (see Volume 2: Map CT-06-317, E9 toF6);

- three ecological mitigation ponds within an area of grassland habitat creation to the east of the HS2 main line to provide replacement habitat (see Volume 2: Map CT-06-317, F7 to H7);
- realignment of Tabley Inferior Footpath 4, 150m east of its current alignment for 60m, crossing the HS2 main line on the Tabley Inferior Footpath 4 accommodation overbridge. The existing Tabley Inferior Footpath 4 would be closed where it would cross the route of the Proposed Scheme (see Volume 2: Map CT-06-317, I6 to I8);
- Tabley Inferior Footpath 4 accommodation overbridge, 70m in length and up to 12m in height (see Volume 2: Map CT-06-317, E9 toF6);
- Pickmere Lane overbridge, on an embankment 2.5km long and up to 14m in height with landscape mitigation planting to the west and east to help integrate the Proposed Scheme into the surrounding landscape (see Volume 2: Map CT-06-317, I7);
- a balancing pond for highways drainage, on the eastern side of the diverted Flittogate Lane (see Volume 2: Map CT-06-317, H9);
- realignment of the B5391 Pickmere Lane, 90m to the south of its existing alignment on an embankment 2.5km long and up to 11m in height. The realigned B5391 Pickmere Lane would cross the HS2 main line on the Pickmere Lane overbridge, up to 14m above existing ground level. The existing B5391 Pickmere Lane would be closed where it would cross the route of the Proposed Scheme and retained as access for fields associated with School Farm to the west (see Volume 2: Map CT-06-317, G10 to H4 to J8 and Map CT-06-318, A4 to C5);
- diversion of Flittogate Lane, 190m to the north of its existing alignment on an embankment 2.5km long and up to 10m in height, within an area of landscape mitigation planting. The diverted Flittogate Lane would join the realigned B5391 Pickmere Lane to cross the HS2 main line on the Pickmere Lane overbridge. The existing Flittogate Lane would be closed where it would cross the route of the Proposed Scheme (see Volume 2: Map CT-06-317, G10 to I7);
- diversion of School Lane, 190m to the north of its existing alignment. The diverted School Lane would join the B5391 Pickmere Lane via a new junction located 30m south of the existing junction (see Volume 2: Map CT-06-317, I5);
- three ecological mitigation ponds within an area of grassland habitat creation to the west of the HS2 main line to provide replacement habitat (see Volume 2: Map CT-06-317, J6 and Map CT-06-318, A2 to B3);
- a balancing pond for railway drainage to the east of the route of the Proposed Scheme, adjacent to the Pickmere embankment. Access would be provided via Pickmere Lane (see Volume 2: Map CT-06-318, A3);

- Waterless Brook culvert, 190m south of Waterless Brook Cottages, for surface water drainage under the realigned B5391 Pickmere Lane (see Volume 2: Map CT-06-318, A5);
- a balancing pond for highways drainage located to the east of the realigned B5391 Pickmere Lane 250m east of the Arley Brook viaduct (see Volume 2: Map CT-06-318, B5); and
- Arley Brook viaduct, 102m in length and up to 8m in height, with associated wetland habitat creation under the viaduct on both sides of the HS2 main line (see Volume 2: Map CT-06-318, B3).

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

2.2.14 Construction of this section would be managed from the Smoker Brook viaduct north satellite compound, the Pickmere Lane satellite compound, Budworth Road satellite compound and Milley Lane auto-transformer station satellite compound.

2.2.15 These are described in Section 2.3, and shown on maps CT-05-316b to CT-05-318 in the Volume 2: MA03 Map Book.

Heyrose embankment to High Legh box structure

2.2.16 The HS2 main line would continue north from the Arley Brook viaduct onto the Heyrose embankment before passing onto the M6 Mere viaduct and continuing on the Over Tabley embankment. The route HS2 main line would then continue into the Hoo Green cutting, the Mere cutting and enter the High Legh box structure to the east of the Mere Court Hotel and Conference Centre.

2.2.17 This section of route is illustrated on maps CT-06-318 to CT-06-320 in the Volume 2: MA03 Map Book.

2.2.18 The key features of the 4.8km section would include:

- a balancing pond for railway drainage to the east of the HS2 main line, 60m to the north of Arley Brook. Access would be provided via a new access track off Budworth Road (see Volume 2: Map CT-06-318, B3);
- Heyrose embankment, 1.8km in length, 39m in width and up to 6m in height, with associated landscape earthworks and landscape mitigation planting on the western side of the HS2 main line to help integrate the Proposed Scheme into the surrounding landscape and reduce noise (see Volume 2: Map CT-06-318, B2 to J3 and Map CT-06-319, A6 to B6);
- closure of Budworth Road where it would cross the HS2 main line with access to properties retained on both sides of the route. Users would be diverted along the realigned School Lane, B5391 Pickmere Lane and the Pickmere Lane overbridge increasing the length of the journey by 1km (see Volume 2: Map CT-06-318, C2 to D3);

- Bongs Wood South culvert, 740m north of the existing Budworth Road, for the realignment of an unnamed watercourse (a tributary of Tabley Brook). The watercourse would be realigned for 55m, 25m south of its existing alignment and would cross under the HS2 main line to then continue on its existing alignment (see Volume 2: Map CT-06-318, G2 to G3);
- an area of wetland and woodland habitat creation west and east of the HS2 main line extending along the unnamed watercourse linked to Bongs Wood South culvert and to the north of Yew Tree Farm (see Volume 2: Map CT-06-318, G1 to H5);
- a balancing pond for railway drainage, partially within an area of landscape mitigation planting, to the east of the HS2 main line, 600m to the north of Yew Tree Farm. Access would be provided off the existing Budworth road via a new access track (see Volume 2: Map CT-06-318, H3);
- Bongs Wood North culvert, 120m south of The Shooting Box, for the realignment of an unnamed watercourse. The watercourse would be realigned for 60m, 40m south of its existing alignment and would cross under the HS2 main line to then continue on its existing alignment within an area of wetland and woodland habitat creation to provide replacement habitat (see Volume 2: Map CT-06-318, H2 to I3);
- an area of wetland habitat creation to the west and east of the HS2 main line along the unnamed watercourse linked to Bongs Wood North culvert and south of The Shooting Box (see Volume 2: Map CT-06-318, H2 to I3);
- realignment of Tabley Superior Restricted Bridleway 4, 20m to the south of its existing alignment, crossing the HS2 main line via the Tabley Superior Restricted Bridleway 4 accommodation underbridge 142m in length and increasing the length of the journey by 30m. The existing Tabley Superior Restricted Bridleway 4 would be closed where it would cross the route of the Proposed Scheme (see Volume 2: Map CT-06-318, J2 to J4);
- M6 Mere viaduct, 50m in length and up to 10m in height (see Volume 2: Map CT-06-319, B5 to C6);
- Over Tabley embankment, 1.6km in length, 70m in width and up to 12m in height, with associated landscape earthworks and landscape mitigation planting along the eastern side of the main line to help integrate the Proposed Scheme into the surrounding landscape (see Volume 2: Map CT-06-319, C5 to J6 and Map CT-06-320, A6);
- Mere Bridleway 1 accommodation underbridge, 430m north of the M6 Mere viaduct, 4m in length and up to 9.5m above existing ground level (see Volume 2: Map CT-06-319, E5 to E6);
- Winterbottom South culvert, 580m north of the M6 Mere viaduct, for surface water drainage under the HS2 main line (see Volume 2: Map CT-06-319, F5 to F6);

- three ecological mitigation ponds within an area of grassland habitat creation to the west of the HS2 main line to provide replacement habitat (see Volume 2: Map CT-06-319, G5);
- two areas of woodland habitat creation, one 300m north-east of Winterbottom Farm to the west of the HS2 main line, and the second 200m north of Winterbottom South culvert to the east of the HS2 main line, to provide replacement habitat (see Volume 2: Map CT-06-319, G6 to H5);
- Winterbottom North culvert, 1.1km north of the M6, for surface water drainage under the Hs2 main line (see Volume 2: Map CT-06-319, I5);
- a balancing pond for railway drainage to the west of the HS2 main line, 100m east of Winterbottom Lane with access via a new access track off Winterbottom Lane (see Volume 2: Map CT-06-319, I5);
- an area of woodland habitat creation to the west and east of an unnamed road to provide replacement habitat (see Volume 2: Map CT-06-319, J5 to J6);
- two ecological mitigation ponds within an area of grassland habitat creation to the east of the Hs2 main line to provide replacement habitat (see Volume 2: Map CT-06-319, J6 and Map CT-06-320, B6 to B7);
- Hoo Green cutting, 1.1km in length, up to 50m in width and up to 10m in depth; with associated landscape earthworks and landscape mitigation planting on both sides of the HS2 main line to screen views of the Hoo Green auto-transformer feeder station and Hoo Green Grid Supply Point (see Volume 2: Map CT-06-320, B6 to G6);
- Hoo Green auto-transformer feeder station, on the eastern side of the HS2 main line, 300m by 105m, 300m south-west of Hoo Green, with access from the diverted Hoo Green Lane. There will be areas of grassland habitat creation to the east and the south of the auto-transformer feeder station (see Volume 2: Map CT-06-320, B6 to C6);
- Hoo Green Grid Supply Point (GSP) located to the east of the Hoo Green auto-transformer feeder station, 200m by 130m, within an area of grassland habitat creation to the north and west to mitigate for habitat severance and loss of terrestrial habitat. Access would be from the diverted Hoo Green Lane (see Volume 2: Map CT-06-320, B7 to C8);
- closure of Cliff Lane Road on the western side of the route of the Proposed Scheme to enable construction of Hoo Green cutting (see Volume 2: Map CT-06-320, C5);
- three ecological mitigation ponds within an area of grassland habitat creation to the east of the HS2 main line to provide replacement habitat (see Volume 2: Map CT-06-320, C7 to C8);
- realignment of Hoo Green Lane, 180m to the north of its existing alignment on an embankment 680m long, crossing the HS2 main line on the Hoo Green Lane overbridge. The realigned Hoo Green Lane would cross the HS2 main line

on the Hoo Green Lane overbridge (see Volume 2: Map CT-06-320, B4 to E7);

- Hoo Green Lane overbridge, up to 6m above existing ground level, with landscape mitigation planting to the north and south to help integrate the Proposed Scheme into the existing landscape (see Volume 2: Map CT-06-320, B4 to E7);
- an area of landscape mitigation planting to the east of Hoo Green Grid Supply Point and Hoo Green auto-transformer feeder station to help integrate these features into the surrounding landscape and reduce visual intrusion (see Volume 2: Map CT-06-320, C7 to C9);
- a balancing pond for railway drainage to the east of the HS2 main line, 50m to the south of Hoo Green Lane. Access would be provided via a new access track off Hoo Green Lane (see Volume 2: Map CT-06-320, D7);
- realignment of the A50, 30m to the south of its existing alignment crossing the HS2 main line on the A50 overbridge which would be 370m in length and up to 2m above existing ground level. The existing A50 would be closed where it would cross the route of the Proposed Scheme (see Volume 2: Map CT-06-320, F7 to G4);
- A50 overbridge, up to 2m in height above existing ground level (see Volume 2: Map CT-06-320, F7 to G4);
- closure of Bowden View Lane where it would cross the HS2 main line with access to properties retained on both the western and eastern sides of the route. Users would be diverted along the realigned A50 (see Volume 2: Map CT-06-320, G7);
- Mere cutting, 100m in length, up to 50m in width and up to 10m in depth (see Volume 2: Map CT-06-320, G6); and
- High Legh box structure, 230m in length and up to 12m in depth, to the north-east of the Mere Court Hotel, passing beneath the HS2 Manchester spur (see Volume 2: Map CT-06-320, G6 to H6).

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

2.2.20 Construction of this section would be managed from the Budworth Road satellite compound, M6 viaduct south satellite compound, M6 viaduct north satellite compound, Winterbottom Lane satellite compound, Hoo Green auto-transformer feeder station satellite compound and A50 Cliff Lane main compound and transfer node.

2.2.21 These are described in Section 2.3, and shown on maps CT-05-318 to CT-05-320 in the Volume 2: MA03 Map Book.

High Legh cutting to Lymm embankment

2.2.22 The HS2 main line in this section would continue in the High Legh cutting north-west towards Broomedge and would pass beneath the Manchester spur (northbound) in the High Legh box structure. The HS2 main line would then continue towards the Peacock Lane west overbridge, pass through the M56 west box structure onto Agden cutting, and then reach Lymm embankment.

2.2.23 This section of route is illustrated on maps CT-06-320 to CT-06-322a in the Volume 2: MA03 Map Book.

2.2.24 The key features of the 2.7km section would include:

- High Legh cutting, 1.9km in length, up to 148m in width and up to 21m in depth; with associated landscape earthworks and landscape mitigation planting on the west side of the route to help integrate the HS2 main line into the surrounding landscape (see Volume 2: Map CT-06-320, H6 to J5 and Map CT-06-321, A4 to I5);
- an area of landscape mitigation planting on the west of the HS2 main line located north-east of Wrenshot House to help integrate the HS2 mainline into the existing landscape (see Volume 2: Map CT-06-320 I4 to J5);
- areas of woodland habitat creation along both sides of the High Legh cutting, 270m north of Wrenshot House on the west and between the HS2 main line and the HS2 Manchester spur on the east, to provide replacement habitat (see Volume 2: Map CT-06-320, J4 to J6 and Map CT-06-321, A4 to B2);
- three ecological mitigation ponds within an area of grassland habitat creation to the west of the HS2 main line to provide replacement habitat (see Volume 2: Map CT-06-321, A4 to B4);
- realignment of Peacock Lane, 180m to the north of its existing alignment on an embankment 1.9km in length, up to 148m in width and up to 21m in height. The realigned Peacock Lane would cross the HS2 main line on the Peacock Lane west overbridge, up to 12.5m above existing ground level and over the HS2 Manchester spur on the Peacock Lane east overbridge. The existing Peacock Lane would be closed where it would cross the HS2 main line and HS2 Manchester spur with access to properties retained on both the western and eastern sides of the route via two new junctions off the realigned Peacock Lane (see Volume 2: Map CT-06-321, B10 to F1 and D6);
- landscape mitigation planting both sides of the realigned Peacock Lane to help integrate the Proposed Scheme into the existing landscape (see Volume 2: Map CT-06-321, D6 to F1);
- two ecological mitigation ponds within an area of grassland habitat creation 250m north of the Peacock Lane overbridge to the west of the HS2 main line to provide replacement habitat (see Volume 2: Map CT-06-321, F5 to G5);
- closure of Agden Lane where it would cross the HS2 main line with access to properties retained on both the east and western sides of the route. Users

would be diverted along Peacock Lane West overbridge, increasing the length of the journey by 2.1km (see Volume 2: Map CT-06-321, H4 to H5);

- M56 West box structure, 80m in length and up to 25m below ground level to enable the Proposed Scheme to pass beneath the M56 215m north-east of Agden Lane (see Volume 2: Map CT-06-321, I4 to I5);
- diversion of Agden Footpath 4 500m north of its current alignment for 800m, crossing the HS2 main line on Agden Footpath 2 accommodation overbridge (see Volume 2: Map CT-06-322a, A5 to C5);
- Agden cutting, 590m in length, up to 149m in width and up to 21m in depth, with associated landscape earthworks and landscape mitigation planting on both sides of the HS2 main line to help integrate the Proposed Scheme into the surrounding landscape (see Volume 2: Map CT-06-321, J5 to J6 and Map CT-06-322a, A5 to D6);
- an area of landscape mitigation planting on the eastern side of the HS2 main line to help integrate the Proposed Scheme into the surrounding landscape (see Volume 2: Map CT-06-322a, A6 to B7);
- an area of landscape mitigation planting on the western side of the HS2 main line to help integrate the Proposed Scheme into the surrounding landscape (see Volume 2: Map CT-06-322a, B5 to C5);
- realignment of Agden Footpath 2, 50m to the north of its existing alignment for 120m, crossing the HS2 main line on Agden Footpath 2 overbridge, 60m long and up to 7m above existing ground level. The existing Agden Footpath 2 would be closed where it would cross the HS2 main line (see Volume 2: Map CT-06-322a, C5 to C6);
- realignment of Agden Footpath 1 175m south of its current alignment for 350m, crossing the HS2 main line on the Agden Footpath 2 accommodation overbridge. The existing Agden Footpath 1 would be closed where it would cross the HS2 main line (see Volume 2: Map CT-06-322a, C5 to D6);
- a balancing pond for railway drainage to the east of the HS2 main line, 90m south-west of Agden Brook Farm. Access would be provided via a new access track from the A56 Lymm Road (see Volume 2: Map CT-06-322a, D6 to E8);
- Lymm embankment, 70m in length,92m in width and up to 14m in height in this section, with associated landscape earthworks and landscape mitigation planting on both sides of the main line to help integrate the Proposed Scheme into the surrounding landscape (see Volume 2: Maps CT-06-322a, D6 to G6);
- A56 Lymm Road underbridge 13m in length and up to 10m above existing ground level to allow the road to cross the Proposed Scheme (see Volume 2: Map CT-06-322a, F6); and
- an area of woodland habitat creation adjacent to Agden Brook Farm and Bridgewater Canal to provide replacement habitat (see Volume 2: Map CT-06-322a, F9 to G7).

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

2.2.26 Construction of this section would be managed from the A50 Cliff Lane main compound, Peacock Lane satellite compound, Agden Lane satellite compound, M56 West satellite compound and A56 Lymm Road satellite compound.

2.2.27 These are described in Section 2.3, and shown on maps CT-05-321 and CT-05-322a in the Volume 2: MA03 Map Book.

HS2 Manchester spur

2.2.28 The HS2 Manchester spur would diverge from the HS2 main line as the HS2 main line passes into the Hoo Green cutting. The Manchester spur (southbound) would initially run along the east side of the HS2 main line and the Manchester spur (northbound) would initially run along the west side.

2.2.29 The Manchester spur (northbound) would begin to diverge from the HS2 main line to the south of the Hoo Green Lane overbridge to continue along the west side of the HS2 main line for 125m before crossing the HS2 main line to the east of the Mere Court Hotel and Conference Centre.

2.2.30 The Manchester spur (southbound) would begin to diverge from the HS2 main line 25m south of the A50 overbridge to continue along the east side of the HS2 main line for 870m. The two spurs would converge on the east side of the HS2 main line 550m south of Peacock Lane and continue together north-east towards the Hulseheath to Manchester Airport area (MA06) to ultimately terminate at Manchester Piccadilly High Speed station.

2.2.31 The HS2 Manchester spur is illustrated on Maps CT-06-319 to CT-06-321.

2.2.32 Key features of the 1.6km section would include:

- High Legh flyover, 230m in length and 12m in height, to facilitate the connection of the HS2 main line with the HS2 Manchester spur (see Volume 2: Map CT-06-320, G6 to H6);
- Hulseheath cutting, 410m in length, 49m in width and 4m in depth, with associated landscape earthworks and landscape mitigation planting to reduce visual intrusion and integrate the Proposed Scheme into the surrounding landscape (see Volume 2: Map CT-06-320, I6 to J7 and Map CT-06-321, A5 to A6);
- Hulseheath embankment, 1km in length, 54m in width and 9m9m in height, with associated landscape mitigation planting on both sides of the Proposed Scheme and landscape earthworks on the western side of the Proposed Scheme to reduce visual and noise intrusion and integrate the Proposed Scheme into the surrounding landscape (see Volume 2: Map CT-06-321, A6 to D8);

- areas of woodland habitat creation along the western and eastern sides of the Hulseheath embankment, to provide replacement habitat (see Volume 2: Map CT-06-321, A5 to D8);
- four ecological mitigation ponds within an area of grassland habitat creation to the west of the HS2 Manchester spur to provide replacement habitat (see Volume 2: Map CT-06-321, B5 to C6); and
- realignment of Peacock Lane, 160m to the north of its existing alignment on an embankment 1km in length and up to 9m in height. The realigned Peacock Lane would cross the HS2 Manchester spur on the Peacock Lane East overbridge, up to 13.1m above existing ground level. The existing Peacock Lane would be closed where it would cross the HS2 Manchester spur (see Volume 2: Map CT-06-321, C7 to D8).

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

2.2.34 Construction of this section would be managed from the A50 Cliff Lane main compound.

2.2.35 This is described in Section 2.3, and shown on map CT-05-319 to CT-05-321, CT-05-351 and CT-05-351-R1 in the Volume 2: MA03 Map Book.

Demolitions

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

2.2.37 At this stage of the design development, it is anticipated that demolition of 14 existing residential properties, six commercial/ business properties (including farm outbuildings) and six other structures would be required to construct the permanent features in the Pickmere to Agden and Hulseheath area. These could be needed for construction of permanent features or, in some cases, to enable the construction works for the Proposed Scheme. Demolitions would be managed from the same construction compounds as the permanent features with which they are associated. The identified demolitions are listed in Section 2.3 under the relevant construction compounds.

2.3 Construction of the Proposed Scheme

2.3.1 This section sets out the key construction activities that are envisaged to build the Proposed Scheme in the Pickmere to Agden and Hulseheath area. The construction arrangements described in this section provide the basis for the assessment presented in this working draft ES.

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

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

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

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

Code of Construction Practice

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

2.3.7 In addition, HS2 Ltd has produced a Community Engagement Framework[13] which sets out how HS2 Ltd and its contractors, as well as their sub-contractors, would undertake community engagement during the construction of the HS2 project. The framework is being implemented on Phase One of HS2 and is applicable to all phases of HS2.

2.3.8 The objectives of the framework include:

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

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

offering opportunities to influence them, where appropriate.

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

Overview of the construction process

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

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

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

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

Advance works

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

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

heritage survey and investigation;

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

Engineering works

Introduction

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

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

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

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

General overview of construction compounds

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

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

operatives, and welfare facilities.

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

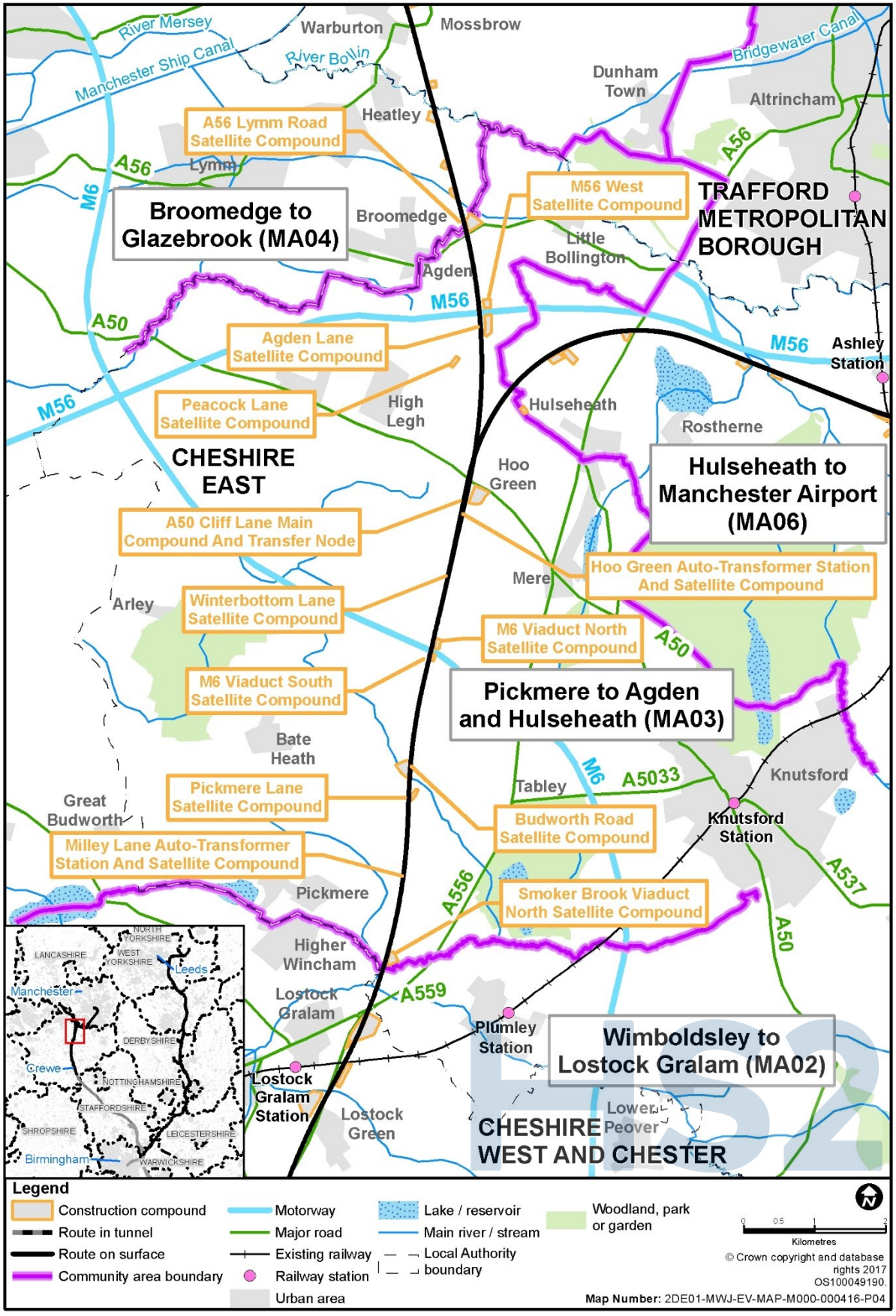
2.3.18 One main civil engineering compound, the A50 Cliff Lane main compound, would be located in the Pickmere to Agden and Hulseheath area. This would manage nine civil engineering satellite compounds in the area.

2.3.19 Nine civil engineering satellite compounds would be located in the Pickmere to Agden and Hulseheath area. A further three satellite compounds would be located in the area and would be used as a railway installation satellite compounds.

2.3.20 The railway installation satellite compounds would be managed from the Manchester Airport Station main compound in the Hulseheath to Manchester Airport area (MA06).

2.3.21 The location of construction compounds in the Pickmere to Agden and Hulseheath area is shown on Figure 4. Map Series CT-05 (in the Volume 2: MA03 Map Book) shows in detail the locations of the construction compounds described below.

Figure 4: Location of construction compounds in the Pickmere to Agden and Hulseheath area



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

2.3.23 In the Pickmere to Agden and Hulseheath area there would be worker accommodation at A50 Cliff Lane main compound for the construction workforce. Details of the location and duration of worker accommodation are provided in the description of the compound.

2.3.24 Soil stripped as part of the works, prior to it being used when the land is reinstated, would be stored for the duration of construction. The location of top soil storage areas would generally be adjacent to compounds and areas of construction activity. These areas are referred to as material stockpiles and those adjacent to compounds are shown on maps CT-05-316b to CT-05-319, maps CT-05-320 to CT-05-321 and map CT-05-322a, in the Volume 2: MA03 Map Book.

2.3.25 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

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

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

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

2.3.29 Areas of land are also required for the storage, loading and unloading of bulk earthworks materials that are moved to and from the site on public roads. These areas would allow transfer of material between road vehicles and site vehicles during construction to balance traffic movements on the road network. These areas are referred to as transfer nodes and are shown on Map CT-05-320 in the Volume 2: MA03 Map Book.

Construction compounds

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

Figure 5: Construction compounds for civil engineering works

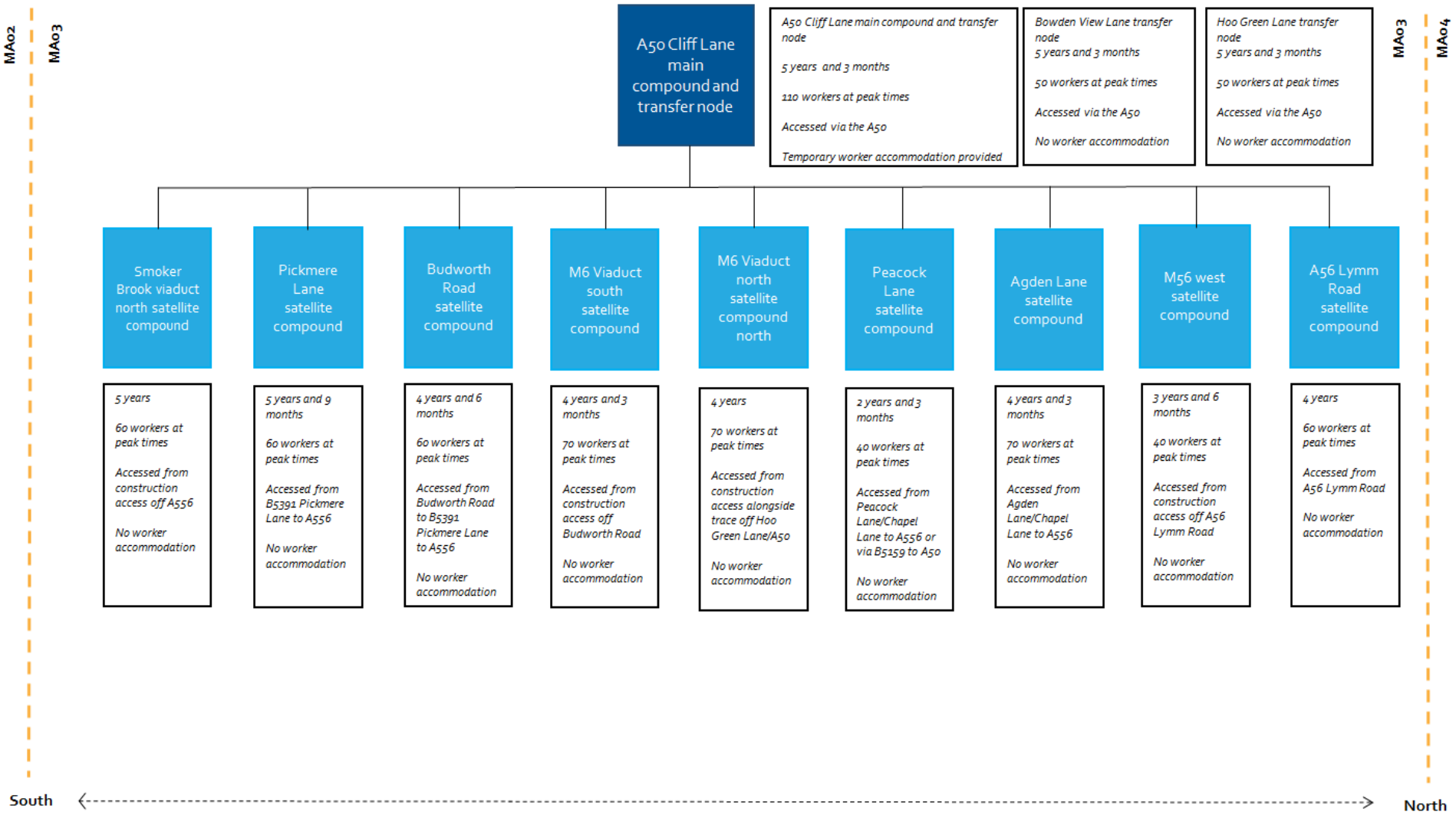
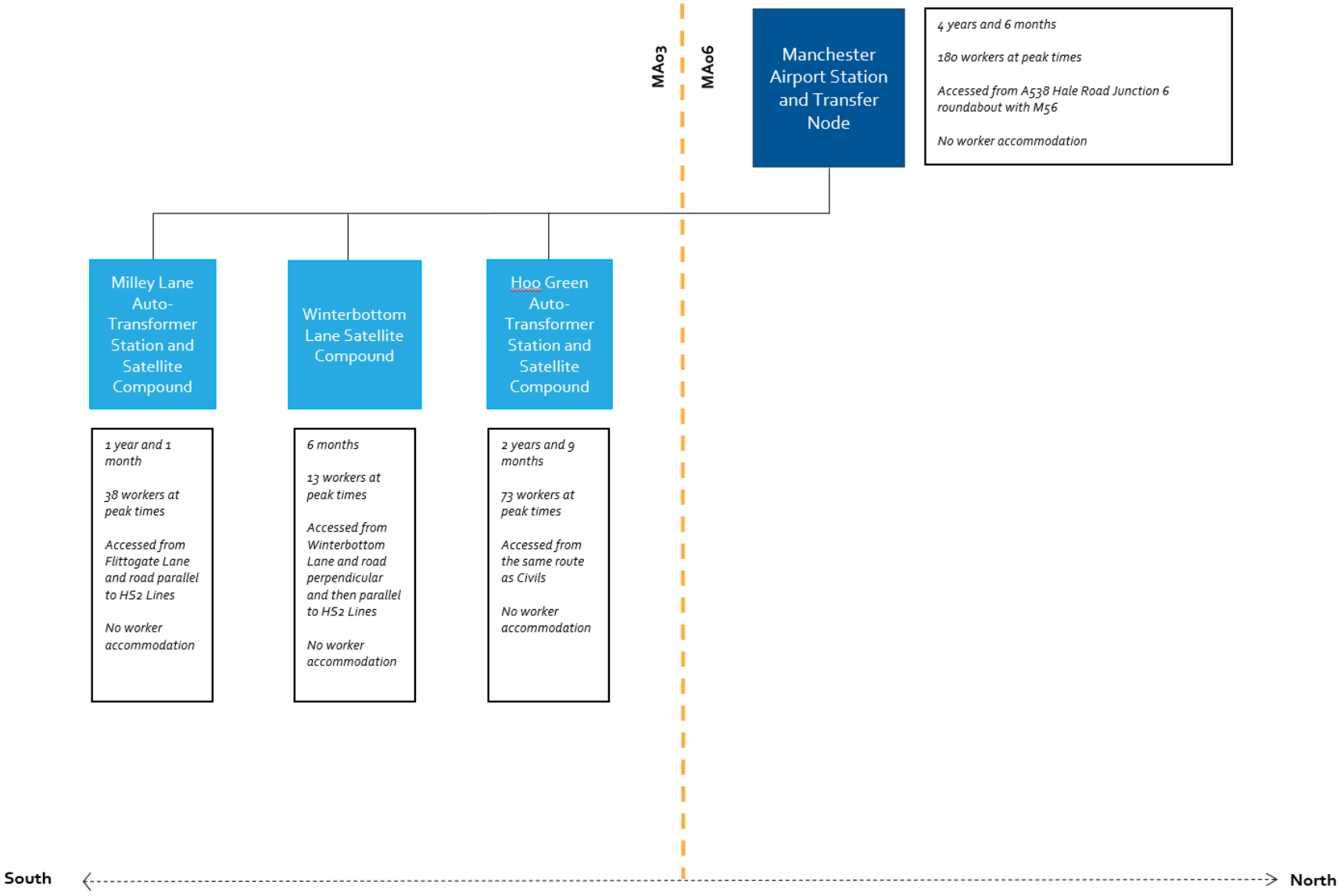


Figure 6: Construction compounds for railway systems works



A50 Cliff Lane main compound

2.3.31 This compound (Map CT-05-320, C4 to C5 and D4 to D5;, Map CT-05-320, E6 to E8 and F6 to F8; and Map CT-05-320, F6 to F9 and G7 to G9) would be used to manage civil engineering works and the storage of excavated material and provide main compound support to nine satellite compounds in the Pickmere to Agden and Hulseheath area, as illustrated in Figure 5, for a period of five years and three months. On completion of the civil engineering works, part of the compound would remain and manage railway systems installation works for a period of two years and six months.

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

Table 1: Demolitions required as a result of the works to be managed from the A50 Cliff Lane main compound and transfer nodes

Description	Location	Feature resulting in the demolition
Residential		
Residential property	Holly House Farm, Warrington Road, Mere	Hoo Green cutting and mitigation earthworks
Two residential properties on Bowden View Lane	Bowden View Lane, Mere	Hoo Green cutting and mitigation earthworks
Residential property	Hollybank House (Four Acres), Lymm Road, Lymm	Lymm embankment
Residential property	Gorse Cottage, Chapel Lane, Mere	Hulseheath embankment
Residential property	Chapel Lane, Mere	Hulseheath embankment
Residential property	Runnymede, Thowler Lane, Millington	Hulseheath embankment
Commercial		
Three commercial units at the Homestead	Bowden View Farm, Bowden View Lane, Mere	Hoo Green cutting and mitigation earthworks
Burnside Farm	Chapel Lane, Mere, Knutsford	Hulseheath embankment
Other		
Four barns/out buildings	Peacock Lane, High Legh	Hulseheath embankment
Two buildings at rear of Scandia House	Moss Lane, High Legh	Mitigation earthworks

2.3.33 The compound would be used to manage the construction of the following bridges and viaducts:

- Hoo Green Lane overbridge, which would take one year and six months to complete;
- A50 overbridge, which would take two years and three months to complete; and
- High Legh box structure to carry the HS2 main line twin tracks below the cross-over for the HS2 Manchester spur line down track, which would take one year and nine months to complete.

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

- Over Tabley embankment, which would take two years to complete;
- Hulseheath embankment, which would take two years to complete;
- Mere cutting, which would take one year to complete;
- Hoo Green cutting, which would take two years and six months to complete; and
- High Legh cutting to the north of the High Legh box structure, which would take two years and nine months to complete.

2.3.35 The compound would also be used to manage access to site for the M6 Mere viaduct and act as interim storage of excavated material prior to transport off site by road.

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

- realignment of Hoo Green Lane for a period of one year and six months. On completion of construction, Hoo Green Lane would be permanently realigned 180 to the north on Hoo Green Lane overbridge; and
- realignment of the A50 for a period of two years and three months. On completion of construction, the A50 would be permanently realigned 30m to the south on the A50 overbridge.

2.3.37 Key railway systems works to be managed from this compound would include:

- Hoo Green ATFS to the east of the Hoo Green auto-transformer feeder station satellite compound. This ATFS would be served by the same access road as the satellite compound and Hoo Green GSP; and
- Hoo Green auto-transformer feeder station satellite compound and Hoo Green GSP, to the east of the Hoo Green cutting, which would be accessed from a new road off Hoo Green Lane.

Smoker Brook viaduct north satellite compound

2.3.38 This compound (Map CT-05-316b, F5 to G6) would be used to manage civil engineering works in the Pickmere to Agden and Hulseheath area, as illustrated in Figure 5 for a period of five years.

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

2.3.40 The compound would be used to manage the construction of Smoker Brook viaduct, which would take two years and nine months to complete.

2.3.41 The compound would be used to manage the construction of the Pickmere embankment (in conjunction with Pickmere Lane satellite compound), which would take two years to complete.

2.3.42 The works to be managed from this compound would require the realignment of Pickmere Footpath 5 for a period of two years and three months. On completion of construction, Pickmere Footpath 5 would be permanently realigned 100m to the north on Pickmere Footpath 5 accommodation underbridge.

Milley Lane auto-transformer station satellite compound

2.3.43 This compound (Map CT-05-317, D7) would be used to manage rail systems works in the Pickmere to Agden and Hulseheath area, as illustrated in Figure 6, for a period of one year and one month.

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

2.3.45 Key railway systems works to be managed from this compound would include the construction and installation of Milley Lane auto-transformer station, on the east side of the route of the Proposed Scheme, 200m north of Providence Farm, which would take two years to complete.

Pickmere Lane satellite compound

2.3.46 This compound (Map CT-05-317, I7 toJ7 and Map CT-05-318, A3 to A4) would be used to manage civil engineering works in the Pickmere to Agden and Hulseheath area, as illustrated in Figure 5, for a period of five years and nine months.

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

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

Description	Location	Feature resulting in the demolition
Residential		
Two residential properties on Pickmere Lane	Pickmere Lane, Pickmere	Pickmere embankment
Residential property	Windmill House, Budworth Road, Tabley	Heyrose embankment
Residential property and outbuilding	Heyrose Lane, Tabley	Heyrose embankment
Two residential properties on Heyrose Lane	Heyrose Lane, Tabley	Heyrose embankment
Residential property	Flittogate Lane, Tabley	Pickmere embankment and Flittogate Lane realignment
Commercial		
Flittogate Farm	Flittogate Lane, Tabley	Pickmere embankment and Flittogate Lane realignment
Commercial property	Windmill Nursery, Budworth Road, Tabley	Heyrose embankment

2.3.48 The compound would be used to manage the construction of Arley Brook viaduct (in conjunction with Budworth Road satellite compound), which would take one year to complete.

2.3.49 The compound would be used to manage the construction of the Pickmere embankment (in conjunction with Smoker Brook viaduct North satellite compound), which would take two years to complete.

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

- realignment of Pickmere Lane, which would take two years and six months to complete. On completion of construction, Pickmere Lane would be permanently realigned 90m to the south on Pickmere Lane overbridge; and
- permanent diversion of Flittogate Lane for a period of one year and six months. On completion of construction, Flittogate Lane would be permanently diverted 190m to the north of its existing alignment.

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

- realignment of Tabley Inferior Footpath 2 and 3 for a period of two years and three months. On completion of construction, Tabley Inferior Footpath 2 and 3 would be permanently realigned 80m to the south on Tabley Inferior Footpath 2 and 3 accommodation overbridge; and
- realignment of Tabley Inferior Footpath 4 for a period of two years and six months. On completion of construction, Tabley Inferior Footpath 4 would be permanently realigned 120m to the north of its existing alignment over the Pickmere Lane overbridge.

2.3.52 Works to watercourses resulting from works to be managed from this compound would include, Waterless Brook culvert to enable the construction of the realigned B5391 Pickmere Lane.

Budworth Road satellite compound

2.3.53 This compound (Map CT-05-318, B2 to B3 and C1 to C3) would be used to manage civil engineering works in the Pickmere to Agden and Hulseheath area, as illustrated in Figure 5, for a period of four years and six months.

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

2.3.55 The compound would be used to manage the construction of Arley Brook viaduct (in conjunction with Pickmere Lane satellite compound), which would take one year to complete.

2.3.56 The compound would be used to manage the construction of Heyrose embankment (in conjunction with the M6 viaduct South satellite compound), which would take one year and six months to complete.

2.3.57 The compound would also be used to manage the access to the site for the southern side of the M6 viaduct construction.

2.3.58 Works to PRoW resulting from works to be managed from this compound include the realignment of Tabley Superior Restricted Bridleway 4 for a period of two years and three months. On completion of construction, Tabley Superior Restricted Bridleway 4 would be permanently realigned 20m to the south on Tabley Superior Restricted Bridleway 4 accommodation underbridge.

2.3.59 The works to be managed from this compound would require the following works to watercourses and drainage:

- Bongs Wood South culvert would be constructed to carry a stream below Heyrose embankment; and
- Bongs Wood North culvert would be constructed to carry this a stream below Heyrose embankment.

M6 viaduct south satellite compound

2.3.60 This compound (map CT-05-319, B6) would be used to manage civil engineering works in the Pickmere to Agden and Hulseheath area, as illustrated in Figure 5, for a period of four years and three months.

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

2.3.62 The compound would be used to manage the construction of the M6 Mere viaduct, which would take two years and three months to complete.

2.3.63 The compound would be used to manage the construction of the Heyrose embankment (in conjunction with the Budworth Road satellite compound), which would take one year and six months to complete.

2.3.64 The compound would be used to manage the construction of the Tabley Superior Restricted Bridleway 4 accommodation underbridge, which would take two years and three months to complete.

M6 viaduct north satellite compound

2.3.65 This compound (Map CT-05-319, C6) would be used to manage civil engineering works in the Pickmere to Agden and Hulseheath area, as illustrated in Figure 5, for a period of four years.

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

2.3.67 The compound would be used to manage the construction of the M6 Mere viaduct, which would take two years and three months to complete.

2.3.68 The compound would be used to manage the construction of the Over Tabley embankment (in conjunction with the A50 Cliff Lane main compound), which would take two years to complete.

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

- construction of a site access road along the line of the permanent embankment from the A50 near Hoo Green, along the route of the Proposed Scheme to construct the M6 Mere viaduct (north side);
- Mere Bridleway 1 accommodation underbridge, which would take two years and three months to complete; and
- a small underbridge to carry the Mere Bridleway 1 accommodation underbridge below Over Tabley embankment.

2.3.70 The works to be managed from this compound would require the following works to watercourses and drainage:

- Winterbottom north culvert would be constructed below the Over Tabley embankment in the vicinity of Winterbottom Farm; and
- Winterbottom south culvert would be constructed below the Over Tabley embankment adjacent to Winterbottom Farm.

Winterbottom Lane satellite compound

2.3.71 This compound (Map CT-05-319, H5) would be used to manage rail systems works in the Pickmere to Agden and Hulseheath area, as illustrated in Figure 6, for a period of six months.

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

2.3.73 Key railway systems works to be managed from this compound would include construction and installation of part of the Manchester spur (northbound), on the west side of the route of the Proposed Scheme, 400m north of Winterbottom Farm, which would take six months to complete.

Hoo Green auto-transformer feeder station satellite compound

2.3.74 This compound (Map CT-05-320, C6 to C7 and D6 to D7) would be used to manage rail systems works in the Pickmere to Agden and Hulseheath area, as illustrated in Figure 6, for a period of two years and nine months.

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

2.3.76 Key railway systems works to be managed from this compound would include construction and installation of part of the Manchester spur (southbound) along with the construction and installation of the Hoo Green auto-transformer feeder station, on the east side of the route of the Proposed Scheme, 300m north of Daisybank Farm. These works would take two years and nine months to complete.

Peacock Lane satellite compound

2.3.77 This compound (Map CT-05-321, E2 to E3 and F2 to F3) would be used to manage civil engineering works in the Pickmere to Agden and Hulseheath area, as illustrated in Figure 5, for a period of two years.

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

2.3.79 The compound would be used to manage the construction of Hulseheath embankment (in conjunction with the A50 Cliff Lane main compound), which would take one year and nine months to complete.

2.3.80 The works to be managed from this compound would require the realignment of Peacock Lane for a period of two years. On completion of construction, Peacock Lane would be permanently realigned 180m to the north on Peacock Lane west overbridge.

Agden Lane satellite compound

2.3.81 This compound (Map CT-05-321, H6 to H7 and I6 to I7) would be used to manage civil engineering works in the Pickmere to Agden and Hulseheath area, as illustrated in Figure 5, for a period of four years.

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

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

- M56 West box structure, which would take two years and three months to complete;
- High Legh cutting (in conjunction with the A50 Cliff Lane main compound), which would take two years and three months to complete; and
- works to public roads resulting from works to be managed from this compound include the permanent closure of Agden Lane.

M56 west satellite compound

2.3.84 This compound (Map CT-05-321, J6 to J7 and Map CT-05-322a, A6 to A7) would be used to manage civil engineering works in the Pickmere to Agden and Hulseheath area, as illustrated in Figure 5, for a period of three years and six months.

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

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

- Lymm embankment (in conjunction with the A56 Lymm Road satellite compound), which would take one year and nine months to complete; and
- Agden cutting, which would take two years to complete.

2.3.87 The compound would be used to manage the construction of the M56 West box structure (in conjunction with the Agden Lane satellite compound), which would take two years and three months to complete.

A56 Lymm Road satellite compound

2.3.88 This compound (Map CT-05-322a, F6 to F7 and G6 to G8) would be used to manage civil engineering works in the Pickmere to Agden and Hulseheath area, as illustrated in Figure 5, for a period of four years.

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

2.3.90 The compound would be used to manage the construction of Lymm embankment (in conjunction with the M56 West satellite compound), which would take one year and nine months to complete.

2.3.91 The compound would be used to manage the construction of A56 Lymm Road underbridge, which would take two years and six months to complete.

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

- permanent closure of Agden Lane to the east of Agden Lane Farm; and
- construction of a temporary 300m long section of road for diversion of the A56 Lymm Road to the north of its current alignment and to facilitate construction of the new A56 Lymm Road underbridge (on its current alignment). On completion of construction and reinstatement of the original A56 road alignment, this temporary road would be removed.

Construction waste and material resources

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

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

2.3.95 Local excess or shortfall of excavated material within the Pickmere to Agden and Hulseheath area would be managed through the mitigation earthworks design approach adopted for the Proposed Scheme with the aim of contributing to an overall balance of excavated material on a route-wide basis. The overall balance of excavated material will be presented in Volume 3 of the Final ES.

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

Commissioning of the railway

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

Construction programme

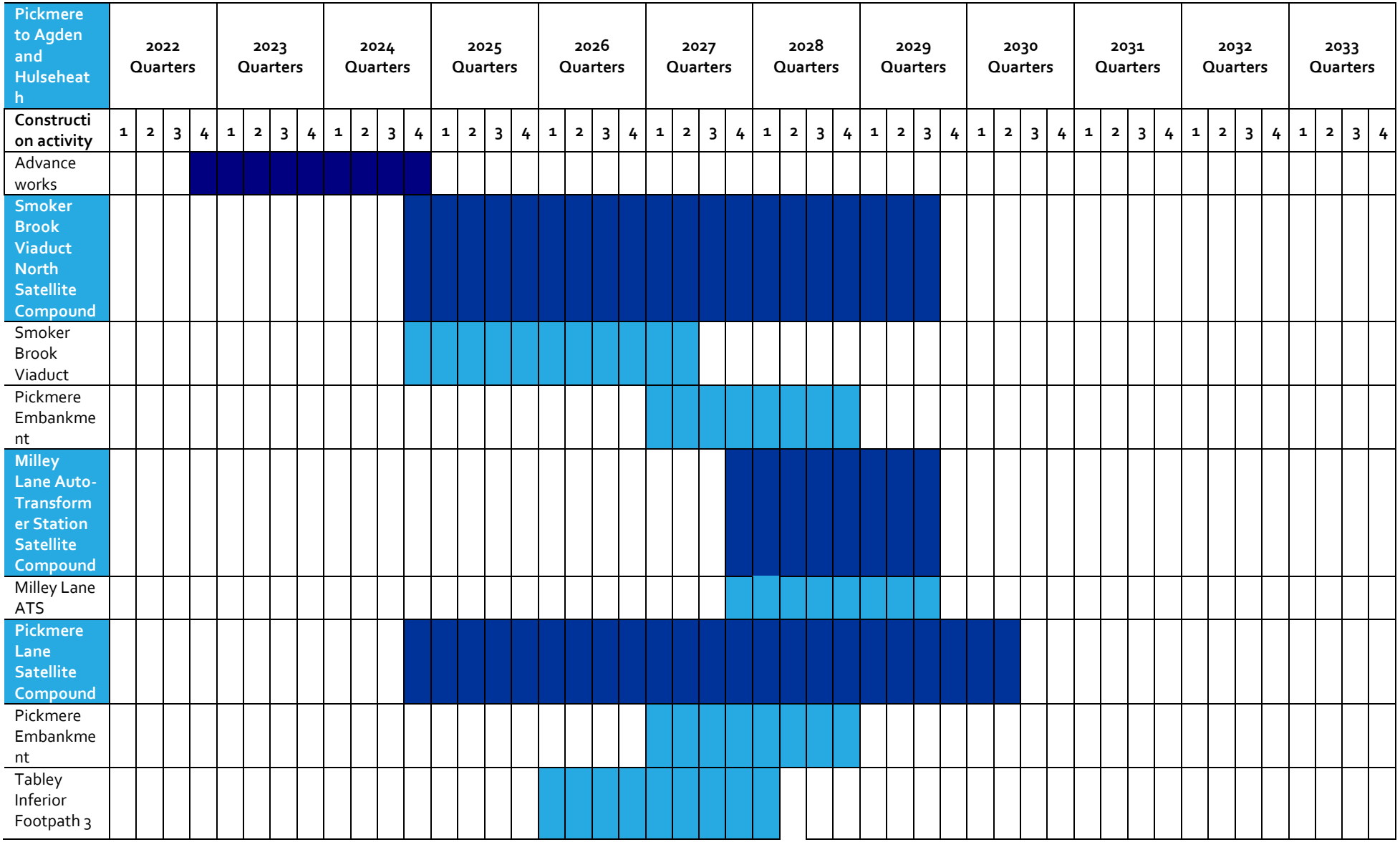
2.3.98 A construction programme illustrating indicative periods for each of the core construction activities described above is provided in Figure 7. Construction durations referred to in the following sections of this report are based on this indicative programme.

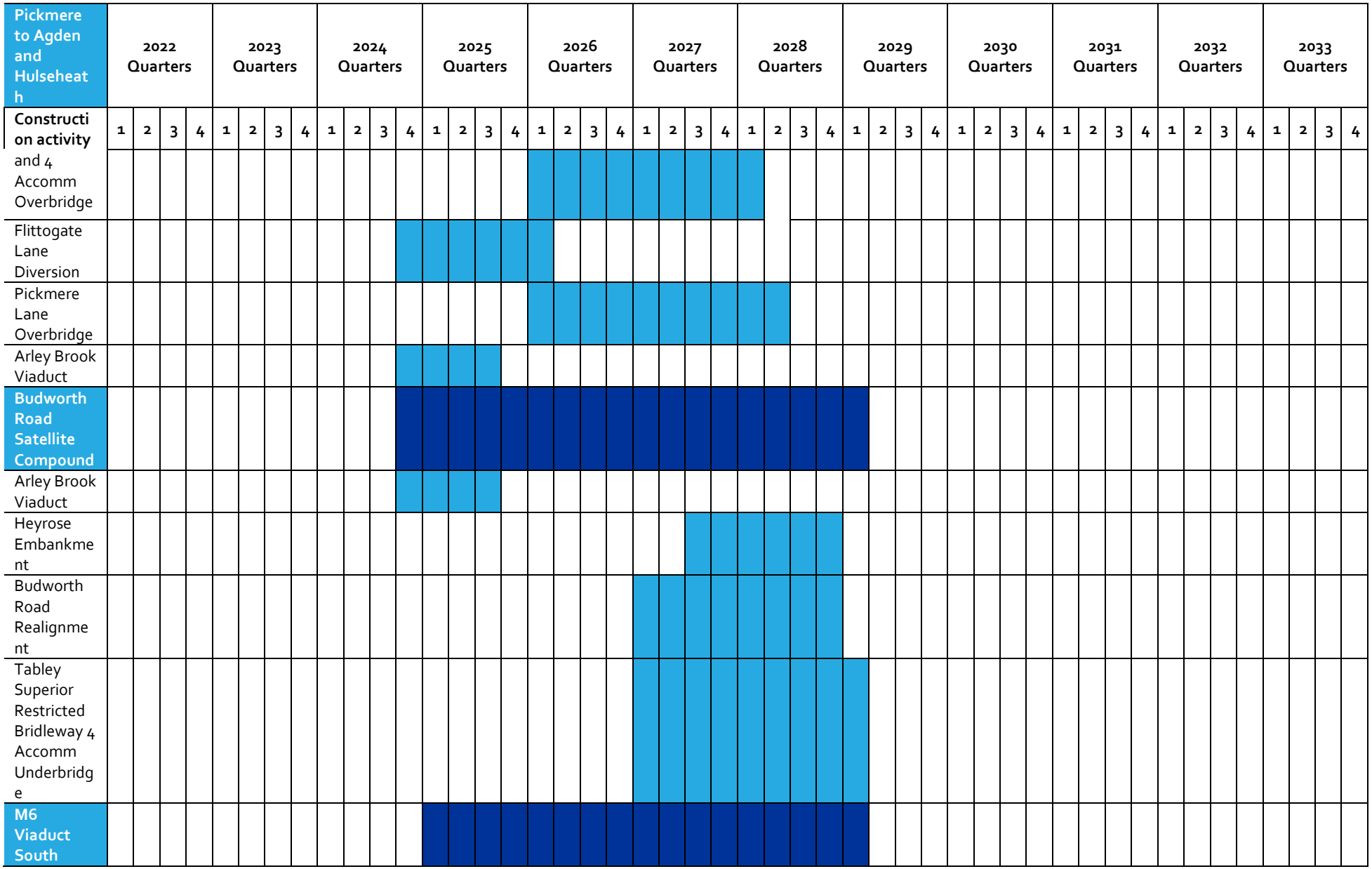
Monitoring during construction

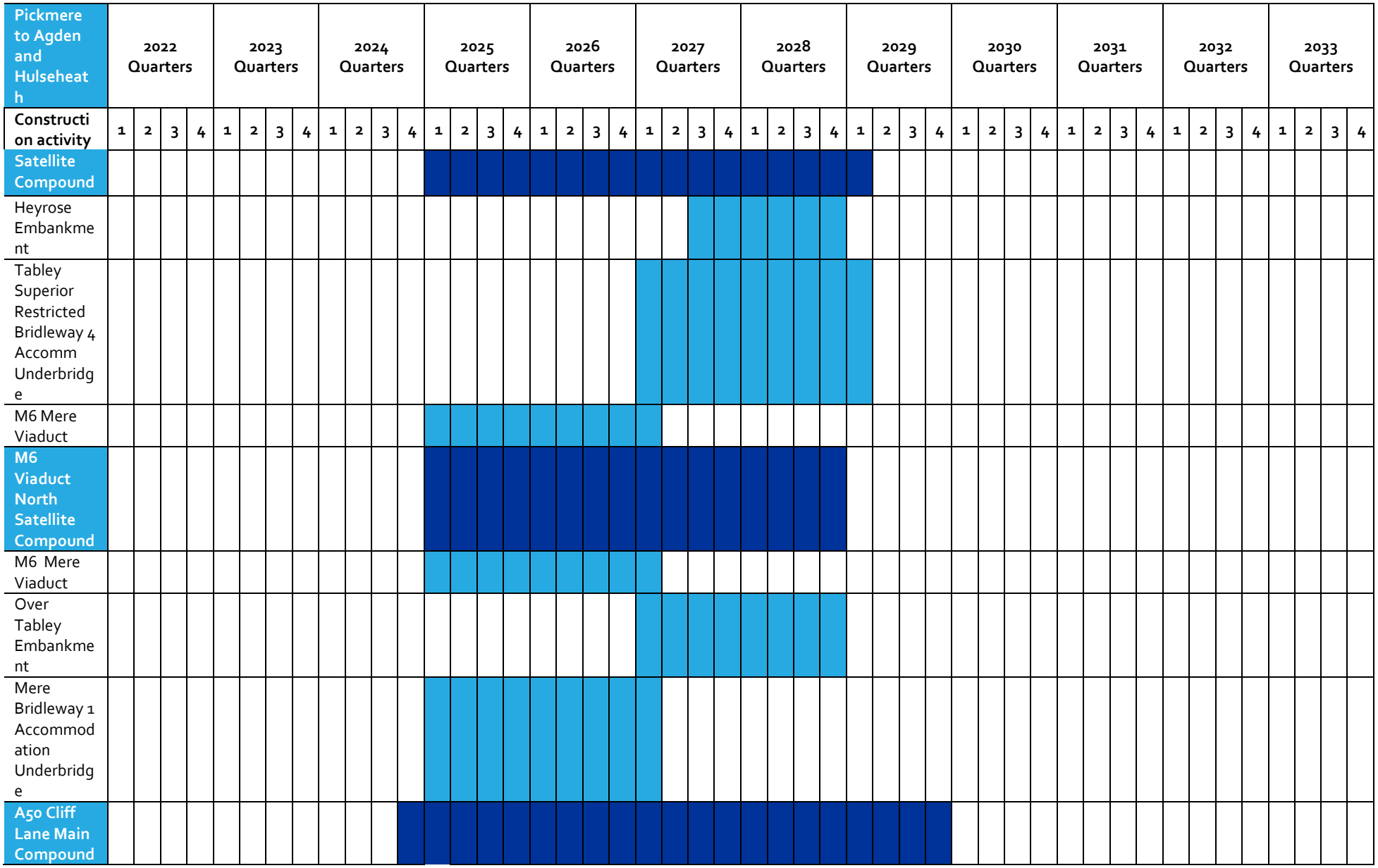
2.3.99 The appointed contractor would be required to undertake the necessary monitoring for each environmental topic to comply with the requirements of the CoCP, the relevant LEMP and any additional consent requirements. Any actions that may be necessary for compliance would be reported to the nominated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

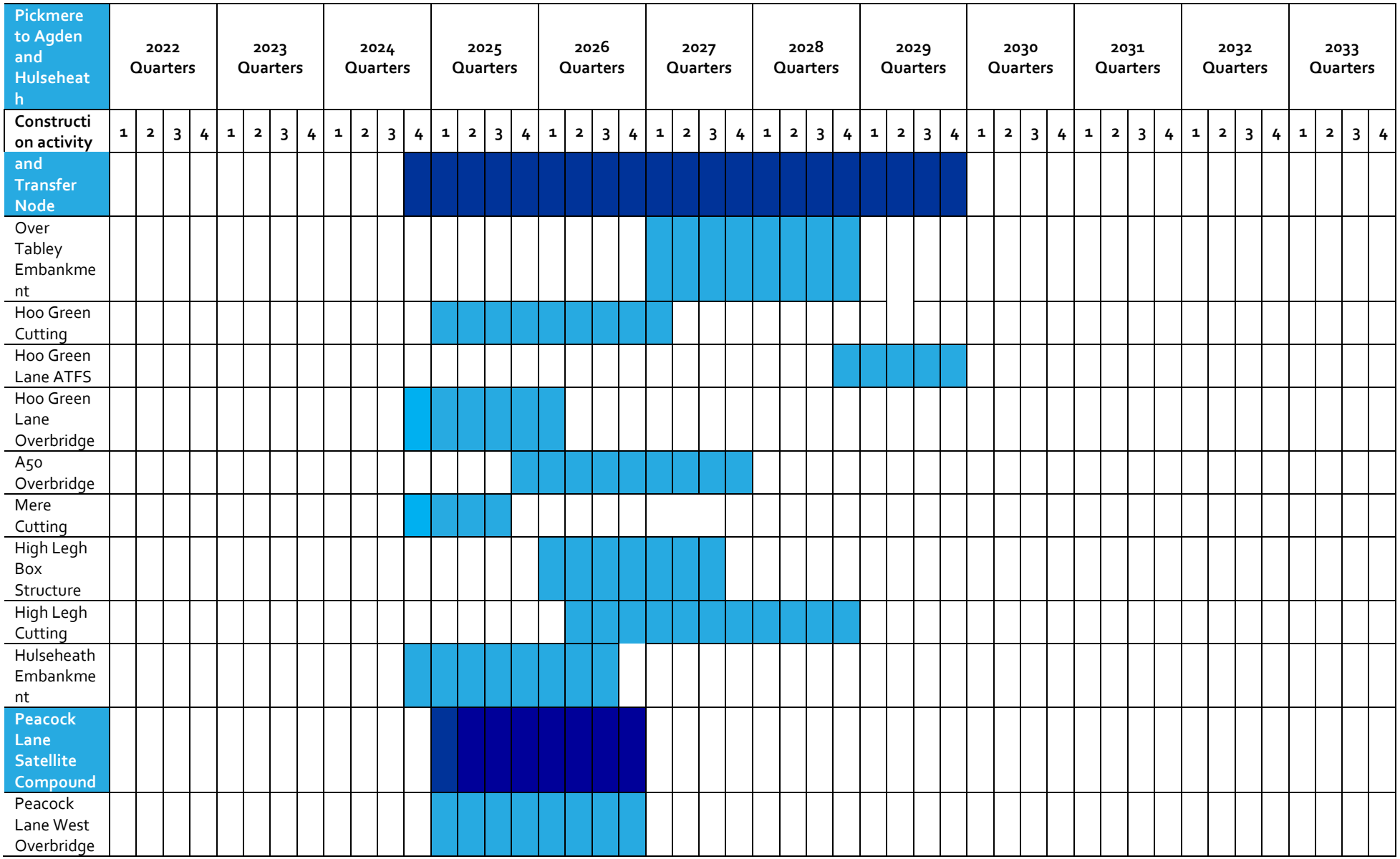
2.3.100 The CoCP and the relevant LEMP would set out inspection and monitoring procedures to assess the effectiveness of measures to prevent or reduce environmental effects during construction. Relevant local authorities and consenting authorities, such as the Environment Agency, would be consulted on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

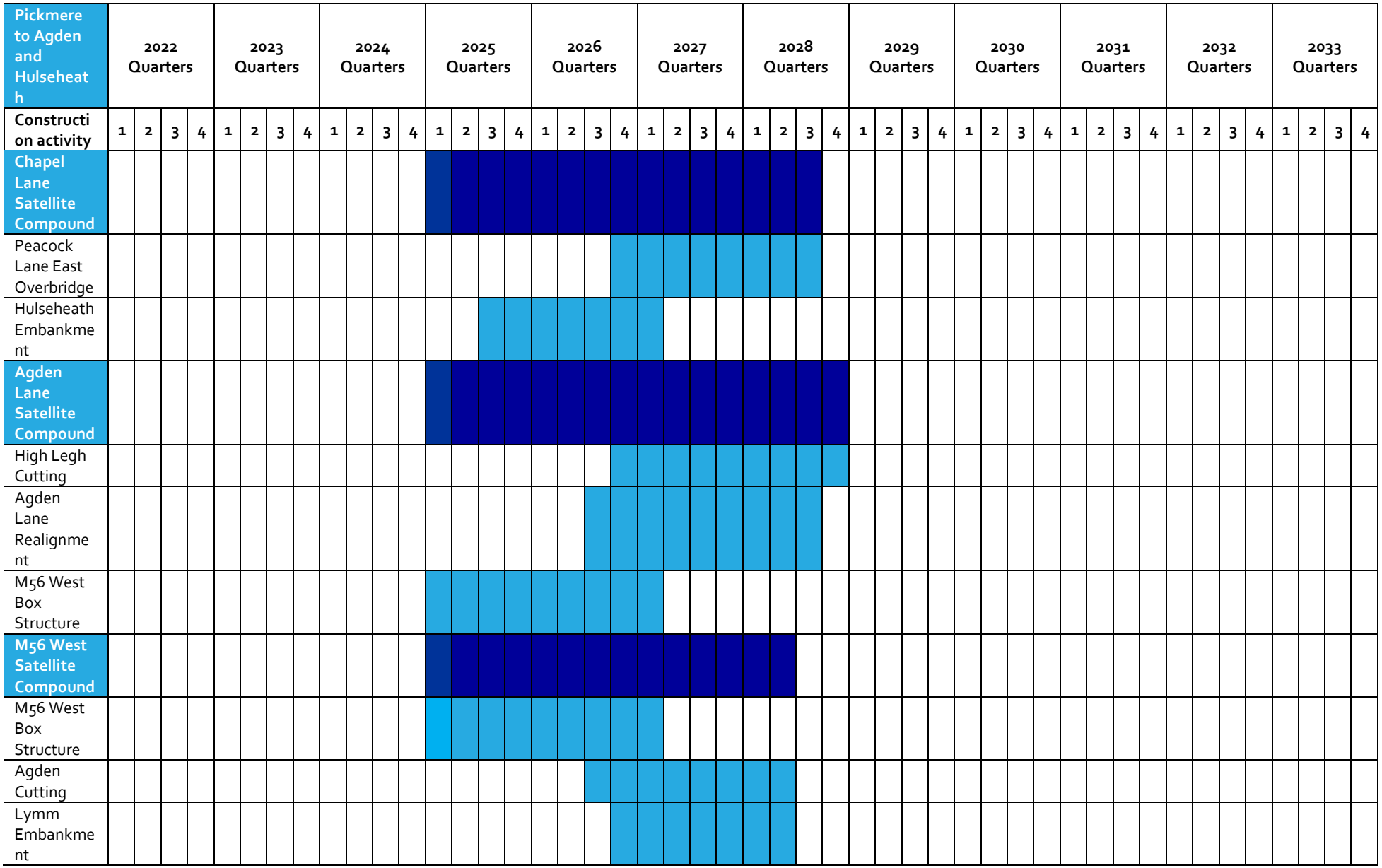
Figure 7: Indicative construction programme between 2023 and 2033




Pickmere to Agden and Hulseheath
2022 Quarters
2023 Quarters
2024 Quarters
2025 Quarters
2026 Quarters
2027 Quarters
2028 Quarters
2029 Quarters
2030 Quarters
2031 Quarters
2032 Quarters
2033 Quarters
1 2 3 4
Construction activity
and 4 Accomm Overbridge
Flittogate Lane Diversion
Pickmere Lane Overbridge
Arley Brook Viaduct
Budworth Road Satellite Compound
Arley Brook Viaduct
Heyrose Embankment
Budworth Road Realignment
Tabley Superior Restricted Bridleway 4 Accomm Underbridge
M6 Viaduct South


Pickmere to Agden and Hulseheath
2022 Quarters
2023 Quarters
2024 Quarters
2025 Quarters
2026 Quarters
2027 Quarters
2028 Quarters
2029 Quarters
2030 Quarters
2031 Quarters
2032 Quarters
2033 Quarters
1 2 3 4
Construction activity
Satellite Compound
Heyrose Embankment
Tabley Superior Restricted Bridleway 4 Accomm Underbridge
M6 Mere Viaduct
M6 Viaduct North Satellite Compound
M6 Mere Viaduct
Over Tabley Embankment
Mere Bridleway 1 Accommodation Underbridge
A50 Cliff Lane Main Compound


Pickmere to Agden and Hulseheath
2022 Quarters
2023 Quarters
2024 Quarters
2025 Quarters
2026 Quarters
2027 Quarters
2028 Quarters
2029 Quarters
2030 Quarters
2031 Quarters
2032 Quarters
2033 Quarters
1 2 3 4
Construction activity
and Transfer Node
Over Tabley Embankment
Hoo Green Cutting
Hoo Green Lane ATFS
Hoo Green Lane Overbridge
A50 Overbridge
Mere Cutting
High Legh Box Structure
High Legh Cutting
Hulseheath Embankment
Peacock Lane Satellite Compound
Peacock Lane West Overbridge


Pickmere to Agden and Hulseheath
2022 Quarters
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2026 Quarters
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2028 Quarters
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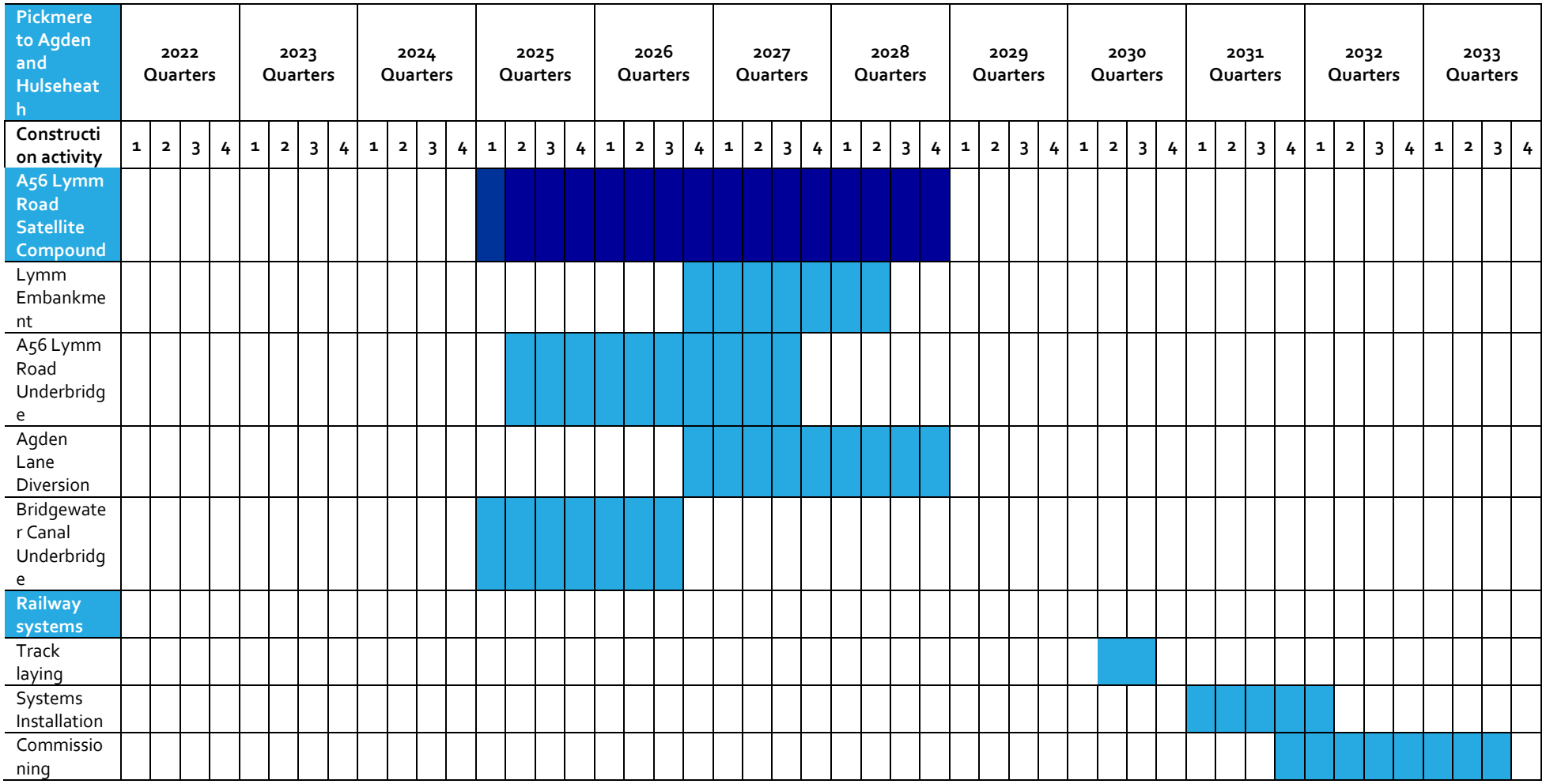
2030 Quarters
2031 Quarters
2032 Quarters
2033 Quarters
1 2 3 4
Construction activity
Chapel Lane Satellite Compound
Peacock Lane East Overbridge
Hulseheath Embankment
Agden Lane Satellite Compound
High Legh Cutting
Agden Lane Realignment
M56 West Box Structure
M56 West Satellite Compound
M56 West Box Structure
Agden Cutting
Lymm Embankment


Pickmere to Agden and Hulseheath
2022 Quarters
2023 Quarters
2024 Quarters
2025 Quarters
2026 Quarters
2027 Quarters
2028 Quarters
2029 Quarters
2030 Quarters
2031 Quarters
2032 Quarters
2033 Quarters
Construction activity
1 2 3 4
A56 Lymm Road Satellite Compound
Lymm Embankment
A56 Lymm Road Underbridge
Agden Lane Diversion
Bridgewater Canal Underbridge
Railway systems
Track laying
Systems Installation
Commissioning

2.4 Operation of the Proposed Scheme

Introduction

2.4.1 This section describes the operational characteristics of the Proposed Scheme in the Pickmere to Agden and Hulseheath area. Volume 1, Section 4 describes the envisaged operational characteristics of the Proposed Scheme as a whole, including Phase One, Phase 2a and Phase 2b.

HS2 services

2.4.2 It is anticipated that there would be up to nine trains per hour each way on the HS2 main line, south of the Manchester spur passing through the Pickmere to Agden and Hulseheath area. North of the Manchester spur, it is anticipated that three trains per hour would continue each way on the HS2 main line. On the Manchester spur, towards the Hulseheath to Manchester Airport area, it is anticipated that there would be up to six trains per hour each way. Services are expected to operate between 05:00 and midnight from Monday to Saturday and 08:00 and midnight on Sunday.

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

Maintenance

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

2.4.5 Asset performance and condition monitoring would be undertaken using asset condition monitoring and unattended measurement systems fitted to the HS2 passenger rolling stock. Intrusive inspections would be carried out during the maintenance period. The maintenance approach would be a combination of risk based, preventative and reactive maintenance.

2.4.6 Provision for railway maintenance vehicles along the western leg of the route of the Proposed Scheme would be made at the Crewe North RSD in the Wimboldsley to Lostock Gralam area (MA02). Further information on the Crewe North RSD can be found in Volume 2: Community area report MA02, Wimboldsley to Lostock Gralam.

Operational waste and material resources

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

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

Monitoring during operation

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

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

2.5 Route section alternatives

Proposed auto-transformer feeder station location

2.5.1 During the design development process since the announcement of the preferred route in July 2017, further consideration has been given to the location of an auto-transformer feeder station at Hoo Green, which would supply electrical power from the National Grid network to the Proposed Scheme. The auto-transformer feeder station would house the electrical equipment that would protect and control the power supply to the Proposed Scheme. The auto-transformer feeder station would be required at the start of a neutral section[14] along the route of the Proposed Scheme at a location with a potential grid supply point to provide grid connection to existing electrical infrastructure.

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

- Option 1A: the auto-transformer feeder station would be located immediately to the south of the A50, on the east side of the Proposed Scheme, near Hoo Green. The auto-transformer feeder station would be adjacent to the Hoo Green cutting, at ground level, within an area of existing agricultural fields. The grid supply point would be located 100m south of the auto-transformer feeder station also on the east side of the Proposed Scheme, at ground level, 100m east of the Proposed Scheme within existing agricultural fields;
- Option 1B (variant of 1A): the auto-transformer feeder station would be located 200m south of the A50, and adjacent to the east side of the Proposed Scheme, near Hoo Green. The auto-transformer feeder station would be located adjacent to the Hoo Green cutting, at ground level, within an area of existing agricultural fields. The grid supply point would be located 100m north-east of the auto-transformer feeder station, also on the east side of the Proposed Scheme, at ground level, 100m east of the Proposed Scheme within existing agricultural fields;
- Option 1D (variant of 1A): the auto-transformer feeder station would be located 200m south of the A50, on the east side of the Proposed Scheme, near Hoo Green. The auto-transformer feeder station would be adjacent to the Hoo Green cutting, at ground level, within an area of existing agricultural fields. The grid supply point would be located 100m east of the auto-transformer feeder station, also on the east side of the Proposed Scheme, at ground level, 100m east of the HS2 main line, within existing agricultural fields; and

[14] A neutral section is an insulated section that prevents two differing electrical sections from touching, by introducing an electrical clearance (an earth section)

- Option 4B: the auto-transformer feeder station would be located to the west of the Proposed Scheme, at the foot of the Heyrose embankment, in an area of land between the HS2 main line, Arley Brook and Heyrose Golf Club. The grid supply point would be located 400m west of the auto-transformer feeder station, adjacent to the existing Budworth Road, 300m south-west of Arley Brook.

2.5.3 Table 3 provides a summary of the outcomes of the preliminary appraisal of the alternative options described above.

Table 3: Consideration of local alternatives for the location of the auto-transformer feeder station at Hoo Green

Option	Outcome of analysis	Further action/considerations
Option 1A	Increased community, noise and air quality impacts compared to the Proposed Scheme due to being closer to sensitive receptors in Hoo Green, which would be less than 100m from the auto-transformer feeder station. Greater impact on historic environment compared to the Proposed Scheme due to closer proximity to heritage assets (Mere Court Hotel and Legh Cottage – Grade II listed, and a scheduled monument at Hough Hall). Temporary landscape and visual impacts would likely result from this option on the residents of Hoo Green, however, impacts would be similar to the Proposed Scheme as there would be no impact on users of Heyrose Golf Club and on the residents of Heyrose Farm and Yew Tree Farm. Similar land requirements, construction complexity, construction programme, and construction and maintenance costs to the Proposed Scheme.	This option will not be subject to further consideration.
Option 1B	Increased community, noise and air quality impacts compared to the Proposed Scheme due to being closer to sensitive receptors in Hoo Green, which would be less than 100m from the grid supply point location. Greater impact on historic environment compared to Proposed Scheme due to closer proximity to heritage assets (Mere Court Hotel and Legh Cottage – Grade II listed, and a scheduled monument at Hough Hall). Temporary landscape and visual impacts would likely to result from this option on the residents of Hoo Green, however, impacts would be similar to the Proposed Scheme as there would be no impact on users of Heyrose Golf Club and on the residents of Heyrose Farm and Yew Tree Farm. Similar land requirements, construction complexity, construction programme, and construction and maintenance costs to the Proposed Scheme.	This option will not be subject to further consideration.

Option	Outcome of analysis	Further action/considerations
Option 1D (the Proposed Scheme)	Lower air quality, community and noise impacts compared to the other options due to the increased distance of 300m from sensitive residential receptors in Hoo Green. Lower impacts on the historic environment compared to other options due to greater distance from heritage assets (Mere Court Hotel and Legh Cottage – Grade II listed, and a scheduled monument at Hough Hall). Temporary landscape and visual impacts would likely result from this option on the residents of Hoo Green, however, impacts would be similar to Options 1A and 1B, and lower when compared to Option 4B, as there would be no impact on users of Heyrose Golf Club and on the residents of Heyrose Farm and Yew Tree Farm. Similar land required to Options 1A and 1B. However, less land required than Option 4B. Similar construction complexity, construction programme, and construction and maintenance costs to the Proposed Scheme.	This is the selected option taken forward into the Proposed Scheme.
Option 4B	Increased community, noise and air quality impacts compared to the Proposed Scheme due to being closer to sensitive receptors at Yew Tree Farm. Larger area of land required than for the Proposed Scheme due to the permanent loss of one hole at Heyrose Golf Club, but it is expected that the course would remain open during construction and operation as the hole could be provided elsewhere. Greater landscape and visual impacts compared to the Proposed Scheme due to impacts on users of Heyrose Golf Club and on the residents of Heyrose Farm and Yew Tree Farm. Greater impact on historic environment compared to the Proposed Scheme due to closer proximity to heritage assets. Similar construction complexity, construction programme, and construction and maintenance costs to the Proposed Scheme.	This option will not be subject to further consideration.

2.5.4 Option 1D was taken forward into the Proposed Scheme. When compared to the other options, Option 1D would be further away from sensitive residential receptors at Hoo Green and would, therefore, have reduced impacts air quality, community, landscape and noise impacts at Hoo Green. The auto-transformer feeder station and grid supply point would be located further away from the nearest heritage assets (Grade II listed Mere Court Hotel and Legh Cottage and a scheduled monument at Hough Hall), and therefore, would have lower impacts on the historic environment than the other options. Option 1D would have similar technical and engineering complexities to the other options.

Highway alignment at Pickmere Lane

2.5.5 As part of the design development process since July 2017, consideration has been given to the design of the highway diversions at Pickmere Lane, Flittogate Lane and School Lane to reduce potential adverse impacts on residents of Pickmere.

2.5.6 The Proposed Scheme would pass on an embankment (Pickmere embankment), north-east of the village of Pickmere. The existing highway network would be disrupted by the Proposed Scheme, resulting in Budworth Road being closed, and Pickmere Lane, Flittogate Lane and School Lane being diverted to maintain connectivity to the east and west of the Proposed Scheme.

2.5.7 As part of the development of the design, further work is being undertaken to consider the location and the design of highway diversions and could result in the HS2 main line vertical alignment being altered in this area or the extension of the Arley Brook viaduct to allow the realigned highways to pass beneath the viaduct.

2.5.8 Further studies will be carried out to consider any changes to be included in the Proposed Scheme and the outcome of these studies would be reported in the formal ES.

Highway alignment at Peacock Lane

2.5.9 As part of the design development process since July 2017, consideration has been given to the design of highway diversions and to reduce potential adverse impacts on residents of High Legh and Hulseheath.

2.5.10 The Manchester spur would diverge from the HS2 main line at High Legh and would pass in cutting (High Legh cutting) to the east of High Legh with the Manchester spur passing on embankment (Hulseheath embankment) to the west of Hulseheath. The existing highway network would be disrupted by the route of the Proposed Scheme (comprising both the HS2 main line and Manchester spur in this area), resulting in Peacock Lane, Throwler Lane and Back Lane being diverted to maintain connectivity to the east and west of the Proposed Scheme.

2.5.11 Further studies will be carried out to consider the location and the design of highway diversions and could result in the HS2 main line vertical alignment being altered in this area. Any changes would be included in the Proposed Scheme and the outcome of these studies would be reported in the formal ES.

3 Stakeholder engagement and consultation

3.1 Introduction

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

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

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

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

3.2 Key stages of Phase 2b engagement and consultation

3.2.1 The process of engagement remains ongoing. A summary of engagement undertaken or underway since the initial preferred route announcement in November 2016 is provided in Table 4.

Table 4: Mechanisms and timeline of stakeholder engagement since route announcement

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

Draft EIA SMR consultation

3.2.2 The draft EIA SMR was formally consulted on between July and September 2017 and was issued to statutory bodies, non-government organisations and local authorities. It was also available on the Government's website, allowing comment by local interest groups and the public. One hundred and seven responses to the draft SMR were received, as a result of which changes were made to the SMR. These are set out in the SMR Consultation Summary Report published alongside this working draft ES and will be used to inform the assessment methodologies applied for the formal ES.

Consultation on the working draft ES and ongoing engagement

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

3.2.4 These consultations and wider feedback from ongoing stakeholder engagement will continue to be considered as part of the ongoing design of the Proposed Scheme and the assessment and identification of mitigation opportunities for the Pickmere to Agden and Hulseheath (MA03) area. A consultation summary report will be published with the formal ES explaining how the responses have been taken into consideration.

3.3 Informing the Proposed Scheme

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

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

- temporary and permanent land requirements;
- impact of construction traffic on the local road network;
- impact on property prices;
- potential interference with Pickmere Telescope;
- impact on the future viability of the Royal Cheshire Show;
- impact on local amenities such as Heyrose Golf Club and Mere Court Hotel;
- agricultural land severance; and
- impacts of the proposed Hoo Green auto transformer feeder station (ATFS).

3.3.3 Stakeholder feedback will continue to be considered as part of the ongoing design of the Proposed Scheme and will be reported in the formal ES.

3.4 Engagement and consultation with stakeholder groups

Communities

3.4.1 Community stakeholders in the Pickmere to Agden and Hulseheath area include a range of local interest groups, local facility and service providers, places of worship, schools and educational establishments, cultural, leisure and sports stakeholders.

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

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

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

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

Table 5: Engagement to date with community stakeholders

Stakeholder	Area of focus
Cheshire Agricultural Society	Engagement to discuss impact upon the Royal Cheshire Show and its ongoing viability; in particular the potential difference in effects of embankment or viaduct as well as the impact on the tranquillity of the site
Mere Court Hotel	Discussion on the impact of the Proposed Scheme on the viability of the hotel and wedding business
Esther McVey MP	Engagement with the MP for Tatton to discuss concerns regarding impacts on residents, farmers and local community as well as the management of property acquisition
Heyrose Golf Club	Meeting to discuss physical impact on the viability of the golf club, including access to it, with proposed temporary road closures
Bucklow Manor Care Home	Meeting to discuss delays caused by construction traffic or diversions.

Local authorities and parish councils

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

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

3.4.8 Key issues identified during engagement with local authorities and parish councils include those summarised in Table 6.

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

Stakeholder	Area of focus
Cheshire East (including highways)	General introductory and project update meetings including discussion on highway realignments, integration with local authority transport strategy and regeneration opportunities.
	Meetings with technical leads to collate data and discuss key assessment topics including: air quality; geotechnics; highways; land quality; sound, noise and vibration; traffic and transport, and waste.
Cheshire Association of Local Councils[15]	General introductory and project update meetings including discussion on the height of embankment (noted that 2013 consultation route was at ground level); traffic and traffic movements; route alignment.
Mere Parish Council	General introductory and project update meetings including discussion on potential impact on a number of key local highways (A50, Hoo Green Lane, Peacock Lane); noise mitigation at Hoo Green Lane.
High Legh Parish Council	General introductory and project update meetings including discussion on the severance of local roads; Ovenback Cottage (Grade II Listed); gas pipeline under route; request for deeper cutting or cut and cover tunnel.
Pickmere Parish Council	General introductory and project update meetings including discussion on construction traffic, temporary diversions and the impact of construction haulage within the village.
Moston and Warmingham Parishes	General introductory and project update meetings including discussion on construction routes.
Cheshire East Northern Parishes	General introductory and project update meetings including discussion on construction traffic, temporary road closures and community severance.

3.4.9 Councils will continue to be engaged as part of the design development of the Proposed Scheme with ongoing dialogue on key topics such as highways, PRoW and the draft Code of Construction Practice (CoCP)[16].

[15] Cheshire East, Plumley Parish Council, Warmingham Parish Council, High Legh Parish Council, Ashley Parish Council, Pickmere Parish Council, Rostherne Parish Council, Tabley Parish Council, Millington Parish Council
[16] Supporting document: Draft Code of Construction Practice

Expert, technical and specialist groups

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

- Animal and Plant Health Agency;
- British Geological Survey;
- Campaign to Protect Rural England;
- Canal & River Trust;
- Coal Authority;
- Department of Environment, Food and Rural Affairs;
- Environment Agency;
- Fera Science Ltd;
- Forestry Commission;
- Highways England;
- Historic England;
- Inland Waterways Association;
- National Farmers Union;
- National Trust;
- Natural England;
- Network Rail;
- Public Health England;
- Ramblers Association;
- Royal Agricultural Society;
- Royal Society for the Protection of Birds;
- Royal Society of Wildlife Trusts/The Wildlife Trusts;
- Woodland Trust;
- Cheshire Wildlife Trust; and
- University of Manchester (regarding Pickmere Telescope).

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

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

Utilities

3.4.13 Engagement is also ongoing with utility companies and statutory stakeholders to establish what infrastructure exists in the Pickmere to Agden and Hulseheath area and how it may need to be modified as part of the Proposed Scheme.

3.4.14 Stakeholders include National Grid Transmission (Gas), National Grid Transmission (Electricity), United Utilities, Cadent Gas, SP Energy Networks, Tata Chemicals Europe Ltd, BT Openreach, Virgin Media, Vodafone Ltd (Below Ground Assets), Vodafone & O2 Mobile Masts, EE & 3 Mobile Masts, Zayo, Instalcom, and GeneSYS.

Directly affected individuals, major asset owners and businesses

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

3.4.16 Engagement is ongoing with farmers and growers whose land or property would be directly affected by the Proposed Scheme whether permanently or temporarily. The purpose of this engagement has been to obtain baseline information and provide them with the opportunity to raise issues and discuss mitigation in relation to the Proposed Scheme. For example, the location of environmental mitigation will seek to reduce the loss of agricultural land and the location of accommodation overbridges across the route will be considered to better reflect the needs of farmers.

3.4.17 Information gathered from 16 farm visits have informed the assessment presented in this working draft ES. Farm visits are ongoing and engagement will continue as the design and assessment develops.

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

3.4.19 A route-wide programme of engagement is ongoing, in parallel to the working draft ES process. This engagement provides affected individuals, major asset owners and businesses the opportunity to raise issues and opportunities in relation to the Proposed Scheme and to gain an understanding of compensation and assistance available for property owners. Within the Pickmere to Agden and Hulseheath area, an information event was held at High Legh Village Hall on 15 June 2018. Facilities were available at the event for affected individuals, major asset owners and businesses to have private meetings with HS2 staff.

3.4.20 Engagement has been undertaken with Mere Court Hotel and Royal Cheshire Showground (owned by Cheshire Agricultural Society) to discuss the Proposed Scheme.

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

4 Agriculture, forestry and soils

4.1 Introduction

4.1.1 This section provides a description of the current baseline for agriculture, forestry and soils and the likely impacts and significant effects of the construction and operation of the Proposed Scheme within the Pickmere to Agden and Hulseheath area (MA03). Consideration is given to the extent and quality of the soil and land resources underpinning the primary land use activities of farming and forestry, and the physical and operational characteristics of enterprises engaged in these activities. Consideration is also given to diversification associated with the primary land uses, and to related land-based enterprises, notably equestrian activities.

4.1.2 Engagement with farmers and landowners has commenced and is ongoing. The purpose of the engagement has been to obtain baseline information on the scale and nature of the farm and forestry operations and related farm-based uses, and to provide farmers and landowners with the opportunity to raise issues and discuss mitigation in relation to the Proposed Scheme. Engagement undertaken with farmers and landowners will be documented in a farm pack for each farm holding within a Phase 2b Farmers and Growers Guide[17].

4.1.3 Maps showing the location of the key environmental features (Map Series CT-10) and the key construction (Map Series CT-05) and key operational (Map Series CT-06) features of the Proposed Scheme are provided in the Volume 2: MA03 Map Book.

4.2 Scope, assumptions and limitations

4.2.1 The assessment scope, key assumptions and limitations for the agriculture, forestry and soils assessment are set out in Volume 1, Section 8 and the Scope and Methodology Report (SMR)[18].

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

4.2.3 The quality of agricultural land in England and Wales is assessed according to the Agricultural Land Classification (ALC)[19] 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

[17] 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
[18] Supporting document: HS2 Phase 2b Environmental Impact Assessment Scope and Methodology Report
[19] Ministry of Agriculture, Fisheries and Food (1988), Agricultural Land Classification of England and Wales – Revised guidelines and criteria for grading the quality of agricultural land

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

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

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

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

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

4.3 Environmental baseline

Existing baseline

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

Soil and land resources

Geology and soil parent materials

4.3.2 A full description of the geological characteristics of the Pickmere to Agden and Hulseheath area is provided in Section 10, Land quality and Section 15, Water resources and flood risk.

4.3.3 The majority of the study area is covered by glacial till[20] (Devensian). These deposits comprise poorly sorted sandy, silty clay, which historically has been extracted from marl pits for use locally as a soil improver for agriculture. Where glacial till is not mapped, the following superficial deposits are identified.

4.3.4 Alluvial deposits, variably comprising organic rich silty clay, silt, sand and gravel, occur along the base of the valley of Smoker Brook, Waterless Brook and Agden Brook. There are also isolated pockets to the south-east of Winterbottom.

4.3.5 Areas of glaciofluvial sheet deposits comprising sand and gravel are present to the south of Smoker Brook, in isolated pockets to the south of Waterless Brook, to the west of junction 19 of the M6. Glaciofluvial sheet deposits also occur in the north of the study area as a band along the route of the A50 and along Agden Brook to the south of the M56 and to the west of Little Bollington.

4.3.6 The Shirdley Hill Sand Formation, comprising sand, is present at the northern extent of the study area associated with the River Bollin.

4.3.7 In terms of bedrock, the Mercia Mudstone Group underlies most of the Pickmere to Agden and Hulseheath area. It is subdivided into many formations and members, of which the following are present in the study area:

- the Northwich Halite Member (Mercia Mudstone Group) extends from the south of the study area to the M6;
- the Bollin Mudstone Member (Mercia Mudstone Group) extends from the north of the M6 to the north-west of Hulseheath;
- the Tarporley Siltstone Formation (Mercia Mudstone Group) occurs in the north of the study area from the north-west of Hulseheath to the end of the Manchester Spur and to 300m north of the M56; and
- the Helsby Sandstone Formation of the Sherwood Sandstone Group extends from the M56 to the northern end of the study area.

Topography and drainage

4.3.8 The study area is located on the Cheshire Plain, characterised by broadly flat countryside, incised by river courses, streams and many ponds. The land rises from an elevation of approximately 35m above Ordnance Datum (AOD) at the southern boundary of the study area to approximately 50m AOD at the M6 in the centre of the study area. To the north of the motorway, the elevation continues to rise to approximately 70m AOD near Hoo Green but descends to approximately 60m AOD at the M56. Between the southern boundary of the study area and the M56, there are no slopes with an angle in excess of seven degrees.

4.3.9 To the north of M56 at Agden Hall, the land falls from approximately 60m AOD to approximately 25m AOD down a strongly inclined, north-east facing slope to the

[20] Glacial till is sometimes described as "diamicton" in the BGS lexicon. This term relates to sediment deposited from land-based erosion (such as from landslides and debris flows). In this case the term "glacial till" refers to diamicton of glacial origin.

floodplain of the River Bollin. The quality of agricultural land on this slope is limited by gradient to Subgrade 3b.

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

Description and distribution of soil types

4.3.11 The broad characteristics of the soils likely to be present in the study area are described by the Soil Survey of England and Wales[21] and their general distribution is shown on the National Soil Map[22]. Soils possessing similar characteristics are amalgamated into associations.

4.3.12 There are three known groups of soil associations in this study area. The presence of each group has been confirmed in part of the study area by detailed soil survey data obtained from publicly available survey records. Soils grouped in the Salop association cover most of the study area. This association comprises slowly permeable and seasonally waterlogged clay loams over clay soils (Wetness Class[23] (WC) III to IV). They are developed in reddish glacial deposits (i.e. till and glaciofluvial sand and gravel deposits).

4.3.13 Deep, well drained (WC I) sandy loam over loamy sand soils in the Wick 1 association occur in a small pocket near Hoo Green. This type of soil is developed on sand and gravel and generally gives rise to high quality agricultural land.

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

Soil and land use interactions

Agricultural land quality

4.3.15 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.

[21] Soil Survey of England and Wales (1984), *Soils and their use in Midland and Western England*, Soil Survey of England and Wales, Bulletin No. 12, Harpenden.
[22] Cranfield University (2001), *The National Soil Map of England and Wales 1:250,000 scale.* Cranfield University: National Soil Resources Institute.
[23] The Wetness Class of a soil is classified according to the depth and duration of waterlogging in the soil profile and has six categories from WC I which is well drained to WC VI which is very poorly drained.

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

4.3.17 Climate within this area does not in itself place any limitation on agricultural land quality. However, the interactions of climate with soil characteristics are important in determining the wetness and droughtiness[24] limitations of the land.

4.3.18 The local agro-climatic data have been interpolated from the Meteorological Office's standard 5km grid point dataset[25] for three points within the study area. The data show climate in the area to be cool and moist. The number of Field Capacity Days[26] (FCDs), when the moisture deficit[27] is zero, ranges from 187 to 195 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 liability of soils to droughtiness in summer, are moderate to moderately small.

4.3.19 The quality of agricultural land from the southern boundary of the study area to north of the M56 is not limited by gradient or microrelief[28]. Some agricultural land in the north of the study area, on a north-east facing slope between Agden Hall and Agden Book Farm is limited by gradient to Subgrade 3b, as the angle of slope is between seven and 11 degrees. Flood risk limits the quality of agricultural land to Subgrade 3b or Grade 4 at the confluence of the Waterless Brook, Arley Brook and Tabley Brook near Pickmere Lane (the B5391). Further details are provided in Section 15, Water resources and flood risk.

4.3.20 The main physical limitations that result from interactions between soil, climate and site factors are soil wetness and soil droughtiness. For soil wetness, each soil can be allocated a Wetness Class based on soil structure, evidence of waterlogging and the number of FCDs. The topsoil texture then determines its ALC grade. Soil droughtiness is determined by the soil textures and thicknesses of each soil horizon, together with the moisture deficits.

4.3.21 The clay loam over clay soils in the predominant Salop association are slowly permeable and seasonally waterlogged for long periods during the winter (WC IV). In a climate area with between 187 to 195 FCDs, soil profiles with heavy clay loam topsoil are limited by soil wetness to Grade 4. Where the topsoil is medium clay loam, the soil profiles are limited to Subgrade 3b. Salop soil profiles in WC III are limited by soil wetness to Subgrade 3b where the topsoil is heavy clay loam, and to Subgrade 3a where the topsoil is medium clay loam.

[24] 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
[25] Meteorological Office (1989), *Gridpoint Meteorological data for Agricultural Land Classification of England and Wales and other Climatological Investigations*.
[26] Field Capacity Days (FCD) is a meteorological parameter which estimates the duration of the period when the soil moisture deficit is zero. Soils usually return to field capacity (zero deficit) during the autumn or early winter and the field capacity period, measured in days, ends in the spring when evapotranspiration exceeds rainfall and a moisture deficit begins to accumulate.
[27] 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.
[28] 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.

4.3.22 As crop moisture deficits are moderately small the soil droughtiness limitation for the well-drained (WC I), sandy loam soils in the Wick 1 association are mostly only slight to moderate. This limits the quality of agricultural land to Grade 2 or Subgrade 3a.

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

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 area, set as a 4km corridor centred on the route of the Proposed Scheme. Department for Environment, Food and Rural Affairs (Defra) predictive mapping[29] shows that there is a moderate likelihood of encountering BMV agricultural land in the locality, which makes such land a resource of medium sensitivity in this study area.

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

Other soil interactions

4.3.26 Soil fulfils a number of functions and services for society in addition to those of food and biomass production, which are central to social, economic and environmental sustainability. These are outlined in sources such as the Soil Strategy for England[30] and the Government's White Paper, The Natural Choice: securing the value of nature[31], and include:

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

4.3.27 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 and Section 11, Landscape and visual.

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

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

Land use

Land use description

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

4.3.30 As described in Section 7, Ecology and biodiversity, land required for the Proposed Scheme includes part of Leonards and Smoker Wood in the south, which comprise some ancient semi-natural woodland and land designated as plantation on ancient woodland site (PAWS). No commercial forestry has been identified within the study area so far.

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

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

4.3.33 Most Environmental Stewardship agreements, which were extensive and covered approximately 70% of agricultural land in England, have now ended although existing agreements will run their course. The higher tier and mid-tier options in the CSS are more focussed than Environmental Stewardship, with applications for funding being competitive and the area covered by the scheme less than that covered under Environmental Stewardship. However, four new simpler non-competitive offers have been introduced in 2018 to complement the higher tier and mid-tier options and open up the scheme to more farmers and land managers. Holdings that have land entered into an agri-environment scheme are identified in Table 7.

Number, type and size of holdings

4.3.34 Table 7 sets out the current understanding of main farm holdings within this study area. The details of holdings have been obtained from face-to-face interviews with farm owners and occupiers. Publicly available sources have been used to obtain

information about other farm holdings where it has not yet been possible to arrange interviews and this information will be validated as survey work continues. Other farm holdings may be identified as survey work continues and the design develops. Effects on these farm holdings will be reported in the formal ES.

4.3.35 Table 7 also sets out the sensitivity of individual holdings to change. This is determined by the extent to which they have the capacity to absorb or adapt to impacts, which in turn is determined primarily by their nature and scale. In general terms, larger holdings have a greater capacity to change enterprise mix and scale, can better absorb impacts and are less sensitive. Units that rely on the use of buildings (such as intensive livestock and dairy farms, and horticultural units) are less able to accommodate change and have a higher sensitivity. Non-commercial land uses and units, such as pony paddocks associated with residential properties, have a low sensitivity.

Table 7: Summary of characteristics of holdings

Holding name	Holding type	Holding size (ha)	Diversification	Agri-environment scheme	Sensitivity to change
Roses Farm[32]	Arable	291	None	None	Medium
Dunholme Farm	Arable and grassland	15	None	None	Low
Cheshire Showground	Showground	121	Showground	None	High
School Farm	Equestrian stud	8	None	None	Medium
Windmill Nurseries*	Horticultural	2	Not known	Not known	High
Heyrose Farm*	Grassland and arable	40	Not known	ELS	Medium
Hollowood Farm	Beef cattle	63	Phone mast	None	Medium
Knowlspit Farm	Dairy	130	None	None	High
Winterbottom Farm	Beef cattle and sheep	80	Not known	Not known	Medium
Yew Tree Farm	Dairy	81	Land let to model aeroplane club	None	High
Land at Bowden View Farm*	Grassland	10	Not known	Not known	Medium
Hulme Barn Farm	Arable and grassland	150	None	None	Medium
Gorse Cottage	Grassland	5	Property rentals	None	Low
Moss Farm	Arable and beef cattle	88	None	None	Medium

[32] Roses Farm is the operating base for a large agricultural business. Farm holdings included in the tenancy include Providence Farm and Flittogate Farm, amongst others.

Holding name	Holding type	Holding size (ha)	Diversification	Agri-environment scheme	Sensitivity to change
Abbey Leys Farm	Organic arable and grassland	40	Farm shop	None	Medium
Middle Moss Farm	Grassland for hay making	5	None	None	Low
Scandia House	Grassland let	3	None	None	Low
Agden Brook Farm	Dairy and arable	760	Property rentals	None	High
Woolstencroft Farm	Dairy	182	None	None	High

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

4.4 Effects arising during construction

Avoidance and mitigation measures

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

4.4.2 Compliance with the Code of Construction Practice (CoCP)[33] 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 and relate to:

- the reinstatement of agricultural land that is used temporarily during construction to agriculture, where this is the agreed end use (Section 6);
- the provision of a method statement within the farm pack for stripping, handling, storing and replacing agricultural and woodland soils to reduce risks associated with soil degradation on areas of land to be returned to agriculture and woodland following construction, based on detailed soil survey work to be undertaken prior to construction. This would include any remediation measures necessary following the completion of works (Section 6);
- 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);

[33] Supporting document: Draft Code of Construction Practice.

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

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

- agricultural crossing incorporated into Pickmere Footpath 5 accommodation underbridge to mitigate severance from Roses Farm (CT-06-317);
- agricultural crossing incorporated into Tabley Inferior Footpath 2 and 3 accommodation overbridge to mitigate severance for Cheshire showground (CT-06-317); and
- agricultural crossing incorporated into Tabley Superior Restricted Bridleway 4 accommodation underbridge to mitigate severance at Hollowood Farm (CT-06-318).

4.4.4 As part of the ongoing development of the design, measures will be incorporated to avoid or mitigate adverse impacts on agriculture, forestry and soils.

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

Assessment of impacts and effects

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

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

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

Temporary effects during construction

Impacts on agricultural land

4.4.8 Interpretation of publicly available data shows that the Proposed Scheme is likely to require approximately 233ha of agricultural land within the Pickmere to Agden and Hulseheath area during the construction phase, of which approximately 93ha (40%) are likely to be classified as BMV land (Grades 2 and 3a). This is a medium magnitude of impact on BMV land.

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

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

Nature of the soil to be disturbed

4.4.11 The sensitivity of the soils disturbed by construction activity reflects their textural characteristics, in the light of local FCDs, as set out in the SMR. In areas with the highest number of FCDs, and during the wettest times of the year, soils with high clay and silt fractions are most susceptible to the effects of handling during construction and the re-instatement of land; whereas soils with a high sand fraction in areas with

the fewest number of FCDs and during the driest times of the year are the least susceptible.

4.4.12 Successful soil handling is dependent upon movements being undertaken under appropriate weather and ground conditions using the appropriate equipment. The principles of soil handling are well established and set out in advisory material such as Defra's Code of Practice for the Sustainable Use of Soils[34]. These principles would be followed throughout the construction period.

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

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

Impacts on holdings

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

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

4.4.17 The potential temporary effects from the construction of the Proposed Scheme on individual agricultural and related interests are summarised in Table 8 for those holdings currently identified. The scale of the impact of land required to construct the Proposed Scheme is based on the likely proportion of land required from the holding during construction. The effects of severance will be judged on the ease and availability of access to severed land. With the implementation of the measures set out in the draft CoCP, these would generally be the same during and post construction.

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

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

Table 8: Summary of temporary effects on holdings from construction

Holding name/ sensitivity to change	**Land potentially required**	**Potential severance impact**	**Potential scale of effect**
Roses Farm Medium sensitivity	Medium	Low	Moderate adverse
Dunholme Farm Low sensitivity	Negligible	Negligible	Negligible
Cheshire Showground High sensitivity	Medium	Low	Major/moderate adverse
School Farm Medium sensitivity	High	Negligible	Major/moderate adverse
Windmill Nurseries * High sensitivity	High	Negligible	Major adverse
Heyrose Farm * Medium sensitivity	Medium	High	Moderate adverse
Hollowood Farm Medium sensitivity	Medium	Low	Moderate adverse
Knowlspit Farm High sensitivity	Negligible	Negligible	Minor adverse
Winterbottom Farm Medium sensitivity	High	High	Major/moderate
Yew Tree Farm High sensitivity	Medium	Medium	Major/moderate adverse
Land at Bowden View Farm * Medium sensitivity	High	Negligible	Major/moderate adverse
Hulme Barn Farm Medium sensitivity	Medium	Negligible	Moderate adverse
Gorse Cottage Low sensitivity	Medium	Negligible	Minor adverse
Moss Farm Medium sensitivity	Low	Negligible	Minor adverse
Abbey Leys Farm Medium sensitivity	Medium	Negligible	Moderate adverse
Middle Moss Farm Low sensitivity	High	High	Moderate adverse
Scandia House Low sensitivity	High	Negligible	Moderate adverse
Agden Brook Farm High sensitivity	Low	Medium	Major/moderate adverse
Woolstencroft Farm High sensitivity	Low	High	Major due to severance

4.4.19 Overall, the construction of the Proposed Scheme could potentially affect 19 holdings in the Pickmere to Agden and Hulseheath area temporarily. On the basis of information currently available, 15 holdings could experience moderate, major/moderate or major adverse temporary effects from construction, which would be significant for each holding.

4.4.20 Two farms are currently anticipated to experience major adverse temporary effects from construction. Woolstencroft Farm is a dairy farm and of high sensitivity; Windmill Nurseries is a horticultural holding with extensive glasshouses and is also of high sensitivity. In both cases the proportion of the holding required (either as land required for construction or because agricultural land is severed and will be inaccessible) is significant.

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

Permanent effects of construction

Impacts on agricultural land

4.4.22 Interpretation of publicly available data shows that the Proposed Scheme is likely to require approximately 126ha of agricultural land permanently within the Pickmere to Agden and Hulseheath area, of which approximately 50ha (40%) are likely to be classified as BMV land (Grades 2 and 3a). This is a medium magnitude of impact on BMV land.

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

Impacts on forestry land

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

Impacts on holdings

4.4.25 The potential permanent effects from the construction of the Proposed Scheme on individual agricultural and related interests are summarised in Table 9 for those holdings currently identified. The scale of the impact of land required to operate the Proposed Scheme is based on the likely proportion of land required from the holding. The potential effects of severance are judged on the ease and availability of access to severed land once construction is completed. The impact on farm infrastructure refers mainly to the potential loss of or damage to farm capital, such as property, buildings and structures, and the consequential effects on land uses and enterprises.

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

Table 9: Summary of permanent effects on holdings from construction

Holding name/ sensitivity to change	Land potentially required	Potential severance impact	Potential impact on farm infrastructure	Potential scale of effect
Roses Farm Medium sensitivity	Low	Low	High[35]	Major/moderate adverse
Dunholme Farm Low sensitivity	Negligible	Negligible	Negligible	Negligible
Cheshire Showground High sensitivity	Medium	Low	Medium	Major/moderate adverse
School Farm Medium sensitivity	High	Negligible	Low	Major/moderate adverse
Windmill Nurseries * High sensitivity	High	Negligible	High	Major adverse
Heyrose Farm * Medium sensitivity	Medium	Low	High	Major/moderate adverse
Hollowood Farm Medium sensitivity	Low	Low	Low	Minor adverse
Knowlspit Farm High sensitivity	Negligible	Negligible	Negligible	Negligible
Winterbottom Farm Medium sensitivity	High	High	Low	Major/moderate adverse
Yew Tree Farm High sensitivity	Low	Medium	Low	Major/moderate adverse
Land at Bowden View Farm * Medium sensitivity	High	Negligible	High	Major/moderate adverse
Hulme Barn Farm Medium sensitivity	Negligible	Negligible	Low	Minor adverse
Gorse Cottage Low sensitivity	Low	Negligible	High	Major/moderate adverse
Moss Farm Medium sensitivity	Negligible	Negligible	Negligible	Negligible
Abbey Leys Farm Medium sensitivity	Low	Negligible	Low	Minor adverse
Middle Moss Farm Low sensitivity	High	High	Negligible	Moderate adverse
Scandia House Low sensitivity	Medium	Negligible	High	Major/moderate adverse
Agden Brook Farm High sensitivity	Negligible	Medium	Low	Major/moderate adverse
Woolstencroft Farm High sensitivity	Negligible	High	Low	Major adverse

[35] Demolition of farm buildings at Flittogate Farm which forms part of the tenancy

4.4.27 Overall, the construction of the Proposed Scheme could potentially affect 19 holdings in the Pickmere to Agden and Hulseheath area permanently. On the basis of information currently available, 13 holdings could experience moderate, major/moderate or major adverse permanent effects from construction, which would be significant for each holding.

4.4.28 Two holdings are currently anticipated to experience major adverse permanent effects from construction. Windmill Nurseries would experience high impacts on farm infrastructure with the demolition of the farm dwelling and buildings. Woolstencroft Farm would experience high impacts due to the proportion of the holding required (either as land required for construction or because agricultural land is severed and will be inaccessible).

4.4.29 Although financial compensation will be available under existing statutory arrangements, there can be no certainty that this would be used to reduce the above adverse effects by the purchase of replacement land or the construction of replacement buildings. Therefore, the above assessment should be seen as the worst case, which could be reduced if the owner and/or occupier is able, and chooses, to use compensation payments to replace assets.

Other mitigation measures

4.4.30 Soils and their associated seed banks from the ancient woodlands would be stored separately and utilised in species translocation.

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

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

Summary of likely residual significant effects

4.4.33 Although the extent of land required permanently by ALC grade is not yet known in the Pickmere to Agden and Hulseheath area, current indications are that the temporary effect on BMV agricultural land would be moderate adverse during construction, which would be significant, and the permanent effect on BMV agricultural land would be moderate adverse from construction, which is significant.

4.4.34 Fifteen of the 19 farm holdings identified are anticipated to experience moderate, major/moderate or major adverse temporary effects during construction, which would be significant for each holding. Thirteen farm holdings are anticipated to experience moderate, major/moderate or major adverse permanent effects of construction, which would be significant for each holding.

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

4.5 Effects arising from operation

Avoidance and mitigation measures

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

Assessment of impacts and effects

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

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

4.5.3 Two sets of farm buildings at Hollowood Farm and Winterbottom Farm lie within approximately 100m of the route of the Proposed Scheme. The potential for significant effects on sensitive livestock receptors from noise at these holdings will be assessed and reported in the formal ES.

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

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

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

Other mitigation measures

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

Summary of likely residual significant effects

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

Monitoring

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

4.5.9 There are no area-specific requirements identified for monitoring agriculture, forestry and soil during the operation of the Proposed Scheme in the Pickmere to Agden and Hulseheath area.

5 Air quality

5.1 Introduction

5.1.1 This section of the report provides an assessment of the impacts and likely significant effects on air quality identified to date arising from the construction and operation of the Proposed Scheme within the Pickmere to Agden and Hulseheath area. Oxides of nitrogen (NOx) including nitrogen dioxide (NO2), fine particulate matter[36] (PM10, PM2.5) and dust have been considered in the assessment. Emissions of all or some of these air pollutants are likely to arise from construction activities, demolition, site preparation works and the use of site haul routes. Emissions would also arise from road traffic during construction and operation of the Proposed Scheme.

5.1.2 Engagement with Cheshire East Council (CEC), Cheshire West and Chester Council (CWCC) and Trafford Metropolitan Borough Council (TMBC) has commenced and is ongoing. The purpose of this engagement has been to obtain relevant baseline information, which includes monitoring data in this area.

5.1.3 Maps showing the location of the key environmental features (Map Series CT-10) and the key construction (Map Series CT-05) and key operational (Map Series CT-06) features of the Proposed Scheme are provided in the Volume 2: MA03 Map Book.

5.2 Scope, assumptions and limitations

5.2.1 The scope, assumptions and limitations for the air quality assessment are set out in Volume 1, Section 8 and the Scope and Methodology Report (SMR)[37].

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[38]:

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

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

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

5.2.4 The assessment of construction traffic impacts will use traffic data based on an estimate of the average daily flows in the peak year during the construction period (2023-2032). The assessment will assume vehicle emission rates and background pollutant concentrations from year 2023. This is because both pollutant emissions from vehicle exhausts and background pollutant concentrations are anticipated to reduce year by year as a result of vehicle emission controls, and so the year 2023 represents the worst case for the construction assessment.

5.3 Environmental baseline

Existing baseline

Background air quality

5.3.1 The main sources of air pollution in the Pickmere to Agden and Hulseheath area are emissions from road vehicles. The main roads within the area are the A556, the M6, the A50, the A56 and the M56.

5.3.2 There are no industrial installations (regulated by the Environment Agency) with permits for emissions to air within the area. The contribution of all industrial processes and other emission sources to local air quality is included within the background concentrations.

5.3.3 Estimates of background air quality have been obtained from Defra[39] for the baseline year of 2017. The data are estimated for 1km grid squares for NOx, NO2, PM10 and PM2.5. Background concentrations are within the air quality standards for all pollutants within the Pickmere to Agden and Hulseheath area.

Local monitoring data

5.3.4 There are currently 17 local authority diffusion tube sites located within the Pickmere to Agden and Hulseheath area for monitoring NO2 concentrations. These are located along the M6, the A5033 Northwich Road, the A556 Chester Road, the B5159 High Legh Road, the A50 Manchester Road and the A537 Chelford Road. Measured concentrations in 2016 were within the air quality standard[40].

Air quality management areas

5.3.5 There are four air quality management areas (AQMA) within the Pickmere to Agden and Hulseheath area: the Chester Road AQMA, Warrington AQMA, Knutsford AQMA and a small part of the Greater Manchester Combined Authority AQMA. All have been designated for exceedances in the annual mean NO2 standard.

5.3.6 The Chester Road AQMA covers a section of the A556 Chester Road between the A56 Lymm Road roundabout and junction 19 of the M6 and was declared in April 2008. The Warrington AQMA covers a continuous strip along both sides of the M6, the M62 and the M56 and was declared in November 2001. The Knutsford AQMA covers five properties along the A50 Manchester Road at the Windsor Way junction and was declared in April 2010. The Greater Manchester Combined Authority AQMA covers

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

large areas of the City of Manchester and boroughs of Oldham, Salford, Stockport and Tameside and was declared in July 2001, then amended in May 2016.

Receptors

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

5.3.8 Most of the receptors that may be affected by the Proposed Scheme are residential. Other receptors include the Elms public house, the Cheshire Showground (sometimes referred to as the Royal Cheshire County Showground, County Showground or Tabley Showground), Heyrose Golf Club, St John's Church, High Legh Park Golf Club, Mere Golf Resort and Spa, and the Mere Day Nursery.

5.3.9 There are five statutory designated ecological sites within the Pickmere to Agden and Hulseheath area, namely Midland Meres and Mosses Phase 1 Ramsar site, Rostherne Mere Ramsar site, Tabley Mere Site of Special Scientific Interest (SSSI), The Mere, Mere SSSI and Dunham Park SSSI. Other non-statutory sensitive ecological sites identified close to the Proposed Scheme include Leonards and Smoker Woods Local Wildlife Site (LWS) and Ancient Woodland Inventory site (AWIS), Round and Rinks Woods LWS and AWIS, Tabley Wood AWIS, Belt Wood LWS, Ye Olde No. 3 LWS and Arley and Waterless Brook Corridor LWS. Further details of the ecological receptors are set out in Section 7, Ecology and biodiversity.

5.4 Effects arising during construction

Avoidance and mitigation measures

5.4.1 Emissions to the atmosphere will be controlled and managed during construction through the route-wide implementation of the CoCP. The draft CoCP[41] includes a range of mitigation measures that are accepted by the Institute of Air Quality Management (IAQM) as being suitable to reduce impacts to as low a level as is reasonably practicable. These measures are generally sufficient to avoid any significant effects from dust during construction.

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

- contractors' being required to manage dust, air pollution, odour and exhaust emissions during construction works;
- inspection and visual monitoring, undertaken in consultation with the local authorities, to assess the effectiveness of the measures taken to control dust and air pollutant emissions;

[41] Supporting document: Draft Code of Construction Practice

- 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.

Assessment of impacts and effects

Temporary effects

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

Construction dust effects

5.4.5 The risks of demolition of existing buildings, earthworks, construction of new structures and trackout[42] have been assessed for their effect on dust soiling, human health[43] and ecological sites. There are residential and ecological receptors located within the Pickmere to Agden and Hulseheath area.

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

[42] 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.
[43] Human health effects relate mainly to short-term exposure to particles of size between 2.5µm to 10µm, measured as PM_{10}.

effects from trackout. There would also be a negligible to low risk of ecological effects from all dust generating activities.

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

Construction traffic effects

5.4.8 Construction activity could also affect local air quality through the additional traffic generated on local roads as a result of construction vehicles and through changes to traffic patterns arising from temporary road diversions and realignments. The following roads would likely provide the primary access for construction vehicles in this area: the A556 between Moss Cottage and Chapel Lane; the A50 between Clamhunger Lane and the M6; the A56 Lymm Road between the M56 and Warrington Lane; the B5159 between Peacock Lane and the A50; the B5391 Pickmere Lane between Flittogate Lane and the A556; Agden Lane; Budworth Road; Back Lane; Chapel Lane; Chester Road; Flittogate Lane; Frog Lane; Peacock Lane; School Lane; Thowler Lane; and the B5159 West Lane.

5.4.9 An increase in traffic flows as a result of construction traffic, temporary closures or diversions is anticipated on the B5391 Pickmere Lane, Back Lane, Flittogate Lane, Hoo Green Lane, Peacock Lane, School Lane and Throwler Lane. A detailed assessment of air quality impacts from traffic emissions in the area will be undertaken and reported in the formal ES.

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

Permanent effects

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

Other mitigation measures

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

Summary of likely residual significant effects

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

5.5 Effects arising from operation

Avoidance and mitigation measures

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

Assessment of impacts and effects

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

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

Operational traffic effects

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

Combustion plant emissions

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

Other mitigation measures

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

Summary of likely residual significant effects

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

Monitoring

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

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

6 Community

6.1 Introduction

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

6.1.2 The assessment draws on information gathered from engagement with the users and operators of community facilities and open spaces including the Cheshire Agricultural Society. The purpose of this engagement has been to understand how the facilities are used and to obtain relevant baseline information to inform the design development and assessment of the Proposed Scheme. Engagement will continue with these and other stakeholders to inform the formal ES.

6.1.3 Maps showing the location of the key environmental features (Map Series CT-10) and the key construction (Map Series CT-05) and key operational (Map Series CT-06) features of the Proposed Scheme are provided in the Volume 2: MA03 Map Book.

6.2 Scope, assumptions and limitations

6.2.1 The assessment scope, key assumptions and limitations for the community assessment are set out in Volume 1, Section 8 and the Scope and Methodology Report (SMR)[44].

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

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

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

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

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

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

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

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

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

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

6.3 Environmental baseline

6.3.1 The Proposed Scheme through the Pickmere to Agden and Hulseheath area would be approximately 10km in length, with an additional approximately 2km for the Manchester Spur. The route of the Proposed Scheme would lie within the Cheshire West and Chester Council (CWCC) and Cheshire East Council (CEC) areas. It would extend from Higher Wincham in the south, passing close to the village of Pickmere and its surrounds, and the settlements of Hoo Green, Mere, Bucklow Hill, Hulseheath and High Legh.

6.3.2 The Pickmere to Agden and Hulseheath area is predominantly rural in nature, characterised by small clusters of dwellings and individual farms within rural areas close to land required for the route of the Proposed Scheme. In general, the majority of community facilities are located in the larger settlement of Knutsford (outside the community study area), and also in High Legh and Pickmere.

Pickmere and surrounds

6.3.3 This area covers the village of Pickmere and its surrounds, from the southern boundary of the Pickmere to Agden and Hulseheath area to the M6. Pickmere is located to the west of the route of the Proposed Scheme, and contains approximately 1,000 residential properties. The route of the Proposed Scheme would be approximately 1km east of the nearest residential properties in the village. Community resources within the village of Pickmere include the Pickmere and Wincham Methodist Church and the Red Lion public house. The surrounding area is sparsely populated.

6.3.4 Other community facilities located in Pickmere and its surrounding area include the Cheshire Showground (sometimes referred to as the Royal Cheshire County Showground, County Showground or Tabley Showground), an approximately 120ha events venue owned by the Cheshire Agricultural Society, which lies on Flittogate Lane in Tabley Inferior. The showground hosts the annual Royal Cheshire Show – an important event for the Cheshire farming community – and several other events throughout the year.

6.3.5 In terms of recreational facilities, the area contains the private members' Heyrose Golf Club an 18-hole golf course and club house. Adjacent to the course is Bongs Wood, a publicly accessible woodland. Further north, but to the south of the M6 runs a section of the North Cheshire Way, a 113km long-distance footpath, which crosses this part of Cheshire on its route from the Wirral to the Peak District.

High Legh, Hoo Green and surrounds

6.3.6 This area covers the villages of High Legh, Hoo Green, Mere, Bucklow Hill and Hulseheath.

6.3.7 The village of High Legh would be to the west of the route of the Proposed Scheme. High Legh contains approximately 500 residential dwellings, the nearest of which would be 1km from the route of the Proposed Scheme. Community resources in High Legh include High Legh Village Hall, High Legh Primary School, and St John's Church. Recreational facilities in the area around the village include High Legh Park Golf Club and High Legh Bowling Club. The National Cycle Network Regional Route 70, a 280km cycle route through Cheshire, passes through the village.

6.3.8 The village of Hoo Green is located close to the route of the Proposed Scheme and comprises approximately 50 residential properties. The route of the Proposed Scheme would be 50m from the nearest residential properties in the village. There are a small number of community resources in Hoo Green, including the Kilton Inn public house.

6.3.9 To the east of the route of the Proposed Scheme are the villages of Mere and Bucklow Hill, which sit on the banks of The Mere (a local lake) and which comprise approximately 200 residential properties. Located within this area are The Mere Golf Resort and Spa, and the Mere Day Nursery. Adjacent to the Manchester spur of the route of the Proposed Scheme is the hamlet of Hulseheath. The Manchester spur would be 350m from the nearest residential properties in the village.

6.4 Effects arising during construction

Avoidance and mitigation measures

6.4.1 The draft Code of Construction Practice (CoCP)[45] includes a range of provisions that will help mitigate community effects associated with construction within this area, including:

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

Assessment of impacts and effects

Temporary effects

Residential properties

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

Community facilities

6.4.3 Construction of Pickmere embankment, the Pickmere Lane realignment, Tabley Inferior Footpath 2 and 3 accommodation overbridge, Tabley Inferior Footpath 2 and 3 realignment, Tabley Inferior Footpath 4 accommodation overbridge, Tabley Inferior footpath 4 realignment, Pickmere footpath 5 accommodation underbridge, Pickmere Footpath 5 realignment and Pickmere Lane overbridge would require the use of approximately 17ha of land at Cheshire Showground. 14ha of the 17ha of land would be required for permanent works.

[45] Supporting document: Draft Code of Construction Practice

6.4.4 However, 3ha of the 17ha land would be required on a temporary basis. The 3ha of land – a strip immediately adjacent to the route of the Proposed Scheme and close to the Pickmere Lane satellite compound – would be required for a period of approximately five years and nine months and would be returned to use as part of the showground following construction.

6.4.5 In addition, work required to construct the Tabley Inferior Footpath 4 accommodation overbridge, Flittogate Farm Access and Footpath 3 overbridge and Pickmere Lane overbridge would affect the existing three access routes to the showground, via Flittogate Lane, Pickmere Road, and Budworth Road. It is anticipated that any potential disruption to local traffic or access to and from the Cheshire Showground would be reduced through phasing of the construction works, off-route construction and temporary diversions.

6.4.6 The temporary loss of 3ha of land, and the limited impact on the local road network of the works would result in a minor adverse effect, which would not be significant.

Recreational facilities

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

Open space and PRoW

6.4.8 A short section (approximately 200m) of the North Cheshire Way, just south of where the Proposed Scheme would cross the M6, is located on the route of the Proposed Scheme. This section of the North Cheshire Way would be inaccessible for approximately two years. Proposed mitigation and an assessment of the likely effects will be reported in the formal ES.

Permanent effects

Residential properties

6.4.9 Construction of the Pickmere embankment would require the demolition of two residential properties on Pickmere Lane. These residential properties would be permanently lost.

6.4.10 Construction of the Pickmere embankment and Flittogate Lane realignment would require the demolition of one property on Flittogate Lane. This property would be permanently lost.

6.4.11 Construction of the Heyrose embankment would require demolition of one property on Budworth Road. This property would be permanently lost.

6.4.12 Construction of the Heyrose embankment would result in the demolition of three properties on Heyrose Lane. These properties would be permanently lost.

6.4.13 Construction of the Hoo Green cutting and mitigation earthworks would require demolition of two properties on Bowden View Lane and one property on Warrington Road, Hoo Green. These properties would be permanently lost.

6.4.14 Construction of the Lymm embankment would require demolition of one property on Lymm Road. This property would be permanently lost.

6.4.15 Construction of the Hulseheath embankment would require demolition of two properties on Chapel Lane and one property on Thowler Lane. These three properties would be permanently lost.

Community facilities

6.4.16 Construction of Pickmere embankment, the Pickmere Lane realignment, Tabley Inferior Footpath 2 and 3 accommodation overbridge, Tabley Inferior Footpath 2 and 3 realignment, Tabley Inferior Footpath 4 accommodation overbridge, Tabley Inferior footpath 4 realignment, Pickmere footpath 5 accommodation underbridge, Pickmere Footpath 5 realignment and Pickmere Lane overbridge would result in the use of approximately 17ha of land at Cheshire Showground.

6.4.17 Of the 17ha, 14ha would be required for permanent works. The showground site is approximately 121ha in total, leaving approximately 105ha available for use. This would affect its capacity to host the annual Royal Cheshire County Show, and other events currently held at the site.

6.4.18 Of the 17ha, 3ha of land comprising a strip of land immediately adjacent to the route of the Proposed Scheme and close to the Pickmere Lane satellite compound, would be required for a period of approximately five years and nine months. This would be returned to its primary use as a showground following construction.

6.4.19 Due to the scale of the events held at the site, alternative sites in the area are not readily available. The permanent loss of this land would result in a major adverse effect, which would be significant.

Recreational facilities

6.4.20 The construction of the Heyrose embankment would result in loss of land at Heyrose Golf Club, a private members club with an 18-hole course covering approximately 36 ha. The land required is located at the eastern edge of the golf course, reducing the size of the course by approximately 4ha (approximately 10% of the total course) and affecting two to three holes. The club house, main entrance and parking would not be affected. The Mere Golf Resort and Spa and High Legh Park Golf Club, which may provide alternatives, are located nearby. In the absence of confirmed mitigation, it is considered the permanent land requirement would result in a moderate adverse effect, which would be significant.

Open space and PRoW

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

Other mitigation measures

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

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

Summary of likely residual significant effects

6.4.24 Land required for construction of the Proposed Scheme is not likely to result in temporary residual significant effects on any community resources.

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

- loss of land at the Cheshire Showground on Flittogate Lane; and
- loss of land at Heyrose Golf Club on Budworth Road.

Cumulative effects

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

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

6.5 Effects arising from operation

Avoidance and mitigation measures

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

Assessment of impacts and effects

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

Other mitigation measures

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

Summary of likely residual significant effects

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

Cumulative effects

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

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

Monitoring

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

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

7 Ecology and biodiversity

7.1 Introduction

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

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

7.1.3 Maps showing the location of the key environmental features (Map Series CT-10) and the key construction (Map Series CT-05) and key operational (Map Series CT-06) features of the Proposed Scheme are provided in the Volume 2: MA03 Map Book.

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

7.2 Scope, assumptions and limitations

7.2.1 The scope, assumptions and limitations for the ecological assessment are set out in Volume 1, Section 8 and the Scope and Methodology Report (SMR)[46].

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

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

7.3 Environmental baseline

Existing baseline

Introduction

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

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

7.3.2 Land required for the construction of and adjacent to the Proposed Scheme in the Pickmere to Agden and Hulseheath area consists mainly of agricultural land and farm buildings. The route of the Proposed Scheme would cross several watercourses, including Waterless Brook, as well as the North Cheshire Way and the M6 at Winterbottom and the M56 at Agden. Ponds are concentrated to the south, between Pickmere and Winterbottom, whilst scattered woodlands and hedgerows occur throughout the Pickmere to Agden and Hulseheath area. The topography of the land along the route of the Proposed Scheme is predominately flat with steep slopes between Agden Hall and Agden Brook Farm.

7.3.3 Statutory and non-statutory designated sites are shown on Map Series CT-10, Volume 2: MA03 Map Book.

Designated sites

7.3.4 There are two internationally important sites of potential relevance to the assessment in the Pickmere to Agden and Hulseheath area. They are:

- Midland Meres and Mosses Phase 1 Ramsar site, covering an area of 510.9ha comprises 16 geographically discrete areas across the Cheshire Plain. This site is designated for its diverse range of habitats from open water to raised bog and because it supports a number of rare species of plants associated with wetlands including five nationally scarce species together with an assemblage of rare wetland invertebrates. Two component Sites of Special Scientific Interest (SSSI) of the Midland Meres and Mosses Phase 1 Ramsar site are of potential relevance to the assessment in the Pickmere to Agden and Hulseheath area. Tatton Meres SSSI is situated to the north of Knutsford, 3km east of the land required for the Proposed Scheme. The Mere, Mere SSSI is located east of Mere, 1.4km east of the land required for the Proposed Scheme. Tatton Meres SSSI is relevant to the Pickmere to Agden and Hulseheath area (MA03) and the Hulseheath to Manchester Airport area (MA06); and

- Rostherne Mere Ramsar site covering an area of 79.8ha is designated because it is one of the deepest and largest of the meres of the Shropshire-Cheshire Plain. Marginal vegetation consists of a narrow fringe of common reed. It supports noteworthy bird fauna occurring at levels of national importance, comprising cormorant, bittern and water rail. It is also designated as Rostherne Mere SSSI. The site is located west of Rostherne, 1.2km east of the land required for the Proposed Scheme within the Pickmere to Agden and Hulseheath area. This Ramsar site is also relevant to the Hulseheath to Manchester Airport area (MA06) where it is located north of Rostherne, 80m south of the land required for the Proposed Scheme.

7.3.5 There are five nationally important SSSIs of potential relevance to the assessment in the Pickmere to Agden and Hulseheath area. For four of these sites, the land required for the Proposed Scheme in this area is within the Impact Risk Zone[47] relevant to railway infrastructure as identified by Natural England. They are:

- Plumley Lime Beds SSSI, covering an area of 23.2ha, is designated for a variety of calcareous habitats including woodland, a pool and marshland. Plants at the site include a range of species associated with alkaline soils including yellow-wort, common centaury and at least four species of orchid. A variety of willow hybrids and rare mosses are also present. Notable assemblages of birds, including warblers and wildfowl, use the habitats on the site. The SSSI is located 760m south-east of the land required for the Proposed Scheme, between Pickmere and Smoker Brook. This site is located within the Wimboldsley to Lostock Gralam area (MA02), where the western extent of the SSSI is located adjacent to the land required for the Proposed Scheme;
- Tabley Mere SSSI covers an area of 44.4ha. It is designated as it represents a very nutrient-rich mere type with a well-developed aquatic flora, as well as acidic marshy grassland and woodland. The site is important for birds, with a large heronry and numerous wildfowl occurring on the site. The site is located 865m east of the land required for the Proposed Scheme between Smoker Brook and Budworth Road and 1.7km north-east of the land required for the Proposed Scheme in the Wimboldsley to Lostock Gralam area (MA02);
- The Mere, Mere SSSI covering an area of 19ha is designated for its moderately nutrient-rich meres with a very diverse aquatic flora. It is a constituent of the Midland Meres and Mosses Phase 1 Ramsar site as noted above. The site consists of two lakes (The Mere and Little Mere), which are separated by a spillway. Twelve species of submerged macrophytes are present. These include the nationally rare autumnal water-starwort, which is locally abundant. Slender spike-rush and shore-weed, which are rare in Cheshire are abundant at this site. The aquatic invertebrate fauna is diverse and includes the red-eyed damselfly which has a restricted distribution in Britain. The site is located 1.4km east of the land required for the Proposed Scheme between Winterbottom and Hulseheath;
- Rostherne Mere SSSI and National Nature Reserve (NNR), covering an area of 153ha, is designated for its nutrient-rich open water body with fringing reed swamp. The area of the Rostherne Mere SSSI extends beyond the boundary of the Ramsar site and includes additional grassland habitats. It is a winter roost for large numbers of ducks and holds nationally significant numbers of pochard and pintail. The site's designation as an NNR is for woodland and wetland birds, mammals, butterflies and its importance for freshwater research.

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

The site is located 1.2km east of the land required for the Proposed Scheme between Hulseheath and Agden Lane. This SSSI /NNR is also relevant to MA06, Hulseheath to Manchester Airport, where it is located adjacent to the land required for the Proposed Scheme; and

- Tatton Meres SSSI, covering an area of 90ha, is situated to the north of Knutsford, 3km east of the land required for the Proposed Scheme. It is a component of the Midland Meres and Mosses Phase 1 Ramsar site, but the land required for the Proposed Scheme in the Pickmere to Agden and Hulseheath area is outside the Natural England Impact Risk Zone for this site. This SSSI is also relevant to MA06, Hulseheath to Manchester Airport, where it is 3km south of the land required for the Proposed Scheme.

7.3.6 There are 10 Local Wildlife Sites (LWS) of potential relevance to the assessment in the Pickmere to Agden and Hulseheath area, each of which is of county/metropolitan value. Citations provided by relevant organisations have been used in the descriptions below, and where citations are outstanding, publicly available sources of information have been used. Details of site interest features and reasons for designation will be updated in the formal ES. The LWS are:

- Leonards and Smoker Wood LWS, covering an area of 10.7ha, comprises woodland habitat along Smoker Brook, including areas of ancient semi-natural woodland. The LWS is located partially within the land required for the Proposed Scheme, to the north of Linnards Lane along Smoker Brook. The LWS is situated is relevant to the Pickmere to Agden and Hulseheath area (MA03) and the Wimboldsley to Lostock Gralam area (MA02);
- Rinks Wood and Round Wood LWS, covering an area of 14.4ha, comprises woodland habitat including areas of ancient semi-natural woodland. The LWS is located 70m east of the land required for the Proposed Scheme, at Nether Tabley;
- Arley and Waterless Brook Corridor LWS, covering an area of 2ha, comprises river habitat along Arley Brook. The LWS is located partially within the land required for the Proposed Scheme, south of Yew Tree Farm along Waterless Brook;
- Bongs Wood and Rough LWS, covering an area of 7.6ha, comprises woodland habitat along Arley Brook, including areas of ancient semi-natural woodland. The LWS is located 350m west of the land required for the Proposed Scheme, east of Feldy;
- Tableypipe Wood LWS, covering an area of 5.2ha, comprises an area of woodland. A site haul route intersects the LWS to the east and is located 215m east of land required for the Proposed Scheme, west of Over Tabley;
- Meremoss (Mere) LWS, covering an area of 42.8ha, comprises woodland habitat including areas of ancient semi-natural woodland. The LWS is located 980m north of the land required for the Proposed Scheme, south of Mere;
- Belt Wood LWS, covering an area of 10.6ha, comprises an area of woodland.

The LWS is located 20m east of the land required for the Proposed Scheme, west of Mere;

- Cicely Mill Pool LWS, covering an area of 4.6ha, comprises a shallow, silty lake managed for sport fishing and wildlife conservation. The LWS is located along Cicely Mill Road at Cicely Mill, 1.4km south of the land required for the Proposed Scheme. The LWS is situated is relevant to the Pickmere to Agden and Hulseheath area (MA03) and the Hulseheath to Manchester Airport area (MA06);
- Fields Behind "Ye Olde No.3" LWS, covering an area of 2.5ha, comprises two fields adjacent to the Bridgewater Canal. The LWS is located 200m east of the land required for the Proposed Scheme, south of Agden Bridge Farm along the Bridgewater Canal; and
- Woolstencroft Farm Meadow LWS, covering an area of 6.8ha, comprises grassland and scrub habitat. The LWS is located 745m east of the land required for the Proposed Scheme, north of Broomedge.

7.3.7 There is one Site of Biological Importance (SBI) of potential relevance to the assessment in the Pickmere to Agden and Hulseheath area, which is of county/metropolitan value. Details of site interest features and reasons for designation will be updated in the formal ES. Dobb Lane SBI, covers an area of 1.2ha, comprises a linear belt of woodland. The SBI is located 95m south-west of the land required for the Proposed Scheme, south of Yew Tree Farm.

7.3.8 There are six Ancient Woodland Inventory sites (AWIS) relevant to the assessment in this area. Due to the habitats and species present, these sites are considered to be up to county/metropolitan value. Four of these AWI sites are also LWS as described above. They are:

- Leonards and Smoker Wood AWIS, covering an area of 8.2ha including 3.7ha of Plantation on Ancient Woodland Sites (PAWS), is located partially within the land required for the Proposed Scheme, to the north of Linnards Lane along Smoker Brook. The woodland is also Leonards and Smoker Wood LWS as described above;
- Round and Rinks Woods AWIS, covering an area of 31.9ha, including 0.9ha of PAWS, is located 70m east of the land required for the Proposed Scheme, at Nether Tabley. Part of the woodland is also Rinks Wood and Round Wood LWS as described above;
- Bongs Wood AWIS, covering an area of 4.1ha, including 2.5ha PAWS, is located 550m west of the land required for the Proposed Scheme, east of Feldy. The woodland is also Bongs Wood and Rough LWS as described above;
- Tabley Wood AWIS, covering an area of 1.3ha of PAWS, is located adjacent to the land required for the Proposed Scheme, to the south of the M6 and north of Holehouses;

- Meremoss Wood AWIS, covering an area of 10.7ha of PAWS, is located 980m north of the land required for the Proposed Scheme, south of Mere. The woodland is also Meremoss (Mere) LWS as described above; and
- Park Covert AWIS, covering an area of 3.3ha of PAWS, is located 295m west of the land required for the Proposed Scheme, south of Woodside Farm.

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

Habitats

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

Woodland

7.3.11 In addition to the aforementioned woodlands, there are two areas of lowland deciduous woodland (likely to qualify as habitats of principal importance[48], and local Biodiversity Action Plan (BAP)[49] habitats) that are partly within the land required for the Proposed Scheme. These are woodland areas east of Woodside Farm and north of Hulseheath. On a precautionary basis, pending the findings of field surveys, these woodlands are considered to be of up to county/metropolitan value.

Grassland

7.3.12 It is possible that grassland outside designated sites, which may qualify as a habitat of principal importance and local BAP habitat, occurs within the land required for the Proposed Scheme. On a precautionary basis, pending the findings of field surveys (which may identify these as unimproved grasslands), these grasslands are considered to be of up to district/borough value.

Hedgerows

7.3.13 Many of the hedgerows in the study area are likely to qualify as a habitat of principal importance and a local BAP habitat. Some may also meet the wildlife and landscape criteria to be 'important' hedgerows as defined in the Hedgerows Regulations 1997[50]. They include those at Providence Farm, at Roses Farm, at Flittogate Farm, along Waterless Brook, along the M6, west of Woodside Farm, along Millington Clough and along Agden Lane. In addition, hedgerow habitats could also provide commuting corridors for wildlife as well as nesting and feeding habitat. On a precautionary basis, pending the findings of field surveys, the hedgerow network is considered to be of up to district/borough value.

Watercourses

7.3.14 Waterless Brook, Millington Clough and several smaller watercourses would be crossed by the route of the Proposed Scheme. Waterless Brook and Millington Clough may qualify as habitats of principal importance, or local BAP habitats. On a

[48]Statutory Instrument 1997 No. 1160" Hedgerows Regulations 1997
[49]Environment Agency (EA) (2010). Fifth otter survey of England 2009-2010. Available online at: http://www.thepredationactiongroup.co.uk/images/EA_otter_survey_oct10.pdf
[50] HS2 (2012), HRA Screening Report for Midland Meres and Mosses Phase 1 Ramsar Site

precautionary basis, pending the findings of field surveys, the larger watercourses are assumed to be of up to county/metropolitan value. The smaller watercourses are considered to be of up to district/borough value.

Water bodies

7.3.15 There are 68 ponds that would be located within, or partly within, the land required for the Proposed Scheme, four of which are within land required for habitat creation or enhancement. Some may qualify as habitats of principal importance, or local BAP habitats (e.g. if they support fauna species of high conservation importance such as great crested newts). It has been assumed that ponds located within land required for the Proposed Scheme, which are within areas of ecological mitigation, will not be lost as a result of the Proposed Scheme. On a precautionary basis, pending the findings of field surveys, these ponds have been assumed to be of up to county/metropolitan value.

Ancient and veteran trees

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

Protected and notable species

7.3.17 A summary of the likely value of fauna species of relevance to the assessment (excluding any features of species interest for which the sites described above are designated) is provided in Table 10.

Table 10*:* Species potentially relevant to the assessment within the Pickmere to Agden and Hulseheath area

Resource/feature	Value	Rationale
Bats	Up to regional	Within land required for the Proposed Scheme there are records for common pipistrelle, soprano pipistrelle and brown long-eared bat in the vicinity of Smoker Hill Farm and common pipistrelle and brown long-eared bat in the vicinity of Heyrose Farm. There are no records of roosts within 200m of land required for the Proposed Scheme. Records within 2km of the Proposed Scheme include common pipistrelle, soprano pipistrelle, Brandt's bat, Daubenton's bat, Natterer's bat, whiskered bat, brown long-eared bat and noctule. They include roosts of common pipistrelle, Daubenton's bat and brown long-eared bat at Dunham Park. Records confirm that Nathusius' pipistrelle and serotine are present in the wider Cheshire area and suitable habitat to support these species is present within the land required for the Proposed Scheme. Field surveys recorded the widespread presence of habitats considered suitable to support roosting, foraging and commuting bats, including hedgerows, woodlands and water bodies and watercourses.

Resource/feature	Value	Rationale
Otter	Up to county/metropolitan	Desk study records for otter were reported on the River Bollin, but none are within the land required for the Proposed Scheme within the Pickmere to Agden and Hulseheath area. Suitable habitat is present, providing foraging, breeding and dispersal opportunities for otter along watercourses, drainage ditches and other large water bodies within the Pickmere to Agden and Hulseheath area. Otter are widely distributed south of the urban areas around Manchester but appear to be present only in small numbers with a slow rate of colonisation in Cheshire[51].
Water vole	Up to county/metropolitan	Populations of water vole are declining throughout the UK but there are strongholds for this species throughout Cheshire and water vole populations are widespread and locally common around Greater Manchester[52]. Habitat suitable for water vole is potentially present along the watercourses and drainage ditches, and there are records of their presence along Millington Clough within 1.4km and at Dunham within 1.9km of land required for the Proposed Scheme.
Polecat	Up to county/metropolitan	Populations of polecat are rare in Cheshire and around Greater Manchester. Habitat suitable for this species is present, including hedgerows, farmland and woodland, and there are several records to the east of the land required for the Proposed Scheme in the Knutsford and Tabley Hill areas and Dunham Park.
Great crested newt	Up to county/metropolitan	There are no records of great crested newt within 250m or 500m of land required for the Proposed Scheme. However, great crested newt is widespread throughout the Cheshire region due to the relative abundance of farm ponds and suitable terrestrial habitat present.
Birds	Up to county/metropolitan	The meres, rivers, farmland, and woodland are suitable for breeding and wintering birds. Species associated with these habitats include spotted flycatcher, willow tit, lapwing, barn owl, skylark, tree sparrow, yellow wagtail, linnet and yellowhammer, which breed in low numbers in farmland and woodland habitats. There is a record of barn owl at Broad Oak Farm, within 225m of land required for the construction of the Proposed Scheme. Wintering bird surveys carried out on arable and wetland habitat have recorded flocks of lapwing and golden plover, as well as snipe, shelduck and teal. Flocks of redwing and fieldfare on farmland habitats were recorded throughout the survey area.

[51]HS2 (2012), HRA Screening Report for Rostherne Mere Ramsar Site.
[52]Water vole Species Action Plan 2009.Available online at: http://www.gmbp.org.uk/site/images/stories/water%20voles%20bap_09.pdf

Resource/feature	Value	Rationale
White clawed crayfish	Up to county/metropolitan	There are no recent records of white clawed crayfish within the land required for the Proposed Scheme. Distribution of white clawed crayfish in Cheshire is restricted[53]; however, suitable habitat is likely to be present in watercourses including the Waterless Brook and Millington Clough, smaller watercourses, and in water bodies.
Aquatic invertebrates	Up to district/borough	Suitable habitat for aquatic invertebrates is present throughout the land required for the Proposed Scheme and includes ponds and ditches and along watercourses including Waterless Brook and Millington Clough, smaller watercourses and associated floodplains. No notable species records exist within the Pickmere to Agden and Hulseheath area. However, notable species could occur in potentially suitable habitat within the land required for the Proposed Scheme.
Terrestrial invertebrates	Up to district/borough	Suitable habitat for terrestrial invertebrates is potentially present within the land required for the Proposed Scheme, however no notable species records exist within the Pickmere to Agden and Hulseheath area. Habitats associated with notable species within Cheshire include woodland, hedgerows, grassland and meadows. These habitats are present throughout the land required for the Proposed Scheme including at ancient woodland sites, Woolstencroft Farm Meadow LWS and hedgerows surrounding fields.
Fish	Up to district/borough	There are records for the river catchments affected by the Proposed Scheme of European bullhead, brook lamprey, eel and brown trout. European bullhead and brook lamprey is listed under Annex II of the EC Directive on the conservation of natural habitats and flora and fauna but is widespread and common in the UK; brook lamprey, eel and brown trout populations are declining across the UK. These species are not found in badly polluted rivers.
Reptiles	Up to district/borough	There is a record of common lizard within the land required for the Proposed Scheme near Agden Hall. Suitable habitat is likely to be present for reptiles, including around the watercourses and ponds, field margins and woodland edges. Consultees have confirmed that reptiles are sparsely distributed in Cheshire and Greater Manchester and that strongholds are associated with remaining mossland areas.

7.4 Effects arising during construction

Avoidance and mitigation measures

7.4.1 The following measures have been included as part of the design of the Proposed Scheme (in addition to the landscape planting shown on the Map Series CT-06 in the

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

Volume 2: MA03 Map Book along the rail corridor, which would be largely a mixture of woodland/scrub and grassland) and would contribute towards mitigating the losses of habitat and effects on species:

- construction of the viaduct over Arley Brook would reduce habitat loss associated with Arley and Waterless Brook Corridor LWS and allow free passage for wildlife beneath the Proposed Scheme in this location including along the river and its banks;
- provision of 5.9ha of additional broadleaved woodland to replace those lost, and/or enhancement of remaining woodlands, including those at the intersection of Flittogate Lane and Pickmere Lane (0.3ha), Budworth Road, south of Hoo Green Lane (1.6ha) and at Hulseheath (4ha);
- provision of new ponds to replace those lost including those at west of Smoker Hill Farm, south of Flittogate Farm, east of School Farm, north of Winterbottom, east of Goodiersgreen Farm, west of Hulseheath and west of Stonedelph Farm;
- provision of new species-rich hedgerows, using appropriate native species, to contribute towards compensation for the loss of hedgerows, and re-connecting the ecological network in the surrounding areas, including along the margins of the Proposed Scheme, but also in specific areas such as along Linnards Lane, near Tabley Wood, near Belt Wood in land surrounding Peacock Lane and the M56;
- provision of new grassland habitats, including species-rich grasslands and meadow creation to contribute towards compensation for losses as a result of the Proposed Scheme (e.g. east of Providence Farm, east of School Farm, south and south-east of Daisy Bank Farm and near Holly House Farm); and
- river restoration and wetland habitat creation within floodplains to contribute towards compensation for the loss of aquatic habitat (e.g. along Waterless Brook and smaller watercourses north of Heyrose Farm).

7.4.2 The assessment assumes implementation of the measures set out within the draft Code of Construction Practice (CoCP)[54], which includes translocation of protected species where appropriate.

[54] Supporting document: Draft Code of Construction Practice

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

- manage impacts from construction, including the timing of works, on designated sites, protected and notable species and other features of ecological importance such as ancient woodlands and watercourses;
- reduce habitat loss by keeping the working area to the reasonable minimum;
- reinstatement of areas of temporary habitat loss;
- restoration and replacement planting;
- implement management measures for potential ecological impacts to control dust, water quality and flow, noise and vibration, and lighting;
- provision of a watching brief, where relevant;
- relocation or translocation of species, soil and/or plant material, as appropriate;
- consultation with Natural England, the Environment Agency, local wildlife trusts and relevant planning authorities prior to and during construction; and
- compliance with all wildlife licensing requirements, including those for protected and invasive species and designated sites.

Assessment of impacts and effects

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

Designated sites

7.4.5 A study to inform Habitats Regulations Screening Assessment was undertaken for Midland Meres and Mosses Phase 1 Ramsar site[55] during the Appraisal of Sustainability stage of project development. This was undertaken in consultation with Natural England and the Environment Agency. The overall conclusion of this screening report was that, with avoidance measures, the impacts on the groundwater regime (and therefore the water levels and water quality in The Mere, Mere SSSI) would not be significant and there would be no likely significant effect on the Midland Meres and Mosses Ramsar Site. HS2 Ltd will continue to consult with these bodies (and other relevant key stakeholders) as the design develops to ensure that the submitted design in the hybrid Bill complies with the Habitats Regulations 2017. Where required, further assessment will be undertaken and an appropriate design will be developed through an iterative process. Any studies to inform the required

[55] HS2 (2012), HRA Screening Report for Midland Meres and Mosses Phase 1 Ramsar Site

assessments will be completed and the outcomes agreed with Natural England prior to submission of the hybrid Bill.

7.4.6 A study to inform Habitats Regulations Screening Assessment was undertaken for Rostherne Mere Ramsar site[56] during the Appraisal of Sustainability stage of the project development. This was undertaken in consultation with Natural England and the Environment Agency. It concluded that with inclusion of the design-led avoidance measures, should they prove necessary, impacts on the groundwater regime (and therefore, the water levels and water quality in Rostherne Mere) would not be significant and that no likely significant effect to the Ramsar Site would occur. The conclusion that there was no likely significant effect to the Ramsar site would occur. HS2 Ltd will continue to consult with these bodies (and other relevant key stakeholders) as the design develops to ensure that the submitted design in the hybrid Bill complies with the Habitats Regulations 2017. Further assessment is being carried out as discussed in Section 15, Water resources and flood risk and an appropriate design will be developed through an iterative process. Any studies to inform the required assessments will be completed and the outcomes agreed with Natural England prior to submission of the hybrid Bill.

7.4.7 Plumley Lime Beds SSSI is located 760m to the south-east of the land required for the Proposed Scheme in the Pickmere to Agden and Hulseheath area. The proposed Smoker Brook Viaduct North satellite compound and access in this location could result in emissions from construction and traffic. It is anticipated that implementation of measures in the draft CoCP would reduce the magnitude of these impacts to a level where there would be no significant effects. In the Wimboldsley to Lostock Gralam (MA02) area, a construction haul route for the Proposed Scheme would be located adjacent to the north-western boundary of the SSSI resulting in an adverse effect, which would be significant at national level.

7.4.8 Tabley Mere SSSI is designated as a mere type consisting of very nutrient-rich water with a well-developed aquatic flora. It is situated 864m east of land required for the Proposed Scheme in this area. The Proposed Scheme in this location is principally on Pickmere embankment and Arley Brook viaduct, so would not affect the surface or groundwater associated with the site. The site is located 110m east of the A556 Chester Road, which would be used as a construction access route. It is anticipated that implementation of measures in the draft CoCP would reduce the magnitude of these impacts to a level where there would be no significant effects. However, on a precautionary basis and in the absence of further information, at this stage the assessment assumes there would be a temporary adverse effect, which would be significant at national level.

7.4.9 The Mere, Mere SSSI is designated as moderately nutrient-rich meres with a very diverse aquatic flora and is located 1.4km east of the land required for the Proposed Scheme. The SSSI is a component of the Midland Meres and Mosses Phase 1 Ramsar site and is designated for similar reasons. Ongoing consultation, appropriate design

[56] HS2 (2012), HRA Screening Report for Rostherne Mere Ramsar Site.

and further assessment, where required, are being undertaken to ensure there would be no adverse impact on the Ramsar site and on the aquatic habitats present to ensure there would be no significant effects on the integrity of the SSSI.

7.4.10 Rostherne Mere SSSI and NNR is designated because it is one of the deepest and largest of the meres of the Shropshire-Cheshire Plain. It is located 1.2km to the east of land required for the Proposed Scheme in this area, and adjacent to the Proposed Scheme in the Hulseheath to Manchester Airport area (MA06). Reasons for designation are similar to those of the Rostherne Mere Ramsar site, for which the Screening Report concluded that there would be no likely significant effects. Ongoing consultation, appropriate design and, where required, further assessment are being undertaken to ensure there would be no adverse impact on the Ramsar site and on the integrity of the aquatic habitats in the SSSI. Any risk of disturbance to the water bird assemblage for which the SSSI/NNR is also designated would be controlled through measures in the draft CoCP. Consequently there would be no significant effects on the integrity of the SSSI.

7.4.11 Construction of the Smoker Brook viaduct would result in the permanent loss of 0.5ha (5%) of Leonards and Smoker Wood LWS and AWIS. Habitat loss from this LWS and AWIS within the Pickmere to Agden and Hulseheath area accounts for the loss of 0.1ha (1%) of the site. The remaining area of loss would be within the Wimboldsley to Lostock Gralam area (MA02). The losses would result in a permanent adverse effect that is significant at the district/borough level.

7.4.12 Construction of the viaduct over Arley Brook would result in the permanent loss and severance of 0.1ha (6%) of Arley and Waterless Brook Corridor LWS. Habitat loss and severance would result in the permanent adverse effect on site integrity that would be significant at the district/borough level.

7.4.13 Construction of a construction haul route at Over Tabley would result in the permanent loss and severance of habitat within Tabley Pipe LWS. Habitat loss and severance would result in a permanent adverse effect on site integrity that would be significant at up to the county/metropolitan level.

Habitats

Woodland

7.4.14 In addition to the aforementioned loss of woodland from designated sites, construction would result in the loss of 0.8ha of broadleaved woodland near the intersection of Flittogate Lane and Pickmere Lane, Budworth Road, south of Hoo Green Lane and at Hulseheath. This would result in a permanent adverse effect that would be significant at up to the county/metropolitan level. The provision of new woodland would connect and help maintain the integrity of remaining areas of woodland. A temporary adverse effect is expected until these woodland areas have become established, after which there will be a reduced effect on lowland mixed deciduous woodland that is not significant, unless the ongoing review identifies any of the woodlands as ancient in which case there would be a permanent adverse effect at up to the county/metropolitan level.

Grassland

7.4.15 Construction of the Proposed Scheme could result in the loss of grassland outside designated sites. It has been assumed that none of the grassland lost would be unimproved. The loss of grassland habitats would result in a permanent adverse effect that would be significant at up to the district/borough level. The provision of 4.7ha of new grassland habitats, including some species-rich grasslands and meadow creation east of Providence Farm, east of School Farm, south and south-east of Daisybank Farm and near Holly House Farm, once established, would reduce the adverse effect on grassland habitats to a level that is not significant.

Hedgerows

7.4.16 The Proposed Scheme would cross hedgerows that are located throughout the area, some of which may be 'important' hedgerows. The land required for construction of the Proposed Scheme would result in the permanent loss of hedgerows, and would result in severance of the network in many places, adversely affecting connectivity with the surrounding area. The length of hedgerow loss will be confirmed in the formal ES. The Proposed Scheme includes new hedgerow planting, which would help compensate for losses. Further hedgerow planting will be proposed as part of the design development. In the absence of mitigation, the loss of these hedgerows would result in a permanent adverse effect on the conservation status of the hedgerow network that would be significant at up to the district/borough level.

Watercourses

7.4.17 The Proposed Scheme would cross Waterless Brook on viaduct. This watercourse would not be directly affected, and indirect effects would not be significant as they would be controlled through the implementation of the measures in the draft CoCP. However, the Proposed Scheme would result in the loss of sections of other smaller watercourses, including Millington Clough, and severance of river corridors due to culverts, which would result, on a precautionary basis, in a permanent effect that would be significant at up to the district/borough level.

Water bodies

7.4.18 Sixty-four ponds would be lost as a result of the construction of the Proposed Scheme. The loss of these ponds could result, on a precautionary basis, in an impact that would be significant at up to county/metropolitan level, if it is confirmed through field surveys that they support great crested newts or other priority species. It is considered likely that the aforementioned pond and grassland habitat creation areas would be sufficient to reduce the effect of the loss of these ponds to a level that is not significant. However, on a precautionary basis, and in the absence of survey data, at this stage the assessment assumes that there would be a temporary adverse effect, which would be significant at the county/metropolitan level.

Ancient and veteran trees

7.4.19 It is assumed that ancient and veteran trees recorded within the land required for the Proposed Scheme in the Pickmere to Agden and Hulseheath area would be permanently lost. Ancient and veteran trees are an irreplaceable resource and their

potential loss would result, on a precautionary basis, in a permanent adverse effect that is significant at district/borough level in each case.

Species

Bats

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

Otter

7.4.21 Otters have been recorded along the River Bollin within 3.9km of the land required for the Proposed Scheme. The proposed viaduct over Waterless Brook would avoid loss of habitat along the river corridor. Indirect effects from construction activities may result in disturbance to these species during the construction period, and prevent them from moving along the river corridor. However, it is anticipated that these indirect effects would be controlled through the application of the measures in the draft CoCP. Habitat loss would result from the impact on several smaller watercourses that would be crossed by the Proposed Scheme. On a precautionary basis, in the absence of survey information, impacts to otters would result in an adverse effect on the conservation status of this species that would be significant up to the county/metropolitan level.

Water vole

7.4.22 Water vole have been recorded along Millington Clough within 1.4km of the land required for the Proposed Scheme. The proposed viaducts over Waterless Brook would avoid loss of habitat along the river corridor. Indirect effects from construction activities may result in disturbance to these species during the construction period, and prevent them from moving along them. However, it is anticipated that these indirect effects would be controlled through the application of the measures in the draft CoCP. Habitat loss would result from the impact on several smaller watercourses that would be crossed by the Proposed Scheme. On a precautionary basis, in the absence of survey information, impacts to water vole would result in an adverse effect on the conservation status of this species that would be significant up to the county/metropolitan level.

Polecat

7.4.23 The loss of woodland and hedgerows along with grassland and arable land could affect polecat, a species that has been recorded east of the land required for the Proposed Scheme in the Knutsford and Tabley Hill areas and Dunham Park. On a precautionary basis, in the absence of survey information, the effects of permanent

habitat loss on this species would be significant at up to the county/metropolitan level.

Great crested newt

7.4.24 It has been assumed that all 64 ponds (and surrounding terrestrial habitat) within the land required for construction of the Proposed Scheme may support great crested newts, and would be lost during construction. The loss of ponds supporting great crested newts and associated terrestrial habitat could result in the isolation and severance of breeding populations of great crested newts across this area. On a precautionary basis, in the absence of further survey information, it has been assumed that all ponds that would be lost support great crested newts. Where great crested newts are present, two new ponds would be created for every one lost to the permanent works, and this would contribute towards reducing the effects to not significant. Suitable terrestrial habitat would be required around all new ponds created along with links to encourage dispersal (e.g. by incorporating existing habitat or creating new habitat), and this would be undertaken as part of scheme design development and included in the formal ES. In the absence of the full mitigation, the loss of the ponds and surrounding land would result in a permanent adverse effect on the conservation status of great crested newts that would be significant at up to the county/metropolitan level.

Birds

7.4.25 Land required for construction of the Proposed Scheme would result in the loss of nesting and foraging habitat for a range of breeding and wintering birds, predominantly farmland and woodland species. These are likely to include barn owl, a Schedule 1 species, which has been recorded at Broad Oak Farm, within 225m of land required for the Proposed Scheme. On a precautionary basis, in the absence of survey information, it has been assumed that the Proposed Scheme would result in a permanent adverse effect that would be significant at up to the county/metropolitan level.

White clawed crayfish

7.4.26 Arley Brook viaduct would avoid removal of habitat for white-clawed crayfish along Waterless Brook, but loss of suitable habitat would occur from the creation of culverts along several smaller watercourses, including Millington Clough, which would be crossed by the Proposed Scheme. Indirect effects such as siltation and sedimentation from construction activities may result in decreased water quality, which may affect white clawed crayfish. However, it is anticipated that these indirect effects would be controlled through the application of the measures in the draft CoCP.

7.4.27 On a precautionary basis, in the absence of survey information, it has been assumed that loss of habitat suitable for white clawed crayfish would result in permanent adverse effect on conservation status that would be significant at up to the county/metropolitan level.

Aquatic invertebrates

7.4.28 The land required for construction of the Proposed Scheme in the Pickmere to Agden and Hulseheath area would result in loss of habitat suitable for aquatic invertebrates

(potentially including rare and notable species). Arley Brook viaduct would however avoid removal of habitat along the Waterless Brook, but loss of suitable habitat for aquatic invertebrates would occur from the creation of culverts along several smaller watercourses, such as Millington Clough, which would be crossed by the Proposed Scheme. It is also assumed that the 68 ponds within the land required for the Proposed Scheme may support notable aquatic invertebrates.

7.4.29 Indirect effects associated with activities such as siltation and sedimentation from construction may result in decreased water quality, which may affect aquatic invertebrate species. However, it is anticipated that these indirect effects would be controlled through the application of the measures in the draft CoCP. There would be habitat loss affecting several smaller watercourses that would be crossed by the Proposed Scheme.

7.4.30 On a precautionary basis, in the absence of survey information, it has been assumed that loss of habitat suitable for aquatic invertebrates would result in permanent adverse effect on conservation status that would be significant at up to the district/borough level.

Terrestrial invertebrates

7.4.31 The land required for construction of the Proposed Scheme would result in loss of habitat suitable for terrestrial invertebrates (including Section 41 species) including woodland, hedgerows and grassland, which may support notable terrestrial invertebrates. These are likely to include sites such as Leonards and Smoker Wood LWS and Arley and Waterless Brook Corridor LWS located within the land required for the Proposed Scheme. Indirect effects from construction activities such as changes to hydrology and air pollution may result in changes to habitats present, which may affect terrestrial invertebrate species. However, it is anticipated that these indirect effects would be controlled through the application of the measures in the draft CoCP. On a precautionary basis, in the absence of survey information, it has been assumed that the Proposed Scheme would result in permanent adverse effect that would be significant at up to the district/borough level.

Fish

7.4.32 There are records of fish from the main watercourses including species such as European bullhead and brook lamprey (both listed on Annex II of the EC Habitats Directive[57]) eel and brown trout. The Proposed Scheme would pass over these watercourses, such as Waterless Brook, on the Arley Brook viaduct and indirect impacts to the watercourses would be controlled through measures set out in the draft CoCP. However, other smaller watercourses would still be affected and may require assessment under the Water Framework Directive (WFD)[58]. On a precautionary basis, in the absence of survey information, it has been assumed that the Proposed Scheme would result in permanent adverse effect that would be significant at up to the district/borough level.

[57]EU Water Framework Directive. Available online at: http://ec.europa.eu/environment/water/water-framework/index_en.html
[58] Currently in development for Phase One of HS2

Reptiles

7.4.33 There is a record of common lizard at Agden Hall, within the land required for the Proposed Scheme. Suitable habitat is also likely to be present for reptiles, including grass snake near the watercourses and common lizard and slow worm in grassland and scrub habitats. On a precautionary basis in the absence of survey information, it has been assumed that the Proposed Scheme would result in a permanent adverse effect that would be significant at up to the district/borough level.

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

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

Other mitigation measures

7.4.36 Further measures currently being considered, but which are not yet part of the design and will be informed by the findings of the ongoing field surveys and engagement with relevant stakeholders, include:

- considering the need for inclusion of structures to reduce severance effects on bats;
- provision of additional measures to facilitate connectivity where significant foraging or commuting routes of fauna species would be affected;
- use of temporary fencing or retention of existing habitat links to reduce the risk of disturbance to otters during construction; design of watercourse culverts and underpasses to allow the free passage of wildlife;
- provision of alternative roosting habitat for bats; and
- provision of additional ponds (on a two to one basis where existing ponds supporting great created newts are lost), outside the area required for the permanent works but within the land required for the Proposed Scheme and suitable terrestrial habitat around these ponds with habitat links to allow dispersal.

7.4.37 Some of the above may also be achieved through strategic mitigation, which is currently being discussed with relevant stakeholders.

7.4.38 Ancient woodland is an irreplaceable resource and this loss is considered to be a permanent adverse residual effect. The loss of ancient woodland would be partly compensated through a package of measures bespoke to the woodland affected. Ancient woodland soil with its associated seed bank would be salvaged and translocated to receptor sites that have, wherever possible, been chosen because they link to and/or are adjacent to ancient woodland fragments. This would seek to increase the connectivity of fragmented ancient woodland parcels. Other measures such as planting native tree and shrub species of local provenance, enhancement of

retained woodland, and translocation of coppice stools and dead wood, would be undertaken as appropriate.

Summary of likely residual significant effects

7.4.39 Taking into account mitigation proposed in the design of the Proposed Scheme set out above, the anticipated significant residual ecological effects during construction are described in Table 11.

Table 11: Residual significant effects on ecological resources/features during construction

Resource/feature	Residual effect	Level at which the effect would be significant
Tabley Mere SSSI	Temporary adverse effect on site integrity due to indirect airborne pollution from construction traffic	National
Leonards and Smoker Wood LWS and AWIS	Permanent adverse effect on site integrity due to loss of 0.1ha (1%) of habitats, including irreplaceable loss of ancient woodland habitat.	District/borough
Arley and Waterless Brook LWS	Permanent adverse effect on site integrity due to loss and severance of 0.1ha (6%) of habitats	District/borough
Tableypipe Wood LWS	Permanent adverse effect on site integrity due to loss and severance of habitats	Up to county/metropolitan
Woodlands	Potential adverse effect on unidentified ancient woodlands	Up to county/metropolitan
Hedgerows	Permanent adverse effect from loss of hedgerows and fragmentation of hedgerow network	Up to district/borough
Watercourses	Permanent adverse effect from loss and fragmentation of minor watercourses	Up to district/borough
Water bodies	Permanent adverse effect from loss of 68 ponds	Up to county/metropolitan
Ancient and veteran trees	Potential loss of ancient and veteran trees	Up to district/borough
Bats	Potential permanent adverse effect on conservation status due to loss of roosts, foraging habitat and fragmentation	Up to regional
Otter	Potential permanent adverse effect on conservation status due to loss and fragmentation of habitat along minor watercourses	Up to county/metropolitan
Water vole	Potential permanent adverse effect on conservation status due to loss and fragmentation of habitat along minor watercourses	Up to county/metropolitan

Polecat	Potential permanent adverse effect on conservation status due to loss of habitat.	Up to county/metropolitan
Great crested newts	Potential permanent adverse effect on conservation status due to loss of 68 ponds and surrounding terrestrial habitat which may support great crested newts	Up to county/metropolitan
Birds	Potential permanent adverse effect on conservation status due to loss of habitat	Up to county/metropolitan
White clawed crayfish	Potential permanent adverse effect on conservation status due to loss of habitat	Up to county/metropolitan
Aquatic Invertebrates	Potential permanent adverse effect on conservation status due to loss of habitat	Up to district/borough
Terrestrial invertebrates	Potential permanent adverse effect on conservation status due to loss of habitat	Up to district/borough
Fish	Potential permanent adverse effect on conservation status due to loss of habitat along minor watercourses	Up to district/borough
Reptiles	Potential permanent adverse effect on conservation status due to loss of habitat	Up to district/borough

7.5 Effects arising during operation

Avoidance and mitigation measures

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

Assessment of impacts and effects

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

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

7.5.4 Barn owls are at risk of colliding with trains, particularly near Broad Oak Farm north-west of High Legh where there is suitable grassland foraging habitat. The grassland vegetation that would grow along the embankments of the Proposed Scheme may encourage barn owls to forage close to trains, with the risk that they may be killed. Mortality, even if infrequent, could affect the conservation status of this Schedule 1

species and the ongoing reduction in numbers would result in a permanent adverse effect that would also be significant at up to county/metropolitan level.

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

Other mitigation measures

7.5.6 Additional mitigation measures currently being considered include:

- updating the HS2 barn owl mitigation plan[59] which is being developed to provide measures that will be implemented to reduce the effects of the Proposed Scheme to a level that is not significant. This is likely to include seeking opportunities to provide barn owl nest boxes and where feasible habitat enhancement opportunities at least 3km from the Proposed Scheme in consultation with local landowners; and
- structures to reduce mortality to bats.

Summary of likely residual significant effects

7.5.7 Taking into account mitigation included as part of the Proposed Scheme design, the anticipated significant residual ecological effects during operation are detailed in Table 12.

Table 12: Residual significant effects on ecological resources/features during operation

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

Monitoring

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

7.5.9 There are no area-specific requirements for monitoring ecology and biodiversity effects or mitigation during the operation of the Proposed Scheme in the Pickmere to Agden and Hulseheath area.

[59] HS2 (2018) Barn Owl Mitigation Plan

8 Health

8.1 Introduction

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

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

8.1.3 This section deals specifically with impacts and effects at a local level within the Pickmere to Agden and Hulseheath area. Health effects across the Proposed Scheme as a whole are assessed in the route-wide health assessment contained in Volume 3: Route-wide effects.

8.1.4 Maps showing the location of the key environmental features (Map Series CT-10) and the key construction (Map Series CT-05) and key operational (Map Series CT-06) features of the Proposed Scheme are provided in the Volume 2: MA03 Map Book.

8.2 Scope, assumptions and limitations

8.2.1 The scope, assumptions and limitations for the health assessment are set out in Volume 1, Section 8 and the Scope and Methodology Report (SMR[60]).

8.2.2 As set out in the SMR, the health assessment is based on a broad understanding of health, consistent with the World Health Organization (WHO) definition of health as 'a state of complete physical, mental and social well-being and not merely an absence of disease or infirmity'. An individual's health is mostly determined by genetics and lifestyle factors, but for a large enough population many other factors, or 'health determinants', are known to be important, and these factors may be affected by the Proposed Scheme.

8.2.3 The assessment has considered the impacts of the Proposed Scheme on a range of environmental and socio-economic 'health determinants', which could result in adverse or beneficial effects on health and wellbeing.

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

8.2.4 The health determinants of relevance within the Pickmere to Agden and Hulseheath area are:

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

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

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

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

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

8.3 Environmental baseline

Existing baseline

8.3.1 The route of the Proposed Scheme runs from Higher Wincham in the south, passing close to the village of Pickmere and its surrounds, and the settlements of Hoo Green, Mere, Bucklow Hill, Hulseheath and High Legh.

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

Description of communities in the Pickmere to Agden and Hulseheath area

Pickmere and surrounds

8.3.3 This area covers the village of Pickmere and its surrounds, from the southern boundary of the Pickmere to Agden and Hulseheath area to the M6. Pickmere is located to the west of the route of the Proposed Scheme, and contains approximately 1,000 residential properties. The route of the Proposed Scheme would be approximately 1km from the nearest residential properties in the village. The surrounding area is sparsely populated.

High Legh, Hoo Green and surrounds

8.3.4 This area covers the villages of High Legh, Hoo Green, Mere, Bucklow Hill and Hulseheath.

8.3.5 The village of High Legh would be to the west of the route of the Proposed Scheme. High Legh contains approximately 500 residential dwellings, the nearest of which would be 1km from the HS2 main line. It also contains a number of community resources, High Legh Park Golf Club and High Legh Bowling Club. The National Cycle Network Regional Route 70, a 280km cycle route through Cheshire, passes through the village. The village of Hoo Green is located to the east of the route of the Proposed Scheme and comprises approximately 50 residential properties

8.3.6 To the east of the route of the Proposed Scheme are the villages of Mere and Bucklow Hill, which sit on the banks of The Mere (a local lake) and which comprise approximately 200 residential properties. Located within this area are the Mere Golf Resort and Spa, and the Mere Day Nursery. Adjacent to the Manchester spur of the route of the Proposed Scheme is the hamlet of Hulseheath. The Manchester spur would be 350m from the nearest residential properties in the village.

Demographic and health profile of the Pickmere to Agden and Hulseheath area

8.3.7 The local communities potentially affected by the Proposed Scheme in the Pickmere to Agden and Hulseheath area have a relatively low population density, commensurate with the rural nature of the area.

8.3.8 Data provided by the Office for National Statistics[61] show that this population has a broadly similar health status compared with the national (England) averages.

8.3.9 The population is more deprived than the national average with regard to the combined indices of multiple deprivation[62], and the health domain (a sub-set of the indices of multiple deprivation).

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

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

8.3.11 The available data provide detail down to ward level and enable a profile to be made of the population within the Pickmere to Agden and Hulseheath area. The description of the whole population, and the populations within wards, does not exclude the possibility that there will be some individuals or small groups of people who do not conform to the overall profile.

8.4 Effects arising during construction

Avoidance and mitigation measures

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

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

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

8.4.3 HS2 Ltd would require its contractors to comply with the environmental management regime for the Proposed Scheme, which would include the measures set out in the draft Code of Construction Practice (CoCP)[63], which provides a general basis for route-wide construction environmental management. Contractors would also be required to comply with the measures in Local Environmental Management Plans (LEMP), which apply the environmental management strategies at a local level.

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

8.4.5 The CoCP will require the nominated undertaker and its contractors to: produce and implement a community engagement framework and provide appropriately experienced community relations personnel to implement the framework; provide appropriate information; and to be the first point of contact to resolve community

[63] Supporting document: Draft Code of Construction Practice

issues. The nominated undertaker would be required to take reasonable steps to engage with the community, focusing on those who may be affected by construction impacts, including local residents, businesses, landowners and community resources, while taking into account the specific needs of protected groups (as defined in the Equality Act 2010).

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

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

Assessment of impacts and effects

Neighbourhood quality

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

8.4.8 The construction of the Proposed Scheme will affect neighbourhood quality through impacts such as noise, air emissions, visual impacts and additional traffic, including heavy goods vehicles (HGV). These will be assessed in the relevant sections of the formal ES, with a focus on those receptors, or groups of receptors, that are most affected. The Community section of the formal ES will provide a combined assessment, which will identify locations that are subject to significant environmental effects on two or more topics (e.g. noise and visual).

8.4.9 In contrast, a qualitative approach is taken to assessing impacts on neighbourhood quality. The assessment looks at changes in character, tranquillity and amenity across the neighbourhood as a whole, including streets and other public and private outdoor areas. This is judged on a case-by-case basis, taking into account the characteristics of each neighbourhood. It will be informed by the findings from other assessments, but does not rely on the same significance thresholds, as it is not focused on individual receptors. The assessment of health and wellbeing effects considers issues such as people's feelings of attachment to, and pride in, their neighbourhood and enjoyment of outside space, and how these may change.

8.4.10 The sections most relevant to the neighbourhood quality assessment are: Section 5, Air quality; Section 11, Landscape and visual; Section 13, Sound, noise and vibration; and Section 14, Traffic and transport.

8.4.11 Dust emissions from construction activities are considered in Section 5, Air quality, which identifies no significant adverse effects with respect to the effects of

construction activities on dust soiling and human health within the Pickmere to Agden and Hulseheath area, taking account of mitigation measures contained in the draft CoCP. Therefore, it is not expected that dust emissions around construction sites would contribute to adverse impacts on neighbourhood quality.

8.4.12 The construction of the Proposed Scheme would have temporary and permanent[64] impacts on neighbourhood quality in areas close to construction sites, including those at Pickmere, Hoo Green, Hulseheath and Agden. Impacts on neighbourhood quality have the potential to affect the wellbeing of residents adversely during the construction phase, by giving rise to negative feelings in relation to quality of life and the local environment, and potentially changing behaviours, such as deterring the use of outdoor space.

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

8.4.14 Traffic and transport impacts in the Pickmere to Agden and Hulseheath area would include:

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

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

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

Access to services, health and social care

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

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

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

Access to green space, recreation and physical activity

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

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

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

8.4.21 It is currently anticipated that the route of the Proposed Scheme would intersect a number of PRoW in the Pickmere to Agden and Hulseheath area. The impacts on amenity and recreational value of these footpath networks, and therefore levels of physical activity and associated health and wellbeing benefits, will be reported in the formal ES.

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

Social capital

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

"In general terms, social capital represents social connections and all the benefits they generate. Social capital is also associated with civic participation, civic-minded

attitudes and values which are important for people to cooperate, such as tolerance or trust."[65]

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

8.4.25 The villages along the route of the Proposed Scheme support small, well-established communities. The size of the temporary construction workforce may be substantial relative to the size of these local communities. During the day, the workforce would be present on construction sites and compounds throughout the area, including main compounds and satellite compounds in the vicinity of Hoo Green. The duration of the works at each site ranges from approximately one year to approximately six years. The presence of construction workers is likely to be noticeable, with construction vehicles using local roads to access compounds and workers using facilities such as shops, restaurants and public houses within all local villages.

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

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

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

8.4.29 The health assessment considers changes to the social environment and loss of social networks experienced by the remaining community following the loss of residential properties. For this to have an adverse impact on overall levels of social capital, the loss of homes would need to make up a sizeable proportion of the local community, with the potential to result in the direct loss of contacts in the local area and/or a noticeable reduction in the number of people using local facilities. This will be judged on a case-by-case basis, taking account of the size of the community and its

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

characteristics. Therefore not all of the significant effects identified in the Community section will result in adverse health and wellbeing effects.

8.4.30 Individual properties would be demolished at Pickmere Lane, Flittogate Lane, Budworth Road, Heyrose Lane, Warrington Road, Bowden View Lane, Lymm Road, Chapel Lane and Thowler Lane. These losses do not represent sizable proportions of the communities, and therefore, no health effects are anticipated on the remaining community. Effects on residents directly impacted by demolitions are assessed in Volume 3, Section 7, Health.

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

Other mitigation measures

8.4.32 Any other mitigation identified to reduce adverse impacts on health determinants during the construction of the Proposed Scheme will be described in the formal ES.

8.4.33 HS2 Ltd will engage with local authorities and community representatives to identify measures aimed at fostering positive relationships between local communities and the temporary construction workforce. Any measures identified will be included within the Community Engagement Framework.

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

8.5 Effects arising from operation

Avoidance and mitigation measures

8.5.1 Adverse impacts on health determinants would be reduced insofar as reasonably practicable through mitigation measures incorporated into the design of the Proposed Scheme to reduce adverse effects on people. The mitigation measures incorporated into the design of the Proposed Scheme in the Pickmere to Agden and Hulseheath area will be reported in the formal ES.

Assessment of impacts and effects

Neighbourhood quality

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

Other mitigation measures

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

Monitoring

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

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

9 Historic environment

9.1 Introduction

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

9.1.2 Engagement has been undertaken with Historic England, the local planning authority, Cheshire Archaeology Planning Advisory Service and the Greater Manchester Archaeological Advisory Service. The purpose of this engagement has been to discuss the assessment approach, to obtain relevant baseline information and to inform the design development and assessment of the Proposed Scheme. Engagement will continue as part of the development of the Proposed Scheme and to inform the formal assessment.

9.1.3 Maps showing the location of the key environmental features (Map Series CT-10) and the key construction (Map Series CT-05) and key operational (Map Series CT-06) features of the Proposed Scheme are provided in the Volume 2: MA03 Map Book. Only designated heritage assets within the Pickmere to Agden and Hulseheath area are shown on maps CT-10-309b to CT-10-312a. Non-designated heritage assets have also been assessed as part of this work, although they are not illustrated on these maps.

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

9.1.5 Assets have been identified in this section of the report using their National Heritage List for England (NHLE) number. If no record number is known (e.g. an asset identified from historic mapping), then the asset is referred to by name. Project-specific asset identification numbers will be used for the formal ES.

9.2 Scope, assumptions and limitations

9.2.1 The scope, key assumptions and limitations for the historic environment assessment are set out in full in Volume 1, Section 8 and the Scope and Methodology Report (SMR)[66], including the method for determining the value of a heritage asset and magnitude of impact (Tables 19 and 20 in the SMR, respectively).

9.2.2 The assessment focuses on the extent to which the Proposed Scheme would affect designated and non-designated heritage assets. Impacts on assets as a result of the

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

Proposed Scheme would occur largely through the physical removal and alteration of heritage assets and changes to their setting.

9.2.3 The study area within which a detailed assessment of all assets, designated and non-designated, has been carried out is defined as the land required for the Proposed Scheme plus 250m in urban areas and 500m in rural areas. This is referred to in the remainder of this assessment as the 250m, or 500m study area.

9.2.4 The setting of all designated heritage assets within a study area of up to 2km from the land required for the Proposed Scheme has been considered. This is referred to in the remainder of this assessment as the 2km study area.

9.2.5 The historic environment methodology includes the consideration of the relevant intra-project effects. These interactions will be included in the assessment of impacts and effects in the formal ES.

9.2.6 Where noise is considered, this is within the context of the contribution that this makes to the heritage significance of the assets, and is not a reference to absolute noise levels or sound, or the noise or vibration impacts on the health and quality of life of people who live in or visit the area.

9.2.7 The baseline studies informing this assessment have been drawn from a wide and comprehensive range of information sources. These will be supported by a programme of non-intrusive survey, including geophysical survey, the results of which will be reported in the formal ES.

9.2.8 At this stage of the design development, heritage assets within the land required to construct the Proposed Scheme are assumed to require complete removal and the assessment has been undertaken on that basis. With respect to overhead line diversions/realignments in particular, it is likely that the majority of the heritage assets can in fact be retained, as the land is only required to allow for raising or lowering of pylons and/or re-stringing of cables, or to provide an access route to the works.

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

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

- field surveys are ongoing, and are subject to land access and site conditions. The result of field surveys will be included as part of the formal ES;
- desk-based assessment is ongoing and data on non-designated heritage assets will be described more fully in the formal ES and accompanying technical appendices; and

- intra-project topic assessments are ongoing and will be considered as part of the assessment of historic environment effects as part of the formal ES.

9.2.11 At the time of writing the Cheshire HER data was not available and will be reported in full in the formal ES

9.3 Environmental baseline

Existing baseline

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

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

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

Designated assets

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

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

- three scheduled monuments of high value comprising Tabley Hall (NHLE 1012354), Alderhedge Wood (NHLE 1011889) and Hough Hall (NHLE 1011884);
- five Grade I listed buildings of high value comprising Tabley House (NHLE 1115424); Church of St Peter at Tabley House (NHLE 1329685); Stables to the south of (Dunham) Hall (NHLE 1356495); Carriage House immediately to the south of kitchen courtyard (Dunham Hall) (NHLE 1067942) and Dunham Hall (NHLE 1356512);
- three Grade II* listed buildings of high value comprising Tabley Old Hall (NHLE 1139011), Chapel of St Mary (NHLE 1139516) and Sawmill (NHLE 1067903);
- 58 Grade II listed buildings of moderate value including 21 farmhouses and associated structures from the 17th, 18th and 19th centuries. Twelve buildings located within Tabley House registered park and garden, two buildings within Dunham Massey registered park and garden, eight cottages including Ovenback Cottage (NHLE 1329662), two lodge buildings, two houses including the Mere Court Hotel (NHLE 1139522), two churches, two halls with four associated structures distributed throughout the 2km study area, Brick Kiln Lane Bridge (NHLE 1356510), Bollington Mill (NHLE 1121942), and AA Box 372 at Mere Corner (NHLE 1139490);
- Tabley House Conservation Area of high value;
- two Grade II* registered park and gardens of high value comprising Arley Hall

(NHLE 1000637) and Dunham Massey (NHLE 1000853); and

- Tabley House (NHLE 1000645) Grade II registered park and garden of moderate value.

Non-designated assets

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

- two rural properties – Barr Hill, Pickmere Lane and Gorse Cottage, Chapel Lane; and
- five farms – Flittogate Farm, Flittogate Lane; Heyrose Farm, Heyrose Lane; Holly House Farm, Warrington Road; Bowden View Farm, Bowden View Lane; Gorse Barn; Chapel Lane and Four Acres (Burnside Farm), Chapel Lane.

9.3.6 Non-designated heritage assets located partially or wholly within the 500m study area include:

- two locally listed buildings of low value comprising Cobb Lodge, Pickmere Lane and Moss Lane Farm, Froghall Lane;
- the Bridgewater Canal[67];
- three deserted medieval settlements of moderate value comprising Tabley Inferior, Strettle and Millington;
- Archaeological remains of low value associated with the North Chester Ridge Roman Road, Tabley Chapel of Ease, a duck decoy pond and a bombing decoy site; and
- two farms and a rural dwelling of low value comprising Hulseheath Farm, Hulseheath Lane, Wolstencroft Farm, Spring Lane and Brook and Ivy Cottages, Chapel Lane.

Historic environment overview

9.3.7 There is no recorded archaeological evidence from the Palaeolithic and Mesolithic periods within the study area. The earliest evidence for human activity in Cheshire and south-west Greater Manchester from these periods is found on the fringes of the Pennines and the mid Cheshire sandstone ridge outside of the study area. This includes evidence of Mesolithic settlement at Tatton Mere in the form of a flint knapping site.

9.3.8 Evidence of settlement from the Neolithic, Bronze and Iron Age periods is present in the wider archaeological record, but is rare within the study area. Evidence of a possible Bronze Age settlement enclosure has been identified at High Legh. The remains of Bronze Age burial mounds, have also been identified at Dunham Massey and Bucklow Hill. There is little evidence for Iron Age field patterns which represent

[67] See Working Draft Environmental Statement Volume 2: MA04 Broomedge to Glazebrook for full discussion of the Bridgewater Canal.

physical evidence of past agricultural practices; this may be a result of the absence of investigation rather than a lack of agricultural activity.

9.3.9 The Romano-British period began within the region with the expansion of Roman occupation north of the midlands from AD70. No known major Roman settlements are located within the study area, settlement is expected to have largely consisted of rural enclosed farmsteads, representing little change from the Iron Age period. The construction of roads within the study area including the Roman road from Northwich to Manchester and the North Cheshire Roman Ridge Road would have had an effect on the movement of people and trade.

9.3.10 Archaeological evidence becomes increasingly scant in the early medieval period, and what is known of this period is largely dependent on documentary sources. Cheshire became part of a unified England by the early 10th century AD. The recording of small settlements in the Domesday Book including Great Budworth, Aston by Budworth, Tabley, Over Tabley, Mere, High Legh and Dunham Massey suggests that the 2km study area was sparsely populated during this period. During the medieval period ecclesiastical establishments and manorial centres were the major landholders. The manors of north Cheshire were focused on moated sites that emerged in the 12th century AD. These include the scheduled monuments at Tabley Old Hall, Alderhedge Wood and Hough Hall, located within the 2km study area. Agricultural land in the region was generally poor in quality, due to poorly draining soils. Farming typically involved mixed arable and pastoral subsistence farming carried out in irregular field patterns as was the case over much of Northern England. In the 14th century agricultural production began to be dominated by cattle rearing and fattening activities, a pattern that has continued to the present day.

9.3.11 The enclosure of land within the study area was largely complete by the 19th century. The process of enclosure was slower than elsewhere in the country, largely due to the poor quality of the north Cheshire soils, which made them less attractive to prospective landowners. During this period the enclosure of land was driven by increasing demand from growing markets in the West Midlands and the North West and a requirement for improved land that saw poor quality land, such as mosses, brought into agricultural use. Improvements in the management of cattle and pasture enabled a substantial increase in the size of herds of livestock. The move towards the in-wintering of cattle and the development of crops designed specifically to feed livestock, led to changes in the layout and function of traditional farm buildings. These improvements often resulted in the amalgamation of holdings and complete rebuilding of farm buildings. Transport links were improved from the 18th century driven by the industrial revolution, including the introduction of toll roads and the construction of the Bridgewater Canal[68]. Agricultural production continued to dominate the landscape into the 20th century and very little change occurred more broadly within the modern period.

[68] See Working Draft Environmental Statement Volume 2: Community area report MA04 Broomedge to Glazebrook for full discussion of the Bridgewater Canal.

9.4 Effects arising during construction

Avoidance and mitigation measures

9.4.1 The design of the Proposed Scheme has sought to avoid impacts on heritage assets within the area insofar as reasonably practicable.

9.4.2 Section 8 of the draft Code of Construction Practice CoCP[69] sets out the measures that will be adopted, insofar as reasonably practicable, to control effects on heritage assets. These include:

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

Assessment of impacts and effects

Temporary effects

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

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

9.4.5 Mere Court Hotel (NHLE 1139522) is Grade II listed and of moderate value. It is located approximately 10m west of land permanently required for the Proposed Scheme. The Arts and Crafts house constructed in 1903 is currently a hotel. It sits within seven acres of designed landscaped gardens containing a lake, lodge and coach house. The hotel and sections of the landscaped gardens are surrounded by mature trees and planting, which prevents views of the open agricultural land beyond. The trees give the gardens a discrete and enclosed character. Although traffic noise from the A50 is audible within the grounds of the property, this becomes less pronounced within the northern section of the gardens where there is a peaceful atmosphere. The setting of the asset was designed to complement the building, and therefore, contributes to its aesthetic appeal. The setting of Mere Court Hotel would be affected by construction activities to the east including excavations and the movement of construction traffic, which would adversely affect the peaceful atmosphere of the setting of the asset and therefore detract from the ability to fully appreciate the heritage significance of

[69] Supporting document: Draft Code of Construction Practice

the asset. This would constitute a temporary medium adverse impact and a moderate adverse effect.

Permanent effects

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

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

9.4.8 Flittogate Farm, Flittogate Lane, a non-designated asset of low value, is located within the land required for the construction of the Proposed Scheme. The 19th century farmhouse with associated farm buildings would be demolished as a result of the construction of the Pickmere embankment and Flittogate Lane realignment. This would constitute a permanent high adverse impact and result in a moderate adverse effect.

9.4.9 Barr Hill, Pickmere Lane, a non-designated asset of low value, is located within the land required for the construction of the Proposed Scheme. The pair of mid-19th century cottages would be demolished as a result of the construction of the Pickmere embankment. This would constitute a permanent high adverse impact and result in a moderate adverse effect.

9.4.10 Heyrose Farm, Heyrose Lane, a non-designated asset of low value, is located within the land required for the construction of the Proposed Scheme. The 19th century farmhouse with associated farm buildings would be demolished as a result of the construction of Heyrose embankment. This would constitute a permanent high adverse impact and result in a moderate adverse effect.

9.4.11 Holly House Farm, Warrington Road, a non-designated asset of low value, is located within the land required for the construction of the Proposed Scheme. The 19th century house, formerly a farmhouse would be demolished as a result of the construction of the Hoo Green cutting and mitigation earthworks. This would constitute a permanent high adverse impact and result in a moderate adverse effect.

9.4.12 Bowden View Farm, Bowden View Lane, a non-designated asset of low value, is located within the land required for the construction of the Proposed Scheme. The farmhouse with associated farm buildings now converted to dwellings would be demolished as a result of the construction of the Hoo Green cutting and mitigation earthworks. This would constitute a permanent high adverse impact and result in a moderate adverse effect.

9.4.13 Four Acres (Burnside Farm), Lymm Road, a non-designated asset of low value, is located within the land required for the construction of the Proposed Scheme. The 19th century farmhouse would be demolished as a result of the construction of the Lymm embankment. This would constitute a permanent high adverse impact and result in a moderate adverse effect.

9.4.14 Gorse Cottage and Barn, Chapel Lane, a non-designated asset of low value, is located within the land required for the construction of the Proposed Scheme. The 19th century farmhouse with associated farm buildings would be demolished as a result of the construction of the Hulseheath embankment. This would constitute a permanent high adverse impact and result in a moderate adverse effect.

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

9.4.16 Mere Court Hotel (NHLE 1139522) is Grade II listed and of moderate value. It is located approximately 10m west of land permanently required for the Proposed Scheme. The Arts and Crafts house constructed in 1903 is currently a hotel. It sits within seven acres of designed landscaped gardens containing a lake, lodge and coach house. The hotel and sections of the landscaped gardens are surrounded by mature trees and planting, which prevents views of the open agricultural land beyond. The trees give the gardens a discrete and enclosed character. Although traffic noise from the A50 is audible within the grounds of the property, this becomes less pronounced within the northern section of the gardens where there is a peaceful atmosphere. The setting of the asset was designed to complement the building, and therefore, contributes to its aesthetic appeal. It would be affected by the construction of the A50 overbridge, Mere cutting and the High Legh box structure. Approximately half of the gardens (2.8ha) would be located within land required for the Proposed Scheme. The removal of this extent of the gardens would result in the loss of the intended character of the setting. The ability to appreciate the aesthetic interest of the asset would be severely affected. This would constitute a high impact and result in a major adverse effect.

9.4.17 Ovenback Cottage (NHLE 1329662) is Grade II listed and of moderate value. It is located approximately 10m west of land permanently required for the Proposed Scheme. The asset is a mid-17th century cottage with later additions. The immediate setting of the cottage is its garden to the south, the junction of Agden Lane and Moss Lane to the north and east, and the neighbouring farm and farmhouse to the west. The wider setting of the asset is agricultural land. The M56, which passes approximately 215m north of the asset, is audible but not visible from the asset. The traffic noise from the motorway dominates the auditory experience of the asset. This contrasts with the asset's visual setting, making a negative contribution to the experience of the asset. The wider agricultural setting is in keeping with its historic rural context and makes a positive contribution to the value of the asset. The setting of the asset would be affected by the construction of the High Legh cutting. Agricultural land, which forms part of the wider setting, would be removed by the construction of the High Legh cutting. This would noticeably alter the setting by changing the ability to appreciate the historic context of the asset. This would constitute a medium impact and result in a moderate adverse effect.

Other mitigation measures

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

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

Summary of likely residual significant effects

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

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

9.5 Effects arising from operation

Avoidance and mitigation measures

9.5.1 The following measures have been incorporated into the design of the Proposed Scheme, which would reduce the impacts and effects on heritage assets as shown on the CT-06 Map Series within the Volume 2: MA03 Map Book:

- noise mitigation measures have been included within the Proposed Scheme which could reduce potential impacts on some heritage assets; and
- landscape planting could increasingly reduce impacts on the setting of the designated assets within the 2km study area as it matures.

Assessment of impacts and effects

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

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

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

9.5.5 Further effects could occur in relation to heritage assets during the operation of the Proposed Scheme where additional, permanent, changes to the asset's settings have an additional detrimental effect on the way that the asset is understood or

appreciated, for example as a result of increased noise or the movement of the trains in combination with the effect of the presence of the Proposed Scheme.

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

- Mere Court Hotel (NHLE 1139522); and
- Ovenback Cottage (NHLE 1329662).

Other mitigation measures

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

Summary of likely residual significant effects

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

Monitoring

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

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

10 Land quality

10.1 Introduction

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

10.1.2 Engagement has been undertaken with the British Geological Survey (BGS), The Coal Authority, Cheshire East Council (CEC), Chester West and Chester Council (CWCC), the Environment Agency, Fera Science Ltd (FSL)[70] and the Animal and Plant Health Agency (APHA). The purpose of this engagement has been to discuss the Proposed Scheme and potential effects, and obtain relevant baseline information. Engagement will continue as part of the development of the Proposed Scheme and to inform the formal assessment.

10.1.3 Maps showing the location of the key environmental features (Map Series CT-10) and the key construction (Map Series CT-05) and key operational (Map Series CT-06) features of the Proposed Scheme are provided in the Volume 2: MA03 Map Book.

10.1.4 Land contamination issues are closely linked with those involving water resources and waste. Issues regarding groundwater resources are addressed in Section 15, Water resources and flood risk. Issues regarding the disposal of waste materials, including contaminated soils, are addressed in Volume 3: Route-wide effects (Section 15).

10.2 Scope, assumptions and limitations

10.2.1 The scope, assumptions and limitations for the land quality assessment are set out in Volume 1, Section 8 and the Scope and Methodology Report (SMR)[71].

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

10.2.3 The majority of new and diverted utilities would be laid in the boundaries of existing highways within normal road construction layers and natural soils below. These have been considered in the context of the conceptual site model (CSM) approach, and the

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

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

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

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

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

10.2.7 The minerals assessment is based upon the mineral resources[72] identified on published minerals plans, and existing planning or licensed areas. Any inference of minerals provided by geological maps/reports is excluded (except where these are covered by the Minerals Plan).

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

10.3 Environmental baseline

Existing baseline

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

Geology

10.3.2 This section describes the underlying ground conditions within the Pickmere to Agden and Hulseheath area. Recent changes in lithostratigraphic classifications by the BGS have been incorporated where appropriate[73].

[72] Defined in the SMR as "mineral body including aggregates, salt, coal and other hydrocarbons, Petroleum Extraction Development Licences (PEDLs), Shale Prospective Areas (SPAs)".
[73] British Geological Survey, (2014), *Lithostratigraphy of the Sherwood Sandstone. Research Report RR/14/01.* Available online at: http://www.bgs.ac.uk/downloads/start.cfm?id=2904

10.3.3 Table 13 provides a summary of the geology (made ground, superficial and bedrock units) underlying the land required for the Proposed Scheme in the study area.

Table 13: Summary of the geology underlying the land quality study area

Geology	Distribution	Formation description	Aquifer classification
Made ground			
Made ground	No artificial ground is present on geological mapping, but will be associated with landfilling activities and may be present in areas with previous development.	Artificial ground comprising variable deposits of reworked natural and man-made materials	Not classified
Superficial			
Alluvium	Located along the base of the valley of Smoker Brook, Waterless Brook, two unnamed tributaries of the Tabley Brook, and Agden Brook.	Organic rich clay, silt, sand and gravel	Secondary A
Shirdley Hill Sand Formation	Located at the northernmost 300m of the route of the Proposed Scheme.	Sand	Secondary A
Glaciofluvial sheet deposits	Isolated pockets to the south of Smoker Brook, Waterless Brook, Agden Brook, south of the M6, where the route of the Proposed Scheme would intersect the A50 and to the west of Little Bollington.	Sand and gravel	Secondary A
Glacial till	Located across the majority of the study area where other superficial deposits are not described.	Sandy silty clay with gravel	Secondary (Undifferentiated)
Bedrock			
Mercia Mudstone Group - Sidmouth Mudstone Formation - Northwich Halite Member	Present along the route of the Proposed Scheme south of the M6. Potential collapse breccia[74] may be present throughout the Northwich Halite Formation.	Halite and mudstone	Unproductive strata
Mercia Mudstone Group - Sidmouth Mudstone Formation - Bollin Mudstone Member	From the north of the M6 to the north-west of Hulseheath. Potential collapse breccia may be present in the Bollin Mudstone Member around geological boundaries.	Mudstone and siltstone	Secondary B
Mercia Mudstone Group - Tarporley Siltstone Formation	At the northern extent of the Proposed Scheme on both the Manchester spur and the HS2 main line.	Siltstone, mudstone and sandstone	Secondary B

[74] Collapse breccia is a rock composed of broken fragments of minerals or rock from the collapse of the parent rock, cemented together by a fine-grained matrix that can be similar to, or different from, the composition of the fragments.

Sherwood Sandstone Group - Helsby Sandstone Formation	From 300m north of the M56 until the end of the area on the HS2 main line.	Pebbly sandstone	Principal

Made ground

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

10.3.5 Made ground is not shown in the study area on the BGS artificial ground mapping[75]. However, although not recorded, localised deposits of made ground may be present across the previously developed land in the study area.

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

Superficial geology

10.3.7 The majority of the Pickmere to Agden and Hulseheath area is underlain by glacial till[77] (Devensian). These deposits comprise poorly sorted sandy, silty clay. Where glacial till is not mapped, the following superficial deposits are identified.

10.3.8 Alluvium, variably comprising organic rich silty clay, silt, sand and gravel, occur along the base of the valley of Smoker Brook, Waterless Brook and Agden Brook. There are also isolated pockets to the south-east of Winterbottom.

10.3.9 Areas of glaciofluvial sheet deposits comprising sand and gravel, are present in various locations along the route of the Proposed Scheme. These are summarised as: to the south of Smoker Brook, in isolated pockets to the south of Waterless Brook, to the west of junction 19 of the M6, as a band along the route of the A50 where it would be crossed by the route of the Proposed Scheme, along Agden Brook to the south of the M56 and to the west of Little Bollington.

10.3.10 The Shirdley Hill Sand Formation, comprising sand, is present at the northern extent of the route of the Proposed Scheme, associated with the River Bollin to the north.

[75] British Geological Survey 1:10,000 Artificial ground mapping
[76] Animal and Plant Health Agency (2001) Foot and Mouth Disease 2001 - County Status Maps. Available at https://data.gov.uk/dataset/1c7ae62d-3268-467d-a2df-e8c5a6d93ab3/foot-and-mouth-disease-2001-county-status-map-29-10-2001
[77] Glacial till is sometimes described as "diamicton" in the BGS lexicon. This term relates to sediment deposited from land based erosion (such as from landslides and debris flows). In this case the term "glacial till" refers to diamicton of glacial origin.

Bedrock geology

10.3.11 The Mercia Mudstone Group underlies the majority of the land required for the Proposed Scheme in this study area and is subdivided into many formations and members, of which, the following are present:

- the Northwich Halite Member (Mercia Mudstone Group) is located along the route of the Proposed Scheme as far as the M6;
- the Bollin Mudstone Member (Mercia Mudstone Group) from the north of the M6 as far as the north-west of Hulseheath;
- the Tarporley Siltstone Formation (Mercia Mudstone Group) from the north-west of Hulseheath; and
- the Helsby Sandstone Formation of the Sherwood Sandstone Group is also present in the central northern part of the study area , from 300m north of the M56.

10.3.12 Bedrock faults are recorded underlying the land required for the Proposed Scheme in three locations: 575m to the north of the M6, 950m south of the M56 and at the northernmost extent of the route of the HS2 main line.

10.3.13 An area of potential collapse breccia may be present in the bedrock strata (Northwich Halite Member and Bollin Mudstone Member) from the southern extent of the study area as far as 600m south of the M6.

Radon

10.3.14 Radon is a radioactive gas formed by the radioactive decay of naturally occurring uranium in rocks and soils. The occurrence of radon gas is shown in the BGS Radon Potential Dataset[78].

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

Groundwater

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

- the Helsby Sandstone Formation of the Sherwood Sandstone Group is classified as a Principal aquifer;

[78] Available at: http://www.bgs.ac.uk/radon/hpa-bgs.html Accessed 09/05/2018. This dataset underpins PHE's Indicative Atlas of Radon in England and Wales (Miles J.C.H, Appleton J.D, Rees D.M, Green B.M.R, Adlam K.A.M and Myers, A.H. (2007). Indicative Atlas of Radon in England and Wales. Public Health England. ISBN: 978-0-85951-608-2. 29 pp) available at www.ukradon.org/information/ukmaps

- the alluvium, glaciofluvial sheet deposits and the Shirdley Hill Sand Formation are designated as Secondary A aquifers;
- the Bollin Mudstone Member and Tarporley Siltstone Formation of the Mercia Mudstone Group are designated as Secondary B aquifers;
- glacial till is designated as a Secondary (Undifferentiated) aquifer; and
- the Northwich Halite Member is designated as Unproductive Strata.

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

10.3.18 There are no groundwater source protections zones (SPZ)[79] identified within the study area. There is one private groundwater abstraction licence and one Licence of Right (for less than 20m^3 per day) registered within the study area.

10.3.19 According to the Environment Agency, there are no drinking water safeguard zones[80] for groundwater within the study area.

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

10.3.21 Further information on the groundwater in the Pickmere to Agden and Hulseheath area is provided in Section 15, Water resources and flood risk.

Surface water

10.3.22 The Proposed Scheme would intersect the following main rivers: Smoker Brook at the southern extent of the study area, Waterless Brook to the north of the B5391 in Tabley Superior, Agden Brook at Booth Bank and a tributary of Millington Clough to the north of Hulseheath. Numerous ordinary watercourses are located in the study area, including Tabley Brook and its tributaries, tributaries of Waterless Brook, tributaries of Millington Clough, and a tributary of Agden Brook.

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

10.3.24 Surface water bodies in the Pickmere to Agden and Hulseheath area are described in more detail in Section 15, Water resources and flood risk.

10.3.25 There is one licensed surface water abstraction located within the study area: Agden Brook Farm, for spray irrigation for agricultural use, grid reference SJ72008610.

[79] A groundwater SPZ is a defined area within which groundwater is extracted for potable water supply. The area is defined by the Environment Agency on the basis of the length of time taken for groundwater to migrate to the potable source.
[80] Environment Agency (2017) Drinking Water Safeguarding Zones mapping. Available at: https://environment-agency.cloud.esriuk.com/farmers/. Accessed July 2018

10.3.26 There is one private water supply from surface water sources that has been identified within the study area.

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

Current and historical land use

10.3.28 Current potentially contaminative land uses within the study area include 39 identified potentially contaminative sites. The key potentially contaminative sites are limited to a number of farms with tanks that possibly contain fuels, and an electrical sub-station.

10.3.29 Historical land uses identified within the study area with the potential to have caused contamination include one landfill site, two mining sites and 21 other identified potentially contaminative sites. Infilled pits and ponds may have been filled with a variety of waste materials, but have not been licensed. The key historical potentially contaminative sites are: a petrol filling station, depot, smithy[81], and infilled brick fields and ponds.

10.3.30 Further details of these key current and historical contaminative land uses within the study area are shown in Table 14, Table 15 and Table 16.

Table 14: Current and historical landfill sites located in the study area

Name and area reference	Location	Description
Booth Bank Farm, Boothbank (MA03-172)	The landfill is located on land required for construction of the Proposed Scheme, in a field adjacent to the north of the M56.	Local authority (CEC) recorded landfill site. No information supplied on waste types deposited or years active. No record of licence or licence surrender.

Table 15: Current and historical mining, mineral sites and colliery spoil sites located in the study area

Name and area reference	Location	Description
Brick field, south-west of Hulseheath (MA03-123)	East of High Legh Park Golf Club near Hulseheath, within land required for construction of the Proposed Scheme.	Historical brick field with kiln, active in 1876. Since redeveloped as residential land.
Brick field, north of High Legh (MA03-156)	North of High Legh within land required for construction of the Proposed Scheme.	Historical brick field with potential kiln, active between 1898 and 1938. Now a field and partially intersected by M56.

Table 16: Current and historical industrial sites located in the study area

Name and area reference	Location	Description
Electrical sub-station (MA03-13)	On Flittogate Lane, Nether Tabley, adjacent to and required	Current National Grid electrical sub-station compound.

[81] Commonly used term on historical mapping to denote a blacksmiths

Name and area reference	Location	Description
	for the construction of the Proposed Scheme.	
Petrol filling station (MA03-109)	Hoo Green, 80m east of land required for construction of the Proposed Scheme.	Historical petrol filling station with tanks, active between 1967 and 1992. Since been redeveloped for residential use.
Works (MA03-143)	North-east of High Legh, 230m south of land required for construction of the Proposed Scheme.	Current works associated with Limetree Farm.
Depot (MA03-151)	Copper Beaches, south of the M56. 35m south of land required for construction of the Proposed Scheme.	Historical depot, active between 1954 and 1992.
Smithy (MA03-182)	Agden Bridge, 10m east of land required for construction of the Proposed Scheme.	Historical smithy from 1899 to 1967, now a residential property.

10.3.31 Contaminants commonly associated with sites in Table 14, Table 15 and Table 16 could include metals, semi-metals, asbestos, organic and inorganic compounds. Additionally, infilled pits and landfills could also give rise to landfill gases such as methane or carbon dioxide and leachate.

Other regulatory data

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

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

10.3.34 There are no recorded major, significant and minor incidents in the Pickmere to Agden and Hulseheath area.

10.3.35 The Environment Agency reports that there is one consented discharge to groundwater within the study area. Further details on the groundwater in the Pickmere to Agden and Hulseheath study area can be found in Section 15, Water resources and flood risk.

10.3.36 There are 13 discharge consents to surface water within the study area, one of which is within the land required for construction of the Proposed Scheme.

10.3.37 There are nationally important ecological designations, as defined in the land quality section of the SMR, located within the study area. There are three Ancient Woodland Inventory Sites (AWIS) and also Local Wildlife Sites (LWS): including Leonards and Smoker Woods LWS, which is located within the land required for the construction of the Proposed Scheme, and Round and Rinks Wood LWS and Tabley Wood LWS, which are located outside the land required for construction of the Proposed Scheme.

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

Mining/mineral resources

10.3.39 There are a range of mining and mineral resources located within the study area that have the potential to be affected by the Proposed Scheme. These can include sand, gravel, clay, stone, lime, salt, gypsum and coal, which can be protected via local or county level 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 Oil and Gas Authority (OGA) via the issue of Petroleum Exploration Development Licences (PEDLs).

Minerals plans

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

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

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

Sand, gravel and clay deposits

10.3.43 There are two recorded quarries within the study area. These are recorded at Yew Tree Farm and Agden Lane Farm, both in the northern part of the study area, extracting minerals from the glaciofluvial sheet deposits (sand) and Helsby Sandstone Formation (sandstone), respectively.

10.3.44 The route of the Proposed Scheme would cross sand and gravel mineral safeguarding areas (MSA) associated with Arley Brook, Agden Brook and the River Bollin.

10.3.45 There is a sand and gravel Area of Search underlying the route of the Proposed Scheme in a strip approximately 380m wide immediately to the north of the A50. Another Area of Search is recorded on land required for the construction of the Proposed Scheme to the north-west of Arthill (north of the M56).

Salt deposits

10.3.46 There are no recorded salt extraction permissions or brinefields[84] in the study area.

10.3.47 The southern extent of the study area north to Winterbottom is within an MSA for salt.

[82] Cheshire County Council (1999) *The Cheshire Replacement Minerals Local Plan*.
[83] Norton, GE *et al* (2006) *Mineral Resources Information for National, Regional and Local Planning: Cheshire (comprising Cheshire and the Boroughs of Halton and Warrington*. British Geological Survey Commissioned Report CR/05/090N.
[84] Brine denotes a high concentration solution of salt in water

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

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

Coal mining

Open cast coal mining

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

Deep coal mining

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

10.3.52 Available records from the Coal Authority show that the land required for the construction of the Proposed Scheme would not be located in areas of recorded current or historical underground coal mining activities.

PEDLs/Hydrocarbons

10.3.53 The OGA indicates that the route of the Proposed Scheme passes through PEDL 296. The PEDL area is associated with extraction wells for conventional oil and gas. However, none of the extraction wells associated with the PEDL are located in the study area.

Geo-conservation resources

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

Receptors

10.3.55 The sensitive receptors that have been identified within the study area are summarised in Table 17. A definition of receptor sensitivity is given in the SMR.

Table 17: Summary of sensitive receptors

Issue	Receptor type	Receptor description	Receptor sensitivity
Land contamination	People	Residents of existing properties, nurseries, schools, study centres, play areas, parks and public open space	High
		Employees and visitors at commercial areas, retail parks and areas, hotels	Moderate
		Workers at and visitors to industrial premises	Low
	Groundwater	Principal aquifer (Helsby Sandstone Formation)	High
		Secondary A aquifers (alluvium and glaciofluvial sheet deposits)	Moderate

		Secondary (undifferentiated) aquifer (glacial till), Secondary B aquifer (Bollin Mudstone Member and Tarporley Siltstone Formation)	Low
	Surface waters	Smoker Brook, Waterless Brook, Agden Brook, Tabley Brook, Millington Clough, tributary of Millington Clough	Moderate
		Other tributaries and unnamed watercourses	Low
	Ecological designations	AWIS and also LWS (Leonards and Smoker Woods, Round and Rinks Wood, and Tabley Wood)	Moderate
	Built environment	Underground structures and buried services	Low
Impacts on mining/mineral and petroleum (gas) sites (severance and sterilisation)	Mining/mineral sites	Salt mineral safeguarding area, sand and gravel mineral safeguarding area, PEDL	Moderate
		Areas of search for sand and gravel resources	Low

10.4 Effects arising during construction

Avoidance and mitigation measures

10.4.1 The construction assessment takes into account the mitigation measures described in the draft Code of Construction Practice (CoCP)[85]. The draft CoCP sets out the measures and standards of work that would be applied to the construction of the Proposed Scheme and includes requirements to ensure the effective management and control of work in contaminated areas.

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

- methods to control noise, waste, dust, odour, gases and vapours (Sections 5, 7, 11, 13, 14 and 15);
- methods to control spillage and prevent contamination of adjacent areas (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);

[85] Supporting document: Draft Code of Construction Practice

- storage requirements for hazardous substances such as oil (Sections 5, 11 and 16);
- traffic management to ensure that there is a network of designated site haul routes to reduce compaction/degradation of soils (Sections 5, 6 and 14);
- methods to monitor and manage flood risk and other extreme weather events which may affect land quality during construction (Sections 5 and 16); and
- methods to manage discovery of unknown animal burial pits (Section 6).

10.4.3 The draft CoCP would require that prior to and during construction, a programme of further detailed investigations, which may include both desk based and site based work, takes place in order to confirm the full extent of areas of contamination. It also requires a risk assessment to be undertaken to determine what, if any, site specific remediation measures are required to allow the Proposed Scheme to be constructed safely and to prevent harmful future migration of contaminants. The investigation and assessment of potentially contaminated sites would be undertaken in accordance with Environment Agency CLR11[86] and British Standards BS10175[87] and BS8576[88].

10.4.4 Where significant contamination is encountered, a remedial options appraisal would be undertaken to define the most appropriate remediation techniques. Where appropriate, this appraisal would be undertaken based on multi-criteria attribute analysis that considers environmental, resource, social and economic factors in line with the framework set out by the Sustainable Remediation Forum UK[89]. The preferred option would then be developed into a remediation strategy.

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

Assessment of impacts and effects

10.4.6 Construction of the Proposed Scheme in this area would require earthworks, utility diversions, deep foundations, grouting, ground stabilisation and other activities, including the construction of the various viaducts and road infrastructure works. These aspects of the Proposed Scheme, along with other construction features, are shown on the Map Series CT-05 in the Volume 2: MA03 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

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

contaminative risks for the Proposed Scheme. Sites that present a low risk have not been taken further in the assessment. Any moderate to higher risk sites have been taken forward to more detailed risk assessments, in which the potential risks are assessed more fully. The majority of the areas that have undergone the more detailed risk assessments are historical or current landfills, industrial, commercial and mining sites.

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

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

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

10.4.10 A simple summary of the baseline CSM is provided in Table 18. The potential impacts and baseline risks quoted are those before any mitigation is applied. The assessed baseline risk is based on the information provided at the time of the assessment. Where limited information is available, the assessment is based on precautionary, worst case assumptions and may therefore report a higher risk than that which actually exists. A screening assessment of the effects of contamination has been completed by comparing the detailed CSM developed for potential contaminated areas at baseline with construction and post-construction stages.

Table 18: Summary of baseline CSM for sites which may pose a contaminative risk for the Proposed Scheme

Area reference[90]	**Area name**	**Human health risk**	**Ground water risk**	**Surface water risk**	**Ecosystem risk**	**Buildings risk**
On site[91]						
MA03-48, MA03-115, MA03-117, MA03-118, MA03-139, MA03-144, MA03-152	Farms, including tanks	Low to moderate/low	Very low to moderate/low	N/A[92]	N/A	Low
MA03-95, MA03-133	Marshland	Very low to moderate/low	N/A	N/A	N/A	Very low

[90] Each potentially contaminated site is allocated a unique reference number.
[91] 'On-site' is within the area of land required for construction of the Proposed Scheme.
[92] Risks are deemed to be not applicable when the pollutant linkage is not considered to exist between the source and receptor.

MA03-172	Booth Bank Landfill	Low to moderate	Moderate to high	Moderate/low	N/A	Very low to moderate /low
MA03-123	Historically infilled land	Very low to moderate/low	Low	N/A	N/A	Very low to low
Off site[93]						
MA03-104, Ma03-109, Ma03-112	Petrol filling station and tanks for fuel storage	Low to moderate/low	Moderate	N/A	N/A	Low
MA03-13	Electricity sub-station	Moderate/low	Very low	Low	N/A	Very low to low
MA03-143, MA03-151, MA03-182	Depots, works and smithy	Very low to moderate/low	Very low to moderate/low	Moderate/low	N/A	Low
MA03,83, MA03-96, MA03-137, MA03-154, MA03-157, MA03-163, MA03-169, MA03-181	Farms, including tanks	Low to moderate/low	Very low to moderate/low	Moderate/low	N/A	Low

Temporary effects

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

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

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

10.4.14 All of the sites set out in Table 18 have been assessed for the change in impact associated with the construction stage of the work and were found to have non significant (neutral) effects.

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

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

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

Permanent effects

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

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

10.4.19 All of the sites set out in Table 18 have been assessed for the change in impact associated with the permanent post construction stage and were found to have non significant (neutral or minor beneficial) effects.

Mining/mineral resources

10.4.20 Construction of the Proposed Scheme has the potential to affect existing mineral resources and proposed areas of mineral exploitation. This could occur by sterilisation of the resource through direct excavation during construction of the Proposed Scheme or through temporary and/or permanent severance[94] or isolation that may occur during the construction phase of the Proposed Scheme, possibly continuing through to its operation.

10.4.21 The route of the Proposed Scheme would intersect MSAs for sand and gravel associated with Arley Brook, Agden Brook and the River Bollin. Sand and gravel Areas of Search are also present on the route of the Proposed Scheme in the area north of the A50 at Hoo Green, and within the land required for the construction of the Proposed Scheme to the north-west of Arthill.

10.4.22 The route of the Proposed Scheme would also cross an extensive MSA for salt, from the start of the study area until Winterbottom.

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

Temporary effects

10.4.23 There are no shallow coal resources in the study area, therefore, no temporary effects from the construction of the Proposed Scheme on this resource would be present.

Sand, gravel and clay deposits

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

10.4.25 The A50 Cliff Lane main compound and transfer node falls within this MSA.

Salt deposits

10.4.26 The effect of construction of the Proposed Scheme on the identified salt deposits would be negligible where the Proposed Scheme would cross a salt MSA.

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

10.4.28 The following construction compounds would be located within the MSA:

- Smoker Brook Viaduct North satellite compound;
- Pickmere Lane satellite compound;
- Budworth Road satellite compound;
- M6 viaduct South satellite compound; and
- M6 viaduct North satellite compound.

Coal mining - deep

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

Petroleum Exploration Development Areas (PEDLs)

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

Permanent effects

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

Sand and gravel deposits

10.4.32 The effects of construction of the Proposed Scheme on the sand and gravel MSA would be permanent where the MSA would underlie the footprint of the permanent works, with a strip of mineral becoming sterilised. However, as a proportion of the total MSA, this strip would be less than 3% of the total, and the effect on the MSA is considered to be minor, and therefore, not significant. Mitigation measures (if any) would be discussed in advance of the works with the Mineral Planning Authority, CEC and the mineral owner.

Salt deposits

10.4.33 The effects of the Proposed Scheme on the identified salt deposits would be negligible. Sterilisation of a strip of salt MSA within the land required for the Proposed Scheme would potentially occur as the operational railway would restrict potential shaft access locations. This would be a minor impact (loss of approximately 2.5% of the overall salt MSA in the study area) of a medium value resource, which is not significant.

Coal mining - deep

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

Petroleum Exploration Development Areas (PEDLs)

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

10.4.36 Table 19 reports the assessment of permanent effects from construction on the mining and mineral resources identified.

Table 19: Summary of effects for mining and mineral resources

Site name	Status	Description	Sensitivity/ value	Magnitude of impact	Effect and significance (Y/N)
Sand and gravel MSA, associated with Arley Brook, Agden Brook and the River Bollin	MSA	MSA for sand and gravel extraction, defined by CEC	Medium	Minor	Negligible effect (N)
Sand and gravel Area of Search, High Legh	Area of Search	Area of Search for potential future sand and gravel extraction, defined by CEC	Low	Negligible	Negligible effect (N)
Salt MSA, Cheshire	MSA	MSA for salt extraction, defined by CEC	Medium	Negligible	Negligible effect (N)

Deep coal	No designation	Deep coal at more than 1200m	Low	Negligible	Negligible effect (N)
PEDL296	PEDL	Petroleum exploration and development licence areas	Medium	Negligible	Negligible effect (N)

10.4.37 There would be negligible effects on the mineral resources located in the study area, which are not significant.

Geo-conservation sites

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

Other mitigation measures

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

10.4.40 Mitigation of the effects on mineral resources within the MSA could include extraction of the resource, for use within the Proposed Scheme. Further extraction may be limited to landscaping areas within the Proposed Scheme adjacent to, rather than beneath the structural footprint of the Proposed Scheme, which would require good founding conditions. A plan would be discussed in advance of the construction works with the landowner, the mineral planning department at CEC and CWCC, and any other relevant parties to assist in achieving an effective management of minerals within the affected location of the MSAs.

Summary of likely residual significant effects

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

10.5 Effects arising from operation

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

Avoidance and mitigation measures

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

Assessment of impacts and effects

10.5.3 The Proposed Scheme within this area would include Green Lane auto-transformer station, Hoo Green auto-transformer feeder station and Hoo Green grid supply point. An auto-transformer station, feeder stations and sub-stations can, in principle, be a source of contamination through accidental discharge or leaks of coolant. However, in common with other modern sub-stations, secondary containment appropriate to the level of risk would be included in the installed design.

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

Other mitigation measures

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

Summary of likely residual significant effects

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

Monitoring

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

10.5.8 Requirements for monitoring would be determined as part of the investigation, treatment and validation of contamination on a site specific basis as part of the detailed design process. Monitoring requirements may include water quality, air quality and/or (landfill bulk and trace gases), depending on the site being considered.

11 Landscape and visual

11.1 Introduction

11.1.1 This section of the report presents the assessment of the likely significant landscape and visual effects identified to date within the Pickmere to Agden and Hulseheath 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 National Trust and Cheshire East Council (CEC) has commenced. The purpose of this engagement has been to discuss the assessment methodology, extent of the landscape and visual study area, and the locations of visual assessment and verifiable photomontage viewpoints. Engagement will continue as part of the development of the Proposed Scheme and to inform the formal assessment.

11.1.4 The Volume 2: MA03 Map Book shows the locations of key environmental features (Map Series CT-10) and the key construction (Map Series CT-05) and operational (Map Series CT-06) features of the Proposed Scheme. It also shows the locations of landscape and visual impact mitigation measures (Map Series CT-06) and viewpoints that would potentially be significantly affected at the construction (Map Series LV-03) and operation (Map Series LV-04) phases and Landscape Character Areas (LCA) that would potentially be significantly affected at the construction and operation phases (Map Series LV-02).

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

11.2 Scope, assumptions and limitations

11.2.1 The scope, key assumptions and limitations for the landscape and visual assessment are set out in full in Volume 1, Section 8 and the Scope and Methodology Report (SMR)[95].

11.2.2 Summer surveys for the landscape and visual assessment were undertaken from July 2017 and winter surveys in February 2018 to inform the assessment. Further surveys will be undertaken to inform the assessment and will be reported in the formal ES. At this stage it has not been possible to complete surveys of all publicly accessible land in this area. Therefore, for the working draft ES an assumption has been made about the level of sensitivity and magnitude of change on a case by case basis. This will be adjusted, as appropriate, on the basis of survey results to inform the formal ES.

11.2.3 The extent of the study area has been informed by construction and operational phase zones of theoretical visibility (ZTV). The ZTV have been produced in line with the

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

methodology described in the SMR and are an indication of the theoretical visibility of the Proposed Scheme. In some locations, extensive vegetation cover would mean the actual extent of visibility is substantially less than that shown in the ZTV and professional judgement will be used to further refine the study area to focus on likely significant effects.

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

11.2.5 Landscape and visual receptors within approximately 1.5km of the Proposed Scheme have been assessed as part of the study area. Vegetation, variations in local topography, viaducts, embankments and urban development limit long-distance views across the area.

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

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

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

11.3 Environmental baseline

Existing baseline

Landscape baseline

11.3.1 The study area extends from Smoker Brook in the south to Dunham Massey and the River Bollin and Hulseheath in the north. It includes a corridor approximately 3km wide along the route of the Proposed Scheme. It is a mainly flat, but in places gently rolling, rural landscape, which forms part of the Cheshire Plain. There is a localised area of steeper landform at Agden, where the land slopes down steeply to the Bollin

Valley in the north. The high water table and clay soils support lush pastures for grazing dairy cattle and there is arable land in the southern and central parts of the area. Fields are generally enclosed by hedgerows with mature oak trees. The intricate arrangement of small scale fields, hedgerows and fine old trees is characteristic of the Cheshire Plain landscape. For much of the area, where fields are small, hedges are high and hedgerow trees abundant, this contributes to a strong sense of enclosure. Here, the perception is of a small scale and verdant landscape. Towards the northern part of the area and close to the M6, the M56, the A556 and the A50, fields are larger, with low trimmed hedgerows and fewer trees. Here, the lower levels of enclosure mean that the landscape character is more open and on a larger scale than further south. In these locations the views are extensive, with the hills of the Peak District visible to the east.

11.3.2 There are a number of ancient woodlands in the area including Round and Rinks Wood, Bongs Wood, Park Covert and Tabley Wood. There are other small woodland blocks throughout the area. The watercourses of Smoker Brook, Arley Brook and Agden Brook are tree-lined. In contrast, the River Bollin in the north is more open where it enters the floodplain of the River Mersey. Ponds are characteristic features of the landscape and many are meres left after the last ice age. Other ponds are flooded marl pits, a result of farmers digging for lime, which was spread on fields to reduce the acidity of the soil. Historic assets that contribute to landscape character include the 18th century Bridgewater Canal and two important designed landscapes: Dunham Massey and Arley Hall. Both are included in Historic England's Register of Historic Parks and Gardens of Special Historic Interest in England (both Grade II* listed). The Bridgewater Canal passes through the northern end of the area and its aqueduct over the River Bollin is listed (Grade II). The Cheshire Ring Canal Walk follows the Bridgewater Canal towpath. The North Cheshire Way long distance Footpath links Northwich, to the south, skirts round Arley Hall then travels east to Knutsford.

11.3.3 There is an extensive arterial road network in the area with the M6, the M56 and the A50 crossing east to west and the A556 Chester Road running north to south. Prominent features in the landscape include transmission lines north of the M6 and the radio telescope east of Pickmere. There is street lighting in most settlements. Through traffic on the rural roads is frequent and there are few places in the study area away from traffic noise. Consequently, the area is not tranquil.

11.3.4 Villages include Pickmere in the south, Mere and Bucklow Hill in the east and High Legh, Hoo Green and Little Bollington in the north. There are many hamlets and isolated cottages distributed across the area and the substantial red-brick farmhouses and associated barns are another characteristic feature of the Cheshire Plain landscape. Many of the barns have now been converted to residential or commercial use.

11.3.5 LCAs have been determined as part of an integrated process of environmental characterisation, informed by a review of historic landscape mapping and the outcome from other topics including ecological assessments. These LCAs will be refined, as appropriate, upon review of available historic landscape characterisation data and will be included in the formal ES. Use has been made of published landscape character assessments and a wide range of supporting geographic information system

(GIS) data, aerial photography and Ordnance Survey mapping, plus desk study and fieldwork. Landscape character assessments reviewed include the relevant National Landscape Character Areas[96] and the Cheshire Landscape Character Assessment[97]. The published LCA have been adapted for this assessment to provide LCA of an appropriate and consistent scale.

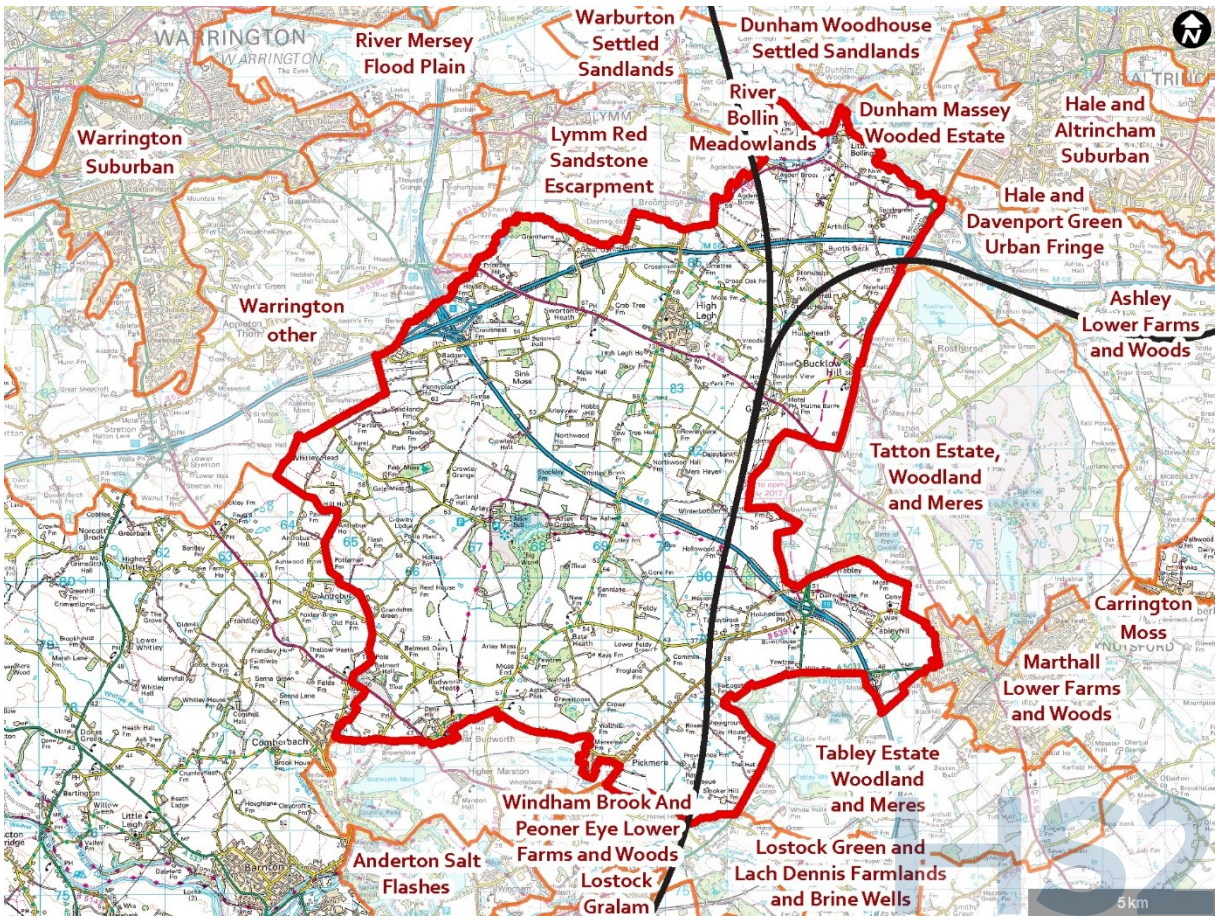
11.3.6 For the purposes of this assessment, the Pickmere to Agden and Hulseheath has been subdivided into four LCAs. These LCAs are draft and subject to review in consultation with local planning authorities. Full descriptions of all LCAs will be provided in Volume 5 of the formal ES.

11.3.7 Three of the four LCAs would not be significantly affected by the Proposed Scheme on account of the intervening vegetation, variable topography and urban form which would contain landscape effects to a relatively narrow corridor along the route of the Proposed Scheme. A summary of the remaining two LCAs that would be significantly affected within the Pickmere to Agden and Hulseheath area is provided in Table 20.

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

Table 20: Summary of Significantly Affected LCAs

Arley Lower Farms and Woods



View over the flat, open rural landscape in the northern part of the LCA, with isolated trees and powerlines.

View of a rural road, hedgerows, fields and mature oak trees, characteristic of the Cheshire Plain.

The Arley Lower Farms and Woods LCA is a low, rolling or flat rural landscape with a distinctive pattern of hedges and hedgerow oaks, which is highly characteristic of the Cheshire Plain. The main agricultural use is dairy farming. Much of the area has a small-scale feel with small to medium sized, irregularly shaped fields. The surrounding hedges, abundant oak trees and small woodland belts filter and prevent long distance views, giving the area a feeling of enclosure. The northernmost part of the character area, where the River Bollin flows towards the Mersey Valley, is more open, with larger fields, longer views and thus a more expansive feel than further south. Settlement is mainly dispersed, with isolated cottages and red-brick farmhouses, which enhance the rural character. Settlements vary in size and include hamlets such as Hoo Green and Hulseheath; the small villages of Pickmere, Mere, Bucklow Hill and Little Bollington; and the large village of High Legh. The area has a verdant, lush quality given by the combination of trees and woodland, tree-lined watercourses and frequent meres and ponds. A good network of PRoW and two long-distance Footpaths, the North

Cheshire Way and the Cheshire Ring Canal Walk, contribute to the recreational value of the area. The landscape is mostly intact, although there are detracting infrastructure elements such as the M6, the M56, the A50 and the A556 and high-voltage power lines. Road noise from the busy motorways and main roads is audible in much of the area. There is street lighting in settlements and at major road junctions, but much of the area is unlit at night. It is notable that the Cheshire Plain was frequently depicted in woodcut prints by Cheshire-born artist Charles Tunnicliffe RA, one of the best-known wildlife illustrators of the 20th century.

The overall value of this LCA is high based on the above.

Visual baseline

11.3.8 A summary description of the distribution and types of receptors most likely to be affected is provided below. The viewpoints are numbered to identify their locations and are shown on the viewpoint location maps (see Volume 2: MA03 Map Book, Map Series LV-03 and LV-04). In each case, the middle number (xxx.**xx**.xxx) identifies the type of receptor that is present in this area – 1: Protected views (none within this area), 2: Residential, 3: Recreational, 4: Transport, 5: Hotels/healthcare/education and 6: Employment.

11.3.9 The flat and gently rolling, rural landscape of the Cheshire Plain is characterised by a strong pattern of hedgerows and mature trees, enclosing and screening views from settlements and scattered residential properties. Views from locations in the south of the Pickmere to Agden and Hulseheath area are predominantly rural in character, and the layers of trees, hedgerows and woodland generally screen detracting elements such as the M6, the M56, the A50 and the A556 Chester Road. Close to these roads and in the River Bollin floodplain, in the north of the area, fields are flatter and larger, with low trimmed hedgerows and fewer trees than further south. Consequently views tend to be more extensive from around Winterbottom, Hoo Green, Agden Brow and the Bridgwater Canal (where there are residential moorings). The hills of the Peak District can be seen looking east from the northern part of the area.

11.3.10 Views from individual houses and farmsteads are largely filtered and framed by intervening trees and hedgerows.

11.3.11 Recreational users have open views from parts of the North Cheshire Way, the Bridgewater Canal towpath and the Cheshire Ring Canal Walk (a long-distance Footpath that follows the canal). Views experienced by walkers on the majority of PRoW are from relatively low-lying land and restricted by woodland and hedgerows.

11.3.12 People travelling on rural roads and lanes generally experience partially restricted views, due to mature roadside hedgerows and trees.

11.4 Temporary effects arising during construction

11.4.1 As is commonplace with major infrastructure works, the scale of the construction activities means that works would be visible from many locations and would have the potential to give rise to significant temporary effects that cannot practicably be mitigated. Such effects are temporary and would vary over the construction period depending on the intensity and scale of the works at the time. The assessment of landscape and visual effects has been based on the activities occurring during the peak construction phase, which is defined as the period during which the main

construction works would take place, including the presence of compounds, main earthworks and structure works.

11.4.2 The effects associated with the construction stage in this area are generally considered to be medium-term, based on the indicative construction programme in Section 2.3. It is currently anticipated that the civil engineering stage in this area would be undertaken between the start of 2025 and the end of 2028. Effects during other stages of works are likely to be less intensive due to less construction equipment being required at the time and a reduced intensity of construction activity.

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

Avoidance and mitigation measures

11.4.4 Measures that have been incorporated into Sections 12 and 14 of the draft Code of Construction Practice (CoCP)[98] 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[99];
- use of well-maintained hoardings and fencing;
- prevention of damage to the landscape features adjacent to the construction sites due to movement of construction vehicles;
- designing lighting to avoid unnecessary intrusion onto adjacent buildings and other land uses; and
- replacement of any trees intended to be retained which may die as a consequence of nearby construction works.

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

Assessment of temporary impacts and effects

11.4.6 The most apparent changes to the landscape and to the views experienced by visual receptors during construction would relate to the presence of construction plant, compounds and soils and material storage and stockpiling. Key construction activities that would give rise to the most apparent changes to landscape and visual receptors are: the excavation of cuttings, the construction of viaducts, embankments overbridges, underbridges and electrical sub-stations, road and utility diversions, the removal of trees and hedgerows, the demolition of buildings and the closure or diversion of existing public highways and PRoW.

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

Landscape assessment

11.4.7 Based on the current design it is anticipated that the LCAs set out in Table 21 would be significantly affected during construction of the Proposed Scheme.

Table 21: Summary description and assessment of effect on LCAs

Arley Lower Farms and Woods	**High susceptibility and sensitivity**
Susceptibility to change: the LCA's high scenic quality and strong sense of place impart a high susceptibility of change arising from the Proposed Scheme. The Proposed Scheme associated construction activity would pass through the intricate pattern of woodland, hedges and hedgerow oaks, which is a key characteristic of the Cheshire Plain landscape. Construction activity on the Pickmere, Heyrose, Over Tabley and Lymm embankments, the high Smoker Brook, Arley Brook and M6 Mere viaducts, the wide, deep Hoo Green, Mere, High Legh, Hulseheath and Agden cuttings, the Hoo Green auto-transformer feeder station and grid supply point and the introduction of construction plant into a predominantly rural landscape would substantially alter the character of the area. Millington Clough, in the northern part of the LCA (in the adjoining CA 06) would be directly affected by construction of the Millington embankment, the Agden Brook viaduct, the deep Rostherne cutting, the access road from Boothbank and the realignment of Millington Lane. There would be changes to the local terrain due to large scale earthworks and the introduction of temporary material stockpiles. Temporary closure and diversion of PRoW would reduce connectivity within the wider countryside. The landscape would be affected by construction vehicle movements, construction activity, lighting in an area largely without street lighting and noise, which would further reduce the tranquillity of the rural landscape. There would therefore be a high magnitude of change and a major adverse effect.	**Level of effect:** Major adverse (significant).

Visual assessment

Introduction

11.4.8 The following section describes the likely significant effects on visual receptors during construction. The construction assessment has been undertaken for the winter period, in line with best practice guidance, to ensure a robust assessment. However, in some cases, visibility of construction activities may be reduced during summer when vegetation, if present in a view, would be in leaf. The assessment does not include assessment of night time visual effects, although where general night time visual effects can be substantiated they are discussed in this section.

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

11.4.10 Potential visual impacts arising from additional lighting at night during construction within the area may arise from continuous working and/or overnight working. Assessment of these effects will be reported in the formal ES on completion of the night time assessment.

11.4.11 Table 22 describes the construction phase potentially significant visual effects based on the current design of the Proposed Scheme. Viewpoint locations are shown in Map Series LV-03 in the Volume 2: MA03 Map Book.

Table 22: Construction phase potentially significant visual effects

Views from Pickmere, Pickmere Lane, School Lane, farms in the landscape and PRoW Pickmere Footpath (FP)5 and FP9 and Tabley Inferior FP1, FP2, FP3 and FP4. (VPs 313-02-005, 313-02-006, 313-03-010, 314-02-001, 314-02-002, 314-03-003, 314-02-004). **Map Numbers: LV-03-313 and LV-03-314**	**High and medium-high sensitivity receptors**
Residents in School Lane and in Pickmere Lane (north of Hall Lane) and walkers on PRoW would have near and middle distance views, some partially filtered through intervening vegetation, of the construction of the Smoker Brook viaduct, the Pickmere embankment, Milley Lane auto-transformer station, the Pickmere Footpath 5 accommodation underbridge, the Tabley Inferior Footpath 2 and 3 and Tabley Inferior Footpath 4 accommodation overbridges, the Pickmere Lane overbridge and the realignment of School Lane. The site haul route south of Smoker Hill Farm would also be clearly visible. The large-scale features associated with construction including machinery, earthworks, temporary stockpiles, construction compounds and access roads, fencing and lighting would be prominent in existing views over the rural landscape of the Cheshire Plain. The features would extend across the majority of the view for PRoW users, but most views from residential properties would be partially filtered. Vehicles using the site haul routes and local roads would introduce uncharacteristic movement into views. The removal of trees and hedgerows from farmland, along the track to Smoker Hill Farm and along Tabley Brook would increase the visibility of the Proposed Scheme from the surrounding area. There would therefore be a high magnitude of change and major adverse effect.	**Level of effect:** Major adverse (significant)
Views from the Heyrose Golf Club, residences in Budworth Road, the unnamed road to Heyrose Farm, Old Hall Lane and Pickmere Lane, at the Shooting Box and Hollowood Farm and walkers on the North Cheshire Way, Tabley Superior Restricted Bridleway (RB) 4 and Aston by Budworth FP6. (VPs 314-02-005, 314-02-006, 315-02-001, 315-03-002, 315-02-003). **Map Numbers: LV-03-314 and LV-03-315**	**High, medium-high and medium sensitivity receptors**
Residents, walkers on PRoW and golfers would experience substantial changes to near and middle distance views, some partially filtered through intervening vegetation, as a result of the construction of the Arley Brook and M6 Mere viaducts and the Heyrose embankment. The large-scale features associated with construction, including machinery, earthworks, temporary stockpiles, construction compounds (at Budworth Road and adjacent to the M6), fencing and lighting would be prominent in existing views over the rural landscape of the Cheshire Plain. The features would extend across the majority of the view for PRoW users, but most views from residential properties would be partially filtered. The removal of trees and hedgerows from along the Arley Brook and farmland would increase the visibility of construction from the surrounding area, but the temporary material stockpiles along the southern part of the route of the Proposed Scheme would screen the lower parts of construction. Vehicles using site haul routes would introduce uncharacteristic movement into views. There would therefore be a high magnitude of change a major adverse effect.	**Level of effect:** Major adverse (significant)
Views from residential properties on the unnamed road to Heyrose Farm and Old Hall Lane (VPs 315-02-01) would be largely screened by intervening vegetation, though the taller elements of construction such as cranes would be visible above the trees. There would therefore be a medium magnitude of change moderate adverse effect.	**Level of effect:** Moderate adverse (significant)
Views east, west and south from the residences on and close to Winterbottom Lane, from Bentleyhurst Farm and from PRoW Mere Bridleway (BR)1 and RB2. (VPs 315-02-005 and 315-03-004) **Map Number: LV-03-315**	**High and medium-high sensitivity receptors**
Residents and PRoW users would experience substantial changes to near and middle distance views as a result of the construction of the M6 Mere viaduct, the Over Tabley embankment and the Mere Bridleway 1 accommodation underbridge. The large-scale features associated with construction, including machinery, earthworks, temporary stockpiles, construction compounds (adjacent to the M6), fencing and lighting would be out of character with existing views over the rural landscape of the Cheshire Plain. The features would extend across the majority of the view for PRoW users, but most views from residential properties would be partially filtered by intervening vegetation. An existing high-voltage power line can be seen from most of these locations, which detracts from the rural character of the existing view. The removal of trees	**Level of effect:** Major adverse (significant)

and hedgerows from within the land required for construction would increase the visibility of construction from the surrounding area, but the temporary material stockpiles along the eastern side of the Proposed Scheme would screen the lower parts of construction from the east. Vehicles using the site haul route would introduce uncharacteristic movement into views from Bentleyhurst Farm and PRoW Mere RB1 and RB2. There would therefore be a high magnitude of change and major adverse effect.	
Views east, north-east and west from the residences on Winterbottom Lane, Hoo Milley Lane, Oakwood Road, the A50, Bowden View Lane and Wrenshot Lane, from the Mere Court Hotel and Conference Centre and from the High Legh Park Golf Course. (VPs 316-02-002, 316-02-003, 317-02-002, 317-02-001 and 317-02-004) **Map Numbers: LV-03-316 and LV-03-317**	**High and medium-high sensitivity receptors**
Residents, hotel guests and golfers would experience substantial changes to near and middle distance views as a result of the construction of the Hoo Green cutting, the Hoo Green auto-transformer feeder station, and grid supply point, the Hoo Milley Lane overbridge, the A50 overbridge, the High Legh box structure and the High Legh cutting. The features associated with construction, including machinery, earthworks, temporary stockpiles, the Hoo Milley Lane and Bowden View Lane transfer nodes, the A50 Cliff Lane main compound and transfer node and the Hoo Green auto-transformer feeder station satellite compound would be prominent in existing views due to their large scale and extent. However, these views already include infrastructure elements such as the high-voltage power lines and the busy A50. Views of construction would be clear and close from Oakwood Road, Wrenshot House and the Mere Court Hotel and Conference Centre. Views from other receptors would be partially screened or filtered by intervening vegetation. An existing high-voltage power line can be seen from most of these locations, which detracts from the rural character of the existing view. The removal of trees and hedgerows from within the land required for construction would increase the visibility of construction from the surrounding area, but the temporary material stockpiles along parts of the Proposed Scheme would screen the lower parts of construction. Vehicles using site haul routes and Hoo Milley Lane routes would introduce uncharacteristic movement into views. Construction vehicles would be less noticeable on the A50, which is a trunk road and already well used by goods vehicles. There would therefore be a high magnitude of change and a major adverse effect.	**Level of effect:** Major adverse (significant)
Views east, north and west from residential properties on Hulseheath Lane, Moss Lane, Peacock Lane Thowler Lane, Agden Lane, Boothbank Lane and from PRoW High Legh FP4. (VPs 317-02-005, 317-02-006, 317-02-008, 317-02-009, 318-02-001, 318-02-002 and 318-02-005) **Map Numbers: LV-03-317 and LV-03-318**	**High and medium-high sensitivity receptors**
Residents and walkers would experience substantial changes to near and middle distance views as a result of the construction of the High Legh cutting, the Peacock Lane West overbridge, Peacock Lane East overbridge and the Hulseheath embankment, partially screened by temporary material stockpiles along the route of the High Legh cutting. The features associated with construction, including machinery, earthworks, temporary stockpiles, construction compounds (the Agden Lane, Peacock Lane and Chapel Lane satellite compounds) and site haul routes would be prominent in existing views due to their large scale and extent. However, an existing high-voltage power line can be seen from most of these locations, which detracts from the rural character of the existing view. Most views of the construction of the Proposed Scheme from residences on Thowler Lane, Peacock Lane, Boothbank Lane, Moss Lane and Agden Lane would be close and unfiltered. The removal of trees and hedgerows from within the land required for construction would increase the visibility of construction from the surrounding area. Vehicles using site haul routes and local roads would introduce uncharacteristic movement into views of country roads and farmland. There would therefore be a high magnitude of change major adverse effect.	**Level of effect:** Major adverse (significant)
Views east and west from residential properties on the A56 Lymm Road (Agden Brow), Agden Park Lane, Agden Bridge/Spring Lane and the Bridgewater Canal (canal boats) and from PRoW Agden FP1 and PRoW High Legh FP4, Agden FP6 and Agden FP9 (Cheshire Ring Canal Walk). (VPs 318-02-006, 318-03-007, 318-02-008, 318-02-010 and 319-02-001)	**High and medium-high sensitivity receptors**

Map Numbers: LV-03-318 and LV-03-319	
Residents and walkers would experience substantial changes to near and middle distance views as a result of the construction of the Agden cutting, the Agden Footpath 2 accommodation overbridge, the Lymm embankment and the A56 Lymm Road and Bridgewater Canal underbridges. Views would be partially screened by temporary material stockpiles along the south-western side of the Agden cutting. The features associated with construction, including machinery, earthworks, temporary stockpiles, construction compounds (the M56 west, A56 Lymm Road and Bridgewater Canal satellite compounds) would be prominent in existing views due to their large scale and extent. However, an existing high-voltage power line can be seen in views from most locations, which detract from the rural character of the existing view. Most views from residences on the A56 Lymm Road (Agden Brow), Agden Park Lane, Agden Bridge/Spring Lane and the Bridgewater Canal (canal boats) would be close and unfiltered. Vehicles using site haul routes would introduce uncharacteristic movement into views. There would therefore be a high magnitude of change and major adverse effect.	**Level of effect:** Major adverse (significant)

Other mitigation measures

11.4.12 To reduce the significant effects described above, consideration will be given during the detailed design stage to where planting can be established early in the construction programme to help achieve earlier landscape and visual integration. However, not all landscape and visual effects can be mitigated due to the visibility of construction activity and the sensitivity of surrounding receptors. No other mitigation measures are considered practicable during construction.

Summary of likely residual significant effects

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

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

- major adverse effects in relation to one LCA;
- major adverse visual effects in relation to 25 residential viewpoint locations;
- major adverse visual effects in relation to five recreational viewpoint locations; and
- moderate adverse visual effects in relation to one residential viewpoint location.

11.5 Permanent effects arising from operation

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

Avoidance and mitigation measures

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

- design of earthworks to tie the engineering earthworks for embankments such as the Millington and Ashley embankments, cuttings such as the Rostherne, Halebank and Manchester Airport Station cuttings and bridges such the Peacock Lane East and Millington Lane overbridges 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 planting (using the same species composition and planting types) to replace woodland lost from Smoker Wood ancient woodland and along Arley Brook, to provide connectivity between habitats, green infrastructure, historic landscape features and to soften the appearance of embankments and viaduct abutments and integrate them into the landscape; and
- hedgerow replacement and restoration in areas of loss throughout the LCA to restore connectivity and landscape pattern, where reasonably practicable, (using an appropriate palette of hedgerow types and species) and to tie the Proposed Scheme mitigation into the wider landscape.

Assessment of impacts and effects

11.5.3 The likely effects on landscape and visual receptors during operation of the Proposed Scheme relate to the presence of new structures and elements in the landscape including: the Smoker Brook, Arley Brook and M6 Mere viaducts (up to 14m high), the Pickmere, Heyrose, Over Tabley and Lymm embankments, the Hoo Green, Mere, High Legh, Hulseheath and Agden cuttings (up to 21m deep), the Hulseheath and Lymm embankments, the Pickmere Lane, A50 and Peacock Lane (east and west) overbridges, the Tabley Inferior Footpath 2 and 3, the Tabley Inferior Footpath 4 and Agden Footpath 2 accommodation overbridges, the Pickmere Footpath 5, Tabley Superior Restricted Bridleway 4 and Mere Bridleway 1 accommodation underbridges, the A56 Lymm Road and Bridgewater Canal (outside the area but visible) underbridges, the Milley Lane auto-transformer station, the Hoo Green auto-transformer feeder station and grid supply point and the High Legh and M56 West box structures. Other aspects include road realignments and the presence of trains, overhead line equipment and fencing.

Landscape assessment

11.5.4 Based on the current design, it is currently anticipated that the LCA described in Table 23 would be significantly affected during operation of the Proposed Scheme.

Table 23: Summary description and assessment of effect on LCAs

Arley Lower Farms and Woods	**High susceptibility and sensitivity**
Susceptibility to change: the LCAs intact and intricate field pattern, extensive tree cover and strong sense of place and overall rural character impart a high susceptibility of change arising from the Proposed Scheme. **Year 1:** The LCA would be directly affected by the loss of trees and hedgerows that are so characteristic of the Cheshire Plain landscape, and the demolition of buildings that contribute to local landscape character such as Flittogate Farm. The Proposed Scheme would dissect the landscape, especially around Hulseheath where the line divides and land would be isolated between the HS2 main line and the Manchester spur. The route of the Proposed Scheme on high embankments, the high Smoker Brook, Arley Brook and M6 Mere viaducts, wide and deep cuttings, the Hoo Green auto-transformer feeder station and grid supply point, the trains and overhead line equipment would be new features in the landscape that would substantially alter its character. The highways overbridges would be uncharacteristic new structures in the landscape due to their large scale. Millington Clough, in the northern part of the LCA (in the adjoining CA 06) would be directly affected by the loss of trees and woodland and the presence the Millington embankment, the Agden Brook viaduct, the deep Rostherne cutting, the access road from Boothbank and the realignment of Millington Lane. The deep and wide cutting, viaduct, overhead line equipment and trains would be new features in the landscape, changing its character. Millington Clough would be particularly affected by losing its existing small-scale, quiet, secluded quality through the loss of woodland and the introduction of trains along the high Agden Brook viaduct. Mature oak trees would be lost with the changes to Millington Lane. While there already is large-scale infrastructure in the area, Millington Clough and the area around Booth Bank are currently protected from most of its effects by the intervening topography and woodland. Tranquillity would also be affected, although existing traffic noise from the M56 is apparent in most parts of the LCA. There would therefore be a high magnitude of change and a major adverse effect.	**Level of effect:** Major adverse (significant)
Year 15: Mitigation planting would provide screening or integration of the embankments and cuttings into the landscape by summer of year 15, however the large-scale of elements such as the highways overbridges, the Hoo Green auto-transformer feeder station and grid supply point and the Agden Brook viaduct means that they would still be prominent and would continue to have an adverse effect on the LCA. There would therefore be a reduced medium magnitude of change and a moderate adverse effect.	Moderate adverse (significant)

Visual assessment

Introduction

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

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

11.5.7 Table 24 identifies the locations where the operation of the Proposed Scheme would potentially result in significant effects. Viewpoint locations are shown in Map Series LV-04 in the Volume 2: MA03 Map Book

Table 24: Operation phase significant visual effects

Views from Pickmere Lane, School Lane, farms in the landscape and PRoW Pickmere FP5 and FP9 and Tabley Inferior FP1, FP2, FP3 and FP4. (VPs 313-02-005, 313-02-006, 313-03-010, 314-02-001, 314-02-002, 314-03-003, 314-02-004) **Map Numbers: LV-04-313 and LV-04-314**	**High and medium-high sensitivity receptors**
Year 1 – winter and summer: Walkers on Footpaths and occupants of residential properties would experience substantial changes, some partially filtered, through intervening vegetation, to near and middle distance views as a result of the Proposed Scheme. The Smoker Brook viaduct and the Pickmere embankment (up to 11m high), the boundary fencing, overhead line equipment and movement of trains would be seen against the skyline, altering key characteristics of the view. The Proposed Scheme would introduce a high, wide linear feature across the intricate pattern of hedgerows and hedgerow oaks of the Cheshire Plain. The Pickmere Footpath 5 accommodation underbridge, the Tabley Inferior 2 and 3 and Tabley Inferior Footpath 4 accommodation overbridges would be new structures that would visible in close and medium-distance across the flat landscape. The loss of mature trees (especially oaks) and hedgerows from farmland along the track to Smoker Hill Farm, along the track to Smoker Hill Farm and along Tabley Brook, and the demolition of Flittogate Farm (a typical red-brick Cheshire farmstead) would remove key features that contribute to the historic and rural character of the existing view. The mitigation woodland and hedgerow planting would not be sufficiently mature to contribute to any visual integration or enclosure at this stage. There would therefore be a high magnitude of change major adverse effect.	**Level of effect:** Major adverse (significant)
Year 15 – summer: Views of the Smoker Brook viaduct and the Pickmere embankment boundary fencing and overbridges would be partially screened by mitigation planting. However, the height of the Smoker Brook viaduct, the Pickmere embankment, the Pickmere Footpath 5 accommodation underbridge, the Tabley Inferior 2 and 3 and Tabley Inferior Footpath 4 accommodation overbridges, means that the upper parts of the structures, the overhead line equipment and the movement of trains would continue to be prominent in views across the landscape, resulting in changes to key characteristics of the view such as the pattern of hedgerows and hedgerow oaks of the Cheshire Plain. The magnitude of change would remain high and there would be a major adverse effect.	**Level of effect:** Major adverse (significant)
Views from the Heyrose Golf Club, residences in Budworth Road and Pickmere Lane, at the Shooting Box and Hollowood Farm and walkers on the North Cheshire Way, Tabley Superior RB4 and Aston by Budworth FP6. (VPs 314-02-005, 314-02-006, 315-03-002, 315-02-003) **Map Numbers: LV-04-314 and LV-04-315**	**High, medium-high and medium sensitivity receptors**
Year 1 – winter and summer: Users of PRoW and golfers would experience substantial changes to near and middle distance views, and occupants of residential properties would experience substantial changes, partially filtered through intervening vegetation, to near and middle distance views as a result of the Proposed Scheme. The Arley Brook and M6 Mere viaducts and the Heyrose embankment (up to 8m high), boundary fencing, overhead line equipment and the movement of trains would be seen against the skyline, altering key characteristics of the view. The Proposed Scheme would introduce a high, wide and linear feature across the intricate pattern of fields, hedgerows and hedgerow oaks of the Cheshire Plain. Views from the North Cheshire Way already include taller vehicles on the M56 in cutting, but the motorway is not visible from other locations. The loss of trees and hedgerows from farmland and along Arley Brook would remove elements that contribute to the rural character of the existing view. Landscape mitigation earthworks would screen the embankment from many views, but the tracks, trains and overhead lines would still be visible. The mitigation woodland and hedgerow planting would not be sufficiently mature to contribute to any visual integration or enclosure at this stage. Landscape mitigation earthworks would screen the embankment from the east, but the tracks, trains and overhead lines would still be visible.	**Level of effect:** Major adverse (significant)

There would therefore be a high magnitude of change and major adverse effect.	
Year 15 Summer (VPs 314-02-005, 314-02-006): Views of the viaduct, embankment and boundary fencing would be partially screened by mitigation planting. However, the height of the Proposed Scheme means that the overhead line equipment and the movement of trains would continue to be prominent in views across the landscape, resulting in changes to key characteristics of the view including the pattern of hedgerows and hedgerow oaks of the Cheshire Plain. The magnitude of change would remain high and there would be a major adverse effect.	**Level of effect:** Major adverse (significant)
Year 15 Summer (VPs 315-03-002, 315-02-003): Views of the M6 Mere viaduct, Heyrose embankment and boundary fencing from the North Cheshire Way, Hollowood Farm and the Shooting Box (Way (VP315-03-002, 315-02-003) would be partially screened by mitigation planting, though the height of the Proposed Scheme means that the overhead line equipment and the movement of trains would continue to be visible in close views from the North Cheshire Way. More distant views from the long-distance path and from the Shooting Box and Hollowood Farm would be partially screened by existing vegetation or farm buildings and mitigation planting which would provide integration of the embankments into the view. The magnitude of change would reduce to medium and there would be a moderate adverse effect.	**Level of effect:** Moderate adverse (significant)
Views from residences on and close to Winterbottom Lane, from Bentleyhurst Farm and from PRoW Mere RB1 and RB2. (VPs 315-02-005 and 315-03-004) **Map Number: LV-04-315**	**High and medium-high sensitivity receptors**
Year 1 – winter and summer: Residents and walkers on PRoW would experience substantial changes to near and middle distance views as a result of the Proposed Scheme. The Over Tabley embankment (up to 11m high), M6 Mere viaduct, boundary fencing, overhead line equipment and the movement of trains would be seen against the skyline, altering key characteristics of the view. The Proposed Scheme would introduce a high, wide and linear transport infrastructure feature across the intricate pattern of fields, hedgerows and hedgerow oaks of the Cheshire Plain. However, existing high-voltage power lines and taller vehicles on the M56 in cutting can be seen in views from most locations and detract from the rural character of the existing view. The features would extend across the majority of the view for PRoW users, but most views from residential properties would be partially filtered by intervening vegetation. The M6 Mere viaduct (9.5m high) would be visible in oblique views from most locations but the Mere Bridleway 1 accommodation underbridge would only be visible from the PRoW. The loss of trees and hedgerows from along the route of the Proposed Scheme would remove elements that contribute to the rural character of the existing view. Landscape mitigation earthworks would screen the embankment from the east but the tracks, trains and overhead lines would still be visible. The mitigation woodland and hedgerow planting would not be sufficiently mature to contribute to any visual integration or enclosure at this stage. There would therefore be a high magnitude of change major adverse effect.	**Level of effect:** Major adverse (significant)
Year 15 – Summer: Views of the Over Tabley embankment would be partially screened by mitigation planting. However, the proximity of residences and the height of the Proposed Scheme means that the overhead line equipment and the movement of trains would continue to be prominent in views across the landscape, resulting in changes to key characteristics of the view including the pattern of hedgerows and hedgerow oaks of the Cheshire Plain. The magnitude of change would be high and there would be a major adverse effect.	**Level of effect:** Major adverse (significant)
Year 15 (VP 315-03-004): Views of the Over Tabley embankment, M6 Mere viaduct and boundary fencing from Bentleyhurst Farm and PRoW Mere RB1 and RB2 (VP 315-03-004) would be partially screened and filtered by	**Level of effect:** Moderate adverse (significant)

mitigation planting and existing vegetation. However, the height of the Proposed Scheme means that the overhead line equipment and the movement of trains would continue to be visible, though seen in the context of the moving vehicles on the M56. The magnitude of change would reduce to medium and a moderate adverse effect.	
Views from the residences on Winterbottom Lane, Hoo Milley Lane, Oakwood Road, the A50, Bowden View Lane and Wrenshot Lane, from the Mere Court Hotel and Conference Centre and from the High Legh Park Golf Course. (VPs 316-02-002, 316-02-003, 317-02-001, 317-02-002 and 317-02-004) **Map Numbers: LV-04-316 and LV-04-317**	**High and medium sensitivity receptors**
Year 1 – winter and summer: Residents, hotel guests and golfers would experience substantial changes to near and middle distance views as a result of the Proposed Scheme. The Hoo Milley Lane overbridge, Hoo Green auto-transformer feeder station and grid supply point would be large structures that would be prominent in views across the flat landscape. The Hoo Green cutting (up to 3m deep) and the wide, deep High Legh cutting (up to 20m deep) would be on a larger scale than the existing highways and power infrastructure. These elements of the Proposed Scheme, along with the A50 overbridge would, due to their large scale, be uncharacteristic of the existing view, despite the presence of infrastructure elements which detract from the rural character of the existing view. Landscape mitigation earthworks would replace vegetation in the view from Oakwood Road, Wrenshot House and the Mere Court Hotel and Conference Centre, but it would largely screen the cutting trains and overhead line equipment, though the Proposed Scheme might be visible on the Manchester spur. The loss of trees and hedgerows would remove elements that contribute to the rural character of the existing view. The mitigation planting would not be sufficiently mature to contribute to any visual integration or enclosure at this stage. There would therefore be a high magnitude of change and a major adverse effect.	**Level of effect:** Major adverse (significant)
Year 15 – Summer: Views of the cuttings would be partially screened by a combination of mitigation planting and landscape earthworks. The height of the overbridges and the scale of the Hoo Green auto-transformer feeder station and grid supply point means that Proposed Scheme would continue to be prominent in views from south of the A50, resulting in changes to key characteristics of the view including the pattern of hedgerows and hedgerow oaks of the Cheshire Plain. The Mere cutting at the Mere Court Hotel and Conference Centre would allow the restoration of the hotel garden. The magnitude of change would remain high and there would be a major adverse effect.	**Level of effect:** Major adverse (significant)
Year 15 – Summer (VP 317-02-001): Views of the cutting from Bowden View Lane (317-02-001) would be largely screened by mitigation planting and landscape earthworks. The magnitude of change would reduce to medium and there would be a moderate adverse effect.	**Level of effect:** Moderate adverse (significant)
Views from residential properties on Hulseheath Lane, Moss Lane, Peacock Lane, Thowler Lane, Agden Lane, Boothbank Lane and from PRoW High Legh FP4. (VPs 317-02-005, 317-02-006, 317-02-008, 317-02-009, 318-02-001, 318-02-002 and 318-02-005) **Map Numbers: LV-04-317 and LV-04-318**	**High and medium-high sensitivity receptors**
Year 1 – winter and summer: Occupants of residential properties and PRoW users would experience substantial changes to near and middle distance views as a result of the Proposed Scheme. The High Legh cutting (up to 20m deep) would be a wide, deep new feature, altering the appearance of the gently undulating landform. The high Peacock Lane (east and west) overbridges and the Hulseheath embankment would be large new structures that would be prominent in views across the landscape. The cutting, overbridge and embankment would be on a far larger scale than the existing highway infrastructure of the area and	**Level of effect:** Major adverse (significant)

would be uncharacteristic of the existing view. The maintenance access road from Boothbank Lane to Millington Clough would, due to the sloping landform, require wider earthworks to accommodate the gradient and would consequently change the character of the country lane. The loss of trees and hedgerows from along the route of the Proposed Scheme would remove elements that contribute to the rural character of the existing view. The mitigation woodland and hedgerow planting would not be sufficiently mature to contribute to any visual integration or enclosure at this stage. There would therefore be a high magnitude of change and a major adverse effect.	
Year 15 – Summer: Views of the High Legh cutting would remain highly visible from residences at the junction of Agden Lane and Moss Lane. The Hulseheath embankment would be partly screened by mitigation planting from Peacock Lane and Thowler Lane, though the trains and overhead line equipment would remain visible. The height of the Peacock Lane (east and west) overbridges means that it would remain prominent in views above mitigation planting from residences in Moss Lane, Thowler Lane and Peacock Lane and High Legh FP4. The magnitude of change would remain high and there would be a major adverse effect.	**Level of effect:** Major adverse (significant)
Year 15 (VPs 317-02-005 and 318-02-001): Views of the Hulseheath embankment would be largely screened by mitigation planting and existing intervening vegetation from Hulseheath Lane and the junction of Agden Lane and Boothbank Lane (317-02-005 and 318-02-001), though the trains and overhead line equipment would be remain visible in filtered views. The magnitude of change would reduce to medium and there would be a moderate adverse effect.	**Level of effect:** Moderate adverse (significant)
Views from residential properties on Agden Brow, Agden Park Lane, Agden Bridge/Spring Lane and the Bridgewater Canal (canal boats) and from PRoW Agden FP1 and PRoW High Legh FP4, Agden FP6 and Agden FP9 (Cheshire Ring Canal Walk). (VPs 318-02-006, 318-03-007, 318-02-008, 318-02-010 and 319-02-001) **Map Numbers: LV-04-318 and LV-04-319**	**High and medium-high sensitivity receptors**
Year 1 – winter and summer: Residents and PRoW users would experience substantial changes to near and middle distance views as a result of the Proposed Scheme. The Agden cutting (up to 20m deep) would be a wide, deep new feature, altering the appearance of the gentle rise in the land from Agden Brook to Agden Lane. The Lymm embankment and the A56 Lymm Road and Bridgewater Canal underbridges would be wide, high, new structures that would be prominent in views across the flat landscape of the Mersey valley. The cutting, overbridge and embankment would be on a far larger scale than the existing transport infrastructure of roads and the canal and would be uncharacteristic of the existing view. The mitigation woodland and hedgerow planting would not contribute to any visual integration or enclosure at this stage. There would therefore be a high magnitude of change and major adverse effect.	**Level of effect:** Major adverse (significant)
Year 15 – Summer: Views of the cutting would be partly screened by mitigation planting, though it would remain visible from properties off Agden Lane and from PRoW. The Lymm embankment and the A56 Lymm Road and Bridgewater Canal underbridges would remain highly visible due to their large scale, though lower parts of the embankments would be screened by mitigation planting. The magnitude of change would remain high and there would be a major adverse effect.	**Level of effect:** Major adverse (significant)

Other mitigation measures

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

Summary of likely residual significant effects

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

- major adverse significant effects in relation to one LCA;
- major adverse significant visual effects in relation to 16 residential viewpoint locations;
- major adverse significant visual effects in relation to one recreational viewpoint locations;
- moderate adverse significant visual effects in relation to four residential viewpoint locations; and
- moderate adverse significant visual effects in relation to two recreational viewpoint locations.

Monitoring

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

11.5.11 There are no area-specific requirements for monitoring landscape and visual mitigation during the operation of the Proposed Scheme in the Pickmere to Agden and Hulseheath area.

12 Socio-economics

12.1 Introduction

12.1.1 This section reports on the environmental baseline, likely economic and employment impacts and significant effects identified to date during construction and operation of the Proposed Scheme within the Pickmere to Agden and Hulseheath 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) and Cheshire West and Chester Council (CWCC) has been undertaken as part of the development of the Proposed Scheme. The purpose of the engagement was to increase the understanding of socio-economic characteristics identified through a review of publicly available data. Engagement will continue as part of the development of the Proposed Scheme and to inform the formal assessment.

12.1.3 The socio-economic effects on employment at a route-wide level will be reported in Volume 3: Route-wide effects (Section 12).

12.1.4 Maps showing the location of the key environmental features (Map Series CT-10) and the key construction (Map Series CT-05) and key operational (Map Series CT-06) features of the Proposed Scheme are provided in the Volume 2: MA03 Map Book.

12.2 Scope, assumptions and limitations

12.2.1 The scope, assumptions and limitations for the socio-economics assessment will be set out in Volume 1, Section 8 and the Scope and Methodology Report (SMR)[100].

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

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

12.3 Environmental baseline

Existing baseline

Study area description

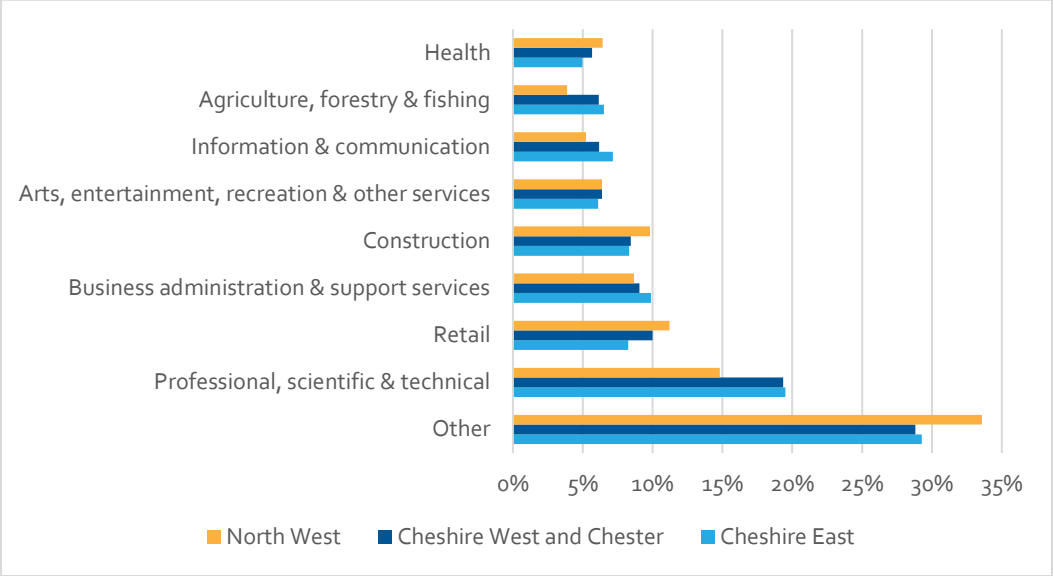
12.3.1 The following provides a brief overview of employment, economic structure, labour market and business premises availability within the Pickmere to Agden and Hulseheath area. It lies within the administrative areas of CEC and CWCC. The area also falls entirely within the Cheshire and Warrington Local Enterprise Partnership (LEP) area[101] and the North West region.

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

Business and labour market

12.3.2 Within the CEC area there is a wide spread of business types, which reflects a diverse range of commercial activities. In 2017, the professional, scientific and technical sector accounted for the largest proportion of organisations (20%)[102]. Business administration and support services were the second largest (10%), followed by construction and retail (8% each). Within the CWCC area the professional, scientific and technical sector accounted for the largest proportion of organisations (19%). Retail was the second largest (10%), followed by business administration and support services (9%). This is shown in Figure 8. For comparison, in the North West region, the largest sectors were professional, scientific and technical (15%), followed by retail (11%) and construction (10%).

Figure 8: Business sector composition in the CEC and CWCC areas and the North West[103, 104]

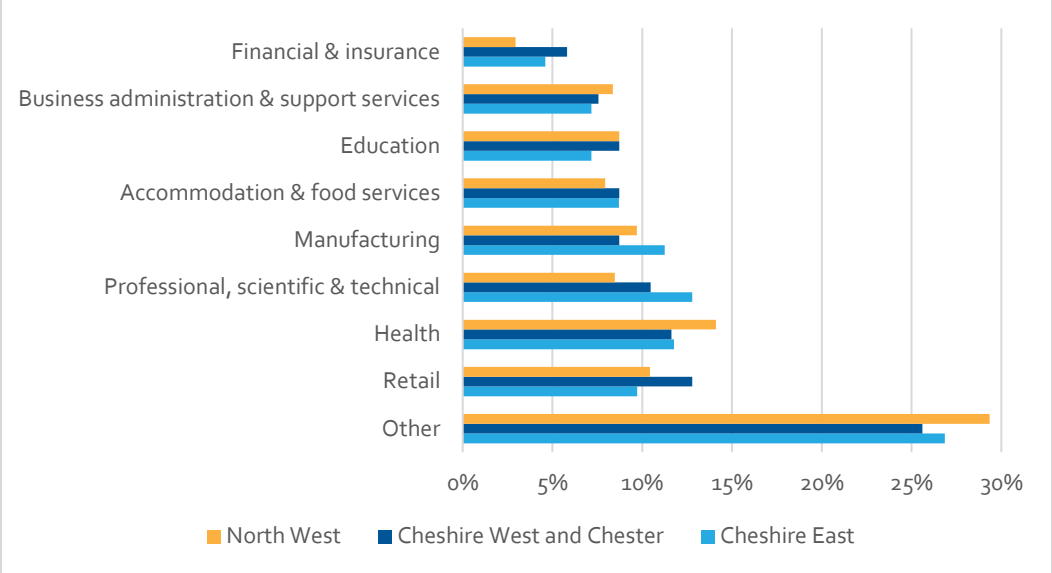


12.3.3 In 2016, approximately 195,000 people worked in the CEC area, and approximately 171,000 people worked in the CWCC area[105]. According to the Office for National Statistics Business Register and Employment Survey 2016[106] the top sectors in terms of share of employment in the CEC area were: professional, scientific and technical (13%), health (12%) and manufacturing (11%). For the CWCC area, the top sectors in terms of share of employment were: retail (13%), health (12%) and professional, scientific and technical (10%).

12.3.4 These compare with the largest sectors for the North West region, which were health (14%), retail and manufacturing (both 10%).This is shown in Figure 9.

[102] Office for National Statistics; (2017); UK Business Count – Local Units; http://www.nomisweb.co.uk
[103] Office for National Statistics; (2017); UK Business Count – Local Units; http://www.nomisweb.co.uk
[104] 'Other' includes: Health; Wholesale; Manufacturing; Property; Transport and storage (inc postal); Motor trades; Financial and insurance; Education; Public administration and defence; Mining, quarrying and utilities.
[105] Office for National Statistics; (2016); Business Register and Employment Survey; http://www.nomisweb.co.uk this number includes both residents and non-residents of CWCC who work within its boundaries.
[106] Office for National Statistics; (2016); Business Register and Employment Survey; http://www.nomisweb.co.uk this number includes both residents and non-residents of CEC who work within its boundaries.

Figure 9: Employment by industrial sector in the CEC and CWCC areas and the North West[107, 108]



12.3.5 According to the Annual Population Survey (2016)[109], the employment rate[110] within the CEC area was 76% (170,900 people) and within the CWCC area was 73% (147,700 people). This compares to 72% in the North West and 74% in England. In 2016, unemployment in the CEC area was 4.5% and 3.2% in the CWCC area, both of which are lower than that recorded for the North West (5.3%) and England (5%).

12.3.6 The Annual Population Survey (2016) also shows that 39% of CEC residents and 40% of CWCC residents aged 16-64 were qualified to National Vocational Qualification Level 4 (NVQ4) and above. This compares to 34% in the North West and 38% in England. Six percent of CEC residents and 9% of CWCC residents had no qualifications, which is lower than the North West for both areas (10%) and lower and higher respectively when compared to England (8%).

Property

12.3.7 A review of employment land in 2012[111] identified a need for approximately 13-15ha per year to 2030 of general business land in the CEC area. Across the rural parts of the CEC area there was found to be a lack of vacant marketed industrial floorspace but better availability of office space, though no particular spaces were identified in the Pickmere to Agden and Hulseheath area[112].

[107] Office for National Statistics; (2016); *Business Register and Employment Survey*; http://www.nomisweb.co.uk this number includes both residents and non-residents of CWCC who work within its boundaries.
[108] Percentage of employees within broad industrial groups. 'Other' includes: Financial and insurance; Arts, entertainment, recreation and other services; Construction; Information and communication; Wholesale; Public administration and defence; Motor trades; Property; Mining, quarrying and utilities; Agriculture, forestry and fishing.
[109] Annual Population Survey (2016), *NOMIS*. Available online at https://www.nomisweb.co.uk
[110] The proportion of residents aged 16-64 that are in employment.
[111] Arup (2012), *Cheshire East Employment Land Review*. Includes 30% flexibility factors and covers 2009-2030.
[112] Be Group (2009), *Cheshire and Warrington Rural Workspace Study*.

12.3.8 CWCC has estimated a need for future employment land of up to 72ha for office uses to 2030 (approximately 4ha a year)[113]. The need for traditional manufacturing space and warehousing has been declining.

12.3.9 The importance of providing a portfolio of market responsive, readily available employment land to support the needs of businesses, and to support growth, has been highlighted in the LEP Strategic and Economic Plan[114].

12.4 Effects arising during construction

Avoidance and mitigation measures

12.4.1 The draft CoCP[115] includes a range of provisions that would help mitigate socio-economic effects associated with construction within this area, including:

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

Assessment of impacts and effects

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

- premises demolished with their occupants and employees needing to relocate to allow for construction of the Proposed Scheme;

[113] Cheshire West and Chester Council (2013). *Cheshire West and Chester Council Local Plan: Employment Land Study Update 2013*. Including a 50% buffer.
[114] Cheshire and Warrington Enterprise Partnership (2014). *Cheshire and Warrington Matters: A Strategic and Economic Plan for Cheshire and Warrington*. Available online at: http://www.871candwep.co.uk/content/uploads/2015/05/Strategic-and-Economic-Plan-and-Growth-Plan-for-Cheshire-and-Warrington.pdf [Accessed 23 Aug. 2017].
[115] Supporting document: Draft Code of Construction Practice

- in-combination effects (e.g. air quality, noise, vibration, construction traffic and visual impacts) and isolation of an area, which could affect business operations, will be reported in the formal ES. Any resulting effects on employment will be reported at a route-wide level (see Volume 3: Route-wide effects); and
- potential employment opportunities arising from construction in the local area (including in adjacent community areas).

Temporary effects

Construction employment

12.4.3 It is currently expected that there would be one main construction compound, the A50 Cliff Lane main compound, nine satellite compounds and three rail system compounds in the Pickmere to Agden and Hulseheath area. The works undertaken at and managed from these sites would result in the creation of up to 2,400 person years of construction employment[116], which is broadly equivalent to 240 full-time jobs[117]. Depending on skill levels required and the skills of local people, this employment is 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) on skill levels required and the skills of local people, this employment is 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).

12.4.4 Construction and the related direct employment could also lead to opportunities for local businesses to supply the Proposed Scheme or to benefit from the expenditure of construction workers. The impact of the indirect construction employment creation has been considered as part of the route-wide assessment (see Volume 3: Route-wide effects).

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

Permanent effects

Businesses

12.4.6 Businesses directly affected, comprising those that lie within land required for the Proposed Scheme, are reported in groups, where possible, to form defined resources based on their location and operational characteristics. A group could contain either one or a number of businesses reflecting the fact that a building may have more than one occupier or that similar businesses and resources are clustered together.

[116] Construction labour is reported in construction person years, where one construction person year represents the work done by one person in a year composed of a standard number of working days.
[117] Based on the convention that 10 employment years is equivalent to one full time equivalent job.

12.4.7 Four business accommodation units or sites in the study area would experience direct impacts as a result of the Proposed Scheme. These four units or sites, together, form four defined resources:

- Cheshire Showground (one site engaged in hosting the Royal Cheshire Show as well as other temporary events);
- Heyrose (one unit engaged in provision of a golf club);
- Mere Court Hotel and Conference Centre (one unit engaged in accommodation, wedding centre, conference centre and restaurant); and
- One unit engaged in provision of electrical contractors and electricians on Bowden View Lane.

12.4.8 Of the four resources identified, one business could potentially experience significant direct effects on business activities and employment, as set out in Table 25.

Table 25: Resource which would potentially experience significant direct effects

Resource	Description of business activity
Mere Court Hotel and Conference Centre and associated restaurant	Hotel (with 34 rooms), wedding venue, conference centre and associated restaurant.

Impact magnitude

12.4.9 The magnitude of impact focuses on the number of jobs that would be affected by the Proposed Scheme, either through displacement or possible job loss. It also considers the implications of this impact in relation to the scale of economic activity and opportunity in the area.

Sensitivity

12.4.10 The sensitivity of resources considers the following:

- availability of alternative, suitable premises;
- size of the local labour market;
- skill levels and qualifications of local people; and
- levels of unemployment.

Significance of effects

12.4.11 Taking account of the sensitivity of the resource and the magnitude of impact, it is currently expected that the significance of the resultant effects would be as set out in Table 26. It should be noted that a precautionary approach has been taken in this assessment as outlined in Section 1.2 and it may change by the time of the formal ES.

Table 26: Significance of effects on resources

Resource	Impact magnitude	Sensitivity	Significance of effect
Mere Court Hotel and Conference Centre and associated restaurant	Medium	Medium	Moderate adverse – significant

12.4.12 The construction of the Hoo Green cutting and Mere cutting would require part of the car park and a large section of the gardens at the Mere Court Hotel and Conference Centre for approximately two years. A further area of the grounds would be required permanently for the Proposed Scheme. The viability of the business might be affected by the loss of the grounds as they represent an important part of the venue for the hosting of events such as weddings. The nature and identity of the business is tied to this particular location and premises and it may be difficult for the business to relocate. The loss of part of the gardens and car parking is considered to be a moderate adverse effect and is therefore significant.

12.4.13 Cheshire Showground is subject to direct impacts as a result of construction of the Proposed Scheme. Significance of its effects will be assessed and reported in the formal ES.

12.4.14 Among all the affected resources, whether significantly affected or not, it is estimated that 60 jobs[118] would either be displaced or possibly lost within the Pickmere to Agden and Hulseheath area. While there is a general availability of vacant premises, there may be cases where alternative locations are problematic and businesses may be unable to relocate on a like-for-like basis within the area. The impact on the local economy from the relocation or loss of jobs is considered to be relatively modest in the context of the total number of people employed in the district authorities (approximately 195,000 jobs in CEC and 171,000 jobs in CWCC) and the scale of economic activity and opportunity in the area.

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

Other mitigation measures

12.4.16 Businesses displaced by the Proposed Scheme would be compensated in accordance with the Compensation Code. HS2 Ltd recognises the importance of businesses, displaced from their existing premises, being able to relocate to suitable alternative premises and at this stage it assumes that it would, therefore, adopt a policy to offer additional support over and above statutory requirements to facilitate this process as it has done on Phases One and 2a.

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

Summary of likely residual significant effects

12.4.18 Any likely residual significant socio-economic effects will be reported in the formal ES.

[118] Employment within businesses has been estimated through a combination of sources, for example, surveys of businesses, the Experian employment dataset, employment floor space and the Homes and Communities Agency (HCA) Employment Densities Guide 3rd Edition (2015). The estimate is calculated using standard employment density ratios and estimates of floor areas and may vary significantly from actual employment at the sites.

12.5 Effects arising from operation

Avoidance and mitigation measures

12.5.1 No mitigation measures are proposed in relation to business resources during operation of the Proposed Scheme.

Assessment of impacts and effects

Resources with direct effects

12.5.2 It is currently expected that no socio-economic resources would experience significant direct effects during the operation of the Proposed Scheme.

Operational employment

12.5.3 Direct operational employment created by the Proposed Scheme could lead to indirect employment opportunities for local businesses in terms of potentially supplying the Proposed Scheme or benefiting from expenditure of directly employed workers on goods and services.

12.5.4 The impact of operational employment creation will be assessed and reported at a route-wide level in Volume 3: Route-wide effects.

Other mitigation measures

12.5.5 Any further mitigation measures will be reported in the formal ES.

Summary of likely residual significant effects

12.5.6 Any likely residual significant socio-economic effects will be reported in the formal ES.

Monitoring

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

12.5.8 There are no area-specific requirements for monitoring socio-economic effects during the operation of the Proposed Scheme in the Pickmere to Agden and Hulseheath area.

13 Sound, noise and vibration

13.1 Introduction

13.1.1 This section reports the initial assessment of the noise and vibration likely significant effects arising from the construction and operation of the Proposed Scheme within the Pickmere to Agden and Hulseheath area on:

- 'residential receptors'; people, primarily where they live, in terms of individual dwellings and on a wider community basis including any shared community open areas[119]; and
- 'non-residential receptors'[120] such as:
  - community facilities including schools, hospitals, places of worship and 'quiet areas'[121]; and
  - commercial properties such as hotels.

13.1.2 The methodology for the assessment of likely significant noise and vibration effects was developed in alignment with Government noise policy[122], planning policy, planning practice guidance on noise (PPGN) [123] and EIA Regulations as described in the Scope and Methodology Report[124] (SMR).

13.1.3 Engagement has been undertaken with Cheshire West and Chester Council (CWCC), Cheshire East Council (CEC) and Trafford Metropolitan Borough Council (TMBC) with respect to the sound, noise and vibration assessment. This engagement process will continue as part of the development of the Proposed Scheme. The purpose of this engagement has been twofold. Firstly, engagement has been undertaken on a route wide basis covering matters including process, scope, method and the approach to baseline and mitigation strategy. Secondly, local engagement has been undertaken to obtain relevant information regarding residential and non-residential receptors and existing baseline sound levels, and to discuss the development of the mitigation to be included in the Proposed Scheme. Officers from local and county authorities are invited to attend and witness baseline sound measurements.

13.1.4 Maps of the Proposed Scheme in the Pickmere to Agden and Hulseheath area showing the location of the key environmental features (Map Series CT-10), key construction features (Map Series CT-05), key operational features (Map Series CT-06) and operational sound, noise and / or vibration impacts and proposed noise mitigation (Map series SV-01), can be found in the Volume 2: MA03 Map Book. Map series SV-01

[119] 'Shared community open areas' are those that the Planning Practice Guidance identifies may partially offset a noise effect experienced by residents at their dwellings and are either a) relatively quiet nearby external amenity spaces for sole use by a limited group of residents as part of the amenity of their dwellings or b) a relatively quiet external publicly accessible amenity space (e.g. park or local green space) that is nearby.
[120] Non-residential receptors with multiple uses would be assessed either based on the most noise sensitive use or would be subject to multiple assessments as appropriate.
[121] 'quiet areas' are defined as either Quiet Areas as identified under the Environmental Noise Regulations 2007 (as amended) or are resources which are prized for providing tranquillity as noted in the NPPF and are therefore designated as such under the relevant local plan or are designated under local plans or neighbourhood development plans as local green spaces.
[122] Noise Policy Statement for England, (2015) Department for Environment, Food & Rural Affairs (Defra)
[123] Department for Communities and Local Government (DCLG) (2014), Planning Practice Guidance – Noise. Available online at: https://www.gov.uk/guidance/noise--2
[124] Supporting document: HS2 Phase 2b Environmental Impact Assessment Scope and Methodology Report

also presents key 'non-residential receptors'. These receptors will be reviewed and developed further to incorporate, where appropriate, consultation feedback and ongoing stakeholder engagement.

13.1.5 The assessment of noise and vibration likely significant effects on agricultural, heritage and ecological receptors and the assessment of tranquillity is ongoing and will be reported in the formal ES.

13.2 Scope, assumptions and limitations

13.2.1 The approach to assessing sound, noise and vibration and identifying envisaged mitigation is outlined in Volume 1, Sections 8 and 9 and the SMR.

13.2.2 In this assessment 'sound' is used to describe the acoustic conditions that people experience as a part of their everyday lives. Noise is taken as unwanted sound and hence adverse effects are noise effects and mitigation is, for example, by noise barriers.

13.2.3 Effects can either be temporary from construction or permanent from the operation of the Proposed Scheme. These effects may be direct, resulting from the construction or operation of the Proposed Scheme, and/or indirect, resulting from changes in traffic patterns on existing roads or railways that result from the construction or operation of the Proposed Scheme.

13.2.4 The effects of construction noise and vibration are assessed qualitatively, based on construction compound locations, construction routes, initial construction estimates and professional judgement. No quantitative assessment has been undertaken for the construction of the Proposed Scheme at this stage. The quantitative assessment will be reported in the formal ES.

13.2.5 The effects on operational noise and vibration are assessed quantitatively based on forecast noise emission from the Proposed Scheme combined with outline baseline information and professional judgement. As baseline information is limited at this stage the quantitative assessment including a full baseline will be reported in the formal ES.

13.3 Environmental baseline

13.3.1 The SMR describes the three rounds of baseline data collection covering existing sources, modelling and by targeted monitoring. Baseline sound levels will be published in the formal ES.

13.3.2 The area is characterised by a mix of small towns, villages, hamlets and isolated residential properties in a predominantly rural setting. The sound environment is generally dominated by local and distant road traffic. There are also overflying aircraft from Manchester Airport, local neighbourhood sounds, and natural and agricultural sounds.

13.3.3 There are several main roads that contribute to the sound environment near to the route of the Proposed Scheme within the Pickmere to Agden and Hulseheath area. These include the M6 affecting Winterbottom and Tabley; the M56 affecting Agden;

the A50 near High Legh, Hoo Green and Mere as well as the newly opened A556 affecting Tabley, Mere, Hoo Green, Bucklow Hill and Hulseheath.

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

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

13.3.6 The baseline assessment presented in the formal ES will consider current sound levels and how these may change in the future. This will include any changes firstly due to national trends such as road traffic growth and the progressive electrification of road vehicles and secondly due to area specific changes caused either by local committed development and / or noise reduction provided in Important Areas identified in Defra's Noise Action Plans for Agglomerations[125], Roads[126] or Railways[127]. HS2 Ltd will engage with the Competent Authorities responsible for the relevant Important Areas. Map Series SV-01 (Volume 2: MA03 Map Book) shows any noise Important Areas in the Pickmere to Agden and Hulseheath area.

13.4 Effects arising during construction

Assumptions and limitations

13.4.1 The construction arrangements that form the basis of the assessment are presented in Section 2.3 of this report, in Volume 1, Section 8 and in the draft Code of Construction Practice (CoCP)[128]. The assessment focuses on the initial identification of communities that may be affected by construction noise. The formal ES will include the assessment of likely significant effects from construction noise and / or vibration on individual receptors and communities.

13.4.2 The assessment takes account of people's sensitivity to noise during the day, evening and night. More stringent criteria are applied during evening and night-time periods, compared to the busier and more active daytime period.

Avoidance and mitigation measures

13.4.3 The assessment assumes the implementation of the principles and management processes set out in the noise and vibration section of the draft CoCP (Section 13), which are:

- best practicable means (BPM) as defined by the Control of Pollution Act 1974 (CoPA) and Environmental Protection Act 1990 (EPA), which will be applied during construction activities to minimise noise (including vibration) at neighbouring residential properties and other sensitive receptors[129];

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

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

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

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

Assessment of impacts and effects

13.4.6 Potential construction airborne noise significant effects could occur at the communities, or those parts of the communities, that are nearest to the Proposed Scheme in the following locations, as a result of the construction works illustrated on Map Series CT-05 (Volume 2: MA03 Map Book):

- Pickmere near the junction of Pickmere Lane and Hall Lane arising from construction activities such as road realignments along with overbridge construction and embankment formation;
- Tabley around Budworth Road arising from construction activities such as road realignments and embankment formation;
- Winterbottom arising from construction works associated with embankment formation;
- Hoo Green arising from construction works associated with road realignments, overbridge construction, cutting formation and use of transfer nodes;
- Hulseheath arising from construction activities such as road realignments;
- Millington near Thowler Lane arising from construction activities including road realignments and overbridge construction;
- at the junction of Agden Lane and Moss Lane arising from construction activities associated with cutting formation; and
- Agden near Agden Lane (north of Agden Brow) arising from construction activities such as road realignments and underbridge construction.

13.4.7 Map Series SV-01 (Volume 2: MA03 Map Book) shows key non-residential properties that have been identified within the study area as defined in the SMR. Of these, the following are likely to experience significant effects (to be confirmed in the formal ES):

- Premier Inn Knutsford Mere, Hoo Green; and
- Mere Court Hotel.

13.4.8 The avoidance and mitigation measures to be implemented would avoid or reduce airborne construction noise adverse likely significant effects. Residual temporary noise or vibration likely significant effects will be reported in the formal ES.

13.4.9 Construction traffic on the following local roads has the potential, on a precautionary basis, to cause adverse noise or vibration effects on the nearest parts of residential communities and nearest noise sensitive non-residential receptors:

- Budworth Road between the route of the HS2 main line and Pickmere Lane;
- Pickmere Lane between Flittogate Lane and the A556;
- the B5569 Chester Road between the M6 and the A556;
- the B5159 West Lane between the A50 and Peacock Lane;
- Back Lane and Thowler Lane, near Millington; and
- Chapel Lane between the B5569 Chester Road and Peacock Lane.

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

Other mitigation measures

13.4.11 Further work is being undertaken to confirm the likely significant effects and identify any site-specific mitigation, or amendment to construction routes considered necessary in addition to the general measures set out in the draft CoCP. Any site-specific mitigation will be presented in the formal ES and would include an estimate of the number of properties that may qualify for noise insulation or temporary re-housing under provisions set out in the draft CoCP.

Summary of likely residual significant effects

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

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

13.5 Effects arising from operation

Assumptions and limitations

Local assumptions

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

13.5.1 Passenger services will start at or after 05:00 from the terminal stations. In this area, with Phase One and Phase Two in operation, after 05:00 services will progressively increase to nine trains per hour in each direction on the main lines south of the Manchester spur with an operating speed of 330kph for 90% of services and 360kph for 10% of services; on the main line north of the Manchester spur up to four trains per hour in each direction will operate at the same operating speed and on the Manchester spur up to six trains per hour will operate with an operating speed of 230kph. This number of services is assumed to operate every hour from 07:00 to 21:00. The number of services will progressively decrease after 21:00 and the last service will arrive at terminal stations by midnight. Further information is presented in Volume 1, Section 4.

Avoidance and mitigation measures

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

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

Airborne noise

13.5.4 Through the procurement process for the trains and the track, the use of proven international technology will enable the railway to be quieter than implied by current minimum European standards. Details of operational train noise will be provided in the formal ES. This will include reduction of aerodynamic noise from the pantograph that otherwise would occur above 300kph (186mph) with current pantograph designs, drawing on proven technology in use in East Asia where reasonably practicable. Overall it is assumed that proven international technology would reduce noise emissions by approximately 3dB at 360kph (225mph) compared to the current minimum European standards[130].

13.5.5 The Proposed Scheme would incorporate noise barriers, in the form of either landscape earthworks and/or noise fence barriers to avoid or reduce significant adverse airborne noise effects. Based upon the currently available information are shown on Map Series SV-01 (Volume 2: MA03 Map Book) there are no noise barriers included in the Pickmere to Agden and Hulseheath area.

13.5.6 In practice, barriers may differ from this description while maintaining the required acoustic performance. For example, where noise barriers are in the form of landscape earthworks, they would need to be higher above rail level to achieve similar noise attenuation to the noise fence barrier because the crest of the earthwork would be further than 5m from the outer rail.

13.5.7 Noise effects would also be reduced in other locations along the route by engineering structures and landscape earthworks provided to avoid or reduce significant visual effects.

13.5.8 As required by statute, noise insulation measures would be offered for qualifying buildings as defined in the Noise Insulation (Railways and Other Guided Transport Systems) Regulations 1996 and the Noise Insulation Regulations 1975 ('the NI Regulations'). Additionally, HS2 Ltd will apply more onerous criteria, to provide the same mitigation as defined in 'the NI Regulations' at residential buildings where[131] noise from the use of the Proposed Scheme measured outside a dwelling exceeds the Interim Target defined by the World Health Organization's (WHO) Night Noise Guidelines for Europe[132] or the maximum noise level criteria[133] 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.

Ground-borne noise and vibration

13.5.9 Significant ground-borne noise or vibration effects would be avoided or reduced through the design of the track and track-bed.

[130] Technical Specification for Interoperability (TSI) Noise – EU Commission Regulation No 1304/2014
[131] Following Government's National Planning Practice Guidance. Available online at: https://www.gov.uk/government/collections/planning-practice-guidance
[132] World Health Organization (2010), *Night time Noise Guidelines for Europe*.
[133] Dependent on the number of train passes.

Assessment of impacts and effects

13.5.10 Map Series SV-01 (Volume 2: MA03 Map Book) indicates the likely long-term daytime noise level (defined as the equivalent continuous sound level from 07:00 to 23:00 or $L_{pAeq,day}$) from HS2 operations alone. The contours are shown in 5dB steps from 50dB to 70dB. With the train flows described in Volume 1, the night-time noise level (defined as the equivalent continuous noise level from 23:00 to 07:00 or $L_{pAeq,night}$) from the Proposed Scheme would be approximately 10dB lower than the daytime sound level. The 50dB contour, therefore, indicates the distance from the Proposed Scheme at which the night time noise level would be 40dB. This contour represents where adverse noise effects may start to be observed during the day (with respect to annoyance) and night (with respect to sleep disturbance). With regard to sleep disturbance the assessment also takes account of the maximum noise levels generated by each train pass by as defined in the SMR.

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

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

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

Other mitigation measures

13.5.14 Further work is being undertaken to confirm the extent, location and type of the noise mitigation to be included within the design of the Proposed Scheme, which will be reported in the formal ES.

Summary of likely residual significant effects

13.5.15 Mitigation, including landscape earthworks, described in Volume 1 (Section 9), Section 2.2 and presented in Map Series SV-01 (Volume 2: MA03 Map Book) and Map Series CT-06 (Volume 2: MA03 Map Book), would substantially reduce the potential airborne noise effects that would otherwise arise from the Proposed Scheme. It is anticipated that the mitigation would avoid likely significant adverse effects due to airborne operational noise on the majority of receptors and communities.

13.5.16 Taking account of the avoidance and mitigation measures, this initial assessment has identified effects on a precautionary basis with the potential to be considered significant on a community basis due to increased airborne noise levels in line with the SMR at or around:

- Pickmere: occupants of residential properties on Pickmere Lane located closest to the Proposed Scheme, identified by MA03-C01 on Map SV-01-309b (Volume 2: MA03 Map Book);
- Winterbottom: occupants of residential properties on Winterbottom Lane located closest to the Proposed Scheme, identified by MA03-C02 on Map SV-01-310 (Volume 2: MA03 Map Book);
- Hulseheath: occupants of residential properties on Chapel Lane located closest to the Proposed Scheme, identified by MA03-C03 on Map SV-01-311 (Volume 2: MA03 Map Book); and
- Millington: occupants of residential properties on Thowler Lane located closest to the Proposed Scheme, identified by MA03-C04 on Map SV-01-312a (Volume 2: MA03 Map Book).

13.5.17 The initial assessment indicates that, the forecast noise from long-term railway operation may exceed the daytime threshold set by the Noise Insulation Regulations, the night-time Interim Target identified in the WHO Night Noise Guidelines for Europe 2009 or the maximum noise level criteria set out in the SMR, at individual residential properties closest to the Proposed Scheme in:

- Broom Manor on Peacock Lane (identified on Map Series SV-01 for MA03 on map SV-01-311 and SV-01-312a (Volume 2: MA03 Map Book));
- Ovenback Cottage on Agden Lane (identified on Map Series SV-01 for MA03 on map SV-01-311 and SV-01-312a (Volume 2: MA03 Map Book));
- Winterbottom Farm on Winterbottom Lane (identified on Map Series SV-01 for MA03 on map SV-01-310 and SV-01-311 (Volume 2: MA03 Map Book)); and
- Daisybank Farm on Winterbottom Lane (identified on Map Series SV-01 for MA03 on map SV-01-311 (Volume 2: MA03 Map Book)).

13.5.18 Map Series SV01 (Volume 2: MA03 Map Book) shows key non-residential properties for the assessment of operational airborne noise impacts in the formal ES. The initial assessment indicates that there are no significant effects identified at any non-residential receptors in this community area as a result of operational noise.

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

13.5.20 HS2 Ltd will continue to seek reasonably practicable measures to further reduce or avoid these significant effects. In doing so HS2 Ltd will continue to engage with stakeholders to fully understand the potentially affected receptor, its use and the benefit of the measures.

Monitoring

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

13.5.22 Operational noise and vibration monitoring would be carried out at different times during the lifetime of the Proposed Scheme at a combination of carefully selected monitoring locations including: adjacent or attached to moving vehicles; at fixed positions or in the vicinity of individual assets; and locations within the surrounding areas and communities alongside the railway corridor.

13.5.23 The expected noise and vibration performance of the Proposed Scheme, operational noise and vibration measurement data, associated asset information, description of corrective actions, results of measured performance compared to expected conditions, and monitoring reports would be shared with the relevant local authorities at appropriate intervals.

14 Traffic and transport

14.1 Introduction

14.1.1 This section considers the likely impacts on all forms of transport and the potential likely significant effects identified to date on transport users arising from the construction and operation of the Proposed Scheme through the Pickmere to Agden and Hulseheath area.

14.1.2 Engagement with Highways England, Cheshire East Council (CEC), Cheshire West and Chester Council (CWCC) and has been undertaken. An important focus of this engagement has been to obtain relevant baseline information and discuss transport survey requirements and assessment methodology. This engagement process will continue as part of the development of the Proposed Scheme.

14.1.3 Maps showing the location of the key environmental features (Map Series CT-10) and the key construction (Map Series CT-05) and key operational (Map Series CT-06) features of the Proposed Scheme are provided in the Volume 2: MA03 Map Book.

14.2 Scope, assumptions and limitations

14.2.1 The scope, key assumptions and limitations for the traffic and transport assessment are set out in Volume 1, Section 8 and the Scope and Methodology Report (SMR)[134].

14.2.2 The study area for traffic and transport includes the communities in Agden, High Legh, Knutsford, Lostock Gralam, Mere, Pickmere, Tabley Inferior, Tabley Superior together with Knutsford Station.

14.2.3 The study area also includes all roads potentially affected by the Proposed Scheme. The strategic roads in the area are: the M6, the M56 and the A556 (north of M6 junction 19).

14.2.4 The local roads in the study area include: the A50, the A556 Chester Road, the A56 Lymm Road, the B5159 West Lane, the B5391 Pickmere Lane, the B5569 Chester Road, Agden Lane, Ashley Road, Back Lane, Budworth Road, Chapel Lane, Flittogate Lane, Frog Lane, Hoo Green Lane, Peacock Lane, School Lane and Thowler Lane.

14.2.5 The potential effects on traffic and transport have been assessed qualitatively, based on the Proposed Scheme design, proposed construction routes, initial estimates of construction traffic and professional judgement.

14.2.6 No quantitative assessment has been undertaken at this stage. A quantitative assessment will be presented in the formal ES.

14.3 Environmental baseline

Existing baseline

14.3.1 Existing conditions in the study area have been determined through site visits, traffic and transport surveys, liaison with Highways England, CEC and CWCC (including

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

provision of information on public transport, public rights of way (PRoW) and accident data) and desktop analysis.

Surveys

14.3.2 Traffic surveys, comprising junction turning counts and queue surveys and automatic traffic counts, were undertaken in June, July and November 2017. These data have been supplemented by existing traffic data from other sources, including from CEC, CWCC and Highways England. Assessment of the data indicates that the peak hours in the area are 07:15-08:15 and 16:30-17:30. However, there are only small differences (typically less than 3%) between the observed peak hours and the periods 08:00-09:00 and 17:00-18:00, the periods when HS2 construction traffic movements and workforce arrivals and departures would have the maximum impact. Consequently, the 08:00-09:00 and 17:00-18:00 have been used as the assessment hours representing a reasonable worst case.

14.3.3 PRoW surveys were undertaken in August and November 2017 to establish their nature and usage by non-motorised users (pedestrians, cyclists and equestrians). The surveys included PRoW and roads that would cross the route of the Proposed Scheme, and any additional PRoW and roads that may be affected by the Proposed Scheme. The majority of the PRoW surveys were undertaken during the weekend, at times when recreational use is expected to be highest, but where routes are likely to be used for non-leisure uses such as commuting, surveys were undertaken on a weekday.

Strategic and local highway network

14.3.4 The strategic routes that pass through the area are: the M6, the M56 and the A556 (north of M6 junction 19). The strategic road network is busy at peak times and delays can be experienced.

14.3.5 The local roads that could be affected by the Proposed Scheme include: the A50, the A556 (south of M6 junction 19), the A56 Lymm road, the B5159 West Lane, the B5391 Pickmere Lane, the B5569 Chester Road, Agden Lane, Ashley Road, Back Lane, Budworth Road, Chapel Lane, Flittogate Lane, Frog Lane, Hoo Green Lane, Peacock Lane, School Lane and Thowler Lane. The local road network in this area generally operates well, although some localised delays can be experienced, particularly at peak times.

14.3.6 Relevant accident data for the road network subject to assessment have been obtained from Department for Transport[135]. Data for the three year period (2014-2016) have been assessed and any identified clusters (i.e. where there are nine or more accidents in the three year period) have been examined.

14.3.7 No accident clusters were identified within the Pickmere to Agden and Hulseheath area.

14.3.8 The route of the Proposed Scheme would cross two roads with footways within the area. These are: the A50 (west of the A556) and the A56 Lymm Road.

[135] STAT19 Road Safety Data 2014-2016 Department for Transport

Parking and loading

14.3.9 The parking spaces at Mere Court Hotel and Conference Centre (off the A50) could be affected by the Proposed Scheme.

Public transport network

14.3.10 Two bus routes operate on five roads that would be crossed by the route of the Proposed Scheme in the Pickmere to Agden and Hulseheath area. There are also bus stops primarily located to serve the main built up area. The bus routes that could be affected by the Proposed Scheme include:

- Bus Route 47 (Holmes Chapel - Knutsford – Warrington): on the A50; and
- Bus Route 289 (Northwich - Knutsford – Altrincham): on the A56 Lymn Road, Agden Lane and Peacock Lane, Pickmere Lane.

14.3.11 National and local rail services are accessible via Knutsford Station which lies just within the Pickmere to Agden and Hulseheath area. Knutsford Station provides access to national services to Chester and Manchester Piccadilly and local services to Mobberley, Ashley, Hale, Altrincham, Lostock Gralam, Northwich, Cuddington, Delamere and Mouldsworth.

Non-motorised users

14.3.12 There are pedestrian footways adjacent to many of the roads in the built up areas of Agden, High Legh, Knutsford, Lostock Gralam, Mere, Pickmere, Tabley Inferior, Tabley Superior. Footways vary in width and condition within these areas. Where there is no formal footway provision adjacent to a road, non-motorised user numbers are generally low.

14.3.13 The route of the Proposed Scheme would cross the route of nine PRoW within the Pickmere to Agden and Hulseheath area that could be affected either temporarily or permanently due to, for example, temporary diversion of PRoW during construction and permanent diversions or upgrades including for maintenance access to the Proposed Scheme. Only limited surveys were possible, which showed low levels of use.

14.3.14 National Route 70 (part of the National Cycle Network) passes through the Pickmere to Agden and Hulseheath area and would be crossed by the Proposed Scheme at Peacock Lane.

Waterways and canals

14.3.15 There is one navigable waterway, the Bridgewater Canal, in the Pickmere to Agden and Hulseheath area which is located at the north-east boundary of the area, west of Little Bollington. The River Bollin runs to the north and crosses under the A56.

Air transport

14.3.16 There is no relevant air transport in the Pickmere to Agden and Hulseheath area. Consequently, this topic is not considered further in this assessment.

14.4 Effects arising during construction

Avoidance and mitigation measures

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

- new highways (roads and PRoW) would be constructed and operational prior to the permanent closure of any existing highways, insofar as reasonably practicable;
- the majority of roads crossing the route of the Proposed Scheme would be maintained or locally diverted during construction to limit the need for diversion of traffic onto alternative routes;
- traffic management measures would be implemented to limit any disruption;
- road closures would be restricted to overnight and weekends, insofar as reasonably practicable;
- temporary alternative routes for PRoW would be provided during construction, insofar as reasonably practicable, where either the existing or final proposed route is not available;
- where reasonably practicable, site haul routes would be created adjacent to the route of the Proposed Scheme to transport construction materials and equipment to reduce heavy goods vehicle (HGV) movements on public roads with access taken via the main road network;
- HGV would be routed, insofar as reasonably practicable, along the strategic and/or primary road network;
- the use of the local road network would, insofar as reasonably practicable, be limited to use for site set-up, access for surveys and on-going servicing (including refuse collection and general deliveries to compounds) during construction;
- the reuse of excavated material along the route of the Proposed Scheme, insofar as reasonably practicable;
- highway measures including junction improvements, passing places and carriageway widening would be provided, as required, to manage the safe passing of construction vehicles on construction HGV routes; and
- on-site welfare facilities would be provided which would reduce daily travel by site workers.

14.4.2 Section 14 of the draft Code of Construction Practice (CoCP)[136] includes measures that aim to reduce the adverse impacts and effects on local communities and maintain

[136] Supporting document: Draft Code of Construction Practice

public access. This includes the impacts of deliveries of construction materials and equipment.

14.4.3 The measures in the draft CoCP include controls on vehicle types, hours of site operation and routes for HGVs to reduce the impact of road-based construction traffic. In order to achieve this, general and site specific traffic management measures would be implemented during the construction of the Proposed Scheme on or adjacent to public roads and PRoW affected by the Proposed Scheme.

14.4.4 The draft CoCP includes the requirement to develop local traffic management plans in consultation with the highway and traffic authorities and the emergency services. These would consider the local traffic management strategy including consideration of sensitive receptors, such that adverse impacts would be reduced insofar as reasonably practicable and any effect on safety and accidents would not be significant.

14.4.5 Specific measures would include core site operating hours of 08:00 to 18:00 on weekdays and 08:00 to 13:00 on Saturdays with site staff and workers generally arriving before the morning peak hour and departing after the evening peak hour.

14.4.6 The number of private car trips to and from the construction compounds (both workforce and visitors) would be reduced by encouraging alternative sustainable modes of transport or vehicle sharing. This would be supported by an overarching framework travel plan that would require construction workforce travel plans[137] to be produced that would include a range of potential measures to mitigate the impacts of traffic and transport movements associated with construction of the Proposed Scheme.

Assessment of impacts and effects

Temporary effects

14.4.7 The traffic and transport impacts during the construction period within the Pickmere to Agden and Hulseheath area are likely to include:

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

14.4.8 The construction assessment has also considered any impacts in the Pickmere to Agden and Hulseheath area that arise from construction of the Proposed Scheme in the adjoining community areas.

14.4.9 Construction vehicle movements required to construct the Proposed Scheme would include the delivery of plant and materials, movement of excavated materials and site

[137] Construction and operational travel plans would promote the use of sustainable transport modes as appropriate to the location and types of trip. They would include measures such as: provision of information on and promotion of public transport services; provision of good cycle and pedestrian facilities; liaison with public transport operators; promotion of car sharing; and the appointment of a travel plan coordinator to ensure suitable measures are in place and are effective.

worker trips. Works would include utilities diversions, earthworks, underpass, viaduct, bridge and highway construction.

14.4.10 Construction activities would be managed from compounds. Details of the construction compounds are provided in Section 2.3. The locations of the compounds are shown in Map Series CT-05 in the Volume 2: MA03 Map Book.

Highway Network

Strategic and local highway network

14.4.11 The primary HGV access routes for construction vehicles would be the strategic and/or primary road network with the use of the local road network limited, where reasonably practicable. The construction routes would also provide access to compounds. Where reasonably practicable, HGVs would use the site haul routes alongside the route of the Proposed Scheme to reduce the impact on the local road network. In this area, it is expected that the main construction routes would use:

- the A50;
- the A556 (south of M6 junction 19);
- the A556 Chester Road;
- the A56 Lymm Road;
- the B5159 West Lane;
- the B5391 Pickmere Lane;
- the B5569 Chester Road;
- Agden Lane;
- Budworth Road;
- Back Lane;
- Chapel Lane;
- Flittogate Lane;
- Frog Lane;
- Peacock Lane;
- School Lane; and
- Thowler Lane.

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

- the A50 (between Wrenshot Lane and west of New Cottages);
- the A56 Lymm Road (north of Hollybank House); and
- Back Lane (between the B5391 Pickmere Lane and Thowler Lane).

14.4.13 Permanent changes to highways are reported under operation.

14.4.14 Changes in traffic have the potential, at some locations, to result in increased travel distance, congestion and delays and increased traffic severance for non-motorised users. The assessment of these changes will be reported in the formal ES.

14.4.15 Assessment of the traffic and transport impacts from utilities works, either separately or in combination with other works, will be reported in the formal ES.

Accidents and safety

14.4.16 Changes in traffic as a result of the Proposed Scheme could result in changes in accident risk. The impacts on accident risk during construction of the Proposed Scheme will be reported in the formal ES.

Parking and loading

14.4.17 It is expected that the Proposed Scheme could have impacts on parking. There will be temporary impacts on parking at Mere Court Hotel and Conference Centre (off A50) which would be suspended for construction of the Proposed Scheme. Some roads that could be used as construction routes and have on-street parking could be affected. Any significant effects will be reported in the formal ES.

Public transport network

14.4.18 It is expected that construction of the Proposed Scheme would require bus route diversions, including bus routes 47 (Holmes Chapel - Knutsford – Warrington) and 289 (Northwich - Knutsford – Altrincham). This could result in increased journey times and the need to relocate bus stops. Any consequent effects will be reported in the formal ES.

Non-motorised users

14.4.19 The construction works associated with the Proposed Scheme would require the temporary closure or diversion/realignment of PRoW and roads. There would be temporary alternative routes for a number of PRoW in the vicinity of the Proposed Scheme. Where necessary, PRoW would be re-routed around construction compounds.

14.4.20 There would be temporary alternative routes for a number of PRoW in the vicinity of the Proposed Scheme, including, where necessary, around construction compounds. It is currently expected that the following PRoW would be temporarily diverted/realigned or closed: Mere Bridleway 1 to be temporarily closed, east of Winterbottom Farm, for underbridge construction.

14.4.21 Permanently diverted PRoW are reported under operation although these PRoW could also be subject to temporary closure or diversion/realignment.

14.4.22 The changes to PRoW are likely to result in some increases in travel distance with the potential for adverse significant effects. The assessment of these will be reported in the formal ES.

Permanent effects

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

Other mitigation measures

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

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

Summary of likely residual significant effects

14.4.26 Construction of the Proposed Scheme has the potential to lead to additional congestion and delays for road users on a number of routes including: the A556 (south of M6 junction 19); the A556 Chester Road; the A50; the A56 Lymm road; the B5159 West Lane; the B5391 Pickmere Lane; the B5569 Chester Road; Agden Lane; Bowden View Lane; Budworth Road; Back Lane; Chapel Lane; Flittogate Lane; Frog Lane; Peacock Lane; School Lane and Thowler Lane. Increases in traffic could also result in increased traffic severance for non-motorised users of the routes and changes to traffic could result in changes in accident risk.

14.4.27 Construction of the Proposed Scheme is expected to result in short term closure of the A50; A56 Lymn Road and Back Lane. This may result in diversion of traffic on the road network and could also result in increased traffic severance for motorised users of the routes.

14.4.28 Construction of the Proposed Scheme is expected to result in some temporary suspension of parking spaces Mere Court Hotel and Conference Centre.

14.4.29 Construction of the Proposed Scheme is expected to result in diversion of bus routes 289 and 47.

14.4.30 Construction of the Proposed Scheme is expected to temporarily close PRoW Mere Bridleway 1.

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

14.5 Effects arising from operation

Avoidance and mitigation measures

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

- reinstatement of roads on or close to their existing alignments, where reasonably practicable; and
- replacement, diversion or realignment of PRoW.

Assessment of impacts and effects

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

Key operation transport issues

14.5.3 The operation of the Proposed Scheme would be unlikely to have any substantial impacts within this area due to increased traffic, as there are no stations or depots proposed within the Pickmere to Agden and Hulseheath area. The maintenance of the Proposed Scheme would generate limited vehicular trips and the effect would not be significant.

14.5.4 The operational impacts are therefore primarily related to permanent diversion, realignment and closure of roads and the diversion or closure of PRoW.

Highway network

Strategic and local highway network

14.5.5 The Proposed Scheme would result in a number of permanent highway changes. These include:

- the B5391 Pickmere Lane permanent realignment (between north of Hall lane and south of Yew Tree Farm);
- Agden Lane road closed (east of Agden Hall Farm);
- Bowden View Lane closure at Holly House Farm;
- Budworth Road closed east of Yew Tree Farm;
- Flittogate Lane diverted to maintain connection to Pickmere Lane;
- Hoo Green Lane realigned (between Winterbottom Lane and Hoo Green);
- Peacock Lane realigned (between Moss Lane and south of Chapel Lane House); and
- Thowler Lane realigned (between the B5391 Pickmere Lane and Agden Lane).

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

Accidents and safety

14.5.7 Changes in traffic could result in changes in accident risk. Operational effects arising from the Proposed Scheme will be reported in the formal ES.

Parking and loading

14.5.8 It is currently expected that there would be a permanent loss of car parking at locations along the route of the Proposed Scheme in this area. This could include permanent loss of some of the parking lost during construction at Mere Court Hotel and Conference Centre (off A50). Where car parking is lost that would have served facilities that are displaced by the Proposed Scheme this is not considered a material effect.

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

Public transport network

14.5.10 The permanent realignment of roads could increase travel distances for bus passengers. However, as most of the realignments are likely to be less than 1km in length, it is not currently expected that there would be significant effects on public transport within the Pickmere to Agden and Hulseheath area.

14.5.11 The Proposed Scheme is not expected to have a significant effect on public transport operations in the area.

Non-motorised users

14.5.12 A number of PRoW that cross the route of the Proposed Scheme would be either permanently realigned or diverted including:

- Tabley Inferior Footpath 4 to be realigned, east of School Farm, over new overbridge;
- Tabley Superior Restricted Bridleway 4 to be realigned, north of Heyrose Farm, through new underbridge;
- Tabley Inferior Footpath 2/Tabley Inferior Footpath 3, east of Roses Farm, to be realigned via new overbridge;
- Pickmere Footpath 5 to be realigned, south east of Roses Farm, through underbridge;
- Agden Footpath 4 to be diverted, to south of Agden Hall Farm, through overbridge on Agden Footpath 2;
- Agden Footpath 1 to be realigned, to south of Agden Brook Farm, via overbridge; and
- Agden Footpath 2 to be closed, to south of Agden Brook Farm, for overbridge construction.

14.5.13 The realignment of some of the PRoW would increase journey distance and time for non-motorised users and may result in significant effects. It is expected that the

greatest increases in journey distance (likely to be in excess of an additional 500 m) would affect the users of PRoW Tabley Inferior Footpath 2/Tabley Inferior Footpath 3, Agden Footpath 1 and Agden Footpath 4. The assessment of PRoW changes will be reported in the formal ES.

Other mitigation measures

14.5.14 HS2 Ltd is continuing to engage with local highway and transport authorities regarding the need for highway and public transport measures to mitigate the impacts of the Proposed Scheme in the area.

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

Summary of likely residual significant effects

14.5.16 Operation of the Proposed Scheme would require the permanent diversion of: the B5391 Pickmere Lane; Agden Lane; Bowden View Lane; Budworth Road; Flittogate Lane; Hoo Green Lane; Peacock Lane; and Thowler Lane. Increases in traffic could also result in increased traffic severance for non-motorised users of the routes.

14.5.17 Operation of the Proposed Scheme is expected to result in permanent loss of parking spaces at Mere Court Hotel and Conference Centre.

14.5.18 Operation of the Proposed Scheme would require permanent diversion or closure of PRoW including Tabley Inferior Footpath 4; Tabley Superior Restricted Bridleway 4; Tabley Inferior Footpath 2/Tabley Inferior Footpath 3; Pickmere Footpath 5; Agden Footpath 4; Agden Footpath 1 and Agden Footpath 2.

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

Monitoring

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

14.5.21 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 Pickmere to Agden and Hulseheath area. The likely impacts and significant effects identified to date arising from the construction and operation of the Proposed Scheme on surface water and groundwater bodies and their associated water resources are reported. The likely impacts and significant effects of the Proposed Scheme on flood risk and land drainage are also reported.

15.1.2 Engagement has been undertaken with the Environment Agency, Cheshire East Council (CEC), which is the Lead Local Flood Authority (LLFA), Cheshire West and Chester Council (CWCC) and United Utilities Limited (the local water and sewerage undertaker). The purpose of this engagement has been to obtain relevant baseline information and to discuss the Proposed Scheme and potential effects. Engagement with these stakeholders will continue as part of the development of the Proposed Scheme.

15.1.3 Maps showing the location of the key environmental features (Map Series CT-10), and the key construction (Map Series CT-05) and key operational (Map Series CT-06) features of the Proposed Scheme can be found in the Volume 2: MA03 Map Book. This map book also includes Map Series WR-01 and WR-02 showing surface water and groundwater baseline information respectively.

15.1.4 Volume 3: Route-wide effects, Water resources and flood risk (Section 16) covers the following at a route-wide level:

- the risk to water resources associated with accidents or spillages from trains during operation of the Proposed Scheme;
- a summary of how the Proposed Scheme aims to demonstrate compliance with the statutory requirements of the Water Framework Directive (WFD); and
- route-wide flood risk issues related to alignment of the Proposed Scheme with the Sequential Test and Exception Test policies in the National Planning Policy Framework (NPPF)[138].

15.2 Scope, assumptions and limitations

15.2.1 The scope, assumptions and limitations for the water resources and flood risk assessment are set out in Volume 1, Section 8 and the Scope and Methodology Report (SMR)[139].

15.2.2 Unless indicated otherwise, the spatial scope of the assessment (the study area) is based upon the identification of surface water and groundwater features within 1km of the centre line of the route of the Proposed Scheme, as described in Section 2.2 of this report. In the Pickmere to Agden and Hulseheath area, the study area has been

[138] DCLG (2015), *National Planning Policy Framework*
[139] Supporting document: HS2 Phase 2b Environmental Impact Assessment Scope and Methodology Report

extended to include The Mere, Mere SSSI (which is also part of the Midland Meres and Mosses Phase 1 Ramsar site) to the east, as the Proposed Scheme may alter groundwater flows within its topographic catchment. Hydraulic modelling of Millington Clough (also a receptor in Hulseheath to Manchester Airport area (MA06)) covers tributaries of Millington Clough within this study area, as the potential for flood risk from the Proposed Scheme mainly occurs in the Pickmere to Agden and Hulseheath area.

15.2.3 This assessment is based on desk study information, including information provided to date by consultees and stakeholders, as well as surveys of accessible water features.

15.2.4 Where surveys have not been undertaken due to land access constraints, a precautionary approach has been adopted in the assessments of receptor value and impact magnitude.

15.2.5 Hydraulic analysis is currently being undertaken of watercourses and key structures within flood risk areas. This includes modelling of Waterless/Arley Brook, as well as Millington Clough and associated tributaries.

15.2.6 Groundwater levels have been inferred from the available Environment Agency groundwater level monitoring boreholes, historic borehole logs and topographic data, as well as from spring and watercourse locations.

15.2.7 Impacts on biological receptors such as aquatic fauna and flora are assessed in Section 7, Ecology and biodiversity.

15.2.8 The assessments in this working draft ES are based on professional judgement using the information that it currently available. A precautionary approach has been adopted with regard to assessing the potential for adverse impacts to occur. The surveys, analysis and modelling work currently in progress, and the results of the consultation process, will be used to refine the assessments reported in the formal ES.

15.3 Environmental baseline

Existing baseline - Water resources and WFD

Surface water

15.3.1 All surface water bodies in the study area fall within the Weaver Gowy and Mersey Upper management catchments of the North West river basin district (RBD).

15.3.2 The river basin management plan[140] identifies the chemical[141] and ecological[142] status of surface water bodies, and the quantitative[143] and chemical[144] status of groundwater bodies within this RBD.

15.3.3 To be compliant with WFD legislation, the Proposed Scheme should not cause deterioration of a water body from its current status; nor prevent future attainment of good status where this has not already been achieved. The Proposed Scheme should also avoid adverse impacts on protected or priority species and habitats.

15.3.4 Specialist field surveys are being undertaken, where access is available. Receptor values will be adjusted to reflect the outputs from these surveys, in close consultation with the Environment Agency. In the absence of field surveys, surface water bodies, other than minor ponds and ditches, have been identified within this assessment as being of either high or very high value on a precautionary basis.

15.3.5 Summary information relating to the surface water bodies potentially affected by the Proposed Scheme within the study area is provided in Table 27. The receptor value attributed to each individual water body is based on the methodologies set out in the SMR.

Table 27: Surface water body receptors

Water body name and location[145]	**Designation**	**Q95 value (m^3/s)[146]**	**Receptor value**	**Parent WFD water body name and identification number[147]**	**Current WFD status / Objective[148]**
Smoker Brook WR-01-304b D7	Borders the Pickmere to Agden and Hulseheath area- reported in Volume 2: Community area report MA02, Wimboldsley to Lostock Gralam				
Tributary of Smoker Brook 1 WR-01-304b D7					
Tributary of Smoker Brook 2 WR-01-304b D8	Ordinary watercourse	<0.002	Low	Smoker Brook (Gale Brook to Wincham Brook) GB112068060410	Poor / Good by 2027
Waterless Brook / Arley Brook	Main river	0.04	Moderate		

[140] Environment Agency (2015), *Water for life and livelihoods Part 1: North West river basin district: River basin management plan.*
[141] The chemical status of surface waters reflects concentrations of priority and hazardous substances present.
[142] The ecological status of surface waters is determined based on the following elements:
- Biological elements – communities of plants and animals (for example, fish and rooted plants), assessed in Section 7, Ecology and biodiversity;
- Physico-chemical elements – reflects concentrations of pollutants such as metal or organic compounds, such as copper or zinc;
- Hydromorphological elements – reflects water flow, sediment composition and movement, continuity (in rivers) and the structure of physical habitats.

[143] The quantitative status of groundwaters reflects the presence or absence of saline or other intrusions, interactions with surface water, issues related to groundwater dependent terrestrial ecosystems (GWDTE) and overall water balance.
[144] The chemical status of a groundwater body reflects effects on drinking water protected areas, its general quality, the importance of water quality within the water body for GWDTEs and surface water interactions and whether there are intrusions of poor quality groundwater present.
[145] The feature locations are indicated by the grid coordinates on the relevant Volume 2: MA03 Map Book (in this case WR-01).
[146] This is the flow within the watercourse that is exceeded for 95% of the time.
[147] The Environment Agency has attributed each surface water and groundwater body a unique water body identification (ID) number.
[148] Status and objectives are based on those set out in the 2015 River basin management plan.

Water body name and location[145]	Designation	Q95 value (m^3/s)[146]	Receptor value	Parent WFD water body name and identification number[147]	Current WFD status / Objective[148]
WR-01-304b F6					
Tributary of Waterless Brook/Arley Brook 3 WR-01-304b F5	Ordinary watercourse	<0.002	Low		
Tributary of Waterless Brook/Arley Brook 4 WR-01-304b F5	Ordinary watercourse	n/a[149]	Low		
Tabley Brook WR-01-304b F6	Ordinary watercourse	0.01	Moderate		
Tributary of Tabley Brook 1 WR-01-304b G6	Ordinary watercourse	<0.002	Low		
Tributary of Tabley Brook 2 WR-01-304b G6	Ordinary watercourse	<0.002	Low		
Tributary of Tabley Brook 4 WR-01-304b H6	Ordinary watercourse	<0.002	Low		
Tributary of Tabley Brook 5 WR-01-304b H6	Ordinary watercourse	n/a[149]	Low		
Tributary of Tabley Brook 7 WR-01-304b I6	Ordinary watercourse	0.002	Low		
Tributary of Tabley Brook 8 WR-01-304b I6	Ordinary watercourse	<0.002	Low		
Tributary of Tabley Brook 9	Ordinary watercourse	n/a[149]	Low		

[149] The Q95 value is unavailable, as insufficient LiDAR data is available to delineate the catchment, and perform the calculation.

Water body name and location[145]	Designation	Q95 value (m^3/s)[146]	Receptor value	Parent WFD water body name and identification number[147]	Current WFD status / Objective[148]
WR-01-304b J6					
Tributary of Millington Clough 1 WR-01-305a A5	Ordinary watercourse	<0.002	Low	Bollin (Ashley Mill to Manchester Ship Canal) GB112069061382	Moderate / Moderate by 2015
Tributary of Millington Clough 2 WR-01-305a B6	Main river	<0.002	Low		
Tributary of Millington Clough 3 WR-01-305a B6	Ordinary watercourse	n/a[149]	Low		
Tributary of Millington Clough 4 WR-01-305a B6	Ordinary watercourse	0.002	Moderate		
Millington Clough WR-01-308b B6	Main river	0.004	Moderate		
Agden Brook WR-01-305a D8	Main river	<0.002	Moderate		
Tributary of Agden Brook 2 WR-01-305a D8	Ordinary watercourse	<0.002	Low		

Abstractions and permitted discharges (surface water)

15.3.6 There are two licensed surface water abstractions in the study area. Neither of these are located within the land required for the construction and operation of the Proposed Scheme. These are considered high value receptors.

15.3.7 Records of private unlicensed surface water abstractions, which comprise those for quantities less than $20m^3$ per day, have been obtained from the local authorities. These data indicate that there are no registered private unlicensed surface water abstractions within the study area. As there is no obligation to register private water supplies, unregistered private surface water supplies may be present. Private water supplies would be assessed as high value receptors unless details obtained from the owner indicate otherwise.

15.3.8 There are 20[150] consented discharges to surface waters within the study area, one of which is within the land required for the Proposed Scheme. These have been assessed as being receptors of low value.

Groundwater

15.3.9 The geology of the study area is described in Section 10, Land quality, and the superficial and bedrock hydrogeology is summarised in Table 28. Unless stated otherwise, the geological groups listed would all be crossed by the Proposed Scheme. Table 28 also identifies the receptor values attributed to each groundwater receptor based on the methodologies set out in the SMR.

Table 28: Summary of geology and hydrogeology in the study area

Geology[151]	Distribution	Formation description	Aquifer classification	WFD body (ID) and current overall status[152]	WFD status objective[153]	Receptor value
Superficial deposits						
Alluvium	Along the valleys of Agden Brook, Wincham Brook, Tabley Brook and Arley Brook	Clay, silt, sand and gravel	Secondary A	Weaver and Dane Quaternary sand and gravel aquifers (GB41202G991700) Poor	Good by 2027	Moderate
Glaciofluvial sheet deposits	Along the valley of the River Bollin and its tributaries. On higher ground near Hoo Green.	Sand and gravel	Secondary A			Moderate
Glacial till	Present on higher ground across much of the study area	Sandy silty clay	Secondary (undifferentiated)			Moderate
Shirdley Hill Sand Formation	Along the southern flank of the valley of the River Bollin	Sand	Secondary A			Moderate

[150] The number of consents listed here is different to the number listed in Section 10, Land quality. This is because the Water resources and flood risk default study area comprises all land within 1km of the centreline of the Proposed Scheme; the Land quality default study area extends 250m from the land required for the construction of the Proposed Scheme. These default study areas are extended, where the potential for wider pathways exists.
[151] In recent years the British Geological Survey has revised the nomenclature used to describe the geological materials present in Great Britain, with the publication of a series of lithostratigraphic framework reports. Some of these reports cover an entire geological period e.g. The Carboniferous and others cover a single group e.g. the Triassic Mercia Mudstone. The nomenclature used in these reports supersede the nomenclature introduced in the 1980s. While some traditional names have been retained by this process, many new names have also been generated, and many geological maps have not yet been updated. Some stratigraphic units have been renamed twice in the last 35 years. To reflect this, the previous name used for geological units (if different) is shown in brackets.
[152] As stated in the 2015 River basin management plan.
[153] As stated in the 2015 River basin management plan.

Bedrock

Sherwood Sandstone Group – Helsby Sandstone Formation	Crossed by the route of the Proposed Scheme between Agden Park and Agden Lane Farm	Pebbly sandstone	Principal	Lower Mersey Basin and Merseyside North Permo-Triassic Sandstone Aquifers (GB41201G101700) Poor	Good by 2027	High
Mercia Mudstone Group – Tarporley Siltstone Formation	Crossed by the route of the Proposed Scheme between Hulseh eath and Agden Park	Siltstone, mudstone and sandstone	Secondary B	Not assessed by the Environment Agency	Not assessed by the Environment Agency	Moderate
Mercia Mudstone Group – Sidmouth Mudstone Formation – Bollin Mudstone Member	Across the study area between the point where the Proposed Scheme would cross the M6 and Hulseheath	Mudstone and siltstone with some halite bearing units, and presence of gypsum	Secondary B	Not assessed by the Environment Agency	Not assessed by the Environment Agency	Moderate
Mercia Mudstone Group– Sidmouth Mudstone Formation – Northwich Halite Member	Across the study area between w here the Proposed Scheme would cross the M6, and the A56	Halite with mudstone	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 28, is outlined briefly as alluvium, glaciofluvial sheet deposits, glacial till and the Shirdley Hill Sand Formation, which may be capable of supporting water supplies at a local rather than regional scale and may also form an important source of baseflow to rivers. They have therefore been classified as moderate value receptors.

Bedrock aquifers

15.3.11 The basis of the receptor values attributed to the bedrock aquifers present within the study area, as shown in Table 28 is outlined briefly as follows:

- the Sherwood Sandstone Group (locally comprising sandstone of the Helsby Sandstone Formation) has been classified as a Principal aquifer by the

Environmental Agency. This aquifer can also provide an important component of baseflow to rivers. It has, therefore, been assessed as a high value receptor;

- the Mercia Mudstone Group (including the Bollin Mudstone Member of the Sidmouth Mudstone Formation and the Tarporley Siltstone Formation) has traditionally been regarded as predominantly impermeable, or at best a poor aquifer. Limited quantities of groundwater suitable for domestic or agricultural use are, however, occasionally obtainable within this rock formation and it has, therefore, been classified as a moderate value receptor; and
- the Northwich Halite Member of the Sidmouth Mudstone Formation within the Mercia Mudstone Group (which is commercially mined for deep rock salt deposits at Winsford) is classified as unproductive strata and is unlikely to provide baseflow to rivers or support groundwater abstraction. It has therefore been classified as a low value receptor.

WFD status of groundwater bodies

15.3.12 A summary of locations, current overall WFD status, and future overall status objectives associated with the designated groundwater bodies in the bedrock and superficial deposits within the study area is provided inTable 28. The value attributed to each of these receptors is also indicated.

Abstraction and permitted discharges (groundwater)

15.3.13 There are no groundwater abstractions licensed for public water within the study area. The source protection zone (SPZ) 3 associated with a public water supply is located within 1km of the route of the Proposed Scheme in this area. Since the SPZ is located within the Broomedge to Glazebrook area (MA04), reporting on this SPZ is included in Volume 2: Community area report MA04, Broomedge to Glazebrook.

15.3.14 There is one private groundwater abstraction licence and one Licence of Right (for less than 20m3 per day) registered in the study area, as shown on Map WR-02-201. Both of these are assumed to be high value private potable water supplies.

15.3.15 Records of private unlicensed groundwater abstractions, which comprise those for quantities less than 20m^3 per day, have been obtained from the local authorities. These data indicate that there are no registered private unlicensed groundwater abstractions within the study area. As there is no obligation to register private water supplies, unregistered private groundwater supplies may also be present. Private water supplies have been assessed as high value receptors unless details obtained from the owner indicate otherwise.

15.3.16 There are no consented discharges to groundwater in the study area. Two consented discharges to unknown water bodies are however recorded. These discharges have been assessed as low value receptors.

Groundwater - surface water interactions

15.3.17 Desk-based assessment using Ordnance Survey maps and detailed river network data provided by the Environment Agency identified 16 features within the study area that

had potential to be springs and one that had potential to be a sink. Access was possible to inspect four of these features, of which:

- two were verified as being minor land drainage features of low value; and
- two were identified as being possible springs of low value, because they provide baseflow to unnamed drainage ditches, which are identified as low value receptors.

15.3.18 The remaining 12 potential spring features and one sink feature that have yet to be inspected are assumed to be high value receptors on a precautionary basis. Two of the potential spring features yet to be inspected are within the land required for the Proposed Scheme, one 200m south of Middle Moss Farm, Agden Lane, and one at the M6, 160m north of Hollowood Farm.

15.3.19 There are 68 ponds within the land required for the Proposed Scheme. The nature and relative value of these features, the magnitude of the impacts that the Proposed Scheme would have on them, and the mitigation proposed, are outlined in Section 7, Ecology and biodiversity.

Water dependent habitats

15.3.20 The following nature conservation sites within the study area are potentially groundwater dependent:

- The Midland Meres and Mosses Phase 1 Ramsar site comprises 16 geographically discrete areas across the Cheshire Plain. One component Site of Special Scientific Interest (SSSI) of the Midland Meres and Mosses Phase 1 Ramsar site, is located in this study area: The Mere, Mere SSSI. The Mere, Mere SSSI is located east of Mere, and approximately 1.4km east of the land required for the Proposed Scheme. The site consists of two lakes (The Mere and Little Mere) which are separated by a spillway. This site may be supported by groundwater inflows from the glaciofluvial deposits and glacial till aquifers; and
- Rostherne Mere Ramsar site, Site of Special Scientific Interest (SSSI) and National Nature Reserve (NNR), may be dependent on surface water or on groundwater. The site is located in the Hulseheath to Manchester Airport (MA06) and as such will be considered in the Volume 2: Community area report MA06 Hulseheath to Manchester Airport.

15.3.21 No designated nature conservation sites within the study area which are dependent on surface water flows have the potential to be affected by the Proposed Scheme.

15.3.22 Further details of the ecology of these sites, including the reporting on the effects and associated other mitigation, if required, are provided in Section 7, Ecology and biodiversity.

Existing baseline - flood risk and land drainage

15.3.23 The Environment Agency's Flood map for planning (rivers and sea)[154] has been used to scope the baseline flood risk for flooding from main rivers and ordinary watercourses. These plans define Flood Zone 2 (land assessed as having between a 1 in 100 (1%) and 1 in 1,000 (0.1%) annual probability of river flooding) and Flood Zone 3 (land assessed as having a 1 in 100 (1%) or greater annual probability of river flooding).

15.3.24 The updated Flood map for surface water[155] has been used to scope surface water flood risks. Infrastructure failure flood risks have been scoped using the Environment Agency risks of flooding from reservoirs national dataset[156]. The British Geological Survey (BGS) Groundwater flooding susceptibility data set[157], has been used to assess the future risk of groundwater flooding.

15.3.25 The following reports were used to help determine the baseline flood risk within the study area:

- Cheshire East Preliminary Flood Risk Assessment (PFRA) [158];
- Cheshire East Strategic Flood Risk Assessment (SFRA) (2013)[159]; and
- Cheshire East Local Flood Risk Management Strategy (LFRMS) Draft for Public Consultation (2017)[160].

River flooding

15.3.26 The study area includes areas of floodplain (Flood Zone 2 or 3) associated with Waterless Brook/Arley Brook and Millington Clough. Table 29 shows all relevant watercourses within the study area with receptors that would potentially be affected by any changes in flood magnitude. The value of these receptors, based on the definitions in Table 57 of the SMR, is also indicated.

Table 29: River flood risk sources and receptors

Source	Location description and figure/coordinate[161]	Receptor potentially affected	Receptor value / sensitivity to flooding
Waterless Brook / Arley Brook (confluence)	Waterless Brook / Arley Brook WR-01-304b F6	Pickmere Lane overbridge	Moderate
		Commercial property	Moderate

[154] Gov.uk (2018) Flood map for planning. Available online at: https://flood-map-for-planning.service.gov.uk/
[155] Gov.uk (2018) Learn more about this area's flood risk. Available online at: https://flood-warning-information.service.gov.uk/long-term-flood-risk/
[156] Gov.uk (2018) Learn more about this area's flood risk. Available online at: https://flood-warning-information.service.gov.uk/long-term-flood-risk/
[157] British Geological Survey (2017) BGS groundwater flooding. Available online at: http://www.bgs.ac.uk/products/hydrogeology/groundwaterFlooding.html
[158] Jacobs (2011), *Cheshire East Preliminary Flood Risk Assessment (PFRA)*
[159] JBA Consulting (2014), *Cheshire East Strategic Flood Risk Assessment (SFRA)*
[160] Cheshire East Council (2017), *Cheshire East Local Flood Risk Management Strategy (LFRMS) Draft for Public Consultation*
[161] This is the location at which the source intersects the Proposed Scheme, as indicated by the grid coordinates on the relevant Volume 2: MA03 Map Book (in this case WR-01).

Surface water flooding

15.3.27 There are numerous areas that are susceptible to surface water flooding within the study area. The key sources and receptors with potential to be affected are shown in Table 30. The value of these receptors, based on Table 57 of the SMR, is also indicated.

Table 30: Surface water flood risk sources and receptors

Source	Location description and figure/coordinate[162]	Receptor potentially affected	Receptor value
Surface flow path contributing to Millington Clough	East of Thowler Lane WR-01-305a B6	Residential property	High
Millington Clough		Commercial property	Moderate
	North of Hulseheath WR-01-305a B6	Peacock Lane	Moderate
Surface flow path draining to Millington Clough	Hulseheath WR-01-305a B6	Residential properties	High
		Commercial property	Moderate
Surface flow path draining towards Agden Brook	Broomedge WR-01-305a D7	Residential properties	High

Artificial water bodies

15.3.28 Flooding from artificial water bodies may occur due to failure of an impounding structure, such as a dam or canal embankment. There are no artificial water bodies with potential implications for flood risk within the study area.

Groundwater flooding

15.3.29 Information related to historical incidents of groundwater flooding in the study area is included in the Cheshire East SFRA and LFRMS. The SFRA states that there is no history of groundwater flooding within the CEC area while the LFRMS does not indicate incidents near the Proposed Scheme.

15.3.30 The BGS Groundwater flooding susceptibility data set indicates that there is some potential for groundwater flooding to occur at the following locations along the route of the Proposed Scheme due to the nature of the superficial deposits (glacial till): Pickmere, Tabley Superior, Mere and Agden.

Land drainage

15.3.31 Existing topography, soils and land drainage systems within the study area are described in Section 4, Agriculture, forestry and soils. The rivers and watercourses within the area are connected to an extensive network of existing open drains.

[162] This is the location at which the source intersects the Proposed Scheme, as indicated by the grid coordinates on the relevant Volume 2:MA03 Map Book (in this case WR-01).

Subsurface drainage systems are also likely to be present in fields used for agriculture. The land drainage function of these systems, which is important for crop productivity, is potentially sensitive to increases in water levels within the receiving watercourses.

15.4 Effects arising during construction

Avoidance and mitigation measures

15.4.1 The principal strategy adopted to limit the temporary and permanent effects of the Proposed Scheme is through avoidance of sensitive receptors wherever reasonably practicable. Where receptors could not be avoided, mitigation measures have been incorporated where appropriate and reasonably practicable, to limit the potential effects. Section 16 of the draft CoCP[163] includes a range of mitigation measures that aim to reduce construction impacts as far as is reasonably practicable. The avoidance and mitigation measures that are of particular relevance to water resources and flood risk during construction are described in the following sections of this report.

Water resources and WFD

15.4.2 The avoidance of sensitive receptors has reduced the risks associated with the Proposed Scheme not complying with the requirements of the WFD. Examples of this strategy include:

- avoidance of channels and floodplain areas, where reasonably practicable – the route of the Proposed Scheme will avoid passing along river or stream valleys, such as that of Waterless Brook/Arley Brook, and their associated floodplains. Instead it would pass over these larger watercourses on viaducts spanning the floodplain, with piers set back from the channel;
- avoidance, where reasonably practicable, of water dependent habitats, including natural springs that can play a key role in the hydrology and hydrogeology of such ecosystems; and
- avoidance, where reasonably practicable, of major public water supplies and smaller licensed and unlicensed abstractions of surface water and groundwater.

15.4.3 The presence of any unregistered private water supplies, their function and the means of protecting or if necessary replacing them would be discussed with any landowners potentially affected by the Proposed Scheme.

15.4.4 The temporary works shown on Map Series CT-05 in the Volume 2: MA03 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 the following locations: on Tributary of Tabley Brook 2, Tributary of Tabley Brook 7, and Tributary of Millington Clough 2 and 4. The aim will be to design these with equivalent hydraulic capacity to the existing channels. The Proposed Scheme would also aim to ensure that field subsurface drainage systems can be adapted to discharge into the new channel. Where such

[163] Supporting document: Draft Code of Construction Practice

watercourses are natural channels, the design aim will be to incorporate appropriate features to retain and, where reasonably practicable, enhance their hydromorphological condition[164].

15.4.6 Watercourse diversions, which would result in changes in flow regime within discrete sections of channel, have been avoided wherever possible. There are three possible diversions proposed within this study area at Tributaries of Millington Clough 1, 3 and 4. These would combine multiple headwater drainage channels in the Peacock Lane area to discharge into a single point along Tributary of Millington Clough 2.

15.4.7 For watercourses that are not in their natural condition, the design aim for realignments and diversions will be to incorporate measures, where reasonably practicable, to improve their hydromorphological condition, provided this is compatible with their flood risk and land drainage functions.

15.4.8 The design of infrastructure required within or in proximity to an existing channel (including bridge abutments, intermediate piers and outfalls) will aim to reduce impacts on the natural hydromorphology of watercourse channels, as far as is reasonably practicable.

15.4.9 The draft CoCP includes requirements to protect water bodies and their associated water resources from the potential impacts of pollution from construction site runoff, including where appropriate:

- provision of maps showing sensitive areas and buffer zones where no pollutants are to be stored or used; and
- preparation of method statements for silt management, site drainage at compounds and satellite compounds, for the storage and control of oils and chemicals and the prevention of accidental spillages, in consultation with the Environment Agency, and if appropriate, the LLFA and other relevant authorities as part of the approvals process. These method statements will cover, where applicable:
  - the avoidance of discharges of site runoff to ditches, watercourses, drains, sewers or soakaways without the prior approval of the appropriate authority;
  - measures to prevent silt-laden runoff and other pollutants entering the water environment; and
  - restrictions or controls on excavation within watercourses to limit effects on water quality, sedimentation, fisheries and aquatic ecology.

15.4.10 Method statements will be required for all watercourse crossings and channel realignments required for site haul routes. The method statements will describe how potential changes to flood risk, water quality and channel hydromorphology will be managed during the establishment, use and decommissioning of all site haul routes.

[164] "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.

15.4.11 Permanent culverts proposed on the smaller watercourse crossings within this study area include those on small drains at Heyrose Farm (tributary of Tabley Brook 2), Winterbottom Farm (tributary of Tabley Brook 7), and Daisybank Farm (Tributary of Tabley Brook 8), as well as two substantial culverts, one located on Tributary of Millington Clough 4 and one linking Tributary of Millington Clough 1, 2, 3 and 4. The detailed design of these culverts will be developed in general accordance with Construction Industry Research and Information Association (CIRIA) and Environment Agency guidance and in consultation with Environment Agency specialists. The design has sought to mitigate the impact on the hydromorphology of the affected watercourses, as follows:

- drop inlet culverts and inverted siphons have been avoided;
- culvert lengths have been reduced as far as is reasonably practicable; and
- invert levels will be set below the firm bed of the watercourse to allow a natural substrate to develop along the bed of the culvert.

15.4.12 The wider issues associated with these culverts, and how their detailed design will aim to ensure no deterioration in the status of any of the relevant water bodies WFD quality elements, will be considered within the formal ES.

15.4.13 Existing groundwater abstraction boreholes or monitoring points will be protected from physical damage, insofar as reasonably practicable, including appropriate decommissioning of abandoned boreholes in order to prevent pollution pathways. If boreholes are to be decommissioned and replaced with alternatives, the contractors will follow the latest good practices. This principle will also be applicable to springs potentially affected by the Proposed Scheme, although additional measures may be required to mitigate temporary construction impacts. Wherever reasonably practicable, the design will aim to recreate affected spring features nearby.

15.4.14 Measures will be introduced, as required, to mitigate the temporary and permanent effects on groundwater flows and water quality during excavation and construction of foundations and cuttings as far as is reasonably practicable. The types of measure likely to be adopted could include:

- installation of cut-off[165] structures around excavations;
- ensuring cut-off structures are driven to sufficient depths to meet an underlying strata or zone of lower permeability;
- promoting groundwater recharge, such as discharging pumped water to recharge trenches around excavations to maintain baseline groundwater and surface water conditions; and
- incorporating passive bypasses within the design, which could comprise a 'blanket' of permeable material, such as gravel, placed around temporary structures allowing groundwater to bypass the below-ground works, without a

[165] Impermeable barrier preventing water flow.

rise in groundwater levels on the upstream side.

15.4.15 The exact requirements will be refined and method of mitigation will be designed following ground investigation at foundations or cutting locations.

Flood risk and land drainage

15.4.16 The design of the Proposed Scheme will aim to mitigate permanent impacts on flood risk and land drainage as follows:

- the floodplain avoidance strategy will ensure that the impacts on flood flows within rivers and streams, and their floodplains, will be limited to those associated with the intermediate pier structures on the viaducts and the realignment of Pickmere Lane, which would cross over the Waterless Brook/Arley Brook floodplain, Hoo Green Lane intercepting a surface flow path, and Peacock Lane, which would intercept various tributaries of Millington Clough. The Proposed Scheme includes replacement floodplain storage areas to replace losses associated with the piers and highway realignment;
- the temporary works shown in the Volume 2: MA03 Map Book have been informed by a detailed consideration of the flood risk constraints and have sought to avoid flood zones wherever reasonably practicable;
- provision has been made to pass surface water runoff and land drainage flows beneath sections of raised embankment that will cross surface water flow paths where reasonably practicable. This will be achieved using perimeter drainage and culverts, with their inverts set below the likely level of any upstream field subsurface drainage systems;
- in locations where the route of the Proposed Scheme would cross watercourses, the design aim is for structures to accommodate flood flows up to and including the 1 in 100 (1%) annual probability flood with an allowance for climate change based on latest guidance issued by the Environment Agency[166];
- runoff from the footprint of the infrastructure could occur more rapidly post-construction due to steeper slope angles and the permeability of the newly-created surfaces. The design of drainage systems aims to ensure that there will be no significant increases in flood risk downstream, during storms up to and including the 1 in 100 (1%) annual probability design event, with an allowance for climate change based on the latest guidance issued by the Environment Agency;
- balancing ponds for new sections of highway and railway drainage have been sized on a precautionary basis, pending more detailed information about the permeability and runoff characteristics of existing and proposed ground surfaces;

[166] Environment Agency (2016) *Adapting to Climate Change. Advice for Flood and Coastal Erosion Risk Management Authorities*

- where the Proposed Scheme would pass in cutting, drainage measures will be provided with the aim of preventing flow into the cutting and diverting this water into its natural catchment. Where reasonably practicable, runoff from the cuttings will also be drained to the catchments to which this water would naturally drain, avoiding transfer of water from one water body to another, which could increase flood risk or impact on land drainage systems; and
- measures will be introduced to reduce any potentially significant effects on groundwater flood risk as far as is reasonably practicable, including the incorporation of passive hydraulic bypasses at cuttings and other below ground structures. These could for example comprise a 'blanket' of permeable material such as gravel.

15.4.17 The nominated undertaker will, insofar as reasonably practicable, ensure that flood risk is managed throughout the construction period and will consider flooding issues when planning sites and storing materials. If necessary, temporary provision will be made to reduce to the potential for impacts on existing land drainage systems during construction. Some of the specific measures referred to in the draft CoCP, include:

- preparation of flood risk assessments and method statements for temporary works, including main construction and satellite compound drainage, watercourse crossings and realignments and temporary realignments in consultation with the Environment Agency, and where applicable, the LLFA and other relevant regulators;
- location of storage, machinery, equipment and temporary buildings outside flood risk areas where reasonably practicable;
- construction of outfalls during periods of low flow to reduce the risk of scour and erosion;
- design of temporary watercourse realignments with equivalent hydraulic capacity to the existing channels, ensuring that field subsurface drainage systems can be adapted to discharge into the new channel; and
- having regard to the requirement for construction activities to avoid any increases in flood risk to vulnerable receptors.

15.4.18 In accordance with Section 16 of the draft CoCP, monitoring will also be undertaken in consultation with the Environment Agency and, where applicable, the LLFA, to ensure that temporary structures are installed, maintained and removed in accordance with the relevant environmental approvals and that impact on existing land drainage systems are managed appropriately.

Assessment of impacts and effects

15.4.19 This section describes the significant effects following the implementation of the avoidance and mitigation measures. The majority of the potential temporary impacts on the water environment during construction will be avoided or mitigated by the working methods outlined in the draft CoCP. The mitigation embedded into the design has focused on reducing permanent impacts resulting from the presence of the Proposed Scheme to as low a level as is reasonably practicable.

Temporary effects – Water resources and WFD

Surface water

15.4.20 Potential temporary impacts on surface water quality, due to site runoff and increased pollution risk, are a key concern during construction and have the potential to affect abstractions and the water environment more generally. However, the practices outlined in the draft CoCP are considered adequate to mitigate any impacts, such that there are unlikely to be any significant effects.

Groundwater

Aquifers

15.4.21 The proposed Hoo Green cutting, Mere cutting, High Legh box structure, High Legh cutting, Hulseheath cutting, M56 West box structure and Agden cutting in the study area would intersect the Sherwood Sandstone Group Principal aquifer, glaciofluvial deposits Secondary A aquifer, the Mercia Mudstone Group Secondary B aquifer and the glacial till Secondary (undifferentiated) aquifer. Whilst there could be minor localised impacts, the implementation of the measures outlined in the draft CoCP would mean that any effects on the overall status of these aquifers would not be significant.

15.4.22 Where cuttings could affect local receptors, such as groundwater abstractions or springs, this is reported in the sections below.

Abstractions

15.4.23 The assessment has not identified any temporary significant effects on groundwater abstractions.

Groundwater - surface water interactions

15.4.24 Where springs flows could be temporarily and permanently affected by the Proposed Scheme these impacts are set out under the permanent effects section. There are no other identified temporary effects on groundwater – surface water interactions in this area.

Water dependent habitats

15.4.25 No temporary impacts on water dependent habitats are anticipated in this study area as a result of construction of the Proposed Scheme.

Temporary effects - Flood risk and land drainage

15.4.26 Construction of Arley Brook viaduct would require temporary working within flood zones. Construction sequencing and temporary works design will be carefully

considered and assessed in terms of potential impacts on flood risk. Method statements detailing how these works would be undertaken will be produced by the nominated undertaker in consultation with the Environment Agency and the LLFA. It is not anticipated that these temporary activities would result in significant effects related to flood risk and land drainage.

Permanent effects – Water resources and WFD

15.4.27 Permanent effects are those initially caused by activity to construct the Proposed Scheme but which would also remain after the Proposed Scheme has been constructed and is present in the area.

Surface water

15.4.28 The Proposed Scheme would cross Tributaries of Millington Clough 1, 2, 3 and 4. This would require two culverts to be constructed along a substantial length of watercourse, and likely realignment of Tributaries of Millington Clough 1, 2, 3 and 4. This has potential to cause a moderate impact on the hydromorphology of Tributary of Millington Clough 4, which is a moderate value receptor. This would potentially result in a permanent moderate adverse effect, which is significant.

15.4.29 Potential temporary impacts on baseflow in surface water receptors arising from dewatering effects are described in 'Groundwater – surface water interactions' below.

Groundwater

Aquifers

15.4.30 It is currently anticipated that implementation of the avoidance and mitigation measures would ensure that there are no permanent significant effects related to the impact of the proposed cuttings on water levels and quality in the aquifers intercepted by the Proposed Scheme. Where the impacts of the cuttings on the aquifers could affect additional local receptors that rely on the groundwater resource, for example springs and abstractions, the impacts on these have been assessed below.

Abstractions

15.4.31 There is a Licence of Right to abstract less than 20m^3/d from groundwater at Heyrose Farm, Over Tabley. The purpose of this abstraction is unknown, but taking into account the small size of the abstraction, it is assumed that the groundwater is used within or around the farm buildings and not for irrigation. The abstraction point at Heyrose Farm is located within the footprint of the Proposed Scheme and is likely to be permanently lost as a result of the construction of the Proposed Scheme. However, the Heyrose Farm buildings would also be demolished as part of the Proposed Scheme. Therefore, assuming the groundwater is abstracted just for use within or around the farm buildings, there would be no significant effect resulting from the loss of this licensed groundwater abstraction.

15.4.32 The assessment has not identified any permanent significant effects on groundwater abstractions.

Groundwater - surface water interactions

15.4.33 The significance of effects and proposed mitigation have been assessed prior to any visits to sites where there is potential for groundwater – surface water interactions. All springs and potential spring features have, therefore, been assumed to be high value receptors. The assessment of effects and appropriate mitigation are likely to be subject to changes once site visits have been made and more detailed assessments are possible.

15.4.34 The potential spring feature at the M6, 160m north of Hollowood Farm, Over Tabley would be permanently lost. The assessment, therefore, identifies its loss as potentially resulting in a permanent major adverse effect, which is significant.

15.4.35 Groundwater discharge could occur in the Hoo Green cutting, Mere cutting, High Legh box structure and High Legh cutting. The discharge, along with dewatering required during construction, would reduce groundwater levels locally. This could in turn result in a reduction in flow at springs. Until the nature of these features has been confirmed by a site survey, they have been assumed to be high value receptors. Therefore, on a precautionary basis, significant adverse effects have been identified for the following springs:

- spring 360m east of Goodiersgreen Farm, Hoo Green Lane (potentially resulting in a moderate adverse effect, which is significant);
- spring 250m south-west of Yew Tree Farm, A50 (potentially resulting in a moderate adverse effect, which is significant);
- spring at Dobb Lane, Yew Tree Farm, A50 (potentially resulting in a major adverse effect, which is significant);
- spring at Wrenshot House, Wrenshot Lane (potentially resulting in a major adverse effect, which is significant);
- spring at ponds 360m north of Wrenshot House, Wrenshot Lane (potentially resulting in a major adverse effect, which is significant); and
- spring 200m south of Middle Moss Farm, Agden Lane (potentially resulting in a major adverse effect, which is significant).

Water dependent habitats

15.4.36 Groundwater discharge could occur in the proposed Hoo Green cutting, Mere cutting, High Legh box structure and Hulseheath cutting. This would lower groundwater levels locally. This would not cause any direct loss from The Mere, Mere SSSI but could cause a minor reduction in flow through the mere.

15.4.37 Land drainage intercepted by these cuttings could be discharged to ground between the cutting and The Mere, Mere SSSI or possibly to streams flowing to the mere. This would ensure that the total volume of water flowing through the mere would be comparable to the natural condition. If the drainage is discharged to streams, there may be minor alterations to the timings of flows. This would result in lower groundwater baseflows to the mere during dry periods, which could be a permanent minor impact on the mere. A detailed assessment of the local hydrogeology is,

however, required to determine whether an impact is likely. If a potential impact is identified then, as set out in Section 7, Ecology and biodiversity, appropriate design and further assessment will be undertaken to ensure there is no adverse impact on the site.

15.4.38 Any permanent groundwater discharge in the proposed Hoo Green cutting and High Legh cutting could result in a reduction in groundwater levels that might in turn reduce the baseflow to several tributaries of Millington Clough. These would be moderate adverse effects, which are significant.

Permanent effects - Flood risk and land drainage

15.4.39 Hydraulic modelling of Waterless Brook/Arley Brook, as well as Millington Clough and associated drains is currently being undertaken to assess potential permanent effects related to flood risk.

15.4.40 On a precautionary basis it is currently anticipated that the Proposed Scheme would result in moderate impacts on flood levels in the case of Waterless Brook/Arley Brook. This would potentially affect commercial properties, which are moderate value receptors, resulting in moderate adverse effects, which are significant. In the case of Millington Clough, on a precautionary basis it is assumed that the Proposed Scheme would potentially result in major impacts on flood levels, affecting residential properties. These are high value receptors and this would therefore result in major adverse effects, which are significant.

Other mitigation measures

15.4.41 Additional mitigation measures to further reduce the temporary and permanent impacts of construction stage activities, where there is potential for the Proposed Scheme to result in significant effects are described in the sections below.

Surface water

15.4.42 The embedded mitigation proposed in the design of the culverts and any associated realignments on Tributaries of Millington Clough 1, 2, 3 and 4 will be developed further in consultation with the Environment Agency.

Groundwater - surface water interactions

15.4.43 A survey of the potential spring features identified as having permanent effects will be undertaken to determine their value and to identify whether further mitigation is required. If these are confirmed to be springs of high or moderate value, measures will be identified to reduce any adverse effects as far as is reasonably practicable.

15.4.44 Additional mitigation measures may be required for the management of groundwater baseflows to the nearby surface watercourses and springs during excavation and dewatering of Hoo Green cutting, Mere cutting, High Legh box structure, High Legh cutting and Hulseheath cutting. Mitigation measures would be designed in detail following ground investigation and monitoring of surface water and groundwater levels. Mitigation could take the form of:

- adoption of construction techniques that avoid the need for dewatering;
- discharge of abstracted water to ground; and

- recirculation of treated water from dewatering to the affected receptors.

15.4.45 Following completion of the Hoo Green cutting, Mere cutting, High Legh box structure and High Legh cutting, groundwater may discharge to the cuttings, reducing flow to several nearby springs and watercourses. Mitigation measures would be designed in detail following ground investigation and monitoring of surface water and groundwater levels. Mitigation could take the form of:

- installation of a groundwater cut-off with a compartmentalised drainage layer to allow groundwater to pass unimpeded across the cutting; and
- discharge of treated water from the cuttings to the affected receptors and/or to ground.

15.4.46 Any such additional measures will be designed in consultation with the Environment Agency.

Flood risk and land drainage

15.4.47 Hydraulic modelling is currently being undertaken for the Proposed Scheme and its interaction with Waterless Brook/Arley Brook, as well as with Millington Clough and associated drains. Any requirements for mitigation identified from the modelling will be developed in consultation with the Environment Agency and LLFA.

Summary of likely residual significant effects

15.4.48 In the absence of the other mitigation measures set out above, the Proposed Scheme would potentially result in residual significant effects as follows:

- a permanent moderate adverse effect related to the installation of two culverts of substantial length and associated realignments of Tributaries of Millington Clough 1, 2, 3 and 4 which is significant;
- a permanent major adverse effect due to the loss of the potential spring feature located adjacent to the M6, 160m north of Hollowood Farm, Over Tabley;
- 4 potential major adverse effects and 2 potential moderate adverse effects on springs as a result of permanent discharge and temporary dewatering during the construction of Hoo Green cutting, Mere cutting, High Legh box structure and High Legh cutting;
- a permanent moderate adverse effects on baseflow to several tributaries of Millington Clough due to groundwater discharge in the proposed Hoo Green cutting and High Legh cutting;
- a precautionary permanent moderate adverse effect on flood risk on Waterless Brook/Arley Brook, which is significant; and
- a permanent major adverse effect on flood risk on Millington Clough and associated tributaries, which is significant.

15.4.49 It is currently anticipated that it should be possible to develop the means of mitigating these impacts, to ensure that there are no residual significant effects arising from construction of the Proposed Scheme, with the exception of:

- the temporary moderate adverse effects, which are significant, on the six potential spring features due to the alteration of the timing of flows during dewatering operations;
- the permanent major adverse effect, which is significant, on the potential spring feature at M6, 160m north of Hollowood Farm, Over Tabley, as it may not be possible to re-establish this feature nearby and it could be permanently lost; and
- the permanent major adverse effects, which are significant, on the two potential spring features due to groundwater discharge to the High Legh cutting. The section of watercourse immediately downstream of these springs would be permanently lost due to the presence of the cutting, making the artificial re-establishment of these springs impossible.

15.5 Effects arising from operation

Avoidance and mitigation measures

15.5.1 The principal issue of concern during operation of the Proposed Scheme is the potential for accidental spillages to occur that could result in the release of contaminants into the water environment. This issue has been assessed on a route-wide basis in Volume 3: Route-wide effects (Section 16), where the mitigation measures associated with this risk are described. A draft operation and maintenance plan for water resources and flood risk will be provided in the formal ES.

15.5.2 The design takes into account the policies in the NPPF and will aim to ensure that the Proposed Scheme is safe from flooding without increasing flood risk elsewhere. Evidence of application of the Sequential Test and Exception Tests in the NPPF is provided on a route-wide basis in Volume 3: Route-wide effects.

15.5.3 Sustainable drainage systems will be used where reasonably practicable. These will help to remove any suspended material within runoff from the Proposed Scheme through filtration, vegetative adsorption or settlement. The drainage systems proposed will aim to ensure that the quantity and quality of water draining from the Proposed Scheme during its operational phase will have a negligible impact on the water environment.

15.5.4 A summary of the route-wide WFD compliance assessment process is provided in Volume 3: Route-wide effects. This describes the ongoing assessment process and how measures will be embedded into the design that are specifically designed to ensure that the Proposed Scheme complies with the requirements of the WFD, where reasonably practicable. It is currently anticipated that the Proposed Scheme will be compliant with WFD legislation.

Assessment of impacts and effects

15.5.5 There are considered to be no significant adverse effects related to water resources and flood risk arising from operation of the Proposed Scheme.

Other mitigation measures

15.5.6 There are considered to be no further measures required to mitigate adverse effects on surface water resources, groundwater resources or flood risk.

Summary of likely residual significant effects

15.5.7 The assessment indicates that there would be no residual significant effects on surface water, groundwater or flood risk during operation of the Proposed Scheme.

Monitoring

15.5.8 Volume 1, Section 9 sets out the general approach to monitoring of water resources and flood risk during operation of the Proposed Scheme.

15.5.9 There are no area-specific requirements for monitoring water resources and flood risk during operation of the Proposed Scheme.

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