HS2

October 2018

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

Working Draft Environmental Statement

Volume 2: Community Area report

MA02: Wimboldsley to Lostock Gralam

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Volume 2: Community Area report

MA02: Wimboldsley to Lostock Gralam

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.

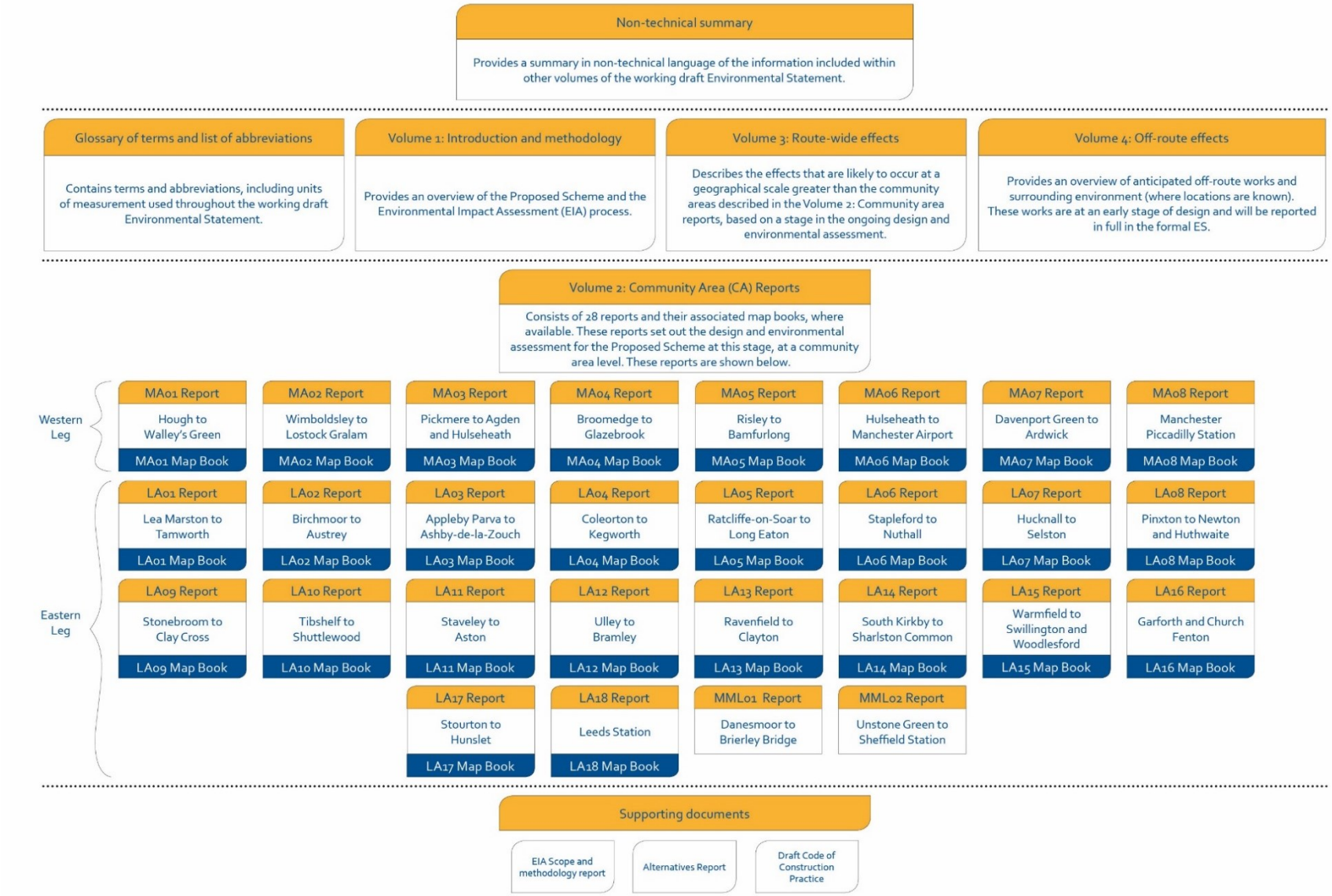
Volume 4: Off-route effects

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.

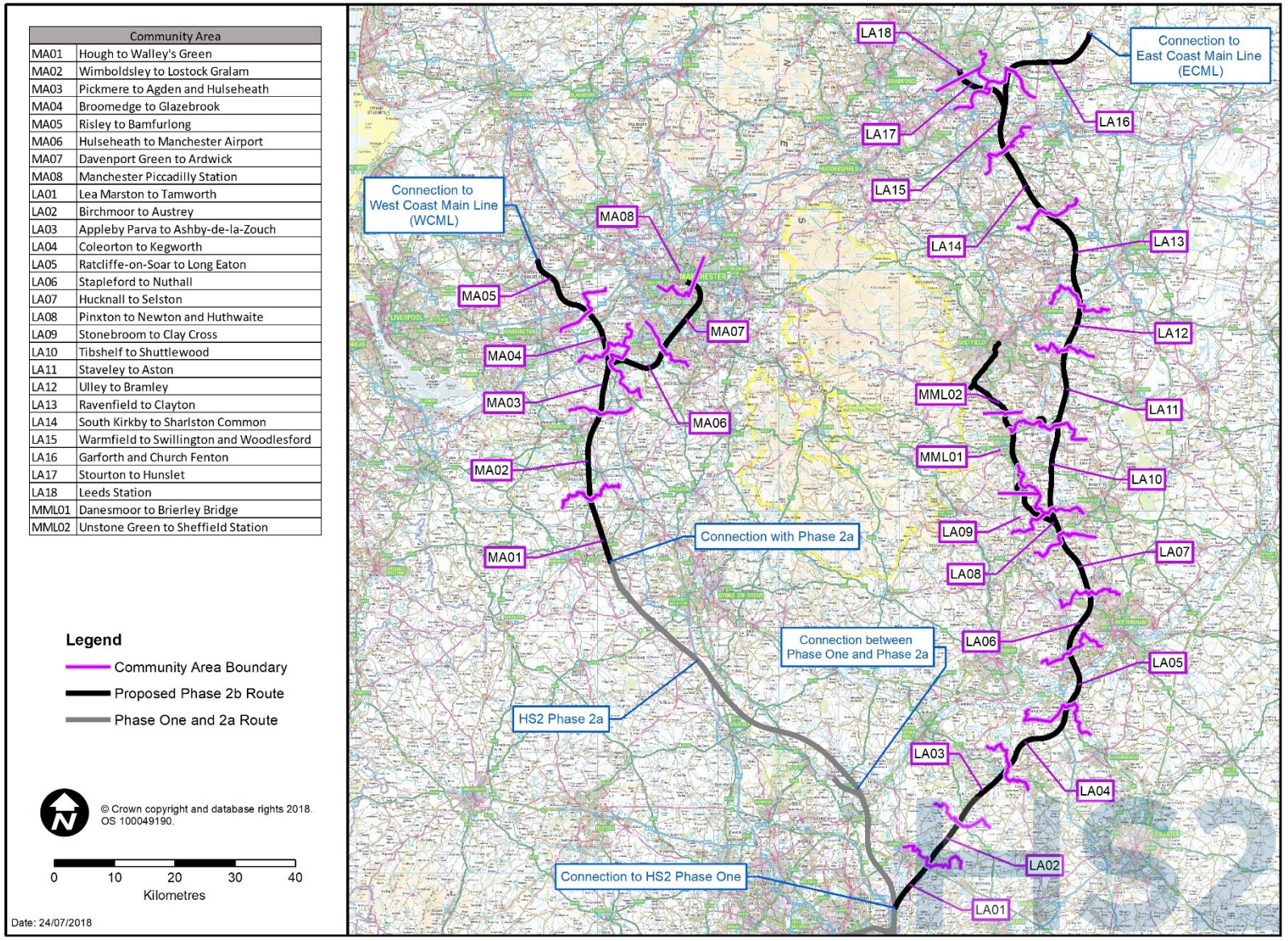
1.1.3 Phase Two of HS2 will extend the route from Phase One in the West Midlands to the north-west to Manchester (approximately 80km (50 miles) with connections to the West Coast Main Line (WCML) at Crewe and Golborne, and to the north-east to Leeds with a connection to the Erewash Valley Line and Midland 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 Wimboldsley to Lostock Gralam area (CA number MA02) which is located on the western leg of the Proposed Scheme.

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



1.2 Purpose of this report

1.2.1 This working draft ES sets out the preliminary environmental information and the key features of a point in time design for the Proposed Scheme. It provides a description of the design of the Proposed Scheme, environmental baseline information, and the likely impacts (and where practicable, the significant effects) of the construction and operation of the Proposed Scheme on the environment within the Wimboldsley to Lostock Gralam 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 (Section 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 Wimboldsley to Lostock Gralam area are provided in a separate corresponding document entitled Volume 2: MA02 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: MA02 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 Wimboldsley to Lostock Gralam area covers an approximately 14.7km section of the Proposed Scheme passing through the parishes of Stanthorne and Wimboldsley, Winsford, Bostock, Byley, Davenham, Rudheath, Lach Dennis, Lostock Gralam and Plumley. The majority of this section of the Proposed Scheme is within the local authority area of Cheshire West and Chester Council (CWCC) and the remaining section is within the local authority area of Cheshire East Council (CEC). The boundary between Minshull Vernon parish and Stanthorne and Wimboldsley parish forms the southern boundary of this section. The boundary between Plumley parish and Tabley Inferior parish forms the northern boundary of this section.

2.1.2 As shown in Figure 3, the Hough to Walley's Green area (MA01) lies to the south and the Pickmere to Agden and Hulseheath area (MA03) lies to the north.

Settlement, land use and topography

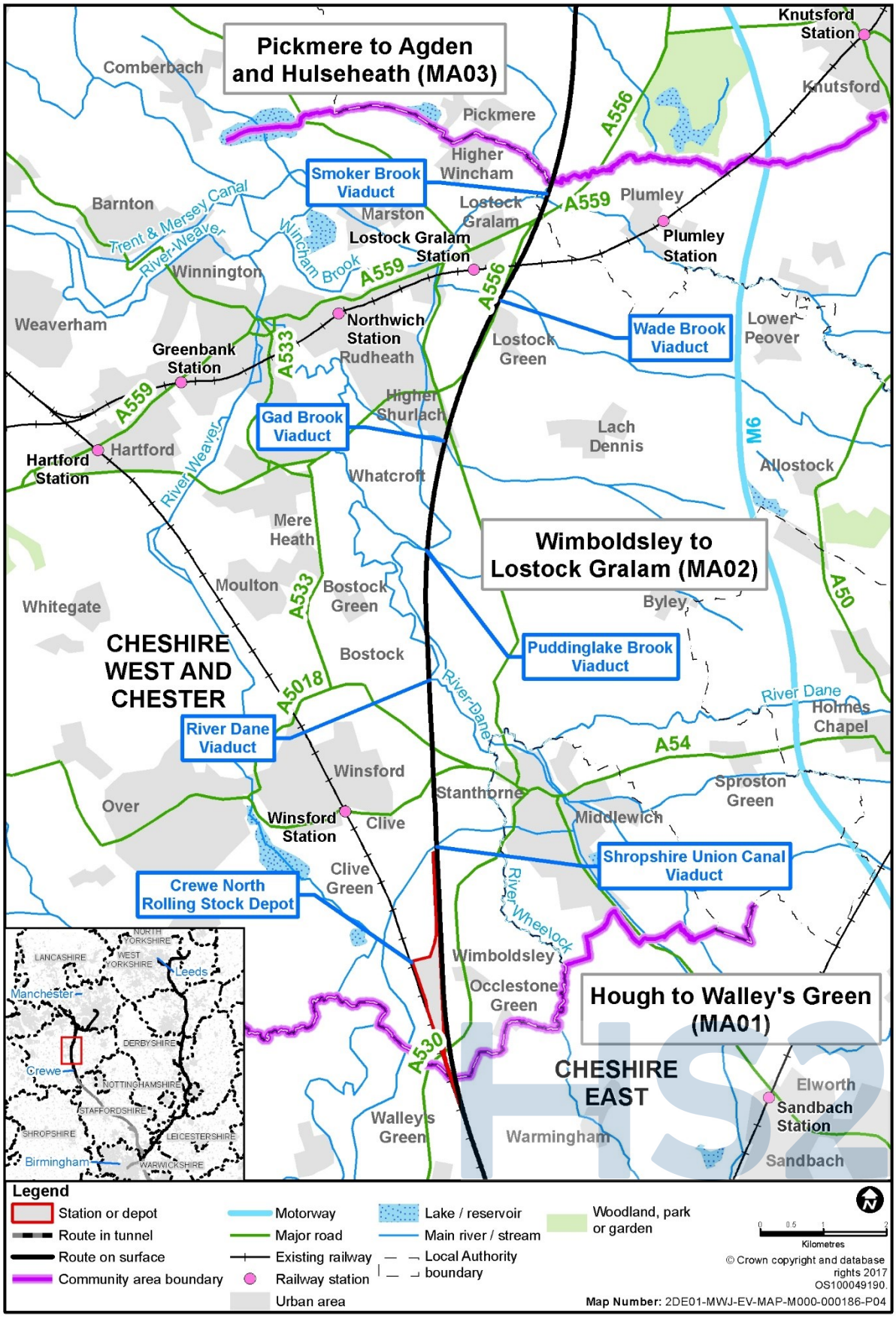
2.1.3 The area is predominantly semi-rural in character, with agriculture being the main land use. The low lying agricultural land is interspersed with occasional woodland, including ancient woodland, the smaller settlements of Walley's Green, Wimboldsley, Stanthorne, Bostock Green and Lach Dennis and a scattering of isolated dwellings and farmsteads. The larger settlements of Middlewich and Winsford are located in the south of the area and Northwich, Lostock Green and Lostock Gralam are located in the north of the area.

2.1.4 The southern section of the Wimboldsley to Lostock Gralam area is semi-rural in character, with agriculture being the main land use with the outskirts of Middlewich in the east and Winsford in the west. The Middlewich branch of the Shropshire Union Canal in located in this southern section of the area. There are also a number of designated heritage assets including several Grade II listed buildings and the scheduled monument of Bostock Hall moated site in the area.

2.1.5 Further north the area remains semi-rural in character, with agriculture being the main land use with the villages of Lostock Green in the east and Rudheath, a suburb of Northwich, in the west. Several waterways are located in this area including the River Dane, the Trent and Mersey Canal and the Wade Brook.

2.1.6 The far north of the Wimboldsley to Lostock Gralam area remains semi-rural in character, with agriculture being the main land use with the village of Lostock Gralam, situated to the west. In the far north of the area is Winnington Wood. Two watercourses are located within the wood: Peover Eye and Smoker Brook. To the east of Winnington Wood is Plumley Lime Beds Nature Reserve and Site of Special Scientific Interest (SSSI) and the Holford Hall moated site scheduled monument.

Figure 3: Community area context map



2.1.7 The topography in the southern section of the Wimboldsley to Lostock Gralam area is largely flat at around 45m above Ordnance Datum (AOD) in the south of the area, between the shallow valleys of the River Weaver and River Wheelock. Through the central section of the area the topography remains flat and low lying at a height of around 25m to 30m. Whilst the valleys of the Peover Eye and the Smoker Brook are more steeply sided, the topography in this northern section of the area remains generally flat at around 25m to 35m AOD.

Key transport infrastructure

2.1.8 The M6 passes through the area, with junction 18 located 2.8km to the east of Middlewich in the south of the Wimboldsley to Lostock Gralam area and the A54 Middlewich Road being the main connection east-west between the motorway and the towns of Middlewich and Winsford. The A530 Nantwich Road passes through the area in a north-south alignment, connecting Crewe with Middlewich in the south and with Northwich in the north. The A533 Bostock Road connects Middlewich with Winsford east to west, and Winsford with Northwich north to south. The A556 Chester Road dual carriageway runs east-west around the southern suburbs of Northwich connecting with Lostock Gralam and the M6 at junction 19 north of the Wimboldsley to Lostock Gralam area.

2.1.9 The West Coast Main Line (WCML) passes through the Wimboldsley to Lostock Gralam area, running in a south to north direction on the western side of the route of the Proposed Scheme. The route of the Proposed Scheme would cross the Sandbach to Northwich line (part of the Mid Cheshire Line) at Whatcroft (between Whatcroft Lane and Davenham Road) and the Northwich to Knutsford railway at Lostock Gralam.

2.1.10 The Middlewich branch of the Shropshire Union Canal at Park Farm, and the Trent and Mersey Canal pass through the Wimboldsley to Lostock Gralam area.

2.1.11 The Proposed Scheme would cross several public rights of way (PRoW) including local access roads and public footpaths, which provide important links between scattered dwellings and surrounding villages. In the Wimboldsley to Lostock Gralam area, the National Cycle Route 5 runs between Winsford and Middlewich. National Cycle Route 551 runs from Winsford to the south-west) and National Cycle Route 573 runs from Davenham eastwards towards the M6. The towpaths of the Trent and Mersey Canal and the Shropshire Union Canal provide off-road cycle routes.

Socio-economic profile

2.1.12 Within the Wimboldsley to Lostock Gralam area there is a wide spread of business types reflecting a diverse range of commercial activities. In the CWCC area the professional, scientific and technical sector accounts for the largest proportion of businesses (19%), with retail as the second largest (10%), followed by business administration and support services (9%)4. Within the CEC area the professional, scientific and technical sector also accounts for the largest proportion of businesses

[4] Office for National Statistics (2017) UK Business Count – Local Units. Available online at https://www.nomisweb.co.uk

(20%), with business administration and support services as the second largest (10%), followed by construction and retail (8% each).

2.1.13 According to the Annual Population Survey (2016)5, the employment rate6 within the CWCC area was 73% (147,700 people), and unemployment in the CWCC area was 3%. The employment rate within the CEC area was 76% (170,900 people), and unemployment in the CEC area was 4.5%.

2.1.14 According to the Annual Population Survey (2016)7, 40% of CWCC area residents aged 16-64 were qualified to National Vocational Qualification Level 4 (NVQ4) and above, while 9% of residents had no qualifications. In the CEC area 39% of residents aged 16-64 were qualified to NVQ4 and above, while 6% of residents had no qualifications.

Notable community facilities

2.1.15 The main concentrations of community facilities are in the larger settlements of Middlewich, Winsford and Northwich. Wimboldsley, Clive and Clive Green, Stanthorne, Bostock and Bostock Green, Mere Heath, Whatcroft, Lach Dennis, Higher Shurlach and Rudheath, Lostock Green, Lostock Gralam and Plumley are smaller villages and hamlets that are located close to the Proposed Scheme, and provide a smaller number of local services.

2.1.16 Notable community facilities in Middlewich include nurseries, primary schools and a secondary school, places of worship, health centres, a police station and a fire station.

2.1.17 Community facilities in Winsford include several nurseries and primary schools, and secondary schools. These include Hebden Green Community School and Specialist Arts College, which is a specialist school providing education for students, aged 2 to 19 with a broad range of physical disabilities, medical needs and associated learning difficulties. The Oaklands School, located on the south-west edge of Winsford town is a school for students aged 11 to 17 with learning difficulties and medical needs. There are also places of worship, health centres, a police headquarters, a fire and rescue service headquarters, a police station, ambulance station and fire station. There is additionally the Meadowbank Lodge, a day activity centre for people with learning disabilities and dementia.

2.1.18 Northwich includes several nurseries, primary schools and secondary schools, places of worship, health centres, a magistrates' court, a fire station and a police station. There is also the Greenbank School, a co-educational secondary school with a residential facility for pupils aged 11 to 19 with moderate and severe learning difficulties.

2.1.19 Wimboldsley and Stanthorne is a small community, with facilities including Wimboldsley Community Primary School, which provides support to pupils with learning disabilities.

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

2.1.20 Rudheath is a village with community facilities which include Chrysalis Day Nursery (in Higher Shurlach), Rudheath Primary Academy and Rudheath Youth Centre.

2.1.21 Lostock Gralam is a village with community facilities which include Lostock Green Methodist Church, Lostock Gralam Church of England Primary School, St John's Church and The Water Mead pub (which has a children's play area).

Recreation, leisure and open space

2.1.22 The Wimboldsley to Lostock Gralam area is a mix of urban and rural areas, with open space, woodland, water ways and farmland interspersed between the settlements. It features two promoted8 PRoW: the Cheshire Ring Canal Walk, passing through Middlewich and Rudheath and includes Wimboldsley Footpath 1, Stanthorne Footpath 3, Davenham Footpath 6 and Rudheath Footpath 10; and the Dane Valley Way, which passes through Middlewich.

2.1.23 Waterways include the Trent and Mersey Canal; the Shropshire Union Canal (Middlewich Branch), which runs through Middlewich; the River Weaver that passes through Wimboldsley and its tributary the River Dane; and the River Wheelock that runs to the east of Wimboldsley and Occlestone Green.

2.1.24 Other notable recreation, leisure and open space facilities in the Wimboldsley to Lostock Gralam area include the Wimboldsley Wood Site of Special Scientific Interest (SSSI), north-east of Wimboldsley; Winsford Flash, which is a series of shallow lakes available to the public for fishing and sailing, south-east of Winsford. Griffith's Park, north of Rudheath; Lostock picnic area alongside the A556 Chester Road; Long Wood and Winnington Wood east of Lostock Gralam; and the Plumley Lime Beds Nature Reserve and SSSI, south-west of Plumley also lie within the area. The National Cycle Route 5 also runs between Winsford and Middlewich.

2.1.25 There are several sports fields, clubs and recreational grounds in many of the towns and villages in the Wimboldsley to Lostock Gralam area, which offer leisure opportunities to residents.

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)[9];

[8] Promoted PRoW refers to those PRoW which are a "promoted" destination in their own right as a recreational resource.
[9] 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

- Adopted Cheshire East Local Plan Strategy 2010-2030 (2017)[10];
- Adopted Macclesfield Borough Local Plan 2004-2011 (saved policies) (2004) [11];
- Adopted Davenham and Whatcroft Neighbourhood Plan (2017)[12];
- Adopted Winsford Neighbourhood Plan (2014)[13];
- Adopted Cheshire Replacement Waste Local Plan 2007 (saved policies) (2007)[14];
- Adopted Cheshire Replacement Minerals Local Plan 1999 (saved policies) (1999)[15];
- Cheshire West and Chester Local Transport Plan 2017-2030 (2017)[16]; and
- Cheshire East Local Transport Plan Strategy 2011-2026 (2011)[17].

2.1.28 Emerging policies are not generally included within this report unless a document has been submitted to the Secretary of State for Examination. This is the case with the Cheshire West Local Plan (Part Two) Land Allocations and Detailed Policies Submission Draft, which was submitted to the Secretary of State on 12 March 2018.

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 will be included as committed developments. These will be listed in the formal ES.

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 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.

[10] 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
[11] 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
[12] Davenham and Whatcroft Neighbourhood Plan (Adopted 2017). Available online at: http://consult.cheshirewestandchester.gov.uk/portal/cwc_ldf/np/davenham_whatcroft_ref
[13] Winsford Neighbourhood Plan (Adopted 2014). Available online at: http://consult.cheshirewestandchester.gov.uk/portal/cwc_ldf/np/winsford_ref
[14] 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
[15] 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
[16] Cheshire West and Chester Local Transport Plan 2017-2030 (Adopted 2017). Available online at: https://www.cheshirewestandchester.gov.uk/residents/transport-and-roads/public-transport/transport-strategy/transport-strategy.aspx
[17] 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

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.

Ongoing design development

2.1.33 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:

- layout of, and railway and highway access to, the Crewe North rolling stock depot (RSD);
- review of the proposed lengths and heights of viaducts and other river crossing structures;
- temporary and permanent utility diversions;
- refinement of the realignment of roads and PRoW crossing the route of 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 for private means of access;
- refinement of construction compound locations and site haul routes; and
- refinement of auto-transformer station, mid-point auto-transformer station and express feeder auto-transformer station locations.

2.2 Description of the Proposed Scheme

2.2.1 The following section describes the main features of the Proposed Scheme in the Wimboldsley to Lostock Gralam 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 route of the Proposed Scheme through the Wimboldsley to Lostock Gralam area would be approximately 14.7km long and would lie within the CWCC and CEC areas. The route would extend from the boundary of the Hough to Walley's Green area (MA01), 625m north-east of Walley's Green, and travel north passed Winsford and Northwich, ending adjacent to Linnards Lane bordering the Pickmere to Agden and Hulseheath area (MA03), 1.4km south-east of Pickmere.

2.2.5 The Proposed Scheme within the Wimboldsley to Lostock Gralam area has two main components:

- the Crewe North RSD and reception tracks: this would provide permanent operations and maintenance facilities for the western leg of the Proposed Scheme; and
- the route of the Proposed Scheme, continuing from the northern boundary of the Hough to Walley's Green area (MA01) and continuing northwards towards the Pickmere to Agden and Hulseheath area (MA03).

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

2.2.7 This section of route is illustrated on maps CT-06-308b to CT-06-316a in the Volume 2: MA02 Map Book.

2.2.8 All dimensions in the sections below are approximate.

Crewe North rolling stock depot (RSD) and reception tracks

2.2.9 The Crewe North RSD (Volume 2: MA02 Map Book, map CT-06-308b to map CT-06-311) would serve as an operational and maintenance hub for the rolling stock on the western leg of the Proposed Scheme. Activities undertaken at the RSD would include light and heavy maintenance, where train servicing (plus interior and exterior cleaning) would take place. The operation of the Crewe North RSD is described further in Section 2.4.

2.2.10 Trains would access the Crewe North RSD via reception tracks (see Volume 2: Map CT-06-310, D5 to Map CT-06-311, D8) on the western and eastern side of the route of the Proposed Scheme.

2.2.11 The reception tracks would diverge from the route of the Proposed Scheme 160m north-east of Bank Farm, with the western track running to the west of the route of the Proposed Scheme, and the eastern track running to the east of the route. The western track would enable trains to leave the route of the Proposed Scheme and pass onto the reception track to enter the RSD from the north. The eastern track would allow trains to exit the RSD and continue northwards towards Stanthorne and the River Dane valley. The eastern track would pass under the route of the Proposed

Scheme, 360m south-west of Stanthorne, before reconnecting to the route of the Proposed Scheme, north-east of Bank.

2.2.12 To accommodate the western track to the Crewe North RSD, alterations to the existing the private access road to Stanthorne Hall would be required.

2.2.13 There would be landscape earthworks and landscape mitigation planting to both sides of the reception tracks to provide visual screening for properties to east and west (see Volume 2: Map CT-06-310, D5 to CT-06-311, E8).

2.2.14 The Crewe North RSD site would be approximately 60ha in area and occupy land between the existing WCML and the route of the Proposed Scheme, 625m north-east of Walley's Green. The site comprises predominantly agricultural land and residential properties to the south of the A530 Nantwich Road.

2.2.15 Key features of the Crewe North RSD would include:

- gatehouse(s);
- operational buildings;
- stabling yards where trains would be cleaned and stabled overnight;
- sidings where trains would be parked;
- maintenance shed(s) including workshops where maintenance on the trains would take place;
- cleaner's store(s) and plant room;
- a wheel lathe(s) and plant room;
- a depot control centre building to manage train movements within the RSD;
- carriage washing machine plant; and
- offices, training facilities cleaners and train crew facilities.

2.2.16 Landscape mitigation planting would be provided to the west and north of the Crewe North RSD to provide visual screening for residents of Wimboldsley Hall, Wimboldsley Grange and Lea Hall and users of the Shropshire Union Canal, and to help integrate the facility into the surrounding landscape (see Volume 2: Map CT-06-308b, E5 to CT-06-309, D1 and CT-06-309, D1 to D3).

2.2.17 Site access to and from the Crewe North RSD would be provided via an access road connecting to the realigned Clive Green Lane. There would be landscape mitigation planting to provide visual screening for residents of Lea Hall and Stanthorne Park Mews and an area of woodland habitat creation to the east of this road to provide replacement habitat (see Volume 2: Map CT-06-309, D4 to J4).

2.2.18 Construction of the Crewe North RSD would be managed from the A530 Nantwich Road satellite compound and the Crewe rolling stock depot satellite compound, which are described in Section 2.3, and shown on map CT-05-308b and map CT-05-309 in the Volume 2: MA02 Map Book.

Route of the Proposed Scheme

2.2.19 In the Wimboldsley to Lostock Gralam area, the route of the Proposed Scheme would be carried on the following features:

- viaducts for a total length of 3.1km (River Dane, Puddinglake Brook, Gad Brook, Wade Brook and Smoker Brook viaducts);
- embankments for a total length of 11.4km (Walley's Green, Clive Green, Stanthorne, Dane Valley, Whatcroft, Billinge Green, Marshall's Gorse, Rudheath and Lostock Gralam embankments); and
- box structure for a total length of 160m (Middlewich box structure).

2.2.20 This section of route is illustrated on maps CT-06-308b to CT-06-316a in the Volume 2: MA02 Map Book.

2.2.21 The route of the Proposed Scheme is described in four separate sections below.

2.2.22 In general, features are described along the route of the Proposed Scheme from south to north and to the eastern and western sides of the route as they cross the route of the Proposed Scheme, as shown on Map Series CT-06 in the Volume 2: MA02 Map Book.

Walley's Green embankment to Shropshire Union Canal underbridges

2.2.23 The route of the Proposed Scheme would continue from the Hough to Walley's Green area (MA01) northwards towards Stanthorne on the Walley's Green embankment. The rest of this section would continue northwards on the Clive Green embankment.

2.2.24 This section of route is illustrated on maps CT-06-308b to CT-06-310 in the Volume 2: MA02 Map Book.

2.2.25 Key features of this 3.8km section would include:

- a section of Walley's Green embankment, 2.6km in length and up to 4m in height, continuing from the Hough to Walley's Green area MA01). There would be landscape earthworks and landscape mitigation planting on the east side of the embankment and further landscape mitigation planting on the west, to help integrate the Proposed Scheme into the surrounding landscape (see Volume 2: Map CT-06-308b, C7 to Map CT-06-309 H5);
- Park Hall culvert, 235m west of Park Hall Farm, for the diversion of an unnamed watercourse under the route of the Proposed Scheme (see Volume 2: Map CT-06-308b, C7);
- a balancing pond for railway drainage, 160m to the west of Park Hall Farm, to the east of the route of the Proposed Scheme. Access would be provided from the A530 Nantwich Road and a new access track (see Volume 2: Map CT-06-308b, C7 to D7);
- four ecological mitigation ponds within areas of woodland habitat creation along the western side of the WCML and the eastern side of the Shropshire Union Canal, both located to the west of the Proposed Scheme, to provide

replacement habitat (see Volume 2: Map CT-06-308b, C7 to Map CT-06-309-L1, H7);

- Occlestone Green mid-point auto-transformer station, 61m by 43m, on the eastern side of the route of the Proposed Scheme, 420m north-west of Park Hall Farm. Access would be provided via an access road from the realigned A530 Nantwich Road to the north (see Volume 2: Map CT-06-308b, E7);
- realignment of the A530 Nantwich Road, 50m south of its current alignment for 1km, crossing the route of the Proposed Scheme on the A530 Nantwich Road overbridge (see Volume 2: Map CT-06-308b, D3 to G9);
- A530 Nantwich Road overbridge, 55m in length and up to 14m above ground level to cross the route of the Proposed Scheme. There would be landscape mitigation planting along the supporting embankments on each side of the overbridge to help integrate the overbridge into the surrounding landscape (see Volume 2: Map CT-06-308b, D3 to G9);
- A530 Nantwich Road culvert, 300m north-west of Park Hall Farm for surface water drainage from the A530 Nantwich Road under the route of the Proposed Scheme (see Volume 2: Map CT-06-308b, E7);
- an accommodation access for Park Hall Farm, located to the east of the route of the Proposed Scheme, provided from the realigned A530 Nantwich Road (see Volume 2: Map CT-06-308b, E7 to F8);
- Wimboldsley culvert, 440m to the west of Hopley House for surface water drainage under the route of the Proposed Scheme (see Volume 2: Map CT-06-308b, I7);
- an area of wetland habitat creation and an adjoining area of woodland habitat creation, adjacent to the east side of the Shropshire Union Canal and extending east to the WCML, located to the west of the Proposed Scheme, to provide replacement habitat (see Volume 2: Map CT-06-308b, J2 to J4);
- realignment of accommodation access for Wimboldsley Grange, on the western side of the Proposed Scheme with users diverted via an alternative route to the south of the existing alignment (see Volume 2: Map CT-06-309, B2);
- an area of woodland habitat creation along the western side of the WCML, west of the route of the Proposed Scheme to provide replacement habitat (see Volume 2: Map CT-06-309, C5 to E6);
- Stove culvert, 440m to the east of Lea Hall for the for surface water drainage under the route of the Proposed Scheme (see Volume 2: Map CT-06-309, F5 to F6);
- a balancing pond for railway drainage, 300m to the east of Lea Hall, to the west of the route of the Proposed Scheme. Access would be provided from a new access track from the realigned Clive Green Lane (see Volume 2: Map CT-06-309, I6 to G5);

- an accommodation access for Lea Hall located to the west of the route of the Proposed Scheme, from the realigned Clive Green Lane. Landscape mitigation planting would be provided on both sides of the accommodation access to help integrate the access into the surrounding landscape (see Volume 2: Map CT-06-309, H4 to CT-06-310, B4);
- Clive Green embankment, 1.6km in length and up to 8m in height with landscape earthworks and landscape mitigation planting on the east of the embankment to help integrate the Proposed Scheme into the surrounding landscape (see Volume 2: Map CT-06-309, H5 to Map CT-06-310, D6);
- an accommodation access for Stanthorne Park Mews located to the west of the route of the Proposed Scheme, from the realigned Clive Green Lane. Landscape mitigation planting would be provided either side of the accommodation access to help integrate the Proposed Scheme into the surrounding landscape (see Volume 2: Map CT-06-309, J4 to CT-06-310, B4);
- Stanthorne culvert, 275m to the north-east of Stanthorne Park Mews for surface water drainage under the route of the Proposed Scheme (see Volume 2: Map CT-06-310, A6);
- realignment of Clive Green Lane, 40m to the north of its existing alignment on an embankment 500m long, crossing the route of the Proposed Scheme on the Clive Green Lane overbridge (see Volume 2: Map CT-06-310, A8 to B4);
- diversion of Wimboldsley Footpath 1, 1km north of its current alignment for 2.5km, crossing the route of the Proposed Scheme on the Clive Green Lane overbridge (see Volume 2: Map CT-06-309, E7 to J8 and CT-06-310, A8 to A1 and CT-06-309, J3 to G3);
- Clive Green Lane overbridge, 48m in length and up to 15m above existing ground level. There would be landscape mitigation planting to help integrate the overbridge into the surrounding landscape (see Volume 2: Map CT-06-310, A8 to B3);
- an area of woodland habitat creation along the western side of the route of the Proposed Scheme to provide replacement habitat (see Volume 2: Map CT-06-310, B5 to D5);
- three ecological mitigation ponds within an area of grassland habitat creation to the east side of the route of the Proposed Scheme to provide replacement habitat (see Volume 2: Map CT-06-310, B5 to D5);
- two ecological mitigation ponds within an area of woodland habitat creation and an adjoining area of grassland habitat creation to the east of the route of the Proposed Scheme to provide replacement habitat (see Volume 2: Map CT-06-310, B6 to E9);
- a balancing pond for railway drainage, 30m to the north-east of Park Farm, to the west of the route of the Proposed Scheme. Access would be provided from the realigned Clive Green Lane and a new access track (see Volume 2: Map CT-

06-310, I6 to G5); and

- Shropshire Union Canal underbridges, 30m in length with limited height clearance, where the route of the Proposed Scheme and the reception track would pass over the Shropshire Union Canal, Stanthorne Footpath 3 and the National Cycle Route 5 (see Volume 2: Map CT-06-310, D5).

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

2.2.27 Construction of this section would be managed from the A530 Nantwich Road satellite compound, Crewe rolling stock depot satellite compound, Clive Green Lane satellite compound and Shropshire Union Canal satellite compound, which are described in Section 2.3, and shown on map CT-05-308b map, CT-05-309 and map CT-05-310 in the Volume 2: MA02 Map Book.

Shropshire Union Canal underbridges to River Dane viaduct

2.2.28 The route of the Proposed Scheme would continue northwards towards Whatcroft on the Clive Green embankment. It would continue northwards over the Middlewich box structure before running on the Stanthorne embankment and transferring onto the River Dane viaduct. Running parallel to the route of the Proposed Scheme would be two reception tracks providing access for trains to the Crewe North RSD.

2.2.29 This section of route is illustrated on maps CT-06-310 to CT-06-311-R1 in the Volume 2: MA02 Map Book.

2.2.30 Key features of this 2.4km section would include:

- continuation of Clive Green embankment, 400m in length and up to 12m in height in this section, with landscape earthworks and landscape mitigation planting on the east of the route of the embankment to help integrate the Proposed Scheme into the surrounding landscape. On the western side of the route there would be a noise fence barrier, 2m in height, 100m west of Yew Tree Farm to provide acoustic screening for properties at Clive (see Volume 2: Map CT-06-309, G5 to Map CT-06-310, D6);
- realignment of an accommodation access to Yew Tree Farm on the eastern side of the route of the Proposed Scheme to enable construction of the Clive Green embankment (see Volume 2: Map CT-06-310, E6 and F6);
- Clive Green retaining wall, 144m in length running along the west side of Clive Green embankment west of Millview (see Volume 2: Map CT-06-310, G6 to H6);
- Clive culvert, 380m to the north of Yew Tree Farm for surface water drainage under the route of the Proposed Scheme (see Volume 2: Map CT-06-310, H5 to H6);

- Middlewich box structure, 160m in length and up to 10m in depth (see Volume 2: Map CT-06-310, H6);
- Stanthorne retaining wall, 152m in length running along the east side of Stanthorne embankment, south-west of Stanthorne Lodge to provide the space for the formation of the Crewe North RSD reception tracks (see Volume 2: Map CT-06-310, I6);
- Stanthorne embankment, 1.2km in length and up to 12m in height with landscape mitigation planting on the east of the route of the Proposed Scheme to help integrate the Proposed Scheme into the landscape (see Volume 2: Map CT-06-310, I6 to Map CT-06-311, G8);
- diversion of A54 Middlewich Road, 200m north of its existing alignment on an embankment, crossing the route of the Proposed Scheme on the A54 Middlewich Road overbridge (see Volume 2: Map CT-06-311, B4 to B10 and CT-06-311-R1, B1 to B5);
- A54 Middlewich Road overbridge, 134m in length and up to 20m above ground level, to cross the route of the Proposed Scheme with landscape mitigation planting to help integrate the Proposed Scheme into the surrounding landscape (see Volume 2: Map CT-06-311, B4 to B10);
- diversion of A533 Bostock Road, 190m south of its existing alignment on an embankment, 1.7km long, crossing the route of the Proposed Scheme on the A54 Middlewich Road overbridge (see Volume 2: Map CT-06-311, C7 to C8);
- realignment of accommodation access for Greenheyes Farm, on the eastern side of the route of the Proposed Scheme to enable the construction of the Stanthorne embankment (see Volume 2: Map CT-06-311, C7 to C8);
- diversion of Winsford Footpath 37, 120m south of its existing alignment for 1km, crossing the route of the Proposed Scheme on the A54 Middlewich Road overbridge (see Volume 2: Map CT-06-311, B4 to C9);
- two ecological mitigation ponds within areas of woodland habitat creation west and east of the diverted A533 Bostock Road, west of the route of the Proposed Scheme, to provide habitat connectivity and replacement habitat (see Volume 2: Map CT-06-311, C2 to E3, C4 and D4 to D6);
- an area of grassland habitat creation to the eastern side of the route of the Proposed Scheme to provide replacement habitat (see Volume 2: Map CT-06-311, D8 to E10 and CT-06-311-R1, D1 to E3);
- Bank culvert, 120m to the north-east of Bank Farm for surface water drainage under the route of the Proposed Scheme (see Volume 2: Map CT-06-311, E7);
- two balancing ponds for railway drainage, to the east of the route of the Proposed Scheme and 160m and 550m south of the River Dane. Access would be provided from Bank Farm accommodation access and new access tracks (see Volume 2: Map CT-06-311, E8 and G8);

- an accommodation access for Bank Farm, located to the west and east of the route of the Proposed Scheme, provided from the realigned accommodation access track (see Volume 2: Map CT-06-311, E8 to F9);
- Bostock Road auto-transformer station, 49m by 43m, on the eastern side of the route of the Proposed Scheme, 330m north-east of Bank Farm. Access would be provided via an access road through Bank Farm from the existing A533 Bostock Road to the south-west (see Volume 2: Map CT-06-311, F8); and
- a section of the River Dane viaduct, 300m in length and up to 26m in height. (see Volume 2: Map CT-06-311, G8 to Map CT-06-312, D5).

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

2.2.32 Construction of this section would be managed from the Shropshire Union Canal satellite compound, A54 Middlewich Road satellite compound and transfer node, River Dane viaduct satellite compound and Puddinglake Brook viaduct satellite compound, which are described in Section 2.3, and shown on map CT-05-310, map CT-05-311 and map CT-05-312 in the Volume 2: MA02 Map Book.

River Dane viaduct to Davenham Road underbridge

2.2.33 The route of the Proposed Scheme would continue northwards towards Rudheath on the River Dane viaduct. It would continue northwards on the Dane Valley embankment before continuing on the Puddinglake Brook viaduct and transferring onto the Whatcroft embankment.

2.2.34 This section of route is illustrated on maps CT-06-311 to CT-06-313 in the Volume 2: MA02 Map Book.

2.2.35 Key features of this approximately 3.4km section would include:

- continuation of the River Dane viaduct, 800m in length and up to 26m in height in this section (see Volume 2: Map CT-06-311, G8 to Map CT-06-312, D5);
- areas of woodland habitat creation, west of the route of the Proposed Scheme and the River Dane, to provide replacement habitat and habitat connectivity (see Volume 2: Map CT-06-311, H7 to J7 and I4 to I5);
- areas of woodland and wetland habitat creation, west of the route of the Proposed Scheme and along both sides of the Trent and Mersey Canal, to provide replacement habitat and habitat connectivity (see Volume 2: Map CT-06-312, C5 to E3);
- Dane Valley embankment, 1.2km in length and up to 9m in height with landscape earthworks on the western and landscape mitigation planting on both sides of the route of the embankment to help integrate the Proposed

Scheme into the surrounding landscape (see Volume 2: Map CT-06-312, D5 to J6);

- a balancing pond for railway drainage, 100m to the north of the Trent and Mersey Canal, to the east of the route of the Proposed Scheme. Access would be provided from Whatcroft Hall accommodation access and a new access track (see Volume 2: Map CT-06-312, D6);
- Trent and Mersey Canal culvert, 600m to the south-east of Whatcroft Hall to convey an unnamed watercourse under the route of the Proposed Scheme (see Volume 2: Map CT-06-312, F5);
- a balancing pond for railway drainage, 470m to the south-east of Whatcroft Hall, to the west of the route of the Proposed Scheme. Access would be provided from Whatcroft Hall accommodation access and a new access track (see Volume 2: Map CT-06-312, F4 to F5);
- realignment of an accommodation access for Whatcroft Hall, 100m south of its existing alignment on an embankment, 390m long, crossing the route of the Proposed Scheme on the Whatcroft accommodation overbridge (see Volume 2: Map CT-06-312, F6 to H4);
- Whatcroft accommodation overbridge, 48m in length and up to 12m above existing ground level to cross the route of the Proposed Scheme close to Whatcroft Hall. There would be landscape mitigation planting to help integrate the Proposed Scheme into the surrounding landscape (see Volume 2: Map CT-06-312, G5);
- Puddinglake Brook viaduct, 144m in length and up to 13m in height (see Volume 2: Map CT-06-313, A6 to B5);
- Whatcroft embankment, 1.3km in length and up to 11m in height, with landscape earthworks on the eastern side and landscape mitigation planting on both sides of the route to help integrate the Proposed Scheme into the surrounding landscape. On the eastern side of the route there would be a noise fence barrier, 3m in height, 280m east of Little Grebe Cottage to provide acoustic screening for properties at Pear Tree Farm Cottages (see Volume 2: Map CT-06-313, B6 to I5);
- a balancing pond for railway drainage, 170m to the north of Bridge Farm, to the west of the route of the Proposed Scheme. Access would be provided from Old Lane and Manor Lane near Bridge Farm and a new access track (see Volume 2: Map CT-06-313, B5);
- six areas of wetland habitat creation to the east and west of the route of the Proposed Scheme, extending along the north-east and south-east of the Trent and Mersey Canal, to provide replacement habitat and habitat connectivity (see Volume 2: Map CT-06-313, C8 to F4);
- Manor culvert, 390m to the south-east of Brook Farm for surface water drainage under the route of the Proposed Scheme (see Volume 2: Map CT-06-

313, C5);

- Whatcroft (railway) underbridge, 59m in length with limited height clearance, where the route of the Proposed Scheme would pass over the Sandbach to Northwich branch of the Mid Cheshire Line railway (see Volume 2: Map CT-06-313, D5);
- Trent and Mersey Canal underbridge, 41m in length and up to 13m above ground level and with a clearance height of up to 5.5m, where the route of the Proposed Scheme would pass over the Trent and Mersey Canal and make provision for Davenham Footpath 6 (see Volume 2: Map CT-06-313, D5);
- a balancing pond for railway drainage, 340m to the north-east of Brook Farm, to the west of the route of the Proposed Scheme. Access would be provided from Davenham Road and a new access track (see Volume 2: Map CT-06-313, E5 to E4); and
- Davenham Road underbridge, 48m in length and up to 13m above ground level and with a clearance height of 8.4m, where the route of the Proposed Scheme would pass over Davenham Road (see Volume 2: Map CT-06-313, H5).

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

2.2.37 Construction of this section would be managed from the River Dane viaduct satellite compound, Puddinglake Brook viaduct satellite compound, Trent and Mersey Canal underbridge satellite compound and Davenham Road underbridge satellite compound and transfer node, which are described in Section 2.3, and shown on map CT-05-311 and map CT-05-313 in the Volume 2: MA02 Map Book.

Davenham Road underbridge to Smoker Brook viaduct

2.2.38 The route of the Proposed Scheme would extend from Davenham Road underbridge north towards Lostock Gralam on the Billinge Green embankment. It would continue northwards on the Marshall's Gorse embankment and on the Gad Brook viaduct before transferring onto the Rudheath embankment. It would proceed north on the Wade Brook viaduct before running on the Lostock Gralam embankment and then transferring onto the Smoker viaduct.

2.2.39 This section of route is illustrated on maps CT-06-313 to CT-06-316a in the Volume 2: MA02 Map Book.

2.2.40 Key features of this4.9km section would include:

- Billinge Green embankment, 80m in length and up to 12m in height, with landscape mitigation planting on both sides of the route of the Proposed Scheme to help integrate the Proposed Scheme into the surrounding landscape. The embankment would be supported on the eastern side by the Billinge Green retaining wall along its full length. On the eastern side of the route there would be a noise fence barrier, 3m in height, 310m east of Little

Grebe Cottage to provide acoustic screening for properties at Pear Tree Farm Cottages (see Volume 2: Map CT-06-313, H5);

- Marshall's Gorse embankment, 162m in length and up to 12m in height, with landscape earthworks on the east side and landscape mitigation planting on both sides of the route to help integrate the Proposed Scheme into the surrounding landscape. On the eastern side of the route there would be a noise fence barrier, 3m in height, 340m east of Little Grebe Cottage to provide acoustic screening for properties at Pear Tree Farm Cottages (see Volume 2: Map CT-06-313, I6);
- three ecological mitigation ponds within an area of grassland habitat creation, east of the route of the Proposed Scheme, north of Pear Tree Farm Cottages, to provide replacement habitat (see Volume 2: Map CT-06-313, I5 to J4);
- an area of wetland habitat creation, east of the route of the Proposed Scheme, north of Pear Tree Farm Cottages, to provide replacement habitat (see Volume 2: Map CT-06-313, I6 to J6);
- an area of woodland habitat creation, west of the route of the Proposed Scheme and north of Davenham Road, to provide replacement habitat and habitat connectivity (see Volume 2: Map CT-06-313, I5 to J4);
- Gad Brook viaduct, 338m in length and up to 17m in height (see Volume 2: Map CT-06-313, I5 to Map CT-06-314, A5);
- an area of woodland habitat creation, east of the route of the Proposed Scheme and west of the A530 King Street, to provide replacement habitat and habitat connectivity (see Volume 2: Map CT-06-314, A6 to B6);
- Rudheath embankment, 2.2km in length and up to 11m in height with landscape mitigation planting on both sides of the route to help integrate the Proposed Scheme into the surrounding landscape. On the western side of the route there would be a noise fence barrier, 2m in height, 800m south-west of Melvin Holme to provide acoustic screening for properties in Rudheath and Broken Cross. On the eastern side of the route there would be a noise fence barrier, 2m in height, 800m north-west of Melvin Holme to provide acoustic screening for properties in Lostock Green (see Volume 2: Map CT-06-314, A6 to Map CT-06-315, E6);
- A530 King Street underbridge, 53m in length with limited height clearance where the route of the Proposed Scheme would pass over the A530 King Street (see Volume 2: Map CT-06-314, B5);
- Crowder's Lane express feeder auto-transformer station, 100m by 43m, on the east side of the route of the Proposed Scheme, 80m north of the A530 King Street. Access would be provided via an access road from the A530 King Street to the south (see Volume 2: Map CT-06-314, B6 to C6);

- diversion of B5082 Penny's Lane, 420m south-west of its existing alignment, crossing below the route of the Proposed Scheme via the B5082 Penny's Lane underbridge (see Volume 2: Map CT-06-314, C5 to E10);
- B5082 Penny's Lane underbridge, 32m in length and up to 12m above ground level, with a clearance height of 5.7m, where the route of the Proposed Scheme would pass over the diverted B5082 Penny's Lane (see Volume 2: Map CT-06-314, C5);
- realignment of A556 Chester Road, 70m north-west of its existing alignment and running parallel to the west of the route of the Proposed Scheme (see Volume 2: Map CT-06-314, E3 to Map CT-06-315, H5);
- an area of grassland habitat creation, west of the route of the Proposed Scheme and east of Cooke's Lane, to provide replacement habitat (see Volume 2: Map CT-06-314, F4 to H5);
- an area of woodland habitat creation, east of Rudheath embankment and north-west of Melvin Holme, to provide replacement habitat (see Volume 2: Map CT-06-314, A6 to B6);
- a balancing pond for railway drainage, 280m to the north-west of Melvin Holme, to the east of the route of the Proposed Scheme. Access would be provided from the diverted B5082 Penny's Lane and a new access track (see Volume 2: Map CT-06-314, G6);
- closure of Cooke's Lane and the provision of a turning head where it would cross the route of the realigned A556 Chester Road (see Volume 2: Map CT-06-314, G4 to I5);
- diversion of Rudheath Footpath 3, 750m south of its existing alignment for 1.8km, crossing the route of the Proposed Scheme through the B5082 Penny's Lane underbridge (see Volume 2: Map CT-06-314, G5);
- A556 Chester Road culvert, 50m to the east of Cooke's Lane to convey an unnamed watercourse under the route of the Proposed Scheme (see Volume 2: Map CT-06-314, H5);
- three ecological mitigation ponds within an area of grassland habitat creation, west of the route of the Proposed Scheme, north of Cooke's Lane, to provide replacement habitat (see Volume 2: Map CT-06-314, I5 to J3);
- an area of woodland habitat creation, east of the route of the Proposed Scheme and north of Cooke's Lane, to provide replacement habitat (see Volume 2: Map CT-06-315, I5 to J5);
- diversion of Birches Lane, 300m north-east of its existing alignment, crossing the route of the Proposed Scheme under the Wade Brook viaduct (see Volume 2: Map CT-06-315, C6 to E5);
- a balancing pond for railway drainage, 320m to the south-west of Fieldhouse Farm, to the east of the route of the Proposed Scheme. Access would be

provided from the diverted Birches Lane and a new access track (see Volume 2: Map CT-06-315, D6);

- Wade Brook viaduct, 294m in length and up to 18m in height. On the western side of the route there would be a noise fence barrier, 2m to 3m in height, 210m west of Fieldhouse Farm to provide acoustic screening for properties in Lostock Gralam (see Volume 2: Map CT-06-315, E6 to F6);
- an ecological mitigation pond in an area of wetland habitat creation, east of the route of the Proposed Scheme, south-west of Fieldhouse Farm, to provide replacement habitat (see Volume 2: Map CT-06-315, E7 to F6);
- a balancing pond for railway drainage, 130m to the west of Fieldhouse Farm, to the east of the route of the Proposed Scheme. Access would be provided from the diverted Birches Lane and a new access track (see Volume 2: Map CT-06-315, F6);
- Lostock Gralam embankment, 669m in length and up to 14m in height, with landscape earthworks on the west side and landscape mitigation planting on both sides to help integrate the Proposed Scheme into the surrounding landscape. On the western side of the route there would be a noise fence barrier, 2m to 3m in height, 200m west of Fieldhouse Farm to provide acoustic screening for properties in Lostock Gralam (see Volume 2: Map CT-06-315, F5 to I6);
- Lostock Gralam (railway) underbridge, 28m in length with limited height clearance where the route of the Proposed Scheme would pass over the Mid-Cheshire Line railway and Lostock Gralam Footpath 14 (see Volume 2: Map CT-06-315, H6);
- an area of woodland habitat creation, east of the route of the Proposed Scheme and along both sides of the Mid-Cheshire Line railway, to provide replacement habitat and habitat connectivity (see Volume 2: Map CT-06-315, H6 to J10);
- an area of woodland habitat creation, west of the route of the Proposed Scheme and east of the A556 Chester Road, to provide replacement habitat and habitat connectivity (see Volume 2: Map CT-06-315, I5 to Map CT-06-316a, C4);
- a balancing pond for railway drainage, 500m to the north of Fieldhouse Farm, to the east of the route of the Proposed Scheme. Access would be provided from the A556 Chester Road and a new access track (see Volume 2: Map CT-06-315, I6);
- Smoker Brook viaduct, 1.2km in length and up to 24m in height. On the eastern side of the route there would be a noise fence barrier, 2m in height, 80m south of the A556 Chester Road to provide acoustic screening for properties on Ascol Drive (see Volume 2: Map CT-06-315, I6 to Map CT-06-316a, F5);

- an area of woodland habitat creation, east of the route of the Proposed Scheme and east of the A556 Chester Road, to provide replacement habitat and habitat connectivity (see Volume 2: Map CT-06-316a, C5);
- an area of wetland habitat creation, on both sides of the route of the Proposed Scheme along the Peover Eye, to provide replacement habitat (see Volume 2: Map CT-06-316a, D6 to D4);
- an area of woodland habitat creation, on both sides of the route of the Proposed Scheme and east of the Smoker Brook, to provide replacement habitat (see Volume 2: Map CT-06-316a, D6 to F5);
- an area of wetland habitat creation, west of the route of the Proposed Scheme and east of the Smoker Brook, to provide replacement habitat (see Volume 2: Map CT-06-316a, E4 to F4); and
- an area of grassland habitat creation, on both sides of the route of the Proposed Scheme and east of the Smoker Brook, to provide replacement habitat (see Volume 2: Map CT-06-316a, E4 to F5).

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

2.2.42 Construction of this section would be managed from the Davenham Road underbridge satellite compound and transfer node, Gad Brook viaduct satellite compound, Rudheath embankment satellite compound and transfer node, A556 Chester Road satellite compound, Lostock Gralam underbridge satellite compound and Smoker Brook viaduct satellite compound and transfer node, which are described in Section 2.3, and shown on map CT-05-313, map CT-05-314, map CT-05-315 and map CT-05-316a in the Volume 2: MA02 Map Book.

Demolitions

2.2.43 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.

2.2.44 At this stage of the design development, it is anticipated that demolition of 24 existing residential properties, one commercial/ business property (including farm outbuildings) and one other structure would be required to construct the Proposed Scheme in the Wimboldsley to Lostock Gralam area. These could be needed for construction of the permanent features or, in some cases, to enable the construction works for the Proposed Scheme. Demolitions would be managed from the same construction compounds as the permanent features with which they are associated. The identified demolitions are listed in Section 2.3 under the relevant construction compounds.

2.3 Construction of the Proposed Scheme

2.3.1 This section sets out the key construction activities that are envisaged to build the Proposed Scheme in the Wimboldsley to Lostock Gralam 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[18] which sets out how HS2 Ltd and its contractors, as well as their sub-contractors, would undertake

[18] 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

community engagement during the construction of the HS2 project. The framework is being implemented on Phase One of HS2 and is applicable to all phases of HS2.

2.3.8 The objectives of the framework include:

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

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

Overview of the construction process

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

- advance works including: site investigations further to those already 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.

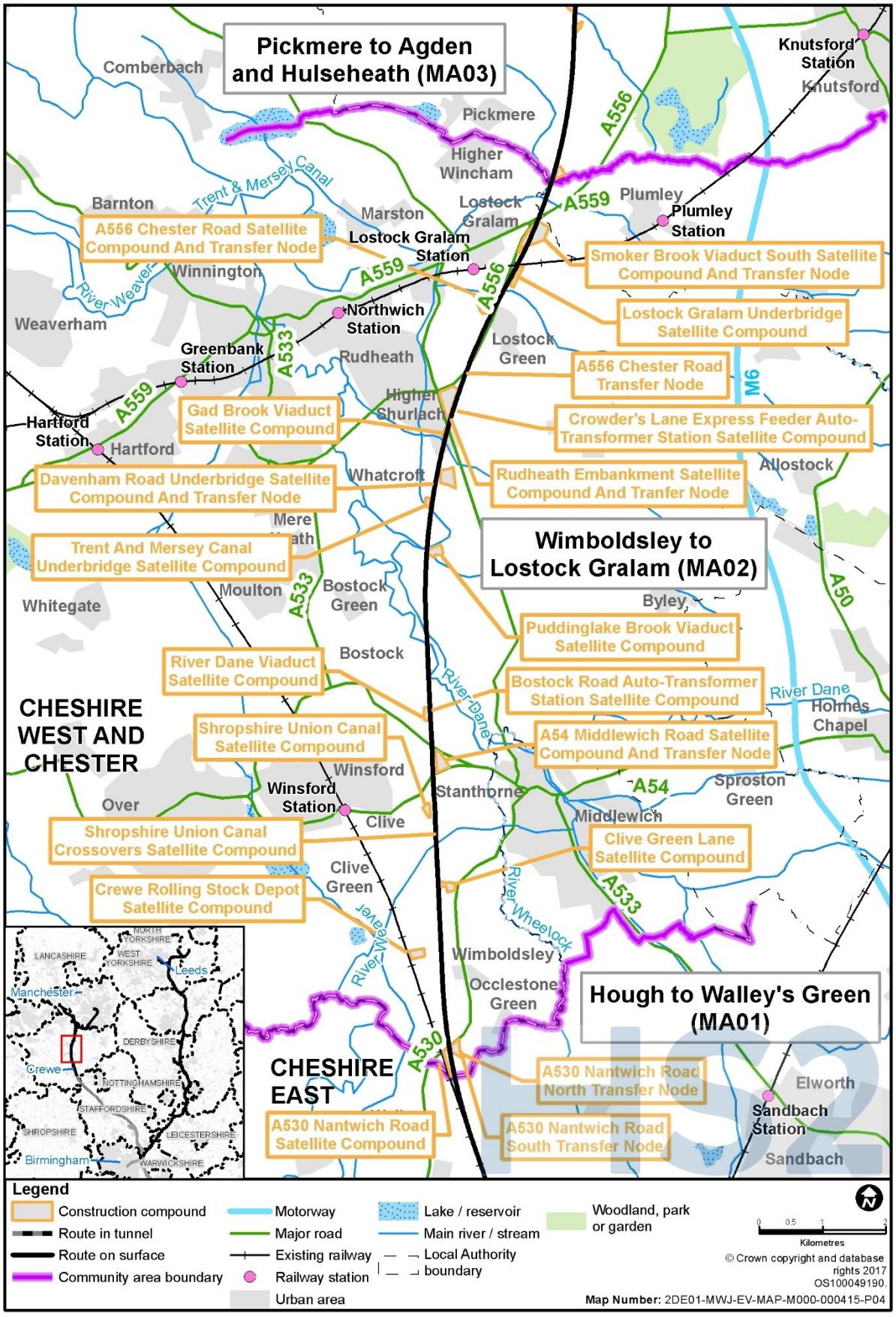
2.3.17 Satellite compounds would be used as the base to manage specific works along a section of the route. Depending on the nature and extent of the works to be managed, these satellite compounds could include office accommodation for staff, local storage for plant and materials, car parking for staff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

2.3.18 Fourteen civil engineering satellite compounds would be located in the Wimboldsley to Lostock Gralam area, one of which would continue to be used as a railway installation satellite compound following the completion of civil engineering works at those compounds. In addition, three separate railway systems compounds and three separate transfer nodes would be located within the Wimboldsley to Lostock Gralam area.

2.3.19 Five satellite compounds for civil engineering works within the Wimboldsley to Lostock Gralam area would be managed from the Crewe tunnel north main compound in the Hough to Walley's Green area (MA01) (see Volume 2: Community area report MA01, Hough to Walley's Green). Nine satellite compounds for civil engineering works within the Wimboldsley to Lostock Gralam area would be managed from the A50 Cliff Lane main compound in the Pickmere to Agden and Hulseheath area (MA03) (see Volume 2: Community area MA03, Pickmere to Agden and Hulseheath area).

2.3.20 The location of construction compounds in the Wimboldsley to Lostock Gralam area is shown on Figure 4. Map Series CT-05 (in the Volume 2: MA02 Map Book) show in detail the locations of the construction compounds described below.

Figure 4: Location of construction compounds in the Wimboldsley to Lostock Gralam area



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

2.3.22 In the Wimboldsley to Lostock Gralam area there would be worker accommodation for the construction workforce at the following compounds and transfer nodes:

- A530 Nantwich Road south transfer node;
- A530 Nantwich Road north transfer node;
- A54 Middlewich Road satellite compound and transfer node; and
- Rudheath embankment satellite compound.

2.3.23 Soil stripped as part of the works, prior to it being used when the land is reinstated, would be stored for the duration of construction. The location of top soil storage areas would generally be adjacent to compounds and areas of construction activity. These areas are referred to as material stockpiles and those adjacent to compounds are shown on maps CT-05-308b to CT-05-316a, in the Volume 2: MA02 Map Book.

2.3.24 Further information on the function of compounds is provided in Section 6 of Volume 1 and Section 5 of the draft CoCP. This includes general provisions for the operation of compounds, such as security fencing, lighting, utilities supply, site drainage and codes of worker behaviour.

Construction traffic routes, site haul routes and transfer nodes

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

2.3.26 The construction compounds would provide the interface between the construction works and the public road or railway network. The likely road routes to access compounds in the Wimboldsley to Lostock Gralam area are described in the subsequent sections of this report.

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

2.3.28 Areas of land are also required for the storage, loading and unloading of bulk earthworks materials that are moved to and from the site on public roads. These areas would allow transfer of material between road vehicles and site vehicles during construction to balance traffic movements on the road network. These areas are referred to as transfer nodes and are shown on Map CT-05-308b, Map CT-05-309, Map CT-05-311, Map CT-05-313, Map CT-05-314, Map CT-05-315 and Map CT-05-316a in the Volume 2: MA02 Map Book.

Construction compounds

2.3.29 This section provides a summary of the works to be managed from the construction compounds in the Wimboldsley to Lostock Gralam area, as illustrated in Figure 5 and Figure 6.

2.3.30 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

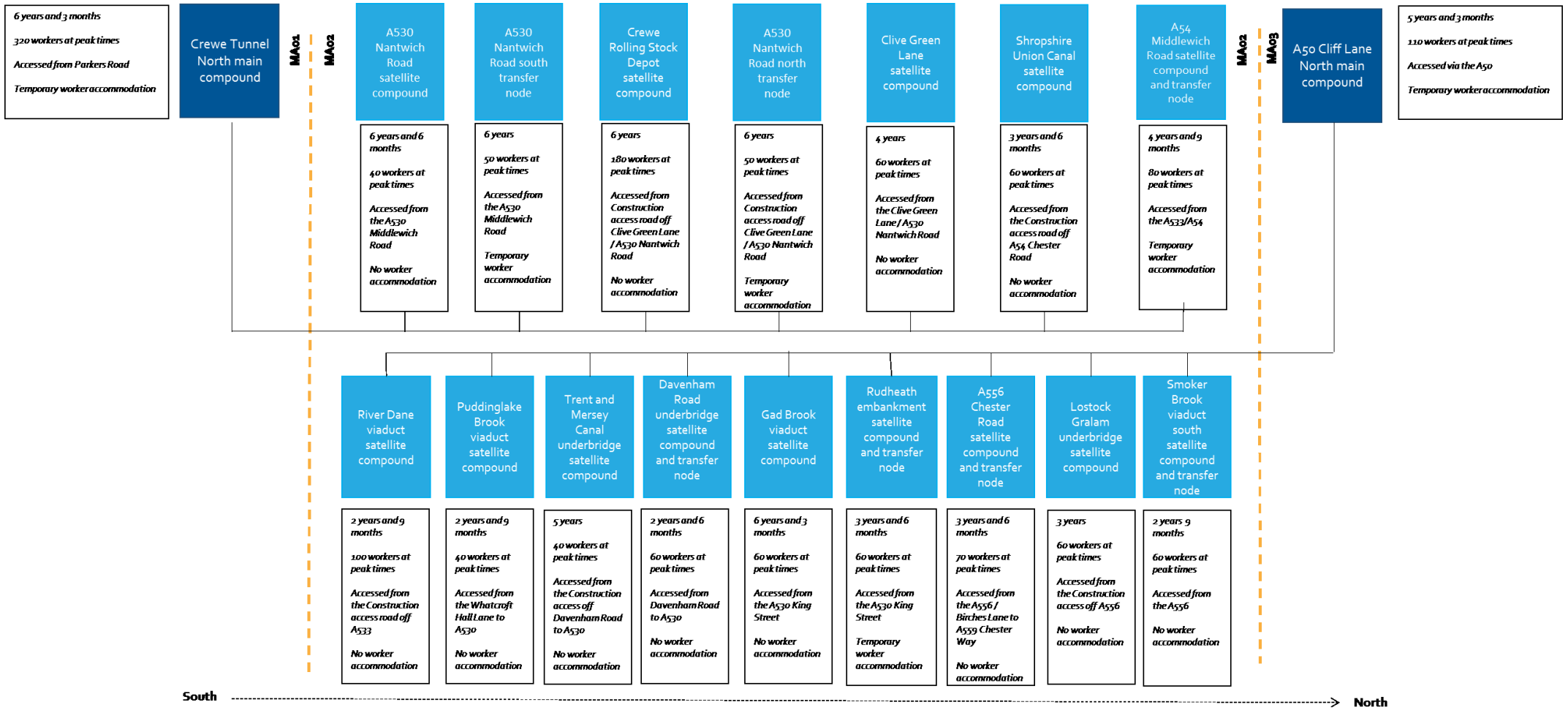
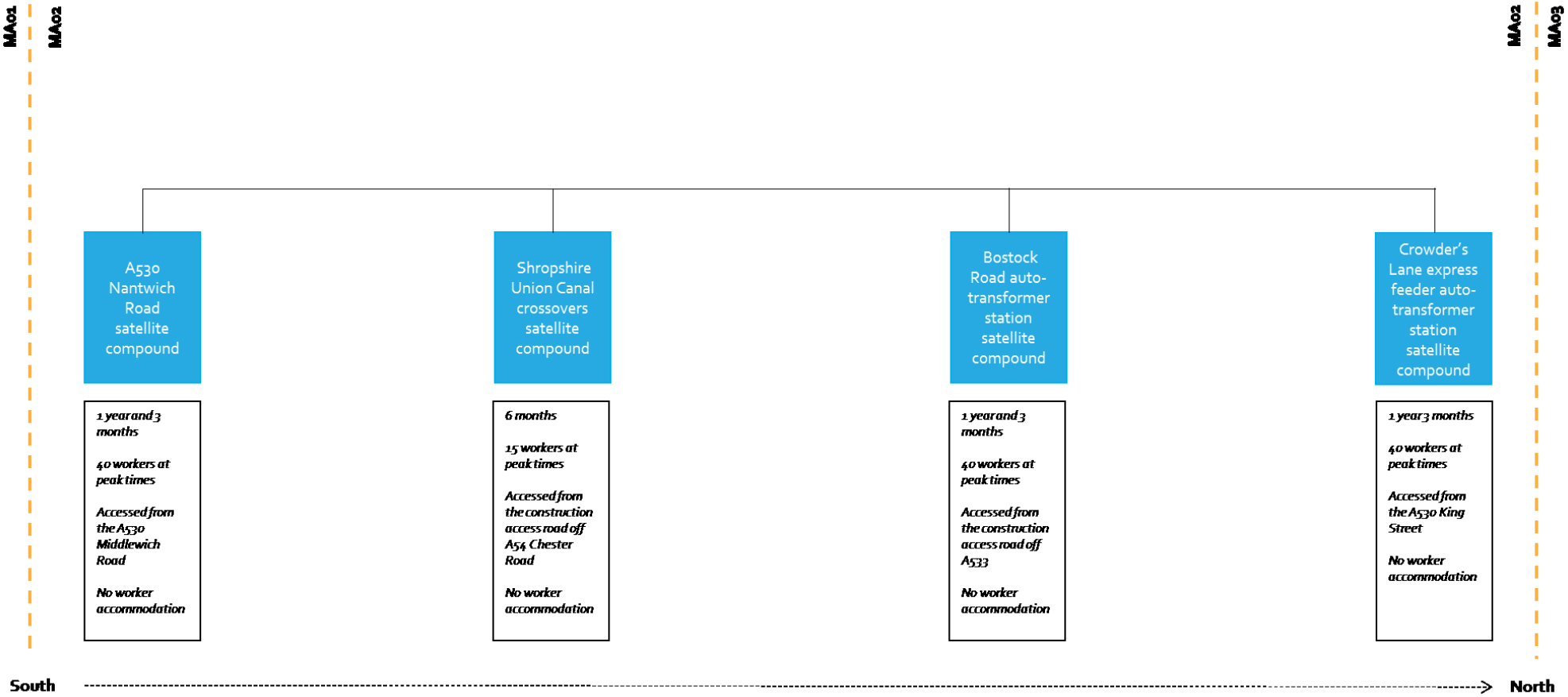


Figure 6: Construction compounds for railway systems works



A530 Nantwich Road satellite compound

2.3.31 This compound (see Volume 2: Map CT-05-308b, E7) would be used to manage civil engineering works in the Wimboldsley to Lostock Gralam area, as illustrated in Figure 5, for a period of six years and three months. On completion of the civil engineering works, the compound would remain and manage railway systems installation works for a period of one year.

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

Table 1: Demolitions required as a result of the works to be managed from the A530 Nantwich Road satellite compound

Description	Location	Feature resulting in the demolition
Residential		
Five residential properties at Railway Cottages	Railway Cottages, Nantwich Road, Wimboldsley	A530 Nantwich Road overbridge and Crewe North RSD
Residential Property	Manor Cottage, Nantwich Road, Wimboldsley	A530 Nantwich Road overbridge

2.3.33 The compound would be used to manage the construction of the A530 Nantwich Road overbridge, which would take two years and three months to complete.

2.3.34 The compound would also be used to manage the construction of the Walley's Green embankment, which would take one year and nine months to complete.

2.3.35 The compound would be one of the compounds used to manage the construction of the Crewe North RSD which would take six years to complete.

2.3.36 The public roads works to be managed from this compound would require the permanent realignment of the A530 Nantwich Road, 50m to the south of its existing alignment, which would take two years and three months to complete and would be constructed offline[19]. On completion of construction, traffic management measures would be implemented to enable connection between the realigned and the existing road.

2.3.37 The works to accommodation accesses to be managed from this compound would require the permanent realignment of an accommodation access for Park Hall Farm, provided from the realigned A530 Nantwich Road on the eastern side of the route of the Proposed Scheme. During construction of the realignment, users would be diverted along an alternative route for a period of two years and three months.

[19] Offline works are works which are generally constructed along or nearby existing routes, which will remain open during construction.

2.3.38 The works to be managed from this compound would require the following works to drainage:

- Park Hall culvert for the diversion of an unnamed watercourse under the route of the Proposed Scheme, which would take nine months to complete;
- A530 Nantwich Road culvert for surface water drainage under the route of the Proposed Scheme, which would take nine months to complete;
- Wimboldsley culvert for surface water drainage under the route of the Proposed Scheme, which would take nine months to complete; and
- Stove culvert for the surface water drainage under the route of the Proposed Scheme, which would take nine months to complete.

2.3.39 Key railway systems works to be managed from this compound would include construction and installation of the Occlestone Green mid-point auto-transformer station located 380m north-west of Park Hall Farm. The construction of the Occlestone Green mid-point auto-transformer station foundation and buildings would take one year and six months to complete. The installation of the Occlestone Green mid-point auto-transformer station railway systems equipment would take one year and three months to complete. Construction works for the mid-point auto-transformer station would be accessed from the Park Hall Farm accommodation access.

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

A530 Nantwich Road South transfer node

2.3.41 Transfer nodes are areas for the storage and loading and unloading of bulk earthworks material, which is moved to and from the site on public highways.

2.3.42 The A530 Nantwich Road South transfer node (see Volume 2: Map CT-05-308b, C6 to F6) would be used to manage the import material for the construction of the Crewe North RSD, for a period of six years. The transfer node would be accessed from the A530 Middlewich Road.

Crewe rolling stock depot satellite compound

2.3.43 This compound (see Volume 2: Map CT-05-309, D2) would be used to manage civil engineering works in the Wimboldsley to Lostock Gralam area, as illustrated in Figure 5.

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

2.3.45 The works to be managed from this compound would require the following works to accommodation accesses:

- permanent realignment of an accommodation access for Wimboldsley Grange on the western side of the route of the Proposed Scheme, which would take one year and three months to complete. During construction of the realignment, users would be diverted along alternative routes; and

- permanent realignment of an accommodation access for Lea Hall and Stanthorne Park Mews off the Crewe North RSD access road from the realigned Clive Green Lane on the western side of the route of the Proposed Scheme, which would take two years and three months to complete. During construction of the access, users would be diverted along alternative routes.

2.3.46 This compound would be one of the compounds used for the construction of the Crewe North RSD, which would take six years to complete.

A530 Nantwich Road North transfer node

2.3.47 The A530 Nantwich Road North transfer node (see Volume 2: Map CT-05-309, C4 to G5) would be used to manage the import material for the construction of the Crewe RSD, for a period of six years. The transfer node would be accessed from the construction access road off Clive Green Lane / A530 Nantwich Road.

Clive Green Lane satellite compound

2.3.48 This compound (see Volume 2: Map CT-05-309, J6) would be used to manage civil engineering works in the Wimboldsley to Lostock Gralam area as illustrated in Figure 3.

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

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

- Clive Green Lane overbridge, which would take two years and three months to complete; and
- Shropshire Union Canal underbridges, which would take two years and three months to complete.

2.3.51 The compound would be used to manage the construction of the Clive Green embankment which would take two years to complete.

2.3.52 The public roads works to be managed from this compound would require the permanent realignment of Clive Green Lane, 40m north of its existing alignment, which would take two years and three months to complete and would be constructed offline. On completion of construction, traffic management measures would be implemented to enable connection between the realigned and the existing road.

2.3.53 The PRoW works to be managed from this compound would require the permanent diversion of Wimboldsley Footpath 1, through the provision of the Clive Green Lane overbridge over the route of the Proposed Scheme. During construction of the diversion and overbridge, users would be diverted along alternative routes.

2.3.54 The works to be managed from this compound would require the construction of the Stanthorne culvert for surface water drainage under the route of the Proposed Scheme, which would take nine months to complete.

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

Shropshire Union Canal satellite compound

2.3.56 This compound (see Volume 2: Map CT-05-310, G5) would be used to manage civil engineering works in the Wimboldsley to Lostock Gralam area as illustrated in Figure 3.

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

2.3.58 The compound would be used to manage the construction of the Shropshire Union Canal underbridges which would take two years and three months to complete.

2.3.59 The compound would be used to manage the construction of the Middlewich box structure and Crewe North RSD reception tracks which would take two years and three months to complete.

2.3.60 The compound would be used to manage the construction of the Clive Green embankment retaining wall and Crewe North RSD reception tracks, which would take one year and nine months to complete.

2.3.61 The works to be managed from this compound would require the permanent realignment of an accommodation track providing access to Yew Tree Farm via the realigned Clive Green Lane on the eastern side of the route of the Propose Scheme, which would take one year and six months to complete. During construction of the realignment, users would be diverted along alternative routes.

2.3.62 The works to be managed from this compound would require the construction of the Clive culvert for surface water drainage under the route of the Proposed Scheme, which would take one year and six months to complete.

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

Shropshire Union Canal crossovers satellite compound

2.3.64 This compound (see Volume 2: Map CT-05-310, E6) would be used to manage railway systems engineering works in the Wimboldsley to Lostock Gralam area as illustrated in Figure 4.

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

2.3.66 Key railway systems works to be managed from this compound would include track installation works for the route of the Proposed Scheme, which would take six months to complete.

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

A54 Middlewich Road satellite compound and transfer node

2.3.68 This compound (see Volume 2: Map CT-05-311, B9) would be used to manage civil engineering works in the Wimboldsley to Lostock Gralam area as illustrated in Figure 3.

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

Table 2: Demolitions required as a result of the works to be managed from the A54 Middlewich Road satellite compound and transfer node

Description	Location	Feature resulting in the demolition
Residential		
Residential Property and garage/outbuildings	Yew Tree Farm, Coal Pit Lane, Stanthorne	Clive Green embankment
Residential Property and garage/outbuildings	Stanthorne Grange, Middlewich Road, Stanthorne	Middlewich box structure
Residential Property and garage/outbuildings	Greenheyes Farm, Northwich Road, Stanthorne	Stanthorne embankment

2.3.70 The compound would be used to manage the construction of the A54 Middlewich Road overbridge which would take two years and nine months to complete.

2.3.71 The compound would be used to manage the construction of the Stanthorne embankment and Crewe North RSD reception tracks, which would take one year and nine months to complete.

2.3.72 The compound would be used to manage the construction of the Stanthorne embankment retaining wall and Crewe North RSD reception tracks, which would take one year and six months to complete.

2.3.73 This compound would manage a transfer node for the storage and loading and unloading of bulk earthworks materials, which would be moved to and from the site on public roads. The transfer node would be accessed from the A533 Bostock Road/A54 Middlewich Road and via site haul routes (Volume 2: Map CT-05-311, A8 to C8).

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

- permanent diversion of the A54 Middlewich Road, 200m north of its existing alignment, which would take two years and nine months to complete and would be constructed offline. On completion of construction, traffic management measures would be implemented to enable connection between the realigned and the existing road; and
- permanent diversion of A533 Bostock Road, 190m south of its existing alignment, which would take one year and six months to complete and would be constructed offline. On completion of construction, traffic management measures would be implemented to enable connection between the realigned and the existing road.

2.3.75 The PRoW works to be managed from this compound would comprise the permanent diversion of Winsford Footpath 37 crossing the route of the Proposed Scheme on the A54 Middlewich Road overbridge. During construction of the diversion and overbridge, users would be diverted along alternative routes.

2.3.76 The works to be managed from this compound would require the permanent realignment of an accommodation track providing access to Greenheyes Farm, which

would take one year and six months to complete. During construction of the realignment, users would be diverted along alternative routes.

2.3.77 The works to be managed from this compound would require the construction of Bank culvert for surface water drainage under the route of the Proposed Scheme, which would take six months to complete.

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

River Dane viaduct satellite compound

2.3.79 This compound (see Volume 2: Map CT-05-311, F7) would be used to manage civil engineering works in the Wimboldsley to Lostock Gralam area as illustrated in Figure 3.

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

2.3.81 The compound would be used to manage the construction of the River Dane viaduct, which would take one year and nine months to complete.

2.3.82 The works to be managed from this compound would require the permanent realignment of an accommodation track providing access to Bank Farm, which would take two years and nine months to complete. During construction of the realignment, users would be diverted along alternative routes.

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

Bostock Road auto-transformer station satellite compound

2.3.84 This compound (see Volume 2: Map CT-05-311, F8) would be used to manage railway systems engineering works in the Wimboldsley to Lostock Gralam area as illustrated in Figure 4.

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

2.3.86 Key railway systems works to be managed from this compound would include construction and installation of the Bostock Road auto-transformer station located 340m north-east of Bank Farm. The construction of the Bostock Road auto-transformer station foundation and buildings would take one year to complete. The installation of the Bostock Road auto-transformer station railway systems equipment would take one year and three months to complete. Construction works for the auto-transformer station would be accessed from the A533 Bostock Road and an access track.

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

Puddinglake Brook viaduct satellite compound

2.3.88 This compound (see Volume 2: Map CT-05-313, A6) would be used to manage civil engineering works in the Wimboldsley to Lostock Gralam area as illustrated in Figure 3.

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 the following bridges and viaducts:

- Whatcroft accommodation overbridge, which would take two years and nine months to complete;
- Whatcroft (railway) underbridge, which would take one year and nine months to complete;
- River Dane viaduct, which would take one year and nine months to complete; and
- Puddinglake Brook viaduct, which would take one year to complete.

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

- Dane Valley embankment which would take one year and six months to complete; and
- Whatcroft embankment which would take two years and three months to complete.

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

- construction of Trent and Mersey Canal culvert to convey an unnamed watercourse under the route of the Proposed Scheme, which would take nine months to complete; and
- construction of Manor culvert for surface water drainage under the route of the Proposed Scheme, which would take nine months to complete.

2.3.93 There would be a temporary diversion of Davenham Footpath 6 for two years during construction. On completion of construction Davenham Footpath 6 would be reinstated along its existing alignment, beneath the River Dane viaduct.

2.3.94 The works to be managed from this compound would require the permanent realignment of an accommodation access for Whatcroft Hall, crossing the route of the Proposed Scheme on the Whatcroft accommodation overbridge. During construction of the realignment, users would be diverted along alternative routes.

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

Trent and Mersey Canal underbridge satellite compound

2.3.96 This compound (see Volume 2: Map CT-05-313, E5) would be used to manage civil engineering works in the Wimboldsley to Lostock Gralam area as illustrated in Figure 3.

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

2.3.98 The compound would be used to manage the construction of the following bridges and viaduct:

- Whatcroft (railway) underbridge, which would take two years and nine months to complete;
- Trent and Mersey Canal underbridge, which would take two years and six months to complete; and
- Puddinglake Brook viaduct, which would take one year to complete.

2.3.99 The compound would be used to manage the Whatcroft embankment which would take two years and three months to complete.

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

Davenham Road underbridge satellite compound and transfer node

2.3.101 This compound (see Volume 2: Map CT-05-313, G7) would be used to manage civil engineering works in the Wimboldsley to Lostock Gralam area as illustrated in Figure 3.

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

2.3.103 The compound would be used to manage the construction of the following bridge and viaduct:

- Davenham Road underbridge, which would take two years and three months to complete; and
- Gad Brook viaduct which would take one year to complete.

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

- Whatcroft embankment which would take two years and three months to complete;
- Billinge Green embankment, which would take one year and six months to complete; and
- Marshall's Gorse embankment, which would take one year and nine months to complete.

2.3.105 This compound would manage a transfer node for the storage and loading and unloading of bulk earthworks materials, which would be moved to and from the site on public roads. The transfer node would be accessed from the Davenham Road and A530 King Street and via site haul routes (Volume 2: Map CT-05-313, H8 to H9).

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

Gad Brook viaduct satellite compound

2.3.107 This compound (see Volume 2: Map CT-05-314, B5) would be used to manage civil engineering works in the Wimboldsley to Lostock Gralam area as illustrated in Figure 3.

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

2.3.109 The compound would be used to manage the following bridge and viaduct:

- A530 King Street underbridge which would take two years and three months to complete; and
- Gad Brook viaduct which would take one year to complete.

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

Crowder's Lane express feeder auto-transformer station satellite compound

2.3.111 This compound (see Volume 2: Map CT-05-314, B6) would be used to manage railway systems engineering works in the Wimboldsley to Lostock Gralam area as illustrated in Figure 4.

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

2.3.113 Key railway systems works to be managed from this compound would include construction and installation of the Crowder's Lane express feeder auto-transformer station located 590m south-west of Melvin Holme. The construction of the Crowder's Lane express feeder auto-transformer station foundation and buildings would take one year and six months to complete. The installation of Crowder's Lane express feeder auto-transformer station railway system equipment would take one year and three months to complete. Construction works for the express feeder auto-transformer station would be accessed from the A530 King Street.

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

Rudheath embankment satellite compound and transfer node

2.3.115 This compound (see Volume 2: Map CT-05-314, E4) would be used to manage civil engineering works in the Wimboldsley to Lostock Gralam area as illustrated in Figure 3.

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

Table 3: Demolitions required as a result of the works to be managed from the Rudheath embankment satellite compound and transfer node

Description	Location	Feature resulting in the demolition
Residential		
Residential Property and garage/outbuildings	High House Farm, King Street, Lach Dennis	Rudheath embankment
Nine residential properties on Cooke's Lane	Cooke's Lane, Rudheath, Northwich	Rudheath embankment and A556 Chester Road realignment
Four residential properties on Birches Lane	Birches Lane, Lostock Gralam	Rudheath embankment
Residential Property	Birches Lane, Lostock Gralam	Rudheath embankment and A556 Chester Road realignment
Commercial		
Buildings at Higgins Lane Farm	Davenham Road, Rudheath	Whatcroft embankment
Other		
Public convenience	Layby off the A556 Chester Road	Rudheath embankment

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

- A530 King Street underbridge which would take two years and three months to complete; and
- B5082 Penny's Lane underbridge which would take two years and six months to complete.

2.3.118 The compound would be used to manage the construction of the Rudheath embankment, which would take two years to complete.

2.3.119 This compound would manage two transfer nodes for the storage and loading and unloading of bulk earthworks materials, which would be moved to and from the site on public roads. The transfer nodes would be accessed from the A530 King Street and via site haul routes (Volume 2: Map CT-05-314, D4 and F5).

2.3.120 The works to be managed from this compound would comprise the following works to public roads:

- permanent realignment of the A556 Chester Road, up to 110m west of its existing alignment, which would take three years and three months to complete and would be constructed offline. On completion of construction, traffic management measures would be implemented to enable connection between the realigned road and the existing road. Works to carry out this realignment would also be managed from the A556 Chester Road satellite compound and transfer node;
- permanent diversion of B5082 Penny's Lane, up to 420m south-west of its existing alignment, crossing below the route of the Proposed Scheme via the B5082 Penny's Lane underbridge and connecting with the A530 King Street, which would take two years and six months to complete and would be

constructed offline. On completion of construction, traffic management measures would be implemented to enable connection between the diverted road and the existing A530 King Street; and

- permanent closure of Cooke's Lane and the provision of a turning head where it would cross the route of the realigned A556 Chester Road to the west of the route of the Proposed Scheme.

2.3.121 The works to be managed from this compound would require the construction of the diversion of Rudheath Footpath 3, which would take two years and nine months to complete. During construction of the diverted Rudheath Footpath 3, users would be diverted along alternative routes.

2.3.122 The works to be managed from this compound would require the construction of the A556 Chester Road culvert to convey an unnamed watercourse under the route of the Proposed Scheme, which would take one year and six months to complete.

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

A556 Chester Road transfer node

2.3.124 The A556 Chester Road transfer node (see Volume 2: Map CT-05-314, E6 to I6) would be used to manage the import material for the construction of Rudheath embankment, for a period of two years. The transfer node would be accessed from the A556 Chester Road / B5082 Penny's Lane.

A556 Chester Road satellite compound and transfer node

2.3.125 This compound (see Volume 2: Map CT-05-315, D4) would be used to manage civil engineering works in the Wimboldsley to Lostock Gralam area as illustrated in Figure 3.

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

2.3.127 The compound would be used to manage the construction of Rudheath embankment, which would take two years to complete.

2.3.128 This compound would manage a transfer node for the storage and loading and unloading of bulk earthworks materials, which would be moved to and from the site on public roads. The transfer node would be accessed from the A556 Chester Road / Birches Lane to the A559 Manchester Road and via site haul routes (Volume 2: Map CT-05-315, C4 to D2).

2.3.129 The public roads works to be managed from this compound would require the permanent realignment of the A556 Chester Road, up to 110m west of its existing alignment, which would take three years and three months to complete and would be constructed offline. On completion of construction, traffic management measures would be implemented to enable connection between the realigned road and the existing road. Works to carry out this realignment would also be managed from the Rudheath embankment satellite compound and transfer node.

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

Lostock Gralam underbridge satellite compound

2.3.131 This compound (see Volume 2: Map CT-05-315, F6) would be used to manage civil engineering works in the Wimboldsley to Lostock Gralam area as illustrated in Figure 3.

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

2.3.133 The compound would be used to manage the construction of the following bridge and viaduct:

- Lostock Gralam (railway) underbridge, which would take two years and nine months to complete; and
- Wade Brook viaduct which would take one year and six months to complete.

2.3.134 The compound would be used to manage the construction of the Lostock Gralam embankment, which would take two years to complete.

2.3.135 The public roads works to be managed from this compound would require the permanent diversion of Birches Lane, 330m north-east of its existing alignment, which would take up to one year and nine months to complete and would be constructed offline. On completion of construction, traffic management measures would be implemented to enable connection between the diverted road and the realigned A556 Chester Road.

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

Smoker Brook viaduct satellite compound and transfer node

2.3.137 This compound (see Volume 2: Map CT-05-315, J5) would be used to manage civil engineering works in the Wimboldsley to Lostock Gralam area as illustrated in Figure 3.

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

2.3.139 The compound would be used to manage the construction of the following bridge and viaduct:

- Lostock Gralam (railway) underbridge, which would take two years and nine months to complete; and
- Smoker Brook viaduct which would take two years and nine months to complete.

2.3.140 The compound would be used to manage the construction of the Lostock Gralam embankment, which would take two years to complete.

2.3.141 This compound would manage a transfer node for the storage and loading and unloading of bulk earthworks materials, which would be moved to and from the site on public roads. The transfer node would be accessed from A556 Chester Road/ A559 Manchester Road and via site haul routes (Volume 2: Map CT-05-316a, A3 to C4).

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

Construction waste and material resources

2.3.143 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.

2.3.144 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.

2.3.145 Local excess or shortfall of excavated material within the Wimboldsley to Lostock Gralam area would be managed through the mitigation earthworks design approach adopted for the Proposed Scheme, with the aim of contributing to an overall balance of excavated material on a route-wide basis. The overall balance of excavated material will be presented in Volume 3 of the formal ES.

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

Commissioning of the railway

2.3.147 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

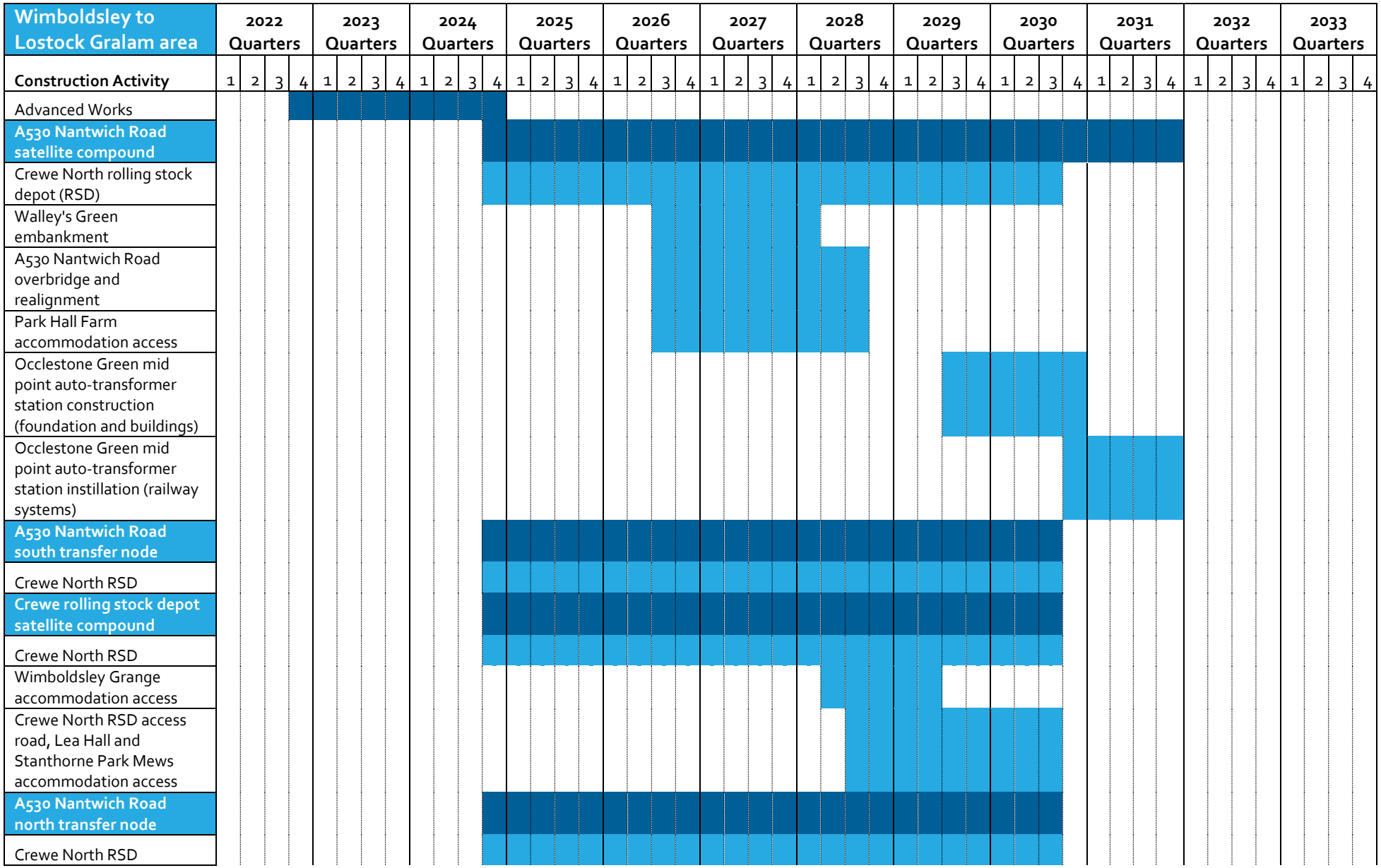
2.3.148 A construction programme illustrating indicative periods for each of the core construction activities described above is provided in Figure 7. Construction durations referred to in the following sections of this report are based on this indicative programme.

Monitoring during construction

2.3.149 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.

2.3.150 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



Clive Green Lane satellite compound

Clive Green embankment

Clive Green Lane overbridge and realignment

Shropshire Union Canal underbridge

Shrophire Union Canal satellite compound

Shropshire Union Canal underbridges

Yew Tree Farm accommodation access

Clive Green embankment (retaining wall) and Crewe North RSD reception tracks

Middlewich box structure and Crewe North RSD reception tracks

Shrophire Union Canal crossovers satellite compound

Track installation

A54 Middlewich Road satellite compound and transfer node

Stanthorne embankment (retaining wall) and Crewe North RSD reception tracks

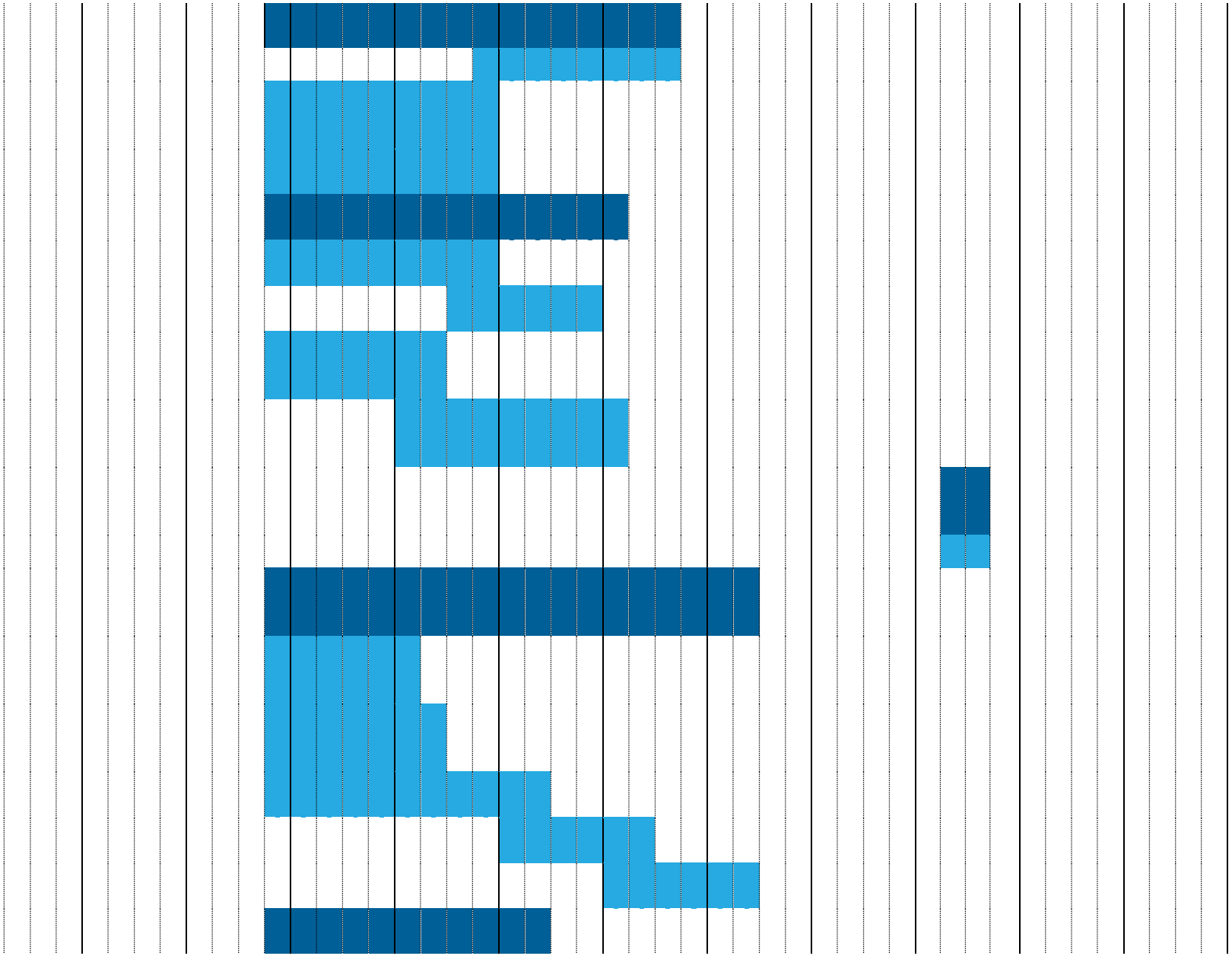
Stanthorne embankment and Crewe North RSD reception tracks

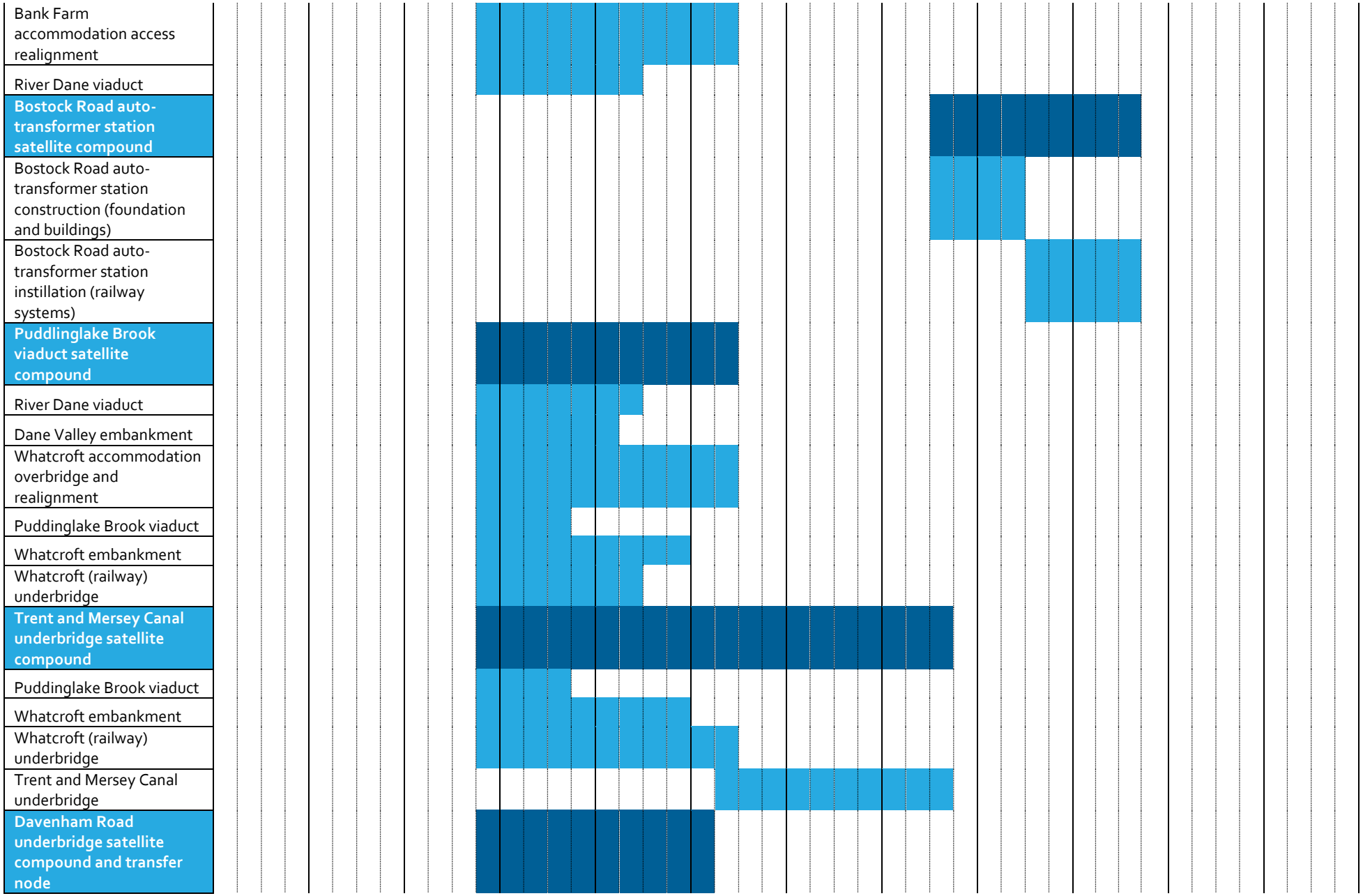
A54 Middlewich Road overbridge and diversion

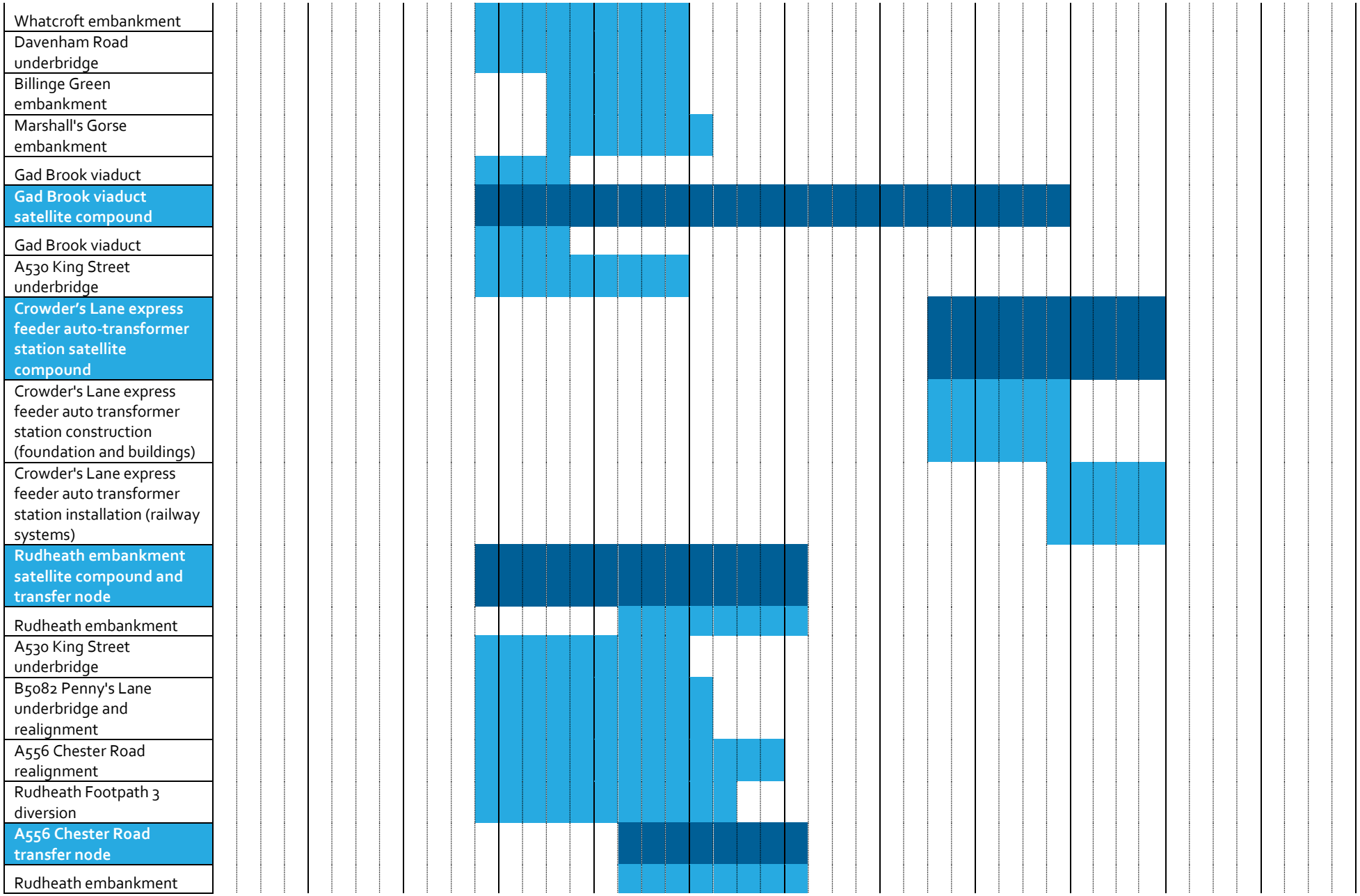
A533 Bostock Road diversion

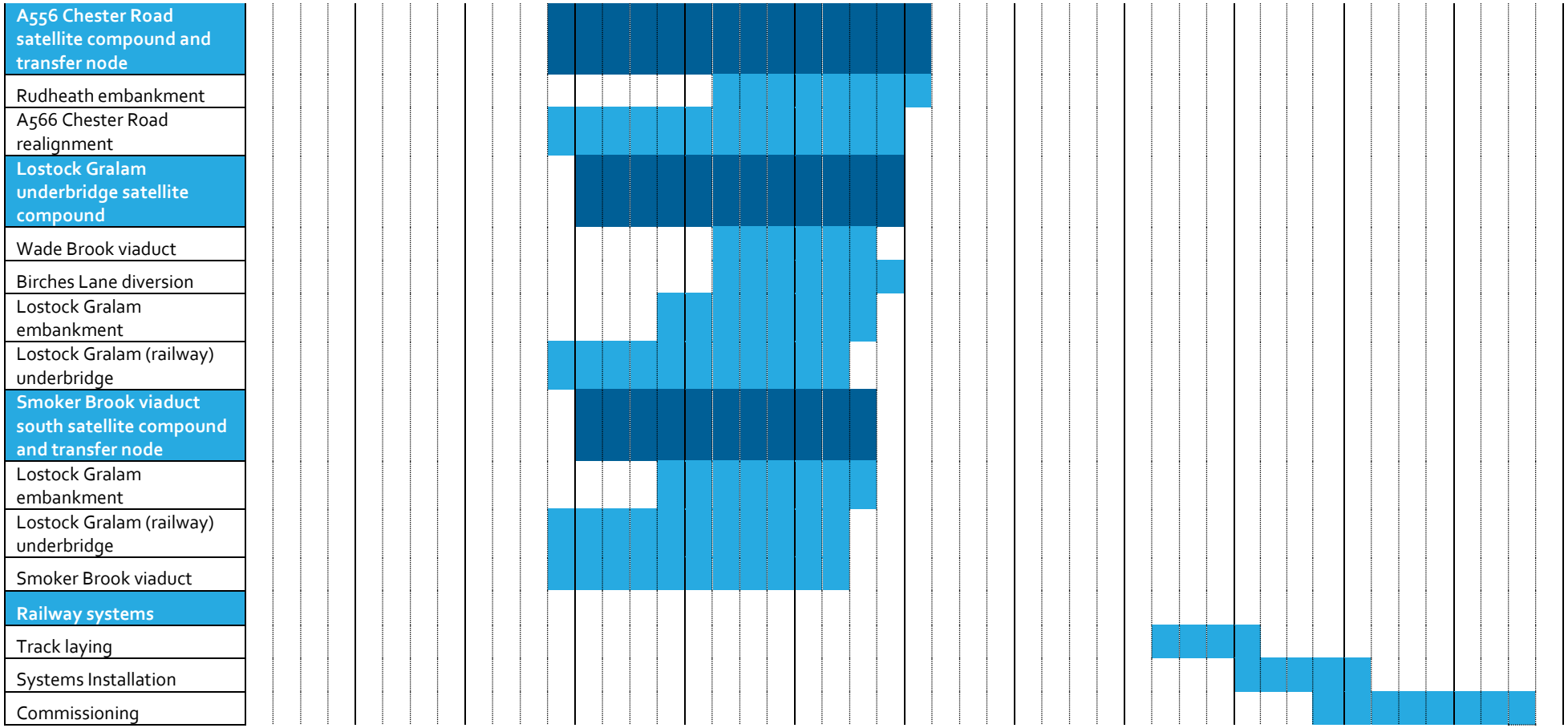
Greenheyes accommodation access

River Dane viaduct satellite compound




Bank Farm accommodation access realignment
River Dane viaduct
Bostock Road auto-transformer station satellite compound
Bostock Road auto-transformer station construction (foundation and buildings)
Bostock Road auto-transformer station instillation (railway systems)
Puddlinglake Brook viaduct satellite compound
River Dane viaduct
Dane Valley embankment
Whatcroft accommodation overbridge and realignment
Puddinglake Brook viaduct
Whatcroft embankment
Whatcroft (railway) underbridge
Trent and Mersey Canal underbridge satellite compound
Puddinglake Brook viaduct
Whatcroft embankment
Whatcroft (railway) underbridge
Trent and Mersey Canal underbridge
Davenham Road underbridge satellite compound and transfer node


Whatcroft embankment
Davenham Road underbridge
Billinge Green embankment
Marshall's Gorse embankment
Gad Brook viaduct
Gad Brook viaduct satellite compound
Gad Brook viaduct
A530 King Street underbridge
Crowder's Lane express feeder auto-transformer station satellite compound
Crowder's Lane express feeder auto transformer station construction (foundation and buildings)
Crowder's Lane express feeder auto transformer station installation (railway systems)
Rudheath embankment satellite compound and transfer node
Rudheath embankment
A530 King Street underbridge
B5082 Penny's Lane underbridge and realignment
A556 Chester Road realignment
Rudheath Footpath 3 diversion
A556 Chester Road transfer node
Rudheath embankment


A556 Chester Road satellite compound and transfer node
Rudheath embankment
A566 Chester Road realignment
Lostock Gralam underbridge satellite compound
Wade Brook viaduct
Birches Lane diversion
Lostock Gralam embankment
Lostock Gralam (railway) underbridge
Smoker Brook viaduct south satellite compound and transfer node
Lostock Gralam embankment
Lostock Gralam (railway) underbridge
Smoker Brook viaduct
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 Wimboldsley to Lostock Gralam area. Volume 1, Section 4 describes the envisaged operational characteristics of the Proposed Scheme as a whole, including Phase One, Phase 2a and Phase 2b.

HS2 services

2.4.2 It is anticipated that there would be up to nine trains per hour each way passing through the Wimboldsley to Lostock Gralam area. Services are expected to operate between 05:00 and midnight from Monday to Saturday and 08:00 and midnight on Sunday.

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

Maintenance

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

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

2.4.6 Provision for railway maintenance vehicles along the western leg of the route of the Proposed Scheme would be made at the Crewe North RSD.

2.4.7 All of the HS2 train fleet on the western leg would have the following servicing and maintenance requirements which would be carried out at Crewe North RSD:

- overnight internal cleaning;
- external washing;
- emptying and replenishing of train toilets;
- periodic heavy cleaning, approximately once a month;
- light maintenance (inspections, minor component changes etc.);
- heavy maintenance (major component change, overhauls, etc.); and
- periodic wheel turning to maintain the correct safe wheel profile.

2.4.8 Accommodation blocks would be provided for maintenance staff, cleaning staff and train crew, who would also be based at the Crewe North RSD.

2.4.9 Crewe North RSD would require different user groups to be on site at various times of the day, with the site operational 24 hours a day, seven days a week. In addition to site operatives, there would also be office-based staff supporting site and network

operations. Welfare areas and parking would be required at all hours, as shifts would start and end throughout the day and night.

Operational waste and material resources

2.4.10 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.

2.4.11 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

2.4.12 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.

2.4.13 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

Cheshire salt plain lowering of alignment (south)

2.5.1 As part of the design development process since the announcement of the preferred route in July 2017, consideration has been given to a 7.2km section of route where it would pass on embankments (Coppenhall embankment, Minshull Vernon embankment, Walley's Green embankment and Clive Green embankment) from Burnt Covert near Minshull Vernon, north of Crewe through to Wimboldsley. This section of the route would be on embankment and the opportunity to reduce the height was considered to reduce the volume of earthworks, associated construction traffic and likely environmental impacts. Reducing the embankment heights would also provide an opportunity to realign the A530 Nantwich Road closer to its current alignment.

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

- Baseline option: route would pass on embankment (Coppenhall embankment, Minshull Vernon embankment, Walley's Green embankment and Clive Green embankment), which would be between 3m and 8m in height. The A530 Nantwich Road would be realigned 1.2km south of its current alignment and Clive Green Lane would be realigned 4m south of its current alignment; and
- Option A: route would pass on embankment (Coppenhall embankment, Minshull Vernon embankment, Walley's Green embankment and Clive Green embankment), which would be between 1m and 7m in height. The A530 Nantwich Road would be realigned 50m south of its current alignment

reducing the length of the realignment by 1.5km and Clive Green Lane would be realigned 40m north of its current alignment.

2.5.3 Table 4 provides a summary of the outcomes of the preliminary appraisal of the alternative option described above.

Table 4: Consideration of local alternatives for route of the Proposed Scheme through Cheshire salt plain (south)

Option	Outcome of analysis	Further action / considerations
Baseline option	• Greater overall landscape and visual impacts on receptors north of Coppenhall Moss, Wimboldsley and along the Shropshire Union Canal (from greater embankment height), and on receptors around Minshull Vernon (from greater embankment height and presence of A530 Nantwich Road realignment) compared with the Proposed Scheme. • Overall greater impacts on the setting of historic environment receptors compared with the Proposed Scheme due to higher embankments. Greater impacts on setting of Grade II listed Park House Farm and Minshull Vernon Moated House Scheduled Monument due to higher embankments and presence of the A530 Nantwich Road realignment. Less impact on Grade II listed Park Farm due to Clive Green Lane realignment being further to the south than the Proposed Scheme. • Potential for greater impacts overall compared to the Proposed Scheme due to direct impacts on ponds and potential great crested newt habitat during construction and due to the larger footprint of the embankments and greater length of A530 Nantwich Road realignment. • Longer duration of impacts from construction traffic compared to the Proposed Scheme, such as noise and air quality impacts for receptors close to proposed construction routes due to the greater material volumes required for larger embankments. • Less road traffic-related air and noise impacts during operation for receptors fronting onto the A530 Nantwich Road at Walley's Green due to the realignment of the A530 compared with the Proposed Scheme as the realigned A530 would be up to 700m further east from these receptors than at present. However, those receptors closer to the realigned A530 Nantwich Road (Parkfield and Park Hall Farm) would experience greater traffic-related impacts during operation compared with the Proposed Scheme. • Greater traffic-related noise and air quality impacts during operation compared to the Proposed Scheme for residential receptors at Stanthorne Park Mews and Lea Head Cottages as the realignment of Clive Green Lane would be closer by up to 70m. • The realignment of the A530 Nantwich Road would also result in greater loss and severance of agricultural land (due to the greater length of the alignment), community severance for those living Walley's Green (due to increased distance to travel to facilities to the east of the alignment), socio-economic impacts on the Verdin Arms public house from potential reduction in business and longer journey times for road users using the A530 during operation compared with the baseline option.	This option will not be subject to further consideration.

Option	Outcome of analysis	Further action / considerations
	• Higher costs due to substantially more imported fill and construction materials to construct higher embankments compared to the Proposed Scheme. Longer construction programme compared to the Proposed Scheme. • This option would present a more complex construction process compared to the Proposed Scheme due to the greater height of bridges and highway embankments required to cross the A530 Nantwich Road and Clive Green Lane.	
Option A (the Proposed Scheme)	• Lower landscape and visual impacts overall compared to the baseline option due to lower embankment heights and because the realigned A530 Nantwich Road would be further from receptors in and around Minshull Vernon and in much closer proximity to the current alignment. There may be slighter greater impacts from the realignment of Clive Green Lane compared with the baseline option due to loss of screening and the road realignment being in closer proximity to Park Farm. • Overall less impact on the setting of the historic environment receptors due to the reduced embankment heights compared with the baseline. Less impact on the setting of historic environment receptors (Grade II listed Park House Farm and Minshull Vernon Moated House Scheduled Monument) due to lower embankment heights and the realignment of the A530 Nantwich Road being located much further north compared to the baseline option. Greater impacts on the setting of Grade II listed Newfield Hall and Summerhouse due to the increased height and change in location of the A530 Nantwich Road realignment compared with the baseline option. Slightly greater impacts on the setting of Grade II listed Park Farm due to the realignment of Clive Green Lane moving further north compared with the baseline option. • Potential for slightly less impact on ecology during construction of the embankments when compared to the baseline option due to the smaller embankment footprint and shorter realignment of the A530 Nantwich Road. However, there would be greater impacts on ecology from the realignment of Clive Green Lane as this would result in the loss of two areas of woodland compared with the baseline option. • Shorter duration of impacts from construction traffic such as noise and air quality impacts for receptors close to proposed construction routes compared to the Proposed Scheme due to the smaller material volumes required for reduced embankments compared with the baseline option. • Greater traffic-related operational impacts compared to the baseline option on receptors close to the A530 Nantwich Road in Walley's Green. However, traffic-related impacts on Parkfield and Park Hall Farm would not occur during operation. • Less traffic-related noise and air quality operational impacts on Stanthorne Park Mews and Leahead Cottages due to increased distance to the realigned Clive Green Lane under the Proposed Scheme when compared with the baseline option. However, the realigned Clive Green Lane would be closer to Park House Farm with potentially greater impacts on this receptor.	This is the selected option taken forward into the Proposed Scheme.

Option	Outcome of analysis	Further action / considerations
	• The realignment of the A530 Nantwich Road under the Proposed Scheme would result in less loss and severance of agricultural land due to the much shorter alignment, less community severance, fewer socio-economic impacts and shorter journey times for car users during operation compared to the baseline option. • The smaller volume of construction materials required for the Proposed Scheme would result in lower costs and a shorter construction programme compared to baseline option. • This option would present a less complex construction process compared to the baseline option due to lower bridges and associated highway approach embankments.	

2.5.4 Option A was taken forward into the Proposed Scheme. Compared with the baseline option, Option A would reduce alignment height by between 2m and 5m and would likely reduce the level of adverse impacts on landscape and visual receptors, and on the historic environment. However, for Option A, the realigned A530 Nantwich Road would be closer to, and have greater traffic related impacts on, receptors around Walley's Green. Option A would be less complex to construct and would cost less than the baseline option due to the smaller volumes of construction material required and less complex highways realignments. As a result, the duration of construction impacts, particularly traffic-related impacts, for Option A, would also be shorter than the baseline option.

Crewe north rolling stock depot

2.5.5 As part of the design development process since July 2017, consideration has been given to the layout of the Crewe north RSD and rail connections between the depot, the HS2 main line and the WCML.

2.5.6 The Proposed Scheme would include a RSD, which would be 60ha in area, and occupy land between the existing WCML and the route of the HS2 main line in the south of the Wimboldsley to Lostock Gralam area, 625m north-east of Walley's Green. The RSD would function as an operational and maintenance hub for the rolling stock that would be deployed to operate on the western leg of the Proposed Scheme. The RSD would serve as an operational and maintenance hub for the Proposed Scheme's passenger rolling stock, with provision for some stabling of infrastructure maintenance trains. Activities undertaken at the RSD would include train servicing (interior and exterior cleaning, refilling water tanks and emptying of controlled emission toilets) and light and heavy maintenance. The RSD would be operational 24 hours a day, seven days a week.

2.5.7 As part of the development of the design, further work is being carried out to consider the RSD layout and the connections to the HS2 main line to be included in the Proposed Scheme and the outcome of these studies will be reported in the formal ES.

Crewe north rolling stock depot connection

2.5.8 In this area the route of the Proposed Scheme would include a 6km long connection to the depot at Crewe north from the HS2 main line between the crossing of the Shropshire Union Canal and the Marshall's Gorse area near Rudheath, on the south-eastern edge of Northwich.

2.5.9 As part of the design development process, consideration of the potential impacts of the height of the embankments (Clive Green embankment, Stanthorne embankment, Dane Valley embankment, Whatcroft embankment, Billinge Green embankment and Marshall's Gorse embankment) along this section on construction material volumes and to environmental and traffic impacts on local receptors. As a result, changes have been incorporated into the Proposed Scheme, which would include increasing the height of the HS2 main line by up to 5m to allow the reception tracks, which diverge from, and connect to, the HS2 main line into and out of the Crewe north RSD to pass beneath, rather than over the HS2 main line. Elsewhere in this section of route, the height of embankments has been reduced by up to 5m. The changes in height would also reduce the length of the realignment of the A533 Bostock Road and the A54 Middlewich Road. Changes to the layout of the Crewe north RSD could result in the HS2 main line vertical alignment being altered in this area.

2.5.10 Further studies will be carried out to consider the vertical alignment along this section should there be changes to Crewe north RSD layout. Any changes would be included in the Proposed Scheme and the outcome of these studies would be reported in the formal ES.

Lowering alignment between Lostock Green and Lostock Gralam

2.5.11 As part of the design development process since the announcement of the preferred route in July 2017, further consideration has been given to a 5km section of the route at the crossing of the A530 King Street south-east of Rudheath on the eastern outskirts of Northwich, to the north of Smoker Brook and Leonard Wood. The opportunity to reduce the height of the embankments (Rudheath embankment, Lostock Gralam embankment and Pickmere embankment) was considered in order to reduce the volume of earthworks, therefore reducing the associated construction traffic and other potential environmental impacts. In addition, the height of the viaducts in this section would also reduce as a consequence.

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

- Baseline option: the route would pass on sections of embankment (Rudheath embankment up to 17m in height, Lostock Gralam embankment up to 17m in height and Pickmere embankment up to 12m in height) and viaducts (Wade Brook viaduct up to 21m in height and Smokers Brook viaduct up to 24m in height). The A556 would be realigned to the west of the HS2 main line, on a separate embankment 1m high; and
- Option A: the route would pass on embankments (Rudheath embankment up to 11m in height, Lostock Gralam embankment up to 14m in height and

Pickmere embankment up to 10m in height), and viaducts (Wade Brook viaduct up to 18m in height and Smokers Brook viaduct up to 23m in height). The A556 would be realigned 70m to the west of the HS2 main line, on a separate embankment 4m high.

2.5.13 Table 5 provides a summary of the outcomes of the preliminary appraisal of the alternative option described above.

Table 5: Consideration of local alternatives for route of the Proposed Scheme between Lostock Green and Lostock Gralam

Option	**Outcome of analysis**	**Further action / considerations**
Baseline option	• Greater severance of agricultural land compared to the Proposed Scheme due to the realignment of the A530 King Street. • Greater potential impact on unknown buried archaeological remains due to the larger area of land required compared to the Proposed Scheme. • Greater impacts on the setting of Grade II listed Park Farmhouse, and Shippon and Barn at Park Farmhouse in Lostock Green, as well as non-designated assets (Robin Hood Cottage, 43 Birches Lane, Poplar Grove, Grove Cottage in Lostock Green and Melvin Holme south of Lostock Green) due to the increased height of the Rudheath embankment compared to the Proposed Scheme. • Greater impacts on the landscape character and setting on Lostock Green as well as visual impacts compared to the Proposed Scheme due to the higher vertical alignment being more prominent and harder to screen through landscape planting. • Greater geotechnical risks associated with the proximity to the Lostock Lime Beds to the west compared to the Proposed Scheme. • Greater construction impacts (noise, dust, traffic) on local communities along site haul routes compared to the Proposed Scheme due to the increased volume of construction vehicle movements required to import embankment fill material. • Greater cost and construction duration compared to the Proposed Scheme.	This option will not be subject to further consideration.
Option A (the Proposed Scheme)	• Less severance of agricultural land compared to the baseline option due to the more southerly realignment of A530 King Street. • Less impact on unknown archaeological remains due to the smaller earthworks footprint when compared to the baseline option. • Lower impacts on the setting of Grade II listed Park Farmhouse, and Shippon and Barn at Park Farmhouse in Lostock Green, as well as non-designated assets (Robin Hood Cottage, 43 Birches Lane, Poplar Grove, Grove Cottage in Lostock Green and Melvin Holme south of Lostock Green) due to the lower height of the Rudheath embankment). • Lower landscape character and setting impacts on Lostock Green as well as visual impacts due to the vertical alignment being lower and easier to screen through landscape planting in some places.	This is the selected option taken forward into the Proposed Scheme.

Option	Outcome of analysis	Further action / considerations
	• Fewer geotechnical risks associated with the proximity to the Lostock Lime Beds as the reduction in embankment height and associated reduction in footprint would increase clearances between the Proposed Scheme and the Lime Beds. • Lower construction impacts (noise, dust, traffic) on local communities along construction haul routes due to the reduced volume of heavy good vehicle movements required to import embankment fill material. • Reduced construction cost and construction duration.	

2.5.14 Option A was taken forward into the Proposed Scheme. Compared with the baseline option, Option A would be lower by an average height of 9m with a maximum reduction of 12m at the approximate location of where the Proposed Scheme would first cross the existing A556 Chester Road alignment, close to Cookes Lane. The lower heights of the viaducts and embankments for Option A would have lower likely adverse landscape and visual impacts for local residential receptors at Lostock Green and those to the west of the existing A556 Chester Road. Option A would also have olower adverse impacts on the setting of Grade II listed Park Farmhouse, and Shippon and Barn at Park Farmhouse in Lostock Green as well as non-designated assets (Robin Hood Cottage, 43 Birches Lane, Poplar Grove and Grove Cottage in Lostock Green, and Melvin Holme south of Lostock Green). Option A would also have less potential for impacts on unknown archaeology due a smaller footprint and lower geotechnical risks associated with the proximity of Lostock Lime Beds. A lower volume of construction materials required would result in less construction traffic, and therefore, reduce associated likely noise and air quality impacts. Overall, Option A would likely have lower adverse environmental impacts during construction, would be less complex to construct, cost less and take less time to build.

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 6.

Table 6: Mechanisms and timeline of stakeholder engagement since route announcement

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

Draft EIA SMR consultation

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

Consultation on the working draft ES and ongoing engagement

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

3.2.4 These consultations and wider feedback from ongoing stakeholder engagement will continue to be considered as part of the ongoing design of the Proposed Scheme and the assessment and identification of mitigation opportunities for the Wimboldsley to Lostock Gralam 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 Wimboldsley to Lostock Gralam area since the initial preferred route announcement in November 2016, and which are informing the Proposed Scheme are:

- temporary and permanent land requirements during construction;
- realignment of the A556 Chester Road near Lostock Green;
- the impact of the crossing of both the Trent and Mersey and Shropshire Union Canals and recreational users of them;
- geological complexities relating to the crossing of brinefield and areas associated with gas storage;
- the impact on Leonard's and Smoker Wood and Winnington Wood, both Ancient Woodlands;
- provision of access to severed agricultural land, including access under viaducts and the provision of farm access tracks;
- retention and/or realignment of public rights of way (PRoW), including the Dane Valley Way;
- potential impact of construction traffic on local highways and traffic flows;

- potential impact of construction traffic on the economic viability of local businesses, notably at Gadbrook Park and Morrisons;
- impact of the Proposed Scheme on local properties and property prices; and
- connectivity and revitalisation of local rail services.

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 Wimboldsley to Lostock Gralam area include a range of local interest groups, local facility and service providers, places of worship, schools and educational establishments, cultural, leisure and sports stakeholders.

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

3.4.3 Engagement has been, and will continue to be, undertaken with schools and educational establishments, in particular, with those within proximity to the Proposed Scheme and those with specialist interests or catering to the needs of vulnerable people within the community. This has informed the assessment of community and health in the working draft ES, whilst also informing the separate equality impact assessment (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 7 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 7: Engagement to date with community stakeholders

Stakeholder	Area of focus
Wimboldsley Primary School	Engagement over proximity of the Proposed Scheme to the school and concerns regarding noise and air quality impacts, increased traffic and visual intrusion.
Mid Cheshire Against HS2 (MCAHS2)	Engagement over issues around constructability on the grounds of perceived ground instability.
DIAL West Cheshire	Engagement to discuss a 'pan-disability organisation providing support to disabled people across West Cheshire', primarily interested in disabled access to rail services.
Implementation Advisory Group20	Meeting to discuss location of the proposed Crewe rolling stock depot (RSD); the impact of bridges over the canals; local geology concerns; traffic congestion; engagement with HS2; impact on the community; scheme viability; community cohesion; mitigation; HS2 Phase 2a and Phase 2b interface, and support for local railway infrastructure.
Petty Pool College	Engagement over concerns regarding student sensitivity to changes in routine, so effects during construction in particular may cause problems e.g. if access routes are changed.
Verdin Arms public house	Meeting to discuss construction routes and noise; potential loss of passing trade if road severed.
Mid Cheshire Rail Partnership	Meeting to discuss connectivity with local rail services.

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 Wimboldsley to Lostock Gralam 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 8.

[20] Cheshire West and Chester (CWC) Parish Councils, Ward Councillors, Police and Fire Service reps, MPs, Gadbrook Business Park, Churches Together, National Farmers Union, CWC Officers and Wimboldsley Primary School

Table 8: Engagement to date with local authorities and parish councils

Stakeholder	Area of focus
Antoinette Sandbach, MP for Eddisbury	General introductory and project update including engagement over route selection and buildability; impacts upon residents, farmers and the local community.
Cheshire West and Chester Borough Council (including highways)	General introductory and project update meeting, including buildability (including construction logistics) and interruption of mineral supplies; impact on waterways; noise impacts; congestion due to A556 Chester Road disruption; integration of works with local highways and rail aspirations; need for infrastructure improvements at Gadbrook Park; impact on listed buildings; and woodland and habitat replacement.
	Meetings with technical leads to collate data and discuss key assessment topics including: air quality; geotechnics; highways; land quality; landscape and visual impact; sound, noise and vibration; traffic and transport and waste.
Stanthorne and Wimboldsley Parish Council	General introductory and project update meeting, including mitigation proposals, particularly with regard to the proposed Crewe RSD and elevation of the line in Lostock area; effects on Gadbrook Business Park and realignment of A566 Chester Road.
Winsford Town Council	General introductory and project update meeting, including engagement over impact on A556 Chester Road, A54 Middlewich Road and A533 Bostock Road; impact on Winsford Industrial Park; viability of businesses at Gadbrook Park.
Davenham Parish Council	General introductory and project update meeting, including buildability; impact on Gadbrook Business Park, new housing and property prices; traffic disruption during construction; route selection; congestion on A556 Chester Road and A530 Nantwich Road; perceived lack of mitigation for Lostock Green, sifting process, geotechnical issues; mitigation.
Rudheath Parish Council	General introductory and project update meeting, including buildability; impact on Gadbrook Business Park, new housing and property prices; traffic disruption during construction.
Lostock Gralam Parish Council	General introductory and project update meeting, including buildability; A556 Chester Road disruption; integration of works with proposed new highways.
Northwich Town Council	General introductory and project update meeting, including buildability; impact on Gadbrook Business Park, new housing and property prices; traffic disruption during construction; route selection; congestion on A556 Chester Road and A530 Nantwich Road; perceived lack of mitigation for Lostock Green, sifting process, geotechnical issues; mitigation.
Moston Parish Council	General introductory and project update meeting, including construction routes, 'eastern bypass' extension, and proposed Crewe RSD.
Warmingham Parish Council	General introductory and project update meeting, including construction routes, 'eastern bypass' extension; and proposed Crewe RSD.
Lostock Green Parish Council	General introductory and project update meeting, including route selection; congestion on A556 Chester Road and A530 Nantwich Road; perceived lack of mitigation for Lostock Green, sifting process, geotechnical issues and mitigation.

3.4.9 Councils will continue to be engaged as part of the design development of the Proposed Scheme with ongoing dialogue on key topics such as highways, PRoW and the draft Code of Construction Practice (CoCP)[21].

[21] 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;
- Cheshire Brine Subsidence Compensation Board;
- 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; and
- Cheshire Wildlife Trust.

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

3.4.12 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 such as: National Grid Transmission (Gas), United Utilities, Cadent Gas, SP Energy Networks, Inovyn (Ineos), CLH Pipeline System Ltd, Manchester Jet Line, SABIC, BT Openreach, Vodafone Limited (below ground assets), Vodafone and O2 Mobile Masts, EE and 3 Mobile Masts, Sky Telecommunications Services Ltd, and Level 3 to establish what infrastructure exists in the Wimboldsley to Lostock Gralam area and how it may need to be modified as part of the Proposed Scheme.

Directly affected individuals, major asset owners and businesses

3.4.14 This group includes those with property potentially affected by the Proposed Scheme, including individuals, major asset owners and businesses within the Wimboldsley to Lostock Gralam area.

3.4.15 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.

3.4.16 Information gathered from 18 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.

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

Property consultation

3.4.18 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 Wimboldsley to Lostock Gralam area, an information event was held at The Winsford Academy on 9 June 2018. Facilities were available at the event for affected individuals, major asset owners and businesses to have private meetings with HS2 staff.

3.4.19 Engagement has been undertaken with Morrisons Distribution Depot, Gadbrook Business Park, Ripple Developments, TATA Chemicals Europe Ltd, King Street Energy, British Salt, EDF Energy Ltd, Inovyn, and Compass Minerals.

3.4.20 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 Wimboldsley to Lostock Gralam area. Consideration is given to the extent and quality of the soil and land resources underpinning the primary land use activities of farming and forestry, and the physical and operational characteristics of enterprises engaged in these activities. Consideration is also given to diversification associated with the primary land uses, and to related land-based enterprises, notably equestrian activities.

4.1.2 Engagement with farmers and landowners has commenced and is ongoing. The purpose of the engagement has been to obtain baseline information on the scale and nature of the farm and forestry operations and related farm-based uses, and to provide farmers and landowners with the opportunity to raise issues and discuss mitigation in relation to the Proposed Scheme. Engagement undertaken with farmers and landowners will be documented in a farm pack for each farm holding within a Phase 2b Farmers and Growers Guide[22].

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 can be found in the Volume 2: MA02 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)[23].

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)[24] 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

[22] 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
[23] Supporting document: HS2 Phase 2b Environmental Impact Assessment Scope and Methodology Report
[24] 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 Wimboldsley to Lostock Gralam 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 Wimboldsley to Lostock Gralam area is provided in Section 10, Land quality and Section 15, Water resources and flood risk.

4.3.3 Most of the study area is covered by glacial till (Devensian). These deposits comprise poorly sorted sandy, silty clay. Where glacial till is not mapped, the following superficial deposits are identified.

4.3.4 Alluvium, variably comprising organic rich silty clay, silt, sand and gravel, occurs along the base of the valleys of the River Weaver, River Wheelock, River Dane, Gad Brook, Wade Brook, Peover Eye and Smoker Brook.

4.3.5 Areas of glaciofluvial sheet deposits, comprising sand and gravel, are present in isolated pockets around the River Weaver, to the west and south-west of Stanthorne, to the west of the River Dane, in Whatcroft, either side of Wade Brook, and around Peover Eye and Smoker Brook.

4.3.6 River terrace deposits comprising sand and gravel are present in isolated locations along the valley of the River Dane.

4.3.7 Bedrock belonging to the Mercia Mudstone Group underlies this study area. It is typically described as mudstone and siltstone with some halite-bearing units and sandstone. The Mercia Mudstone Group is subdivided into many formations and members, of which, the following are present in the study area:

- the Sidmouth Mudstone Formation is located from the southern end of the study area to the north-west of Wimboldsley, and from the south-east of Rudheath to the east of Lostock Gralam; and
- the Northwich Halite Member is present from the north-west of Wimboldsley to the south-east of Rudheath, and from the east of Lostock Gralam to the northern extent of the study area.

Topography and drainage

4.3.8 The Wimboldsley to Lostock Gralam area is located on the Cheshire Plain, characterised by flat to undulating countryside, incised by river courses and streams. At the southern part of the study area, near Walley's Green, the land ranges in elevation from 45m to 50m above Ordnance Datum (AOD), over gentle to moderate slopes with gradients of less than seven degrees.

4.3.9 Where the route of the Proposed Scheme would cross the A533 Bostock Road to the east of Bostock near Bull's Wood, there is a steep, north-east facing slope down to the floodplain and course of the River Dane, and to the Trent and Mersey Canal. The top of the slope descends from an elevation of 50m AOD to 25m AOD in the floodplain. Here, the gradient is between seven and 11 degrees.

4.3.10 To the north of the River Dane, the land rises to 34m AOD before descending to lower ground in the floodplain of Puddinglake Brook to the north of Whatcroft. The brook

flows in an east to west course and merges with the River Dane at Shipbrookhill. From Whatcroft, the land rises and falls between 27m and 30m AOD over gentle to moderate slopes with gradients less than 7 degrees.

4.3.11 Around the eastern edge of Northwich and Rudheath, the A556 Chester Road runs over undulating land at elevations between 29m to 33m AOD. The slopes are gentle to moderate, with gradients less than seven degrees. At Lostock Green, at 38m AOD, the land dips towards the floodplain of the Wade Brook, at approximately 29m AOD. The land rises to 40m AOD to the east of Lostock Gralam, before descending to approximately 30m AOD at the confluence of Peover Eye, Smoker Brook and Wincham Brook at the far northern end of the area, at Leonard's Wood and Smoker Wood.

4.3.12 Land at risk of flooding by rivers occurs in this study area. There are substantial areas of floodplain in Flood Zone 2, in which there is between a 1 in 100 and 1 in 1,000 annual probability of river flooding, and Flood Zone 3, in which there is a 1 in 100 or greater annual probability of river flooding. The flood zones are associated with the River Dane, Gad Brook, Puddinglake Brook, Wade Brook, Peover Eye and Smoker Brook. Further details are provided in Section 15, Water resources and flood risk.

Description and distribution of soil types

4.3.13 The broad characteristics of the soils likely to be present in the study area are described by the Soil Survey of England and Wales[25] and their general distribution is shown on the National Soil Map[26]. Soils possessing similar characteristics are amalgamated into associations.

4.3.14 There are four known groups of soil associations in this study area. The presence of each group has been confirmed in part of the study area by soil survey data. Soil grouped in the Crewe and Salop associations are widespread in this study area.

4.3.15 Clayey and fine loamy soils in the Crewe association extend from the southern boundary of the study area at Walley's Green northwards to Clive Green, near Winsford. These soils, which are developed in reddish, stoneless, glacial deposits, i.e. till and glaciofluvial sand and gravel deposits, overlying the Sidmouth Mudstone, are seasonally waterlogged for long periods during the winter (Wetness Class (WC) IV).

4.3.16 The soils from Clive Green to the A533 Bostock Road near Bostock are slowly permeable and seasonally waterlogged clay loams over clay soils of the Salop association (mainly WC IV, with WCIII where underdrainage is possible). These slowly permeable soils are developed in reddish glacial deposits, i.e. till and glaciofluvial sand and gravel deposits, mainly overlying halite stone and mudstone in the Northwich Halite Member.

[25] 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
[26] Cranfield University (2001), *The National Soil Map of England and Wales 1:250,000 scale.* Cranfield University: National Soil Resources Institute

4.3.17 There is a localised band of deep sandy loam and loamy sand soils of the Newport 1 association developed in glacial river sand and gravel deposits between the A533 Bostock Road and the River Dane. The soils are generally well drained (WC I).

4.3.18 Soils grouped in the Teme association are developed in alluvium (clay, silt, sand and gravel) in the floodplain of the River Dane. The association includes deep, stoneless, permeable, silty soils in the Teme series (WC I to WC II). The associated Conway series is waterlogged for long periods during the winter (WC IV to V). The soils in the Teme association are at risk of flooding, depending on their location and flood control measures in place.

Soil and land use interactions

Agricultural land quality

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

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

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

4.3.22 The local agro-climatic data have been interpolated from the Meteorological Office's standard 5km grid point dataset[28] for three points within the study area. The data show climate in this area to be cool and moist. The number of Field Capacity Days[29] (FCDs), when the moisture deficit[30] is zero, ranges from 182 to 185 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 moderately small.

4.3.23 The quality of agricultural land in this study area is not limited by gradient or microrelief[31] and ground surface gradients are generally less than seven degrees. However, gradient has the potential to limit agricultural land quality on a strongly sloping, north-east facing valley side of the River Dane. Here, the gradient is between seven and eleven degrees, which limits the quality of agricultural land to Subgrade 3b.

[27] A measure of the likely moisture stress in a crop arising from the crop's requirement for water exceeding the available water capacity in the soil
[28] Meteorological Office (1989), *Gridpoint Meteorological data for Agricultural Land Classification of England and Wales and other Climatological Investigations*
[29] Field Capacity Days (FCD) is a meteorological parameter which estimates the duration of the period when the soil moisture deficit is zero. Soils usually return to field capacity (zero deficit) during the autumn or early winter and the field capacity period, measured in days, ends in the spring when evapotranspiration exceeds rainfall and a moisture deficit begins to accumulate.
[30] The moisture deficit is a crop-related meteorological variable which represents the balance between rainfall and potential evapotranspiration calculated over a critical portion of the growing season
[31] Microrelief is the complex change of slope angle and direction over short distances, or the presence of boulders or rock outcrops, which can severely limit the use of agricultural machinery

4.3.24 Flood risk is a potential limitation to agricultural land quality in the floodplains of the River Dane, Gad Brook, Puddinglake Brook, Wade Brook, Peover Eye and Smoker Brook. Land in Flood Zone 3 is at risk of annual flooding, which will be reflected in a moderate to severe limitation to agricultural land quality and a Subgrade 3b/Grade 4 classification. Further details are provided in Section 15, Water resources and flood risk.

4.3.25 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 moisture retention of different soil textures and thicknesses of each soil horizon, soil structures, stone contents and moisture deficits.

4.3.26 Of the main soil types in this area, the clayey and fine clayey soils in the Crewe association are slowly permeable and seasonally waterlogged for long periods during the winter (WC IV). In a climate area with between 182 to 185 field capacity days, soil profiles with clay and 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.

4.3.27 The clay loam over clay soils in the Salop association is mainly slowly permeable and seasonally waterlogged for long periods during the winter (WC IV). In a climate area with between 182 to 185 field capacity days, 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. Where under-drained, Salop soil profiles in WCIII 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.

4.3.28 As crop moisture deficits are moderately-small, the soil droughtiness limitation for the well-drained (WCI), sandy loam soils in the Newport 1 association are mostly only slight, and this limits the quality of agricultural land to Grade 2/Subgrade 3a, in the absence of any other limiting factor.

4.3.29 Being developed on alluvium in floodplains, the permeable and well drained or only occasionally waterlogged (WCI or WCII), silt clay loam over clay soils in the Teme association are at risk of flooding. The quality of agricultural land is limited by flood risk in the winter to Subgrade 3b or Grade 4, depending on the duration and frequency of flooding.

4.3.30 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, and with reference to Department for the Environment, Food and Rural Affairs (Defra) predictive mapping[32]. This shows that there is a medium likelihood of encountering BMV agricultural land in the locality, which makes such land a resource of moderate sensitivity in this study area.

4.3.31 The preceding assessment of agricultural land quality attributed to the soil associations is based on interpretation of publicly available data and will be confirmed

[32] Defra (2005), *Likelihood of Best and Most Versatile Agricultural Land*

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

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

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

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

4.3.34 The low-lying land in the floodplains of the River Dane, Gad Brook, Puddinglake Brook, Wade Brook, Peover Eye and Smoker Brook is prone to occasional flooding, as set out in Section 15, Water resources and flood risk. The soils in this area function as water stores for flood attenuation, as well as providing ecological habitat.

Land use

Land use description

4.3.35 The Cheshire Plain, in which the Wimboldsley to Lostock Gralam area is located, is a dairy farming region, with arable land more commonly associated with pockets of permeable and well drained sandy soils. The land is predominantly under grassland and is divided into small, irregularly shaped fields separated by hedgerows, oak trees and many small woods, often planted as game cover.

4.3.36 The larger stands of woodland in the study area comprise Stove Room Wood to the north-west of Wimboldsley, Bull's Wood to the east of Bostock, Marshall's Gorse near Orchard Marina at Higher Shurlach, Long Wood to the east of Lostock Gralam, and Winnington Wood, Peas Wood, Leonards' and Smoker Wood between Lostock Gralam and the northern boundary of the area. From south to north, the study area

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

includes ancient woodland at Rookery Wood, Wimboldsley Wood, Bull's Wood, Winnington Wood, and Leonard's and Smoker Wood. A full description of woodland in the Wimboldsley to Lostock Gralam area is set out in Section 7, Ecology and biodiversity.

4.3.37 A number of environmental designations potentially influence land use within the study area. The whole of the Wimboldsley to Lostock Gralam area is within the Mersey Forest, a designated national Community Forestry Area. The Wimboldsley to Lostock Gralam area is also located in a surface water nitrate vulnerable zone; where statutory land management measures apply that seek to reduce nitrogen losses from agricultural sources to water.

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

4.3.39 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 9.

Number, type and size of holdings

4.3.40 Table 9 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.

4.3.41 Table 9 also sets out the sensitivity of individual holdings to change. This is determined by the extent to which they have the capacity to absorb or adapt to impacts, which in turn is determined primarily by their nature and scale. In general terms, larger holdings have a greater capacity to change enterprise mix and scale, can better absorb impacts and are less sensitive. Units that rely on the use of buildings (such as intensive livestock and dairy farms, and horticultural units) are less able to accommodate change and have a higher sensitivity. Non-commercial land uses and units, such as pony paddocks associated with residential properties, have a low sensitivity.

Table 9: Summary of characteristics of holdings

Holding name	Holding type	Holding size (ha)	Diversification	Agri-environment scheme	Sensitivity to change
Wimboldsley Hall and Grange	Dairy	291	None	None	High
Lea Hall Farm	Dairy Followers	263	None	Mid-tier Stewardship	Medium
Park Farm	Dairy	58	Canal moorings, commercial lets	None	High
Yew Tree Farm including Stanthorne Hall	Dairy	154	None	None	High
Bostock House Farm	Beef cattle	26	Livery stables	None	Medium
Greenheyes Farm	Dairy	40	Events management in buildings	Mid-tier Stewardship	High
Bank Farm	Dairy heifer rearing	85	None	None	Medium
Bostock Hall Farm	Beef cattle	103	Livery stables, solar PVA production	HLS	Medium
Land at River Dane*	Livestock grazing	10	Unknown	None	Medium
Dairy Farm (Whatcroft)	Dairy	300	None	None	High
Land at Bridge Farm *	Livestock grazing	32	Unknown	None	Medium
Brook Farm	Dairy	50	Unknown	None	High
Land at Orchard Marina*	Livestock grazing	14	Canal moorings	None	Low
Higgins Lane Farm	Beef cattle	42	None	None	Medium
Land at Pear Tree Farm Cottages*	Livestock grazing and cropping	3	Unknown	None	Low
Hulse Heath Farm	Dairy	200	None	Mid-tier Stewardship	High
High House Farm	Beef cattle and arable	78	Agricultural contracting	None	Medium
Land at Penny Lane	Arable	5.4	Unknown	None	Low
Melvin Home Farm	Arable	28	Agricultural contracting	Mid-tier Stewardship	Medium

Birchall Farm	Dairy	121	None	None	High
Land at Springbank Farm*	Livestock grazing and cropping	45	Unknown	None	Medium
Land at Park Farm	Livestock grazing	35	Unknown	None	Medium
Land at Fieldhouse Farm	Livestock grazing and cropping	150	Unknown	None	Medium
Land at Linnards Lane*	Arable	20	Unknown	None	Medium
Wimboldsley Hall and Grange	Dairy	291	None	None	High
Lea Hall Farm	Dairy Followers	263	None	Mid-tier Stewardship	Medium
Park Farm	Dairy	58	Canal moorings, commercial lets	None	High
Yew Tree Farm including Stanthorne Hall	Dairy	154	None	None	High
Bostock House Farm	Beef cattle	26	Livery stables	None	Medium
Greenheyes Farm	Dairy	40	Events management in buildings	Mid-tier Stewardship	High
Bank Farm	Dairy heifer rearing	85	None	None	Medium
Bostock Hall Farm	Beef cattle	103	Livery stables, solar PVA production	HLS	Medium
Land at River Dane*	Livestock grazing	10	Unknown	None	Medium
Dairy Farm (Whatcroft)	Dairy	300	None	None	High
Land at Bridge Farm *	Livestock grazing	32	Unknown	None	Medium
Brook Farm	Dairy	50	Unknown	None	High
Land at Orchard Marina*	Livestock grazing	14	Canal moorings	None	Low
Higgins Lane Farm	Beef cattle	42	None	None	Medium
Land at Pear Tree Farm Cottages*	Livestock grazing and cropping	3	Unknown	None	Low
Hulse Heath Farm	Dairy	200	None	Mid-tier Stewardship	High

High House Farm	Beef cattle and arable	78	Agricultural contracting	None	Medium
Land at Penny Lane	Arable	5.4	Unknown	None	Low
Melvin Home Farm	Arable	28	Agricultural contracting	Mid-tier Stewardship	Medium
Birchall Farm	Dairy	121	None	None	High
Land at Springbank Farm*	Livestock grazing and cropping	45	Unknown	None	Medium
Land at Park Farm	Livestock grazing	35	Unknown	None	Medium
Land at Fieldhouse Farm	Livestock grazing and cropping	150	Unknown	None	Medium
Land at Linnards Lane*	Arable	20	Unknown	None	Medium

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

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)[35] 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. There will be special provisions for handling peat and peaty soils, where the disturbance of these soils cannot be avoided (Section 6);

[35] Supporting document: Draft Code of Construction Practice

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

4.4.3 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:

- realignment of an accommodation access track between Wimboldsley Grange to the west of the Proposed Scheme and Wimboldsley village to the east of the Proposed Scheme via the A530 Nantwich Road overbridge (see map CT-06-308a in the Volume 2: MA02 Map Book);
- permanent realignment of an accommodation access track from Lea Hall Farm to the west of the Proposed Scheme (see map CT-06-309 and CT-06-310 in the Volume 2: MA02 Map Book);
- permanent realignment of access at Greenheyes Farm (see map CT-06-311 in the Volume 2: MA02 Map Book);
- permanent realignment of an accommodation access track to Bank Farm to mitigate severance at Bank Farm (see map CT-06-311 in the Volume 2: MA02 Map Book);
- agricultural crossing provided via the Whatcroft accommodation overbridge to mitigate severance at Dairy Farm, Whatcroft (see map CT-06-312 in the Volume 2: MA02 Map Book); and

- agricultural crossing provided at Wade Brook viaduct to mitigate severance at Fieldhouse Farm (see map CT-06-315 in the Volume 2: MA02 Map Book).

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

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

Assessment of impacts and effects

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

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

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

Temporary effects during construction

Impacts on agricultural land

4.4.8 Interpretation of publicly available data from Defra shows that the Proposed Scheme is likely to require approximately 367ha of agricultural land within the Wimboldsley to

Lostock Gralam area during the construction phase. Approximately 147ha (40%) of this area are likely to be classified as BMV land (Grades 1, 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[36]. These principles would be followed throughout the construction period.

4.4.13 The clay loam and clayey, seasonally waterlogged soils in the Crewe and Salop associations 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.

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

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 10 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.

Table 10: Summary of temporary effects on holdings from construction

Holding name/ sensitivity to change	**Land potentially required**	**Potential severance impact**	**Potential scale of effect**
Wimboldsley Hall and Grange High sensitivity to change	High	Medium	Major adverse
Lea Hall Farm Medium sensitivity to change	Medium	High	Major/moderate adverse
Park Farm High sensitivity to change	High	Negligible	Major adverse
Yew Tree Farm including Stanthorne Hall High sensitivity to change	High	High	Major adverse
Bostock House Farm Medium sensitivity to change	Medium	Low	Moderate adverse
Greenheyes Farm High sensitivity to change	High	Medium	Major adverse
Bank Farm Medium sensitivity to change	High	Low	Major/moderate adverse
Bostock Hall Farm Medium sensitivity to change	Low	Low	Minor adverse
Land at River Dane Medium sensitivity to	Medium	Negligible	Moderate adverse

change			
Dairy Farm (Whatcroft) High sensitivity to change	Medium	Low	Major/moderate adverse
Land at Bridge Farm Medium sensitivity to change	Low	Negligible	Minor adverse
Brook Farm High sensitivity to change	Medium	High	Major adverse
Land at Orchard Marina Low sensitivity to change	High	High	Moderate adverse
Higgins Lane Farm Medium sensitivity to change	High	High	Major/moderate adverse
Land at Pear Tree Farm Cottages Low sensitivity to change	High	Negligible	Moderate adverse
Hulse Heath Farm High sensitivity to change	Negligible	Negligible	Minor adverse
High House Farm Medium sensitivity to change	Medium	High	Major/moderate adverse
Land at Penny Lane Low sensitivity to change	High	Negligible	Moderate adverse
Melvin Home Farm Medium sensitivity to change	High	Low	Major/moderate adverse
Birchall Farm High sensitivity to change	Negligible	Negligible	Minor adverse
Land at Springbank Farm Medium sensitivity to change	Medium	Low	Moderate adverse
Land at Park Farm Medium sensitivity to change	Low	Negligible	Minor adverse
Land at Fieldhouse Farm Medium sensitivity to change	High	Low	Major/moderate adverse
Land at Linnards Lane Medium sensitivity to change	High	Negligible	Major/moderate adverse

4.4.19 Overall, the construction of the Proposed Scheme could potentially affect 24 holdings in the Wimboldsley to Lostock Gralam area temporarily. On the basis of information currently available, 19 holdings could experience moderate, major/moderate or major adverse temporary effects from construction, which would be significant for each holding.

4.4.20 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

4.4.21 Interpretation of publicly available data from Defra shows that the Proposed Scheme would be likely to permanently require approximately 246ha of agricultural land within the Wimboldsley to Lostock Gralam area, of which approximately 98ha (40%) are likely to be classified as BMV land (Grades 1, 2 and 3a). This is a medium magnitude of impact on BMV land.

4.4.22 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 would be moderate adverse, which would be significant.

Impacts on forestry land

4.4.23 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

4.4.24 The potential permanent effects from the construction of the Proposed Scheme on individual agricultural and related interests are summarised in Table 11 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.

4.4.25 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 11: 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
Wimboldsley Hall and Grange High sensitivity to change	High	Medium	Low	Major adverse
Lea Hall Farm Medium sensitivity to change	Low	Medium	Low	Moderate adverse

Park Farm High sensitivity to change	High	Negligible	Low	Major adverse
Yew Tree Farm including Stanthorne Hall High sensitivity to change	High	High	High	Major adverse
Bostock House Farm Medium sensitivity to change	Medium	Medium	Low	Moderate adverse
Greenheyes Farm High sensitivity to change	High	Medium	High	Major adverse
Bank Farm Medium sensitivity to change	Medium	Low	Low	Moderate adverse
Bostock Hall Farm Medium sensitivity to change	Negligible	Low	Low	Minor adverse
Land at River Dane Medium sensitivity to change	Medium	Negligible	Negligible	Moderate adverse
Dairy Farm (Whatcroft) High sensitivity to change	Low	Low	Low	Moderate adverse
Land at Bridge Farm Medium sensitivity to change	Low	Negligible	Negligible	Minor adverse
Brook Farm High sensitivity to change	Medium	High	Low	Major adverse
Land at Orchard Marina Low sensitivity to change	High	High	Negligible	Moderate adverse
Higgins Lane Farm Medium sensitivity to change	Medium	High	High	Major/moderate adverse
Land at Pear Tree Farm Cottages Low sensitivity to change	High	Negligible	Negligible	Moderate adverse
Hulse Heath Farm High sensitivity to change	Negligible	Negligible	Negligible	Minor

High House Farm Medium sensitivity to change	Low	Medium	High	Major/moderate adverse
Land at Penny Lane Low sensitivity to change	High	Negligible	Negligible	Moderate adverse
Melvin Home Farm Medium sensitivity to change	Medium	Negligible	Low	Moderate adverse
Birchall Farm High sensitivity to change	Negligible	Negligible	Negligible	Minor
Land at Springbank Farm Medium sensitivity to change	Medium	Negligible	Low	Moderate adverse
Land at Park Farm Medium sensitivity to change	Low	Negligible	Low	Minor adverse
Land at Fieldhouse Farm Medium sensitivity to change	Medium	Low	Low	Moderate adverse
Land at Linnards Lane Medium sensitivity to change	High	Negligible	Low	Major/moderate adverse

4.4.26 Overall, the construction of the Proposed Scheme could potentially affect 24 holdings in the Wimboldsley to Lostock Gralam area permanently. On the basis of information currently available, 19 holdings could experience moderate, major/moderate or major adverse permanent effects from construction, which would be significant for each holding.

4.4.27 Five dairy farms are currently expected to experience major adverse permanent effects. For the majority it is the high proportion of land is required for the Proposed Scheme that is the most significant impact (Wimboldsley Hall and Grange, Park Farm, Yew Tree Farm and Greenheyes Farm); for Brook Farm it is the impact of severance.

4.4.28 Four holdings would experience major or major/moderate permanent adverse effects due to property demolition (Yew Tree Farm, Greenheyes Farm, Higgins Lane Farm and High House Farm).

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 Wimboldsley to Lostock Gralam area, current indications based on publicly available information are that the effect on BMV agricultural land would be moderate adverse temporarily during construction, which would be significant, and moderate adverse permanently from construction, which would be significant. The amount of land required by ALC grade will be assessed and reported in the formal ES.

4.4.34 Nineteen of the 24 farm holdings identified would experience moderate, major/moderate or major adverse temporary effects during construction, which would be significant for each holding. The same 19 holdings are anticipated to experience moderate, major/moderate or major adverse permanent effects of construction, which would also be significant for each holding.

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

4.5 Effects arising from operation

Avoidance and mitigation measures

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

Assessment of impacts and effects

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

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

4.5.3 Six sets of farm buildings at Park Farm, Yew Tree Farm, Greenheyes Farm, Bank Farm, Dairy Farm and Springbank Farm lie within approximately 100m of the route of the Proposed Scheme. The potential for significant effects on sensitive livestock receptors from noise will be assessed and reported in the formal ES.

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

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

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

Other mitigation measures

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

Summary of likely residual significant effects

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

Monitoring

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

4.5.9 There are no area-specific requirements identified for monitoring agriculture, forestry and soil during the operation of the Proposed Scheme in the Wimboldsley to Lostock Gralam 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 Wimboldsley to Lostock Gralam area. Oxides of nitrogen (NOx) including nitrogen dioxide (NO_2), fine particulate matter[37] (PM_{10}, $PM_{2.5}$) and dust have been considered in the assessment. Emissions of all or some of these air pollutants are likely to arise from construction activities, demolition, site preparation works and the use of site haul routes. Emissions would also arise from road traffic during construction and operation of the Proposed Scheme.

5.1.2 Engagement with Cheshire West and Chester Council (CWCC) and Cheshire East Council (CEC) 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: MA02 Map Book.

5.2 Scope, assumptions and limitations

5.2.1 The scope, assumptions and limitations for the air quality assessment are set out in Volume 1, Section 8 and the Scope and Methodology Report (SMR)[38].

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

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

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

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

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

[39] The assessment of construction dust emissions has been undertaken where sensitive receptors are located up to a distance of 350m from dust generating activities. The assessment of traffic emissions will be undertaken where sensitive receptors are located up to a distance of 200m from roads screened in for further assessment.

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

5.3 Environmental baseline

Existing baseline

Background air quality

5.3.1 The main sources of air pollution in the Wimboldsley to Lostock Gralam area are emissions from road vehicles and agricultural activities. The main roads within the area are the M6, the A533 Bostock Road, the A535 Macclesfield Road, the A49, the A54 Middlewich Road, the A556 Chester Road and the A34 Congleton Road.

5.3.2 There are 13 industrial installations (regulated by the Environment Agency) with permits for emissions to air, namely Advanced Medical Solutions Ltd alginate production, British Salt Ltd, BIP Organics Ltd, Farmers Boy Ltd, Tall Trees Farm Ltd, ECO-Option (UK) Ltd (production and processing of metals), Imerys PCC UK Ltd Lostock sodium carbonate manufacturing site, Tata Chemicals Europe Ltd Lostock sodium carbonate manufacturing site, Centec International Ltd (waste management), Thor Specialities (UK) Ltd, Tata Chemicals Winnington sodium carbonate manufacturing site and Ineos Technologies Ltd Winnington sodium carbonate manufacturing site. The contribution of all industrial processes and other emission sources to local air quality is included within the background concentrations.

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

Local monitoring data

5.3.4 There are currently 35 local authority diffusion tube sites located within the Wimboldsley to Lostock Gralam area for monitoring NO2 concentrations. These are located along the M6, the A54 Middlewich Road and along roads within Macclesfield, Middlewich, Hartford and Northwich. Measured concentrations in 2016 were within the air quality standard[41].

Air quality management areas

5.3.5 There is one air quality management area (AQMA) within the Wimboldsley to Lostock Gralam area, Congleton AQMA No.1. This AQMA covers properties adjacent to the

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

M6 motorway between junctions 18 and 19. The AQMA was designated in May 2005 for exceedances in the annual mean NO2 standard, and then amended in November 2006.

Receptors

5.3.6 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.

5.3.7 Most of the receptors which may be affected by the Proposed Scheme are residential. Other receptors include the Lostock Gralam Primary School, Wimboldsley Community Primary School, Rudheath Primary Academy and Bostock Hall.

5.3.8 There are four statutory designated ecological sites identified within the Wimboldsley to Lostock Gralam area, namely Wimboldsley Wood Site of Special Scientific Interest (SSSI), Sandbach Flashes SSSI, Tabley Mere SSSI and Plumley Lime Beds SSSI.

5.3.9 Other non-statutory sensitive ecological sites identified close to the Proposed Scheme are Wimboldsley Wood Ancient Woodland Inventory Site (AWIS), Shropshire Union Canal Middlewich Branch Local Wildlife Site (LWS), The Willowbeds LWS, Whatcroft Lane Pond LWS, Billinge Green Farm Pond LWS, Winnington Belt AWIS, Winnington Wood AWIS, Winnington and Peas Wood LWS, Leonard's and Smoker Wood LWS, Long Wood LWS, Mill Wood and Mill Bottoms LWS and Roadside Verge near Holford Farm 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[42] includes a range of mitigation measures that are accepted by the Institute of Air Quality Management (IAQM) as being suitable to reduce impacts to as low a level as is reasonably practicable. These measures are generally sufficient to avoid any significant effects from dust during construction.

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

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

[42] 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 may arise from dust generating activities and emissions from construction traffic. As such, the assessment of construction impacts has been undertaken for dust and exposure to NO2, PM10 and PM2.5 concentrations.

Construction dust effects

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

5.4.6 It has been identified that there would be a low to medium risk of dust effects and a negligible to low risk of human health effects from demolition activities. For earthworks, there would be a medium to high risk of dust effects and a low risk of human health effects. For construction, there would be a low to medium risk of dust effects and a negligible to low risk of human health effects. For trackout, there would be a medium to high risk of dust effects and a low risk of human health effects.

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

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

Construction traffic effects

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

5.4.9 The A530 Griffiths Road /King Street /Nantwich Road/Rudheath Roundabout to B5309 King Street, the A533 Bostock Road/ Road One Roundabout to London Road, the A556 Chester Road Davenham Roundabout to Rudheath Roundabout/ Winnington Belt to Rudheath Roundabout, the A559 Manchester Road, and the A54 Chester Road / Middlewich Road /Saint Michael's Way/Holmes Chapel Road/ Kinderton Street would likely provide the primary access for construction vehicles in this area and an increase in traffic flows as a result of construction traffic on these roads is anticipated. 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 would be anticipated. Any significant residual effects from construction traffic emissions will be reported in the formal ES.

5.5 Effects arising from operation

Avoidance and mitigation measures

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

Assessment of impacts and effects

5.5.2 Impacts from the operation of the Proposed Scheme would arise from changes in the volume, composition and/or speed of road traffic, changes in road alignment and emissions from the operation of combustion plant in buildings (which may be included in the Crewe North rolling stock depot).

5.5.3 There would be no direct atmospheric emissions from the operation of trains that would cause an impact on air quality, and therefore no assessment is required. Indirect

emissions from sources such as rail wear and brakes have been assumed to be negligible.

Operational traffic effects

5.5.4 Direct and indirect effects from changes in air quality, such as that arising from increased levels of traffic, will be considered for all receptors within 200m of affected roads. These will include human receptors and those ecological habitats considered to be sensitive to changes in air quality. 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 at 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 Wimboldsley to Lostock Gralam area.

6.1.2 The assessment draws on information gathered from engagement with the users and operators of community facilities including Wimboldsley Community Primary School, and the Verdin Arms public house. 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: MA02 Map Book.

6.2 Scope, assumptions and limitations

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

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

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

6.2.4 Where reasonably practicable, public footpaths and routes would be reinstated or convenient alternatives provided. HS2 Ltd will seek to provide a temporary or permanent alternative route in advance of a closure of a road or PRoW. 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 a precautionary approach has been taken to the assessment.

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

6.2.5 If a temporary or permanent alternative route cannot be provided in advance of any road or PRoW closuring 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 in the Wimboldsley to Lostock Gralam area would be approximately 15km in length and lie within the Cheshire West and Chester Council (CWCC), and Cheshire East Council (CEC) areas. The Proposed Scheme would run from Wimboldsley in the south, passing close to the settlements of Stanthorne, Clive Green, Bostock Hall, Whatcroft, Billinge Green, to Higher Shurlach, Rudheath, Lostock Green, and Lostock Gralam in the north. The main community facilities in the area are located in Middlewich, Winsford, Rudheath and Lostock Green.

6.3.2 The Wimboldsley to Lostock Gralam area is predominantly agricultural in nature and is interspersed with occasional woodland, a number of smaller settlements and a scattering of isolated dwellings and farmsteads.

6.3.3 In general, the majority of community facilities are located in the larger settlements of Northwich which is outside the study area, as well as in Middlewich and Winsford.

Wimboldsley and surrounds

6.3.4 The village of Wimboldsley is a dispersed settlement with no clearly-defined centre, which includes approximately 30 residential properties. The nearest residential properties would be approximately 300m from the route of the Proposed Scheme. Community resources in the village include the Verdin Arms public house and Wimboldsley Community Primary School, both of which would also be located approximately 300m from the route of the Proposed Scheme. The school serves pupils aged 4 to 11 years from the surrounding area and provides support to pupils with special educational needs (SEN).

6.3.5 In the surrounding area, the Shropshire Union Canal (Middlewich Branch) is located to the west of the village, which offers walking paths along the route of the canal. The Wimboldsley Wood Site of Special Scientific Interest (SSSI) is also located to the north-east of Wimboldsley.

Middlewich, Winsford and surrounds

6.3.6 Winsford, Middlewich and their surrounding areas include the two towns and the villages of Stanthorne, Whatcroft, and Davenham. The smaller settlements in the area are mostly comprised of agricultural farms.

6.3.7 To the east of the Proposed Scheme is Middlewich, a town of approximately 14,000 residential properties, the nearest of which is approximately 1km from the route of the Proposed Scheme. Community resources within Middlewich include several places of worship including the St Michael and All Angels, Middlewich Methodist Church and St Mary's Catholic Church, nurseries including Rainbow Day Nursery and Early Learners Nursery, primary schools including Middlewich Primary School, St Mary's Catholic Primary School and Cledford Primary School, the Middlewich High School, and health centres including Oaklands Middlewich and Middlewich Medical Centre.

6.3.8 Winsford is a town of approximately 31,000 residential properties located to the west of the route of the Proposed Scheme. The nearest residential properties would be approximately 900m from the route of the Proposed Scheme. Community resources within Winsford include Hebden Green Community School and Specialist Arts College, a specialist school providing education for students from 2 to 19 with physical disabilities, medical needs and associated learning difficulties; and the Oaklands School, a school for students aged 11 to 17 with learning difficulties and medical needs. The NeuroMuscular Centre, a charity that provides services and specialist advice for people with muscular dystrophy, and the Meadow Bank Lodge, a day activity centre for people with learning disabilities and dementia, are also located in Winsford.

6.3.9 In terms of recreational facilities, the area includes Winsford Flash, a series of shallow lakes available to the public for fishing and sailing, located south east of Winsford. Between Middlewich and Winsford lies the Shropshire Union Canal (Middlewich Branch), a 16km canal pathway and the River Dane, a 16km river and alongside a footpath. In addition, the Trent and Mersey Canal and footpath (150km in total) navigates this area. They form part of the Four Counties Ring and Cheshire Ring tourist boating circuits. The Cheshire Ring Canal Walk corresponds with the same

boating circuit and runs along both canals. The National Cycle Route 5 also runs between Winsford and Middlewich.

Rudheath, Lostock Green, Lostock Gralam and surrounds

6.3.10 This area covers the villages of Rudheath, Lostock Green, Lostock Gralam and their surrounding areas.

6.3.11 Rudheath, which has approximately 3,700 residential properties, lies to the east of the Proposed Scheme. The nearest residential properties would be approximately 250m from the route of the Proposed Scheme. There are a limited number of community resources including Rudheath Primary Academy and Rudheath Youth Centre. The village of Higher Shurlach is located at the southern edge of Rudheath, where the nearest residential properties would be approximately 100m from the route of the Proposed Scheme. The Chrysalis Day Nursery is located in this village.

6.3.12 Lostock Gralam is a village of approximately 1,000 residential properties to the west of the Proposed Scheme. The nearest residential properties would be approximately 100m from the route of the Proposed Scheme. The village also includes the Lostock Green hamlet of approximately 100 residential properties to the south, separated by the A556 Chester Road. The route of the Proposed Scheme would be approximately 100m from the nearest residential properties in Lostock Green. The Lostock picnic area – accessible from the A556 Chester Road to the south-west of Lostock Green – is an area of green space with picnic tables and public toilets. Within Lostock Green lies Lostock Green Methodist Church. Lostock Gralam village has a range of community resources, including Lostock Gralam Church of England Primary School, St John's Church and The Water Mead public house which has a children's play area.

6.3.13 The area includes several recreational facilities including Griffith's Park, north of Rudheath, the Lostock picnic area alongside the A556, south west of Lostock Green, and Long Wood and Winnington and Peas Wood Local Wildlife Site (LWS), east of Lostock Gralam. The Plumley Lime Beds Nature Reserve and SSSI also lies east of Lostock Gralam.

6.4 Effects arising during construction

Avoidance and mitigation measures

6.4.1 The draft Code of Construction Practice (CoCP)[46] includes a range of provisions that will help mitigate community effects associated with construction within this area, including:

- 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);

[46] Supporting document: Draft Code of Construction Practice

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

Assessment of impacts and effects

Temporary effects

Residential properties

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

6.4.3 The construction of the Billinge Green embankment would require approximately 0.1ha of land used as gardens associated with a group of 10 cottages on Davenham Road. The temporary loss of this outside space would last for the approximately 18-month construction period. But residents' access to their properties would be modified and the loss of the space is therefore not expected to affect the ability of the residents to use their properties. The temporary loss of this land is not considered to be a significant community effect.

Community facilities

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

Recreational facilities

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

Open space and PRoW

6.4.6 The Shropshire Union Canal underbridge would cross the Shropshire Union Canal (Middlewich Branch) at Park Farm in the small settlement of Clive Green, west of Middlewich. In addition, a noise barrier would extend from just before and ending after this underbridge. Construction of the underbridge would take approximately two years to complete and pedestrians, cyclists and recreational (water-based) users of the canal are likely to experience disruption during this time. It is likely that this portion of the Canal would be unusable as a navigable waterway for a period of time

during construction. This temporary closure would result in a moderate adverse effect, which would be significant. An update of the assessment of the likely effects and proposed mitigation will be reported in the formal ES.

6.4.7 The Proposed Scheme would cross the Trent and Mersey Canal in three locations around Bostock Hall and Whatcroft. The canal would be crossed by the River Dane viaduct, which would take approximately two years to construct, and the Puddinglake Brook viaduct which would take approximately one year to construct. In addition, the Trent and Mersey Canal underbridge would be required along the route of the canal, which would take approximately two and a half years to complete. Pedestrians, cyclists and recreational (water-based) users of the canal are likely to experience some disruption for a period of time during the construction period. An assessment of the likely effect and proposed mitigation will be reported in the formal ES.

6.4.8 Works for the Proposed Scheme would also divert the Cheshire Ring Canal Walk, which runs along both the Shropshire Union Canal and Trent and Mersey Canal corridors. The length and duration of the diversion are not yet known. A number of options for alternative routes exist in the locality and the majority of the length of the Cheshire Ring Canal Walk would remain available. Proposed mitigation and an assessment of the likely effects will be reported in the formal ES.

Permanent effects

Residential properties

6.4.9 At Wimboldsley, construction works for the A530 Nantwich Road overbridge would require the demolition of six properties near to the junction of the A530 Nantwich Road. The permanent loss of these properties would result in a moderate adverse effect, which would be significant.

6.4.10 Construction works for the Rudheath embankment and A556 Chester Road realignment would require the demolition of nine properties at Cooke's Lane, Broken Cross. The permanent loss of these properties would result in a moderate adverse effect, which would be significant.

6.4.11 Construction of the Rudheath embankment would also require the demolition of five properties at Birches Lane (Rudheath), located to the west of existing A556 Chester Road. The permanent loss of these properties would result in a moderate adverse effect, which would be significant.

6.4.12 Permanent works for the Clive Green embankment would require demolition of a residential farm property on Coalpit Lane. This residential property would be permanently lost.

6.4.13 Permanent works for the Middlewich box structure would require demolition of one property on Middlewich Road (west of Bostock Road), in Stanthorne. This residential property would be permanently lost.

6.4.14 Permanent works associated with the Stanthorne embankment would require the demolition of a residential farm property on Northwich Road, Stanthorne. This residential property would be permanently lost.

6.4.15 Permanent works to support the Rudheath embankment would require demolition of a residential farm property on King Street, Rudheath. This residential property would be permanently lost.

Community facilities

6.4.16 South-west of Lostock Green village, realignment of the A556 Chester Road and construction of the Rudheath embankment would result in the loss of Lostock picnic area, which is situated on the western side of the A556 Chester Road. This area of green space comprises picnic benches, public toilets and green space. The area is accessed via a layby on the A556 Chester Road and therefore the primary users of the resource are passing motorists (an on-road cycle route also provides access). The nearest alternative green space is the Griffiths Park in Rudheath, located almost 2km away. The loss of the picnic area would be likely to result in a moderate adverse effect, which would be significant.

Recreational facilities

6.4.17 No permanent effects on recreational facilities have been identified as a result of the land required for construction.

Open space and PRoW

6.4.18 The A556 Chester Road realignment and Lostock Green embankment would permanently require approximately 1.4 ha of woodland from Winnington and Peas Wood LWS. The Wood is located to the north of the A556/A559 and north-east of Lostock Gralam and comprises approximately 12ha of woodland. Surveys of the woodland have not yet been undertaken although it is understood that the open space is publicly accessible. The requirement for land would fragment Winnington and Peas Wood LWS, although the majority of the woodland would remain accessible from the north and west. Proposed mitigation and an assessment of the likely effects will be reported in the formal ES.

Other mitigation measures

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

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

Summary of likely residual significant effects

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

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

- loss of residential properties near to the junction of the A530 Nantwich Road at Wimboldsley;
- loss of residential properties on Cooke's Lane at Broken Cross;
- loss of residential properties on Birches Lane at Rudheath;

- loss of land at Lostock picnic area; and
- loss of land at Winnington and Peas Wood LWS.

Cumulative effects

6.4.23 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.

6.4.24 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 Wimboldsley to Lostock Gralam area as a consequence of the construction and operation of the Proposed Scheme. This includes effects on sites recognised or designated on the basis of their importance for nature conservation.

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

7.1.3 Maps showing the location of the key environmental features (Map Series CT-10) and the key construction (Map Series CT-05) and key operational (Map Series CT-06) features of the Proposed Scheme are provided in the Volume 2: MA02 Map Book.

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

7.2 Scope, assumptions and limitations

7.2.1 The scope, assumptions and limitations for the ecological assessment are set out in Volume 1, Section 8 and the Scope and Methodology Report (SMR)[47].

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

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

7.3 Environmental baseline

Existing baseline

Introduction

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

7.3.2 Land required for the construction of the Proposed Scheme in the Wimboldsley to Lostock Gralam area consists mainly of low lying land in mixed agricultural use and river valleys. Areas of woodland connected by hedgerows are present in the centre

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

and north of this area, and grassland and ponds are widespread. The route of the Proposed Scheme would cross several watercourses, including the Shropshire Union Canal, River Dane, River Trent and Mersey Canal, and the Peover Eye, as well as numerous drainage ditches and smaller watercourses.

7.3.3 Statutory and non-statutory designated sites are shown on Map Series CT-10, Volume 2 and MA02 Map Book.

Designated sites

7.3.4 There are no sites of international importance that are relevant to the assessment in the Wimboldsley to Lostock Gralam area.

7.3.5 There are four nationally important Sites of Special Scientific Interest (SSSIs) that are relevant to the assessment in the Wimboldsley to Lostock Gralam area. For each of these sites the land required for the Proposed Scheme in this area is within the Impact Risk Zone[48] relevant to railway infrastructure as identified by Natural England. They are:

- Sandbach Flashes SSSI, covering an area of 152.9ha over several distinct areas, is designated primarily for the extremely rare inland saline habitats. Foden Flash includes areas of fen and wet woodland which has an exceptional lichen flora for the county. The flashes are important for notable aquatic invertebrates, as well as wildfowl and waders, supporting large numbers of wigeon, teal, lapwing, snipe and curlew. The site is located 2.4km east of the land required for the Proposed Scheme in the Wimboldsley to Lostock Gralam area. The site is also assessed in the Hough to Walley's Green area (MA01), where it is located 66om east of the land required for the Proposed Scheme at its closest point;

- Wimboldsley Wood SSSI, covering an area of 19ha, is designated for a variety of woodland types, most notably wet woodland dominated by alder and crack willow. Other important habitats include unimproved grassland, open water and the nationally rare saline spring habitat, which supports plant species uncommon in the county such as blunt-flowered rush and brookweed. The SSSI is located 20m west of land that has been identified for the purpose of habitat creation or enhancement, as part of the Proposed Scheme;

- Plumley Lime Beds SSSI, covering an area of 23.2ha, is designated for the presence of a variety of habitats including woodland, a pool and marshland. There are a range of plant species associated with alkaline soils such as 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 within the site. The western extent of the SSSI is located adjacent to the land required for the Proposed Scheme; and

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

- Tabley Mere SSSI, covering an area of 44.4ha, 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 SSSI is located 1.7km north-east of the land required for the Proposed Scheme in the Wimboldsley to Lostock Gralam area. The site is also assessed in the Pickmere to Agden and Hulseheath area (MA03), where it is located 865m east of the land required for the Proposed Scheme at its closest point.

7.3.6 There are 15 Local Wildlife Sites (LWS) of potential relevance to the assessment in the Wimboldsley to Lostock Gralam 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:

- Rookery/Small Rookery Woods LWS, covering an area of 2ha, comprises ancient semi-natural woodland. The LWS is located to the south of Wimboldsley Wood either side of the Shropshire Union Canal and is adjacent to land that has been identified for the purpose of habitat creation or enhancement, as part of the Proposed Scheme;
- Winsford Top Flash LWS, covering an area of 12.5ha, comprises a shallow lake with surrounding woodland, grassland and scrub habitat. The LWS is located on the western bank of the River Weaver at Weaver Hall Farm and is 150m west of land that has been identified for the purpose of habitat creation or enhancement, as part of the Proposed Scheme;
- Shropshire Union Canal Middlewich Branch LWS, covering an area of 14.2ha, comprises the canal and associated riparian habitat. The LWS is partially within the land required for the Proposed Scheme, to the south-west of Yew-Tree Farm;
- The Willowbeds LWS, covering an area of 9.1ha, comprises an area of woodland. The LWS is located adjacent to the land required for the Proposed Scheme, to the north-west of Stanthorne Hall Farm;
- Greenheyes Farm Pasture LWS, covering an area of 2.2ha, comprises an area of grassland bordered by hedgerows. The LWS is located to the north-west of Bostock House Farm and is 140m north of the land required for the Proposed Scheme;
- Meadow by Trent and Mersey Canal LWS, covering an area of 1.2ha, comprises an area of grassland, scrub and woodland habitat. The LWS is located immediately adjacent to the section of canal north-west of Middlewich and is 20m north of the land required for the Proposed Scheme;

- Peck Mill Valley LWS, covering an area of 1.6ha, comprises ancient semi-natural woodland. The LWS is located north-west of Bostock Green, 1.4km north-west of the land required for the Proposed Scheme, but is bisected by the A533 off Peckmill Roundabout, a construction traffic route;
- Whatcroft Lane Pond LWS, covering an area of 0.4ha, comprises a large pond. The LWS is located adjacent to the Trent and Mersey Canal, north of Whatcroft Lane, and is adjacent to land that has been identified for the purpose of habitat creation or enhancement, as part of the Proposed Scheme;
- Billinge Green Farm Pond LWS, covering an area of 6.8ha, comprises a large pond surrounded by woodland and includes an area of swamp that supports diverse flora. The LWS is located predominantly to the south of Davenham Road and is 30m west of land that has been identified for the purpose of habitat creation or enhancement, as part of the Proposed Scheme;
- Long Wood LWS, covering an area of 6.4ha, comprises an area of woodland with two ponds. The LWS is located partly within the land required for the Proposed Scheme, between the A556 Chester Road and Ascol Drive;
- Wincham Brook Valley LWS, covering an area of 24.1ha, comprises woodland, scrub and grassland habitat along Wincham Brook. The LWS is located 325m west of the land required for the Proposed Scheme, to the north of Lostock Gralam;
- Mill Wood and Mill Bottoms LWS, covering an area of 5ha, comprises woodland habitat along Peover Eye. The LWS is located to the south of the A556 Chester Road and is 30m south of land that has been identified for the purpose of habitat creation or enhancement, as part of the Proposed Scheme;
- Winnington and Peas Wood LWS, covering an area of 12.1ha, comprises woodland habitat including areas of ancient semi-natural woodland. The LWS is located partly within the land required for the Proposed Scheme, to the north of the A559 Manchester Road and immediately south of Wincham Brook;
- Roadside Verge near Holford Farm LWS, covering an area of 0.3ha, comprises grassland with a line of trees bordered by hedgerows. The LWS is located adjacent to the land required for the Proposed Scheme, immediately north of the A556 Chester Road and either side of Linnards Lane; and
- Leonard's and Smoker Wood LWS, covering an area of 10.7ha, comprises woodland habitat along Smoker Brook, including areas of ancient semi-natural woodland and Plantation on Ancient Woodland Sites (PAWS). The LWS is located partially within the land required for the Proposed Scheme, to the north of Linnards Lane, and is also relevant to the Pickmere to Agden and Hulseheath area (MA03).

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

- Weaver Bank AWIS, comprising an area of 6.4ha of PAWS, is located 20m west of land that has been identified for the purpose of habitat creation or enhancement, as part of the Proposed Scheme;
- Rookery/Small Rookery Woods AWIS (part of which is also within the aforementioned LWS), comprising an area of 2.4ha of ancient semi-natural woodland, is located adjacent to land that has been identified for the purpose of habitat creation or enhancement, as part of the Proposed Scheme;
- Wimboldsley Wood AWIS (which is also part of the aforementioned SSSI), covering an area of 8.6ha comprising 6.6ha of ancient semi-natural woodland and 2ha of PAWS, is located 20m west of land that has been identified for the purpose of habitat creation or enhancement, as part of the Proposed Scheme;
- Unnamed Wood south-east of Wimboldsley Wood AWIS, comprising an area of 0.6ha of ancient semi-natural woodland, is located adjacent to land that has been identified for the purpose of habitat creation or enhancement, as part of the Proposed Scheme;
- Bull's Wood AWIS, covering an area of 2.4ha comprising 2.1ha of PAWS and 0.3ha of ancient semi-natural woodland, is located partly within the land required for the Proposed Scheme;
- Unnamed Wood north of Peckmill Roundabout AWIS (part of which is also within the aforementioned Peck Mill Valley LWS), comprising an area of 2.8ha of ancient semi-natural woodland, is located north-west of Bostock Green, 1.4km north-west of the land required for the Proposed Scheme, but is bisected by the A533 off Peckmill Roundabout, a construction traffic route;
- Winnington Belt AWIS, comprising an area of 1.2ha of ancient semi-natural woodland, is located 20m east of the land required for the Proposed Scheme;
- Winnington Wood AWIS (which also forms part of the aforementioned LWS), comprising 8.6ha of ancient semi-natural woodland, is partly within the land required for the Proposed Scheme; and
- Leonard's and Smoker Wood AWIS (which also forms part of the aforementioned LWS), covering an area of 8.2ha and comprising 4.5ha of ancient semi-natural woodland and 3.7ha of PAWS, is partly within the land required for the Proposed Scheme. This site is also relevant to the Pickmere to Agden and Hulseheath area (MA03).

7.3.8 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

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

Woodland

7.3.10 In addition to the aforementioned woodlands, there are 21 other areas of lowland deciduous woodland (likely to qualify as habitats of principal importance[49], and local BAP[50] habitats), which would be within or partly within the land required for the Proposed Scheme. These are located in three main areas: south and east of Bostock Hall; south of Rudheath; and north and east of Lostock Gralam. On a precautionary basis, pending the findings of field surveys, these woodlands are considered to be of up to county/metropolitan value.

Grassland

7.3.11 Grasslands outside designated sites occur within the land required for the Proposed Scheme. This includes areas at Bostock Hall and Whatcroft, which may qualify as habitats of principal importance and local BAP habitats. 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

7.3.12 Many of the hedgerows in the Wimboldsley to Lostock Gralam 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[51]. In addition, they could also provide commuting corridors for wildlife and nesting and feeding habitat. On a precautionary basis, pending the findings of field surveys, the hedgerow network is considered to be of up to district/borough value.

Watercourses

7.3.13 The River Dane and several smaller watercourses would be crossed by the route of the Proposed Scheme. The River Dane may qualify as a habitat of principal importance and local BAP habitat. On a precautionary basis, pending the findings of field surveys, the River Dane is considered to be of up to county/metropolitan value. The smaller watercourses are considered to be of up to district/borough value.

7.3.14 The route of the Proposed Scheme would cross the Shropshire Union Canal Middlewich Branch and Trent and Mersey Canal. The former is designated as an LWS, and is of county/metropolitan value, the latter is also considered to be of up to county/metropolitan value.

Water bodies

7.3.15 There are 37 ponds located within, or partly within, the land required for the Proposed Scheme, of which one of these is within land identified for habitat creation or enhancement. Some may qualify as habitats of principal importance, or local BAP

[49] Section 41 of the National Environment and Rural Communities Act 2007
[50] Cheshire region Biodiversity Action Plan (BAP)
[51] *"Statutory Instrument 1997 No. 1160"* Hedgerows Regulations 1997

habitats (e.g. if they support fauna species of high conservation importance such as great crested newt, as at Yew Tree Farm and north-east of Wimboldsley Grange). On a precautionary basis, pending the findings of field surveys, these ponds are considered 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 will be present within the land required for the Proposed Scheme and, on a precautionary basis, are considered 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 12.

Table 12: Species potentially relevant to the assessment within the Wimboldsley to Lostock Gralam area

Resource/feature	Value	Rationale
Bats	Up to regional	The Cheshire Bat Group[52] states that up to 11 species of bats are likely to be present in the county. Interconnecting areas of woodland, watercourses, ditches and hedgerows with scattered trees provide a mosaic of suitable foraging and commuting habitats for bats. There are a large number of buildings and mature trees within the land required for the Proposed Scheme, many of which are likely to have the potential to support roosting bats. Existing records of bats are concentrated near the River Dane north of Bostock Green and south of Rudheath within 1km of the land required for the Proposed Scheme. Records confirm there are at least six species present in the area: brown long-eared bat, common pipistrelle, Daubenton's bat, noctule, soprano pipistrelle and whiskered bat.
Aquatic invertebrates	Up to regional	Suitable habitat for aquatic invertebrates has been identified along the Shropshire Union Canal Middlewich Branch, the River Dane, the Trent and Mersey Canal, Puddinglake Brook, Peover Eye, Gad Brook, Wade Brook, Wincham Brook and Smoker Brook. There are records of various dragonfly species concentrated along the Trent and Mersey Canal, Billinge Green and Plumley Lime Beds SSSI. Species including the depressed river mussel, lesser silver water beetle, mud snail, club-tailed dragonfly, downy emerald dragonfly and variable damselfly are known to occur in Cheshire, although no records exist within the Wimboldsley to Lostock Gralam area. The lesser silver water beetle has been recorded in the adjacent Hough to Walley's Green area (MA01), and could, along with the other species listed above, occur in potentially suitable habitat within the land required for the Proposed Scheme in the Wimboldsley to Lostock Gralam area.

[52] RECORD Local Biological Records Centre for Cheshire, Halton, Warrington and Wirral, Cheshire Bat Group. Available online ar: http://www.record-lrc.co.uk/c1.aspx?Mod=Article&ArticleID=G00020001

Great crested newt	County/metropolitan	Suitable habitats are present in the Wimboldsley to Lostock Gralam area with at least 143 ponds present within 250m of the land required for the Proposed Scheme, of which 37 ponds are within the land required, including one pond that is in land identified for habitat creation and enhancement. The species is widespread throughout Cheshire, probably due to the relative abundance of farm ponds and suitable terrestrial habitat throughout the county. There is a record of great crested newts south-west of Lostock Gralam within 350m of land required for the Proposed Scheme. Environmental DNA (eDNA) surveys provided eight positive results from 28 ponds surveyed within 250m of the land required for the Proposed Scheme. Seven of the ponds were in the Wimboldsley area and one is north of Whatcroft Lane.
Birds	County/metropolitan	The landscape of farmland, hedgerows and woodland provides suitable habitat for breeding and wintering birds. Species associated with these habitats and with records in the area include lapwing, barn owl, skylark, tree sparrow and linnet which breed in low numbers in farmland habitats, and a range of typical common woodland breeding and wintering birds. Wintering bird surveys carried out in arable and wetland habitat have recorded large flocks of lapwing, as well as small numbers of snipe and curlew. Kingfisher have been recorded at water bodies at Billinge Green and a pair were recorded nesting along the River Dane, east of Bull's Wood, within the land required for the Proposed Scheme.
Otter	Up to county/metropolitan	Habitat suitable for otter is present along and adjacent to the Shropshire Union Canal Middlewich Branch, the River Dane, the Trent and Mersey Canal, Puddinglake Brook, Gad Brook, Wade Brook, Wincham Brook and Smoker Brook. The large water body and surrounding woodland at Billinge Green Farm Pond LWS also offer suitable otter habitat. Records of otter have been provided for all major watercourses in the immediate vicinity of the land required for the Proposed Scheme; however, the rate of otter recolonisation in Cheshire has been slow[53].
Water vole	Up to county/metropolitan	Water vole are widespread and locally common in Cheshire[54], favouring ditches and streams, as well as ponds and canals. Habitat suitable for water vole is present along and adjacent to the Shropshire Union Canal Middlewich Branch, the River Dane, the Trent and Mersey Canal, Puddinglake Brook, Gad Brook, Wade Brook, Wincham Brook and Smoker Brook. There are records of water vole from the River Dane and Wade Brook within 2km of the land required for the Proposed Scheme. It is considered possible that this species is present throughout the Wimboldsley to Lostock Gralam area.
Polecat	Up to county/metropolitan	Polecat are considered rare but are recolonising in Cheshire[55]. Habitat suitable for this species is present in the Wimboldsley to Lostock

[53] Environment Agency (EA) (2010). Fifth otter survey of England 2009-2010.
[54] Water vole Local Biodiversity Action Plan – Cheshire Wildlife Trust. Available online at: https://www.cheshirewildlifetrust.org.uk/sites/default/files/2018-06/Water%20vole.pdf
[55] Polecat Local Biodiversity Action Plan – Cheshire Wildlife Trust. Available online at: https://www.cheshirewildlifetrust.org.uk/sites/default/files/2018-06/Polecat.pdf

		Gralam area including hedgerows, farmland and woodland. There is a single record of their presence within the land required for the Proposed Scheme north-east of Clive, as well as records north-west of Middlewich, near Northwich and west of Lostock Gralam.
White-clawed crayfish	Up to county/metropolitan	There are no records of this species in the Wimboldsley to Lostock Gralam area. However, suitable habitat for white-clawed crayfish has been identified along sections of the River Dane, Wade Brook, Wincham Brook, Smoker Brook and their various tributaries.
Terrestrial Invertebrates	Up to district/borough	Areas of suitable habitat for terrestrial invertebrates, including grasslands, woodlands, hedgerows and mature trees, have been identified in the Wimboldsley to Lostock Gralam area including near Wimboldsley, west of Middlewich, near Whatcroft and east of Rudheath. There are records of notable terrestrial invertebrate species within the vicinity of the land required for the Proposed Scheme. These include four species of fly that are nationally scarce recorded near the River Dane in Bostock. There is also a record of ringlet butterfly, a local BAP[56] species, in the Bostock area.
Fish	Up to district/borough	There are records in the river catchments crossed by the Proposed Scheme of brook lamprey, brown trout, European bullhead and European eel. European bullhead is widespread and common. Brook lamprey, European eel and brown trout populations are declining across the UK.
Reptiles	Up to district/borough	There are no records of any reptile species in the Wimboldsley to Lostock Gralam area. However, suitable habitat is likely to be present for reptiles at land near Wimboldsley Hall, Wimboldsley Grange, Clive and between Hill Wood and Whatcroft. Canals and other water bodies are likely to provide habitat for grass snake.

7.4 Effects arising during construction

Avoidance and mitigation measures

7.4.1 The following measures have been included as part of the design of the Proposed Scheme (in addition to the landscape planting shown on the Map Series CT-06 in the Volume 2 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:

- locating a site haul route to avoid direct loss of habitat from Plumley Lime Beds SSSI;
- designing viaducts over the Shropshire Union Canal, River Dane, Trent and Mersey Canal, Puddinglake Brook, Gad Brook, Wade Brook, Peover Eye and Smoker Brook avoid direct effects to these watercourses and allow free passage for wildlife beneath them including along the rivers and their banks;
- inclusion of viaducts would reduce habitat loss on AWIS, including Bull's Wood, Winnington Wood, Leonard's and Smoker Wood, and on other non-ancient

[56] Cheshire region Biodiversity Action Plan (BAP)

woodlands, namely Marshall's Gorse, Long Wood and Peas Wood;

- inclusion of viaducts would reduce direct impacts on four LWS. These are the Shropshire Union Canal Middlewich Branch; Long Wood; Winnington and Peas Wood; and Leonard's and Smoker Wood;
- new woodland planting which would contribute towards compensation for the losses of woodland (e.g. from south and east of Bostock Hall; south of Rudheath; and north and east of Lostock Gralam), and to enhancing connectivity between remaining woodlands. These include 3.5ha of planting north of Newfield Hall Farm, 3.3ha east of Lea Hall, 6.2ha near Oldhall Farm; 1.5ha along the Trent and Mersey Canal near Bostock; 3.4ha at Marshall's Gorse; 2.3ha south-west of Lostock Green; and 3ha near Lostock Gralam;
- provision of new ponds to replace those lost including those near Wimboldsley; at Park Farm, north of Clivegreen Lane; north of Yew-Tree Farm; north and south of Whatcroft; near Billinge Green; north-east of Marshall's Gorse; near Lostock Green; and north and south of Long Wood;
- provision of new species-rich hedgerows, using appropriate native species, to help towards compensation for the loss of hedgerows, and re-connecting the ecological network in the surrounding areas, including along the margins of the route of the Proposed Scheme, but also in specific areas such as near Lostock Green, Lostock Gralam, Cooke's Lane, Marshall's Gorse and Linnards Lane; and
- provision of new grassland habitats, including some species-rich grasslands to contribute towards compensation for the losses from the Proposed Scheme. Grassland habitat creation areas would comprise a matrix of grassland, ponds, ditches and other scattered habitats such as scrub and trees and would incorporate and enhance existing features such as drains and hedgerows. Proposed areas include 5.85ha near Greenheyes Farm; 1.25ha near Broken Cross; 2ha near Lostock Green and 0.5ha near Peas Wood. These areas would also provide habitat for reptiles and invertebrates.

7.4.2 The assessment assumes implementation of the measures set out within the draft Code of Construction Practice (CoCP)[57], which includes translocation of protected species where appropriate.

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

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

[57] Supporting document: Draft Code of Construction Practice

- 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 Wetland habitats at Sandbach Flashes SSSI are potentially vulnerable to changes in hydrology and waterborne pollution. The construction of the Proposed Scheme could result in potential obstruction to surface water flows to the SSSI from the west. However, the site is located 2.5km east of the land required for the Proposed Scheme in the Wimboldsley to Lostock Gralam area and construction would not impact on hydrological connectivity to the site. Therefore, there would be no adverse effect on the integrity of the SSSI as a result of construction in the Wimboldsley to Lostock Gralam area. The potential for impacts and effects on this site are also assessed in the Hough to Walley's Green area (MA01).

7.4.6 Wimboldsley Wood SSSI is located 20m west of land that has been identified for the purpose of habitat creation or enhancement, as part of the Proposed Scheme, and therefore would not involve extensive construction works. The route of the Proposed Scheme would run parallel to the site, principally on embankment and 650m away, with the Shropshire Union Canal situated in between, which is likely to act as a barrier for any surface water flows; however, the site's hydrologically-dependent habitats would potentially still be vulnerable to changes in groundwater flow and waterborne pollution as a result of construction of the Crewe North Rolling Stock Depot (RSD), 500m away. It is anticipated that implementation of measures in the draft CoCP would reduce the magnitude of impacts from waterborne pollution to a level where there would be no significant effect. The assessment on groundwater, as provided in Section 15, Water resources and flood risk, concludes that there would be no significant adverse effects on groundwater levels or flow for this site. Therefore, there would be no adverse effect on the integrity of Wimboldsley Wood SSSI as a result of construction in the Wimboldsley to Lostock Gralam area.

7.4.7 A site haul route for the construction of the Proposed Scheme would be located adjacent to the north-western boundary of Plumley Lime Beds SSSI. As such, there would be no loss of habitat from the SSSI. However, given the proximity of the site to this site haul route there would be risks of impacts from airborne and waterborne pollution. 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 the 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 located 1.7km north-east of the land required for the Proposed Scheme within the Wimboldsley to Lostock Gralam area and no adverse effects are expected. The potential for impacts and effects on this site are assessed in the Pickmere to Agden and Hulseheath area (MA03).

7.4.9 Construction of the Clive Green embankment, Stanthorne embankment and the crossing over the Shropshire Union Canal east of Manor Park would result in shading of 0.4ha (3%) and fragmentation of the Shropshire Union Canal Middlewich Branch LWS. Habitat degradation would result in a permanent adverse effect on site integrity that would be significant at up to the district/borough level.

7.4.10 Construction of the Smoker Brook viaduct would result in the permanent loss of 0.6ha (9%) of Long Wood LWS and 1.4ha (11%) of Winnington and Peas Wood LWS, of which 0.6ha (7%) is ancient woodland habitat from Winnington Wood AWIS. Habitat loss from both these LWS would result in a permanent adverse effect on site integrity that would be significant at the county/metropolitan level in each case, and the loss of irreplaceable ancient woodland habitat from Winnington Wood AWIS would result in a permanent adverse effect which would be significant at the county/metropolitan level.

7.4.11 Construction of the Smoker Brook viaduct would also result in the permanent loss of 0.5ha (5%) of Leonard's and Smoker Wood LWS. Habitat loss from the Wimboldsley to Lostock Gralam area accounts for 0.4ha of the loss with the remainder of the loss of 0.1ha from the Pickmere to Agden and Hulseheath area (MA03). The majority of the loss is of ancient woodland habitat from Leonard's and Smoker Wood AWIS, consisting of 0.3ha of ancient semi-natural woodland and less than 0.1ha of PAWS in the Wimboldsley to Lostock Gralam area. Habitat loss from the LWS and the loss of irreplaceable ancient woodland habitat from the AWIS would result in a permanent adverse effect on the integrity of these sites that would be significant at the county/metropolitan level in each case.

7.4.12 Construction of the River Dane viaduct would cause the loss of 400m^2 (3%) of PAWS habitat at Bull's Wood AWIS. This loss would result in a permanent adverse effect on site integrity that would be significant at the district/borough level.

Habitats

Woodland

7.4.13 In addition to the aforementioned loss of woodland from designated sites, construction of the Proposed Scheme would result in the loss of 7.7ha of broadleaved deciduous woodland from across the Wimboldsley to Lostock Gralam area of the Proposed Scheme. This would result in a permanent adverse effect that is significant at up to the district/borough level. The provision of new woodland habitat creation to compensate for the loss of 7.7ha of broadleaved 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 the effect on lowland deciduous woodland would be reduced to a level that is not significant, unless the ongoing review identifies any of the woodlands as ancient in which case there would be a permanent adverse effect at up to the county/metropolitan level.

Grassland

7.4.14 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 is significant at up to the district/borough level. The provision of 9.6ha of new grassland habitats, including some species-rich grasslands and meadow creation, near Greenheyes Farm, Broken Cross, Lostock Green and Peas Wood, once established, would reduce the adverse effect on grassland habitats to a level that is not significant.

Hedgerows

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

Watercourses

7.4.16 The route of the Proposed Scheme would cross the River Dane, Puddinglake Brook, Gad Brook, Wade Brook, The Peover Eye and Smoker Brook on viaducts. These watercourses would not be directly affected, and indirect effects would not be significant as they would be controlled through the implementation of measures in the draft CoCP. However, the Proposed Scheme would result in the loss of sections of other smaller watercourses and severance of river corridors due to culverts being used to convey watercourses across the route of the Proposed Scheme, which would result, on a precautionary basis, in a permanent effect that would be significant at up to the district/borough level.

Water bodies

7.4.17 Thirty-six ponds would be lost within the Wimboldsley to Lostock Gralam area as a result of the construction of the Proposed Scheme. The loss of these ponds could result, on a precautionary basis, in an impact that would be significant at up to county/metropolitan level, if it is confirmed through field surveys that they support great crested newts and/or other priority species, such as the two ponds known to support great crested newts at Yew Tree Farm and north-east of Wimboldsley Grange. However, it is considered that the aforementioned pond and grassland habitat creation areas would be sufficient to reduce the effect of the loss of these ponds to a level that is not significant.

Ancient and veteran trees

7.4.18 It is assumed that ancient and veteran trees within the land required for the Proposed Scheme in the Wimboldsley to Lostock Gralam 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 the district/borough level in each case.

Species

Bats

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

Aquatic invertebrates

7.4.20 The Proposed Scheme would result in the loss of water bodies and watercourses that could provide suitable habitat for aquatic invertebrates, including rare species such as the lesser silver water beetle and mud snail, with the former having been recorded in the Hough to Walley's Green area (MA01). On a precautionary basis, in the absence of further survey information, it is assumed that the Proposed Scheme would result in a permanent adverse effect that would be significant at up to the regional level.

Great crested newt

7.4.21 It has been assumed that all 36 ponds (and surrounding terrestrial habitat) within the land required for construction of the Proposed Scheme may support great crested newts, and would be lost during construction. The loss of ponds supporting great crested newts and associated terrestrial habitat could result in the isolation and severance of breeding populations of great crested newts across this area. On a precautionary basis, in the absence of further survey information, it has been assumed

that all ponds that would be lost support great crested newts. Where great crested newts are present, two new ponds would be created for every one lost to the permanent works, and this would contribute towards reducing the effects to not significant. Additional ponds would also be required (also on a two to one basis), where other great crested newt ponds would be lost outside the area required for the permanent works associated with the Proposed Scheme, but within the land required for construction of the Proposed Scheme. Suitable terrestrial habitat would be required around all new ponds created along with links to encourage dispersal (e.g. by incorporating existing habitat or creating new habitat), and this will be undertaken as part of scheme design development and included in the formal ES. In the absence of the full mitigation, the loss of the ponds and surrounding land would result in a permanent adverse effect on the conservation status of great crested newts that would be significant at the county/metropolitan level.

Birds

7.4.22 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[58] which has been recorded near Billinge Green within 500m of the land required for the Proposed Scheme. Kingfisher, another Schedule 1 species, have also been recorded near Billinge Green, and a nesting pair were recorded along the River Dane, east of Bull's Wood, within the land required for the Proposed Scheme. Therefore, on a precautionary basis, it is assumed that the Proposed Scheme would result in a permanent adverse effect that would be significant at the county/metropolitan level.

Otter

7.4.23 Otter have been recorded along the River Dane, Trent and Mersey Canal, Peover Eye and Smoker Brook within 100m of the land required for the Proposed Scheme. The viaducts over the floodplains of each of these watercourses would avoid loss of habitat along the river corridors. Indirect effects from construction activities may result in disturbance to otter during the construction period, and prevent them from moving along them. However, it is anticipated that these indirect effects would be controlled through measures in the draft CoCP. Habitat loss would result at several smaller watercourses crossed by the Proposed Scheme. On a precautionary basis, impacts to otter would result in an adverse effect on the conservation status of this species that would be significant at up to the county/metropolitan level.

Water vole

7.4.24 Habitat suitable for water vole has been identified along the Shropshire Union Canal Middlewich Branch, the River Dane, the Trent and Mersey Canal, Puddinglake Brook, Gad Brook, Wade Brook, Wincham Brook and Smoker Brook and their unnamed tributaries, and there are records of water vole from stretches of the River Dane and Wade Brook downstream from the land required for the Proposed Scheme. As described above, the viaducts over the major watercourses and their floodplains

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

would avoid loss of habitat along the river corridor, and it is anticipated that indirect effects from construction activities that may result in disturbance to water vole during construction would be controlled through measures in the draft CoCP. However, habitat loss would result at several smaller watercourses crossed by the Proposed Scheme. Therefore, on a precautionary basis, impacts to water vole would result in an adverse effect on the conservation status of this species that would be significant at up to the county/metropolitan level.

Polecat

7.4.25 The loss of woodland and hedgerows along with grassland and arable land could affect polecat, a species which has been recorded in land required for the Proposed Scheme near Clive, as well as other areas in the vicinity of the route. Therefore, on a precautionary basis, the effects of permanent habitat loss on polecat would be significant at up to the county/metropolitan level.

White-clawed crayfish

7.4.26 Suitable habitat for this species has been identified along sections of the River Dane, Wade Brook, Wincham Brook, Smoker Brook and their various tributaries. The route of the Proposed Scheme would pass over the majority of these watercourses on viaducts, and indirect impacts to the watercourses would be controlled through measures set out in the draft CoCP. Where the smaller and unnamed watercourses are impacted, habitat loss and severance of connections, especially where watercourses are placed into culverts or tunnels, are considered likely. This includes around the area required for the Crewe North RSD, near Park Farm, Yew Tree Farm, Stanthorne, near Bank Farm and Whatcroft. It is assumed, therefore, on a precautionary basis, that the Proposed Scheme would result in a permanent adverse effect on the conservation status of this species that would be significant at up to the county/metropolitan level.

Terrestrial invertebrates

7.4.27 The Proposed Scheme would result in the loss of habitats near Wimboldsley, west of Middlewich, near Whatcroft and east of Rudheath that would be suitable for terrestrial invertebrates, including species of principal importance as identified in Section 41 of the Natural Environment and Rural Communities (NERC) Act (2006)[59] and local BAP species. On a precautionary basis, in the absence of survey information, it is assumed that the Proposed Scheme would result in a permanent adverse effect that would be significant at up to the district/borough level.

Fish

7.4.28 There are records of fish from the main watercourses that would be crossed by the route of the Proposed Scheme including species such as European bullhead and brook lamprey (both listed on Annex II of the EC Habitats Directive), European eel and brown trout. The Proposed Scheme would pass over the majority of these watercourses on viaducts, and indirect impacts to the watercourses would be controlled through measures set out in the draft CoCP. However, other smaller

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

watercourses would still be affected and may require assessment under the Water Framework Directive (WFD)[60]. On a precautionary basis, in the absence of survey information, it is assumed that the Proposed Scheme would result in permanent adverse effect that would be significant at up to the district/borough level.

Reptiles

7.4.29 There are no records of reptiles within 2km of the land required for the Proposed Scheme. However, suitable habitat is likely to be present for reptiles, including along the Shropshire Union Canal and Trent and Mersey Canal. It is considered that the aforementioned grassland habitat creation areas, which would comprise a matrix of grassland, ponds and scattered scrub, and incorporate and enhance existing features such as drains and hedgerows, would be sufficient to reduce the effect of the loss of suitable habitats on reptiles to a level that is not significant.

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

7.4.31 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

7.4.32 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:

- options for the creation of additional woodland and associated habitats which would be capable of qualifying as LWS habitat to mitigate for the loss and severance of LWS within the area, including from the Shropshire Union Canal Middlewich Branch, Long Wood, Winnington and Peas Wood and Leonard's and Smoker Wood;
- creation of new and enhancement of existing riparian habitat to mitigate for the loss from minor watercourses affected by new culverts, providing replacement habitat for water vole and aquatic invertebrates, for example north of Whatcroft, near Billinge Green and on the Peover Eye and Smoker Brook;
- 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;

[60] EU Water Framework Directive. Available online at: http://ec.europa.eu/environment/water/water-framework/index_en.html

- provision of alternative roosting habitat for bats; and
- provision of additional ponds (on a two to one basis where existing ponds supporting great created newts are lost), outside the area required for the permanent works but within the land required for construction of the Proposed Scheme, and suitable terrestrial habitat around these ponds with habitat links to allow dispersal.

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

7.4.34 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

7.4.35 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 13.

Table 13: Residual significant effects on ecological resources/features during construction

Resource/feature	Residual effect	Level at which the effect would be significant
Plumley Lime Beds SSSI	Temporary adverse effect on site integrity due to potential pollution impacts	National
Shropshire Union Canal Middlewich Branch LWS	Permanent adverse effect on site integrity due to loss and severance of 0.4ha (3%) of habitats	Up to district/borough
Long Wood LWS	Permanent adverse effect on site integrity due to loss and severance of 0.6ha (9%) of habitats	County/metropolitan
Winnington and Peas Wood LWS	Permanent adverse effect on site integrity due to loss and severance of 1.4ha (11%) of habitats	County/metropolitan
Leonard's and Smoker Wood LWS	Permanent adverse effect on site integrity due to loss and severance of 0.4ha (4%) of habitats	County/metropolitan
Winnington Wood AWIS	Permanent adverse effect on site integrity due to loss of 0.6ha (7%) of irreplaceable ancient woodland habitat	County/metropolitan

Leonard's and Smoker Wood AWIS	Permanent adverse effect on site integrity due to loss of 0.4ha (4%) of irreplaceable ancient woodland habitat	County/metropolitan
Bull's Wood AWIS	Permanent adverse effect on site integrity due to loss of 400m² (3%) of PAWS habitat.	District/borough
Woodland	Potential adverse effect on unidentified ancient woodland	Up to county/metropolitan
Hedgerows	Permanent adverse effect from loss of hedgerows and fragmentation of hedgerow network	Up to district/borough
Watercourses	Permanent adverse effect from loss and fragmentation of minor watercourses	Up to district/borough
Ancient and veteran trees	Permanent adverse effect from potential loss of ancient and veteran trees	Up to district/borough
Bats	Potential permanent adverse effect on conservation status due to loss of roosts, foraging habitat and fragmentation	Up to regional
Aquatic invertebrates	Potential permanent adverse effect on conservation status due to loss of habitat	Up to regional
Great crested newt	Loss of 36 ponds and surrounding terrestrial habitat which may support great crested newts	County/metropolitan
Breeding and wintering birds	Potential permanent adverse effect on conservation status due to loss of habitat	County/metropolitan
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
White-clawed crayfish	Potential permanent adverse effect on conservation status due to loss and severance of habitat	Up to county/metropolitan
Terrestrial invertebrates	Potential permanent adverse effect on conservation status due to loss of habitat	Up to district/borough

Fish	Potential permanent adverse effect on conservation status due to loss of habitat along minor watercourses	Up to district/borough

7.5 Effects arising during operation

Avoidance and mitigation measures

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

Assessment of impacts and effects

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

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

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

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

Other mitigation measures

7.5.6 Additional mitigation measures currently being considered include:

- structures to reduce mortality to bats; and
- updating the HS2 barn owl mitigation plan[61] 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.

[61] *Currently in development for Phase One of HS2.*

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 14.

Table 14: Residual significant effects on ecological resources/features during operation

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

Monitoring

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

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

8 Health

8.1 Introduction

8.1.1 This section identifies the communities within the Wimboldsley to Lostock Gralam 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 Wimboldsley to Lostock Gralam 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: MA02 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)[62].

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.

8.2.4 The health determinants of relevance within the Wimboldsley to Lostock Gralam area are:

- for impacts during construction (temporary and permanent):

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

  - 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; and
  - education.

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

Description of communities in the Wimboldsley to Lostock Gralam area

8.3.1 The Wimboldsley to Lostock Gralam area is predominantly agricultural in nature and is interspersed with occasional woodland and smaller settlements.

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.

Wimboldsley and surrounds

8.3.3 The village of Wimboldsley is a dispersed settlement, which includes approximately 30 residential properties. Community resources in the village include the Verdin Arms public house and Wimboldsley Community Primary School, which would be located approximately 300m to the east of the route of the Proposed Scheme. The school serves pupils aged 4 to 11 years from the surrounding area and provides support to pupils with special educational needs.

8.3.4 In the surrounding area, the Shropshire Union Canal (Middlewich Branch) is located to the west of the village, which offers walking paths along the route of the canal. The Wimboldsley Wood Site of Special Scientific Interest (SSSI) is also located north-east of Wimboldsley.

Middlewich, Winsford and surrounds

8.3.5 Middlewich, Winsford and their surrounding areas include the villages of Stanthorne, Whatcroft, Davenham and Bostock. The smaller settlements in the area are mostly comprised of farms.

8.3.6 To the east of the route of the Proposed Scheme is Middlewich (approximately 14,000 residential properties) and to the west of the Proposed Scheme is Winsford (approximately 31,000 residential properties). Both towns have a range of community resources.

8.3.7 Between Middlewich and Winsford lies the Shropshire Union Canal (Middlewich Branch) and the River Dane. In addition, the Trent and Mersey Canal and footpath (150km in total) navigates this area. They form part of the Four Counties Ring and Cheshire Ring tourist boating circuits. The Cheshire Ring Canal Walk corresponds with the same boating circuit and runs along both canals. The National Cycle Route 5 also runs between Winsford and Middlewich.

Rudheath, Lostock Green, Lostock Gralam and surrounds

8.3.8 This area covers Rudheath, Lostock Green, Lostock Gralam and surrounds, including the village of Higher Shurlach, south of Rudheath.

8.3.9 To the east of the route of the Proposed Scheme is Rudheath, which has approximately 3,700 residential properties. There are a small number of community resources including Rudheath Primary Academy and Rudheath Youth Centre. The village of Higher Shurlach is located at the southern edge of Rudheath. The Chrysalis Day Nursery is located in this village.

8.3.10 Lostock Gralam is a village of approximately 1,000 residential properties to the west of the route of the Proposed Scheme. The village also includes the Lostock Green hamlet of approximately 100 residential properties to the south, separated by the A556 Chester Road. Lostock Gralam village has a range of community resources, including Lostock Gralam Church of England Primary School, St John's Church and The Water Mead public house, which has a play area for children.

8.3.11 The area includes several recreational facilities including Griffith's Park, north of Rudheath, the Lostock picnic area alongside the A556 Chester Road, south-west of

Lostock Green, and Long Wood and Winnington and Peas Wood Local Wildlife Site (LWS), east of Lostock Gralam. The Plumley Lime Beds Nature Reserve and SSSI also lies east of Lostock Gralam.

Demographic and health profile of the Wimboldsley to Lostock Gralam area

8.3.12 The local communities potentially affected by the Proposed Scheme in the Wimboldsley to Lostock Gralam area have a relatively low population density, commensurate with the rural nature of the area.

8.3.13 Data provided by the Office for National Statistics[63] show that this population has a broadly similar health status compared with the national (England) averages.

8.3.14 The population is less deprived than the national average with regard to the combined indices of multiple deprivation[64], and the health domain (a sub-set of the indices of multiple deprivation).

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

8.3.16 The available data provides detail down to ward level and enables a profile to be made of the population within the Wimboldsley to Lostock Gralam 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).

[63] 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.
[64] Department for Communities and Local Government (2015) English Indices of Deprivation 2015. Available online at: https://www.gov.uk/government/statistics/english-indices-of-deprivation-2015

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

8.4.3 HS2 Ltd would require its contractors to comply with the environmental management regime for the Proposed Scheme, which would include the measures set out in the draft Code of Construction Practice (CoCP)[65], which provides a general basis for route-wide construction environmental management. Contractors would also be required to comply with the measures in Local Environmental Management Plans (LEMP), which apply the environmental management strategies at a local level.

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

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

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

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

Assessment of impacts and effects

Neighbourhood quality

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

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

[65] Supporting document: Draft Code of Construction Practice

formal ES, with a focus on those receptors, or groups of receptors, that are most affected. The Community section of the formal ES will provide a combined assessment, which will identify locations that are subject to significant environmental effects on two or more topics (e.g. noise and visual).

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

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

8.4.11 Dust emissions from construction activities are considered in Section 5, Air quality, which identifies no significant adverse effects with respect to the effects of construction activities on dust soiling and human health within the Wimboldsley to Lostock Gralam area, taking account of mitigation measures contained in the draft CoCP. Therefore, it is not expected that any direct health and wellbeing effects would arise as a result of these emissions around construction sites.

8.4.12 The construction of the Proposed Scheme would have temporary and permanent[66] impacts on neighbourhood quality in areas close to construction sites, including those at Wimboldsley, Clive Green, Stanthorne, Whatcroft, Lostock Green and Lostock Gralam. 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 Wimboldsley to Lostock Gralam area would include:

[66] 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.

- 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 described in Section 14, Traffic and transport.

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

Access to services, health and social care

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

8.4.18 The Wimboldsley to Lostock Gralam 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 Wimboldsley to Lostock Gralam 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.

8.4.23 South-west of Lostock Green village, realignment of the A556 Chester Road and construction of the Rudheath embankment would result in the loss of Lostock picnic area, which is situated on the western side of the A556 Chester Road. This area of green space provides some utility for local people but is primarily used as a stop for motorists via a layby (the area is also accessible by a cycle route). The picnic area includes public toilets which would be demolished as a result of the Proposed Scheme. The picnic area could provide an opportunity for physical activity for local people and a break for motorists which may benefit their wellbeing. Therefore, the loss of the layby and picnic area has the potential to result in an adverse health effect.

8.4.24 The A556 Chester Road realignment and Lostock Green embankment would permanently require approximately 1.4 ha of woodland from Winnington and Peas Wood LWS. The Wood is located to the north of the A556/A559 and north-east of Lostock Gralam and comprises approximately 12ha of woodland. Surveys of the woodland have not yet been undertaken although it is understood that the open space is publicly accessible. The requirement for land would fragment Winnington Wood, although the majority to the woodland would remain accessible from the north and west. The temporary and permanent requirements for land at Winnington and Peas Wood LWS are not expected to result in an adverse health effect.

Education

8.4.25 There is moderate evidence linking low levels of education with poor mental and physical health. The majority of evidence linking education with health outcomes looks at educational attainment in the context of broader socio-demographic status. Educational attainment influences socio-economic factors such as earnings and home ownership, as well as self-esteem and lifestyle choices.

8.4.26 Construction of the Proposed Scheme may impact on education through the provision of training and apprenticeship opportunities, and through impacts on educational resources along the route.

8.4.27 Wimboldsley Community Primary School is located approximately 250m from the land required for construction of the Crewe North rolling stock depot (RSD). Therefore, there is not expected to be any requirement for land that would directly affect the school. The school is located on the A530 Nantwich Road and this road is anticipated to be used as a route for construction traffic. Any health effects associated

with the construction of the Proposed Scheme (including construction traffic) close to the school will be reported in the formal ES.

Social capital

8.4.28 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.'[67]

8.4.29 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.

8.4.30 The villages along the route 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 satellite compounds in the vicinity of settlements of Wimboldsley, Clive Green, Stanthorne, Bostock Green, Whatcroft, Rudheath, Lostock Green and Lostock Gralam. 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.

8.4.31 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.

8.4.32 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

[67] 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

the workforce and local communities. Any measures identified will be included within the community engagement framework as appropriate.

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

8.4.34 The Proposed Scheme would result in the loss of residential properties in Stanthorne, Cooke's Lane near Rudheath, and Birches Lane near Lostock Gralam. In addition, several farm buildings (including some in residential use) would be lost through land required for the construction and operation of the Proposed Scheme. 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.

8.4.35 The Proposed Scheme would result in the demolition of seven properties in the village of Wimboldsley. This represents a relatively sizable proportion of the local community. The erosion of social networks resulting from these demolitions would have the potential to reduce social capital, reducing the beneficial health effects that are gained through social contact and support.

8.4.36 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

8.4.37 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.

8.4.38 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.

8.4.39 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 Wimboldsley to Lostock Gralam 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.

Education

8.5.3 The operation of the Crewe North RSD, located near to Wimboldsley Community Primary School, has the potential to affect the amenity of the school. Assessment of the effects will be reported in the formal ES.

Other mitigation measures

8.5.4 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

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

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

9 Historic environment

9.1 Introduction

9.1.1 This section of the report provides a description of the current baseline for heritage assets and the likely impacts and significant effects identified to date resulting from the construction and operation of the Proposed Scheme within the Wimboldsley to Lostock Gralam 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 Cheshire West and Chester Local Planning Authority and Cheshire Archaeology Planning Advisory Service. The purpose of this engagement has been to discuss the assessment approach, to obtain relevant baseline information and to inform the design development and assessment of the Proposed Scheme. Engagement will continue as part of the development of the Proposed Scheme and to inform the formal assessment.

9.1.3 Maps showing the location of the key environmental features (Map Series CT-10) and the key construction (Map Series CT-05) and key operational (Map Series CT-06) features of the Proposed Scheme are provided in the Volume 2: MA02 Map Book. Only designated heritage assets within the Wimboldsley to Lostock Gralam area are shown on maps CT-10-304b to CT-10-309a. Non-designated heritage assets have also been assessed as part of this work, although they are not illustrated on these maps.

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

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

9.2 Scope, assumptions and limitations

9.2.1 The scope, key assumptions and limitations for the historic environment assessment are set out in full in Volume 1, Section 8 and the Scope and Methodology Report (SMR)[68], including the method for determining the value of a heritage asset and magnitude of impact (Tables 19 and 20 in the SMR, respectively).

9.2.2 The assessment focuses on the extent to which the Proposed Scheme would affect designated and non-designated heritage assets. Impacts on assets as a result of the Proposed Scheme would occur largely through the physical removal and alteration of heritage assets and changes to their setting.

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

9.2.3 The study area within which a detailed assessment of all assets, designated and non-designated, has been carried out is defined as the land required for the Proposed Scheme plus 250m 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. The exception to this is the Grade II listed Milepost on the A533 Bostock Road (NHLE 1139212), which although within the land required for the construction of the Proposed Scheme, would not be removed. 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;
- detailed 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);
- Cheshire historic environment record;
- conservation area appraisals; and
- historic maps and aerial photography.

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

Designated assets

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

- a Grade II listed Milepost on the A533 Bostock Road (NHLE1139212) of moderate value;
- Bostock Conservation Area, a conservation area of moderate value; and
- Trent and Mersey Canal Conservation Area, a conservation area of moderate value.

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

- King's Street Roman Fort, Harbutt's Field (NHLE1008460); moated sites at Kinderton Hall (NHLE1012358); Bostock Hall (NHLE1012357); Drakelow Hall (NHLE1020100) and Holford Hall (NHLE1012413); Murgatroyd's Brine Works (NHLE 1020122), all scheduled monuments of high value;
- four country houses including Bostock Hall (NHLE1138416), Lea Hall (NHLE1160742), Whatcroft Hall (NHLE1138463) and Holford Hall (NHLE1329664); a barn at Twelve Acres Farmhouse (NHLE1160751); the Church of St Wilfrid's, Davenham (NHLE 1138424); and the Church of St Michael and All Angels (NHLE 1138795) and 64 St Ann's Road (NHLE1330028) in Middlewich, all Grade II* listed buildings of high value;
- twenty 18th and 19th century farmhouses and associated structures dotted across the landscape, including Park Farmhouse, Clive Green (NHLE 1160709), Stanthorne Lodge (NHLE 1138454), Bank Farmhouse, Stanthorne (NHLE 1160732), Old Hall Farmhouse, Bostock (NHLE 1310589) and Bridge Cottage and Canal Cottage (NHLE 1160389); a country house Stanthorne Hall (NHLE 1138454); twelve assets including locks, aqueducts and bridges including Hughes Bridge (NHLE 1261168) associated with the Middlewich Branch of the

Shropshire Union Canal; twelve assets including locks, bridges, and mileposts associated with the Trent and Mersey Canal Conservation Area; two milestones on the road systems; a mill and weir on the River Wheelock; seven houses in the Middlewich Conservation Area; the chapel (NHLE1330024), tomb (NHLE1138792) and gate and railings at Middlewich Cemetery (NHLE1330025); ten structures associated with Bostock Hall (NHLE1138416) in the Bostock Conservation Area; two smithies; a bridge at Holford Hall (NHLE1115432) and The Smoker Inn (NHLE1139524); all Grade II listed buildings of moderate value; and

- two conservation areas – Middlewich Conservation Area and Davenham Conservation Area 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:

- 1-4 Railway Cottages, Wimboldsley;
- Greenheyes Farm, Stanthorne; and
- 5, 7, 9 and 11 Birches Lane, Lostock Green.

9.3.6 Non-designated heritage assets located partially or wholly within the 500m study area include 24 locally listed buildings of low value including a number of farms, cottages and properties that reflect the rural landscape of the area, two churches and a war memorial.

Historic environment overview

9.3.7 The study area includes the shallow valleys of the River Dane, the Peover Eye and Smoker Brook. Between these are plains and heathland of poorer quality soils formed as material was deposited by glaciers at the end of the last ice age. Historically these soils would have been difficult to plough and agriculture would have been predominantly pastoral. This meant that settlement density was low and more likely to have been located on the edge of the valleys or as isolated sites on the plains.

9.3.8 There is no recorded archaeological evidence from the Prehistoric period within the study area. From the Neolithic to the Bronze Age periods evidence for agricultural practices, settlement and landscapes of monumental or funerary structures (such as burial mounds or stone graves), are absent from the study area.

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

9.3.10 The Romano-British period began in Cheshire with the expansion of Roman occupation north of the midlands from AD70. The study area became the focus of industrial production, in particular salt-making, in support of the Roman fortress of Deva Victrix established at Chester in AD74 – AD75. Settlements were established at

Middlewich (Salinae) and Northwich (Condate), with associated forts at Castle Hill, Verdin Park in Northwich and the scheduled monument of King Street Roman Fort at Harbutt's Field (NHLE1008460) in Middlewich. A network of roads connected these settlements including Watling Street from Northwich to Manchester (Mamucium), King Street between Middlewich and Northwich, and the Roman Road between Middlewich and Nantwich. Outside of the major settlements there is little evidence for rural settlement although a site of a marching camp may have existed in Occlestone Green and a salt-making site may exist near Bank Farm, Stanthorne.

9.3.11 In the early medieval period, archaeological evidence becomes increasingly scant and is dependent on documentary sources. Cheshire became part of unified England by the early 10th century AD. The Domesday Book records the settlements of Northwich, Middlewich, Wimboldsley, Over (now Winsford), Clive (Clive Green), Wharton (Wharton Green), Davenham, Bostock, and Lach Dennis in the study area.

9.3.12 Northwich and Middlewich were the main urban centres in this study area, with industrial production focused on salt-making. Ecclesiastical establishments, including Vale Royal Abbey and manorial centres were the major landholders during this period. The manors of mid Cheshire are focused on moated sites that emerge in the 12th century AD. These sites contained the halls of the Norman lords who controlled the medieval feudal system within Cheshire. These include the scheduled monuments at Kinderton Hall (NHLE1012358), Bostock Hall (NHLE1012357), Drakelow Hall (NHLE1020100) and Holford Hall (NHLE1012413). The best agricultural land was on the River Weaver and Dane valleys with poorer quality land on the plains around Wimboldsley, Stublach and Lostock. Mixed subsistence farming growing cereal and keeping animals was typically undertaken. The pattern of fields suggests there is some evidence for organised 'common' fields at Over and Kinderton. However, the majority of fields were irregular in plan indicative of poorer quality land brought in to use from marginal land such as the heath around Rudheath.

9.3.13 During the post-medieval period the development of dairy farming and cheese making from the 16th century led to the improvement of agricultural land for grazing. Dairy farms were expanded and larger regular fields replaced the earlier pattern of irregular fields. The process of bringing marginal land into agricultural use was largely completed by the 19th century. Farms that are associated with the development of dairy farming in Cheshire include the 17th century barn at Twelve Acres (Wimboldsley Grange, NHLE1160751). Others developed around existing houses such as Stanthorne Lodge (NHLE1160718). From the 18th century planned farmsteads with courtyard for fattening cattle developed and include Park Farmhouse (NHLE1160709), Bank Farmhouse, Stanthorne (NHLE1160732), Greenheyes Farm (DCH10608), and Bridge Cottage and Canal Cottage (NHLE1160389).

9.3.14 Industrial development in the 17th and 18th centuries in Cheshire and Staffordshire highlighted the poor quality of the roads and transport links in mid Cheshire. Transport links were improved supported by industrial entrepreneurs from the salt manufacturers on the Weaver valley and pottery factories around Stoke-on-Trent. The River Weaver was made navigable as far as Winsford. The Trent and Mersey Canal was built between 1766 and 1777 and the Middlewich branch of the Shropshire Union Canal completed in 1827. The railway followed with the Crewe to Northwich Line built

in 1837 and Midland Railways Altrincham Line was extended to Northwich in 1863. Northwich, Middlewich and Winsford by the 19th century had become important centres for salt production. Poorly managed brine pumping and the collapse of salt mines led to large-scale subsidence from the early 19th century onward.

9.3.15 Urban settlement expanded from the 18th and 19th centuries around Middlewich and Northwich. High status country houses from the 18th and 19th century include Lea Hall (NHLE1160742), Stanthorne Hall (NHLE1139211), and Whatcroft Hall (NHLE1138463). Bostock Hall (NHLE1012357) was surrounded by a designed landscape of lodges, farms, houses, parkland and woodland. Lower status housing in rural Cheshire comprised small brick-built cottages such as Railway Cottages, Wimboldsley, Numbers 5, 7, 9, 11 Birches Lane, Lostock Green and Robin Hood Cottage in Lostock Green.

9.3.16 Urban expansion occurred in the 20th century, including the construction of the Winsford Industrial Estate and the outer suburbs of Northwich and Middlewich. The A556 Northwich bypass was completed to the west of the A530 King Street by the late 1930s and extended further east by the mid 1970s.

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.

[69] Supporting document: Draft Code of Construction Practice

Assessment of impacts and effects

Temporary effects

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

9.4.4 No significant effects are expected to occur as a result of temporary impacts on designated or non-designated heritage assets.

Permanent effects

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

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

9.4.7 Railway Cottages (MCH8285), located on the A530 Nantwich Road are a non-designated asset of low value. The asset derives its significance from its historical and architectural value as a series of 19th century cottages built for railway workers. The cottages would be demolished to allow the construction of the A530 Nantwich Road overbridge and Walley's Green embankment. This would constitute a high adverse impact and result in a moderate adverse significant effect.

9.4.8 Greenheyes Farm, located on the A533 Bostock Road, is a locally listed building of low value. The asset derives its significance from its historical and architectural value as an example of 19th century rural farm architecture. It would be demolished to allow construction of Stanthorne embankment. This would constitute a high adverse impact and result in a moderate adverse significant effect.

9.4.9 Numbers 5, 7, 9, 11 Birches Lane, Lostock Green are non-designated assets of low value. These assets derive their significance from their historical and architectural value as a surviving group of farm workers cottages which define the rural fringes on the northern edge of Lostock Green. They would be demolished as a result of the construction of Rudheath embankment. This would constitute a high adverse impact and result in a moderate adverse significant effect.

9.4.10 The Trent and Mersey Canal Conservation Area is of moderate value and is crossed in three places by the route of the Proposed Scheme on viaducts. The canal is 93 miles in length and the conservation area is 14.5miles from Croxton Aqueduct to Preston Brook tunnel. The conservation area comprises the canal corridor and associated structures. The 18th century canal derives its significance from its architectural, historic, evidential and communal value as an early example of canal architecture now utilised as a leisure resource. Its historic significance is derived from it being one of the first canals on Britain's canal network. The conservation area derives part of its

significance from its setting along the edges of the canal, as it follows natural contours through a landscape alternating between rural farmland and enclosed woodland between the towns of Middlewich and Northwich. Key views are along the canal corridor, across flashes formed by salt extraction subsidence, and west towards Bostock Hall and parkland and the spire of Davenham church. The River Dane viaduct, the Puddinglake Brook viaduct and the Trent and Mersey embankment would cross the conservation area. This would interrupt views along the canal reducing the ability to understand the designed contoured nature of the canal corridor. It would change the secluded, rural environment of the conservation area, reducing the ability to understand the historic context of the asset. This would constitute a medium adverse impact and result in a moderate adverse significant effect.

9.4.11 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:

9.4.12 Lea Hall (NHLE 1160742), a Grade II* listed building is a high value asset. It is located 200m to the north-west of the land required for the Crewe North RSD. The immediate setting of the 17th century country house includes the Grade II listed gate piers (NHLE 1329817) of the former entrance and farm buildings. Excepting the introduction of the linear corridor of the WCML to the west, the house retains its agricultural context of large fields associated with dairy farming. The asset derives its significance from its architectural and historic value as an example of high status, classically influenced country house. Despite the presence of the WCML, the agricultural setting is in keeping with the historical context of the hall and contributes to its significance. The Crewe North RSD and Clive Green embankment would be introduced into the rural landscape setting, affecting the ability to fully appreciate the significance of the asset. This would constitute a medium adverse impact and result in a major adverse significant effect.

9.4.13 Park Farmhouse in Clive Green (NHLE 1160709) is a Grade II listed building of moderate value located 40m west of the land required for the Proposed Scheme. It is a late 17th century brick farmhouse which derives its significance from its historic and architectural value as an example of brick-built vernacular farm architecture. The immediate setting of the farmhouse is a working farmyard within arable fields east of the Shropshire Union Canal. The setting includes views to the south and east across the adjacent fields and is in keeping with the historical context of the farm and so contributes to its significance. The setting would be affected by the presence of the Clive Green embankment to the south-east. This would introduce an embankment and railway into the relatively flat and open rural setting of the asset and affecting the ability to understand the historical context. This would constitute a medium adverse impact and result in a moderate adverse significant effect.

9.4.14 The Middlewich Branch Canal Hughes Bridge (NHLE 1261168) is a Grade II listed building of moderate value and is located 20m west from the land required for the Proposed Scheme. The 18th century brick bridge derives its significance from its historical association with the Middlewich Branch of Shropshire Union Canal. Its setting includes relatively unaltered views along the canal corridor which contribute to its significance. The setting of the asset would be changed by the introduction of the Clive Green embankment which crosses the quiet, tree-lined, rural waterway, severing

views along the waterway looking east. This would reduce the ability to understand the asset's historical context as one of a series of listed bridges along a rural canal. This would constitute a medium adverse impact and result in a moderate adverse significant effect.

9.4.15 Stanthorne Hall (NHLE 1139211) is a Grade II listed building of moderate value surrounded by the Proposed Scheme to the north, east and west at a distance of 200m. It is an early 19th century country house deriving its significance from its historical and architectural value as an example of an Italian influenced formal residence. It derives part of its significance from its farmland setting as this is in keeping with its historical context. The setting would be changed by the presence of the Stanthorne embankment. The surrounding farmland would become enclosed by the realignment of the A54 Middlewich Road to the north and the A533 Bostock Road to the west. This would leave the asset isolated from the remaining farmland affecting the ability to appreciate the historical context. This would constitute a medium adverse impact and result in a moderate adverse significant effect.

9.4.16 Stanthorne Lodge (NHLE 1160718) is a Grade II listed building of moderate value located 40m east of the land required for the Proposed Scheme. It is a 17th or 18th century house deriving its significance from its historical and architectural values and is an example of post medieval rural domestic architecture. It is set on a rise adjacent to former farm buildings south of the A54 Middlewich Road and surrounded by gardens and orchards which still exist today. There are uninterrupted views to the south over fields that allow an appreciation of its rural historical context. The setting would be affected by the presence of the diverted A54 Middlewich Road, the A533 Bostock Road which would expand the infrastructure corridor to the north. The introduction of the Stanthorne embankment would further reduce the rural environment of the house to the south. This would affect the ability to relate the house to its original rural setting and therefore understand the historic context of the house. This would constitute a medium adverse impact and result in a moderate adverse significant effect.

9.4.17 Bank Farmhouse, Stanthorne (NHLE 1160732) is a Grade II listed building of moderate value located approximately 40m west of the land required for the Proposed Scheme. It is a 19th century farmhouse deriving its significance from its historical and architectural value as an example of rural domestic architecture. It is set in farmland which despite the impact of the busy A533 Bostock Road makes a positive contribution to the significance of the asset, being in keeping with its historical context. The setting of the asset would be further changed through the presence of the Stanthorne embankment to the north and east. This would affect the ability to understand the historical rural landscape associated with the farmhouse. This would constitute a medium adverse impact resulting in a moderate adverse significant effect.

9.4.18 The Old Hall Farmhouse, Bostock (NHLE1310589) is a Grade II listed building of moderate value. It is located approximately 100m to the north-east of land required for the Proposed Scheme. It is a 19th century farmhouse deriving its significance from its historic and architectural value as an example of vernacular rural architecture. Its setting is farmland which makes a positive contribution to the significance of the asset

as it is in keeping with its historical context. The traditional line of the adjacent A533 Bostock Road would have formed part of this setting. The construction of the Stanthorne embankment and the diversion of the A533 Bostock Road would change the setting of the asset. This would erode the pastoral landscape and affect the ability to understand the historical context of the farmhouse. This would constitute a medium adverse impact resulting in a moderate adverse significant effect.

9.4.19 The South Lodge, Railings, Gates and Gatepiers (NHLE1138454) are a Grade II listed building of moderate value. The lodge and associated structures are located adjacent to the land required for the Proposed Scheme. It is a 19th century building that derives its significance from its historic and architectural value as an example of a lodge associated with the designed landscape and country residence of Bostock Hall. It derives part of its significance from its setting within the Bostock Conservation Area. This is defined by designed parkland and enclosed woodland that flanks the A533 Bostock Road around the southern entrance to the grounds of Bostock Hall. Key views include those along the road and north through the railings and entrance adjacent to the lodge towards the parkland surrounding Bostock Hall. The setting of the lodge, railings and gateway would be impacted by the diverted A533 Bostock Road. This would include a junction and widening of the carriageway for approximately 250m, and the removal of part of the woodland and field south of the lodge. This would alter the setting of the lodge reducing the ability to understand its relationship with the designed landscape around Bostock Hall. This would constitute a medium adverse impact resulting in a moderate adverse significant effect.

9.4.20 The Bostock Conservation Area is of moderate value and is located partially within the land required for the Proposed Scheme. Within the conservation area are the 19th century Grade II* listed Bostock Hall (NHLE1138416), twelve Grade II listed buildings and the settlement of Bostock Green. It also includes parkland and woodland interspersed with agricultural fields and hedgerows around the hall. It derives its significance from the architectural value of the hall and historic buildings and the aesthetic value of its parkland, woodland copses and rural fields. The setting of the conservation area includes the shallow valley of the River Dane lined with oak woodland and fields to the north and east. Key views include those from Bostock Hall north-east towards the Dane Valley. The setting of the eastern side of the conservation area would be changed by the introduction of the River Dane viaduct approximately 250m to the east of the conservation area. This would introduce a high structure alongside the conservation area, changing the traditional setting of woodland copses and fields. This would reduce the ability to understand the rural context of the Bostock conservation area and impact on views to and from the north-east. This would constitute a medium adverse impact and result in a moderate adverse significant effect.

9.4.21 Whatcroft Hall (NHLE 1138463) a Grade II* listed building of high value is located approximately 250m west from the land required for the Proposed Scheme. The 18th century mansion derives its significance from its historic and architectural value as an example of high class rural domestic architecture. The immediate setting of the asset is a cluster of associated farm buildings. Key views are to the south-east to the moated site of an earlier hall and the pastoral fields beyond. This key view explains the

chronological development and historic significance of Whatcroft Hall. The asset would be affected by the introduction of the mass of the Dane Valley embankment, which would impact upon its setting and adversely affect the key views by introducing the imposing mass of the embankment into an otherwise rural landscape. This would reduce our ability to understand its historic context and significance. This would constitute a low adverse impact and a moderate adverse significant effect.

9.4.22 Bridge Cottage and Canal Cottage (NHLE 1160389) is a Grade II listed building of moderate value, located adjacent to the land required for the Proposed Scheme. The two cottages are the remains of a former 19th century farmhouse, and derive their significance from historic and architectural value as an example of rural architecture. The cottages are set within their original 19th century farmyard surrounded by agricultural land off the quiet Whatcroft Lane. The Trent and Mersey Canal forms part of their rural setting and contributes to their historic significance as the canal served as a transport link to take agricultural produce to markets in towns and cities. The setting of the listed building would be affected by the presence of the River Dane viaduct and Whatcroft embankment 35m to the east of the asset which would change the rural aspect of the setting of the asset. This would affect the ability to understand their rural historic context and erode the appreciation of its relationship with the Trent and Mersey Canal. This would constitute a high adverse impact and a major adverse significant effect.

Other mitigation measures

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

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

Summary of likely residual significant effects

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

9.4.25 As no specific mitigation measures have yet been identified in relation to 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: MA02 Map Book:

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

Assessment of impacts and effects

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

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

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

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

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

- Lea Hall (NHLE1160742);
- Park Farmhouse, Clive Green (NHLE 1160709);
- Middlewich Branch Canal Hughes Bridge (NHLE 1261168);
- Stanthorne Hall (NHLE 1139211);
- Stanthorne Lodge (NHLE 1138454);
- Bank Farmhouse, Stanthorne (NHLE 1160732);
- Old Hall Farmhouse, Bostock (NHLE 1310589);
- Bostock Conservation Area;

- Trent and Mersey Canal Conservation Area;
- Whatcroft Hall (NHLE 1138463); and
- Bridge Cottage and Canal Cottage (NHLE 1160389).

Other mitigation measures

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

Summary of likely residual significant effects

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

Monitoring

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

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

10 Land quality

10.1 Introduction

10.1.1 This section of the report presents the baseline conditions that exist along the Proposed Scheme in the Wimboldsley to Lostock Gralam 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 and current 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: MA02 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 mineral plans, and existing planning or licensed areas. Any inference of minerals provided by geological maps/reports is excluded (except where these are covered by the 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, CWCC, 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 Wimboldsley to Lostock Gralam area. Recent changes in lithostratigraphic classifications by the BGS have been incorporated where appropriate.

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

10.3.3 Table 15 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 15: 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	Along the base of the valleys of: the River Dane; River Weaver; River Wheelock; Wade Brook; Gad Brook and; Peover Eye and Smoker Brook which become Wincham Brook	Organic rich clay, silt, sand and gravel	Secondary A
River terrace deposits	Isolated areas along the valley of the River Dane	Sand and gravel	Secondary A
Glaciofluvial sheet deposits	Isolated areas to the west and north-west of Stanthorne, north of Whatcroft and along the valley of Wade Brook and River Dane. Deposits in the area around Smoker Brook and Peover Eye	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 pebbles	Secondary (Undifferentiated)
Bedrock			
Mercia Mudstone Group - Sidmouth Mudstone Formation	Located along the study area until the north-west of Wimboldsley, and from the south-east of Rudheath until the east of Lostock Gralam. Potential collapse breccia[73] may be present throughout the Sidmouth Mudstone Formation around geological boundaries.	Mudstone, siltstone and sandstone	Secondary B
Mercia Mudstone Group - Northwich Halite Member	From the north-west of Wimboldsley to the south-east of Rudheath, and from the east of Lostock Gralam to the northern extent of the study area. Potential collapse breccia may be present throughout the Northwich Halite Formation.	Halite stone and mudstone	Unproductive strata

[73] 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

Made ground

10.3.4 Made ground is a term used to denote man-made deposits such as landfill, colliery spoil heaps or earthworks associated with construction or ground improvement. Such deposits may be poorly mapped and are often very variable in composition. Minor deposits of made ground may be encountered within this area, for example where ponds, sand or marl pits have been backfilled. There is evidence of historical and existing authorised 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[74]. 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 are known to be present within the Wimboldsley to Lostock Gralam study area. In all cases, publicly available records (including APHA Foot and Mouth Disease County Status Maps)75 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 Wimboldsley to Lostock Gralam area is underlain by glacial till[76] (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 valleys of the River Weaver, River Wheelock, River Dane, Gad Brook, Wade Brook, Peover Eye and Smoker Brook. Isolated pockets of alluvium are also present to the south-east and north of Clive.

10.3.9 Glaciofluvial sheet deposits, comprising sand and gravel, are present in various locations along the route of the Proposed Scheme. These are summarised as: isolated pockets around the River Weaver, to the west and south-west of Stanthorne, to the west of the River Dane, in Whatcroft, either side of Wade Brook, and around Peover Eye and Smoker Brook.

10.3.10 River terrace deposits comprising sand and gravel are present in isolated locations along the valley of the River Dane.

Bedrock geology

10.3.11 The Mercia Mudstone Group underlies this study area. It is typically described as mudstone and siltstone with some halite-bearing units and sandstone. The Mercia

[74] British Geological Survey 1:10,000 Artificial ground mapping
[75] 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
[76] 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

Mudstone Group is subdivided into many formations and members, of which, the following are present in the study area:

- the Sidmouth Mudstone Formation is located from the southern end of the study area to the north-west of Wimboldsley, and from the south-east of Rudheath to the east of Lostock Gralam; and
- the Northwich Halite Member is present from the north-west of Wimboldsley to the south-east of Rudheath, and from the east of Lostock Gralam to the northern extent of the study area.

10.3.12 Bedrock faults are recorded underlying the route of the Proposed Scheme in four locations; 300m north of the A533 Bostock Road, adjacent to the north and south of the Winsford Rock Salt Mine Waste Disposal Facility (to the south of Whatcroft), and 200m to the south of Gad Brook (King Street Fault).

10.3.13 Areas of potential collapse breccia may be present in the bedrock strata (Sidmouth Mudstone Formation and Northwich Halite Member) from 1km north of Walley's Green to Gad Brook, and from Wade Brook to the northern extent of the study area.

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[77].

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

Groundwater

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

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

[77] Available at: http://www.bgs.ac.uk/radon/hpa-bgs.html. Accessed 09/05/2018. This dataset underpins Public Health England's Indicative Atlas of Radon in England and Wales (Miles J.C.H, Appleton J.D, Rees D.M, Green B.M.R, Adlam K.A.M and Myers, A.H. (2007). Indicative Atlas of Radon in England and Wales. Public Health England. ISBN: 978-0-85951-608-2. 29 pp) available at www.ukradon.org/information/ukmaps.

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

10.3.18 There are no groundwater source protections zones (SPZ)[78] identified within 250m of the land required for construction of the Proposed Scheme within the Wimboldsley to Lostock Gralam area. There is one unlicensed private groundwater abstraction licence registered in the study area.

10.3.19 Details of the 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.

10.3.20 Further information on the groundwater in the Wimboldsley to Lostock Gralam area is provided in Section 15, Water Resources and flood risk.

Surface water

10.3.21 The Proposed Scheme would cross the following canals and main rivers:

- the Shropshire Union Canal (Middlewich Branch) between Winsford and Middlewich;
- the Trent and Mersey Canal near Bostock and again on two occasions north of Whatcroft;
- the River Dane near Bostock where the route of the Proposed Scheme would intercept the river at three points within 700m;
- Puddinglake Brook in Whatcroft;
- Wade Brook to the north of the A559 Manchester Road;
- Peover Eye and Smoker Brook at the northern extent of the study area; and
- Gad Brook to the south-east of Rudheath.

10.3.22 The following main rivers and watercourses are also in the study area: tributaries of the River Weaver, the Dingle, tributaries of the River Wheelock, a tributary of the River Dane, a tributary of the Trent and Mersey Canal, a tributary of Peover Eye and a tributary of Smoker Brook. There are also a number of unnamed streams, tributaries, drains, ponds and culverts located within the study area.

10.3.23 Surface water bodies in the Wimboldsley to Lostock Gralam area are described in more detail in Section 15, Water resources and flood risk.

[78] A groundwater SPZ is a defined area within which groundwater is extracted for potable water supply. The area is defined by the Environment Agency on the basis of the length of time taken for groundwater to migrate to the potable source.

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

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

Current and historical land use

10.3.26 Current potentially contaminative land uses within the study area include two landfill sites, one mining site and 49 other identified potentially contaminative sites. The key potentially contaminative sites are: Holford Brinefield Landfill site, Winsford Rock Salt Mine waste disposal facility, Lostock Lime Beds, a petrol filling station in Rudheath, and a recycling centre near Middlewich.

10.3.27 Historical land uses identified within the study area with the potential to have caused contamination include three landfill sites, three mining sites and 46 other identified potentially contaminative sites. The key historical potentially contaminative sites are: historical landfilling in Holford Brinefield Landfill site, a Local Authority recorded landfill near Wimboldsley, petrol filling stations, a chemical works and ammonia soda works near Lostock Gralam, a smithy[79] near Plumley, and a wharf near Rudheath.

10.3.28 Further details of key current and historical contaminative land uses within the study area are shown in Table 16, Table 17 and Table 18.

Table 16: Current and historical landfill sites located in the study area

Name and area reference	Location	Description
Winsford Rock Salt Mine Waste Disposal Facility, Middlewich (MA02-124)	The landfill is located below the land required for the route of the Proposed Scheme, approximately 650m south of Whatcroft	Active Environment Agency authorised landfill site reference JP3134WB. Site for the underground storage of hazardous waste with a total capacity >50 tonnes. Operated by Veolia Limited. This is a deep underground storage facility utilising salt caverns.
Holford Brinefield Landfill Site, Lostock Gralam (MA02-181)	The landfill is located below the land required for the route of the Proposed Scheme on both sides of the A556 Chester Road at Lostock Green	Active Environment Agency authorised landfill site reference EPR/XP3934SL. Waste landfilling >10 tonnes/day with a total capacity of >25,000 tonnes excluding inert waste. This is a deep underground storage facility utilising salt caverns.
Lostock Lime Beds, Lostock, Northwich (MA02-183)	Located 10m from land required for the construction of the Proposed Scheme, to the north-east of Rudheath	Environment Agency historical landfill site reference EAHLD17938. Waste deposited from 1952 to 1994, including; inert, industrial, special wastes and liquid sludge.
LA recorded landfill, The Dingle, Wimboldsley (MA02-30)	Located 125m from land required for the construction of the Proposed Scheme, to the west of Wimboldsley Grange	Historical Vale Royal Borough Council (now part of CWCC) Local Authority recorded landfill, reference 4/458. No information provided on dates or wastes deposited.
Croxton Lane Historical Landfill Site, Middlewich	Located 200m from land required for the construction of the Proposed Scheme, to the north-west of	Environment Agency historical landfill site reference EAHLD17139. Waste deposited from 1945 but no end date supplied. Includes; household and special wastes. Now a recycling

[79] Commonly used term on historical mapping to denote a blacksmiths

(MA02-107)	Middlewich	centre.

Table 17: Current and historical mining, mineral sites and colliery spoil sites located in the study area

Name and area reference	Location	Description
Winsford Rock Salt Mine, Middlewich (MA02-124)	Located below the land required for the route of the Proposed Scheme, approximately 650m south of Whatcroft	Current rock salt mine, originally active 1844-1892, reopened 1928-present. Mine covers approximately 5km (east to west) by 3km (north to south) and is approximately 150m below the surface.
Holford Brinefield, Lostock Gralam (MA02-181)	The brinefield is located below the land required for the route of the Proposed Scheme, on both sides of the A556 Chester Road at Lostock Green	Historical brinefield covering approximately 3.5km (east to west) by 2km (north to south).
Sand pits (MA02-115, MA02-122)	To the north-east of Winsford Industrial Estate, located 60m and 45m from land required for the construction of the Proposed Scheme.	Historical sand pits, extracting from the glaciofluvial sheet deposits between 1875 and 1970. Between 0.5ha and 1.2ha in area.
Brick works (MA02-145)	South of Rudheath, 220m from land required for construction of the Proposed Scheme.	Historical brickworks, extracting from the glacial till between 1898 and 1909. Approximately 1ha in area.

Table 18: Current and historical industrial sites located in the study area

Name and area reference	Location	Description
Chemical works (MA02-200)	South-east of Lostock Gralam, on land required for the construction of the Proposed Scheme	Historical chemical works, present on mapping between 1969 and 1974.
Ammonia soda works (MA02-211)	East of Lostock Gralam, 70m from land required for construction of the Proposed Scheme.	Historical ammonia soda works, present on mapping between 1910 and 1911 for the production of ammonia nitrate for use in munitions. Associated warehousing, tip and rail infrastructure were present.
Petrol filling station (MA02-175)	In Rudheath, 130m from land required for construction of the Proposed Scheme.	Active petrol filling station since 1969.
Smithy (MA02-226)	North-west of Plumley, 150m from land required for construction of the Proposed Scheme.	Historical smithy, present on mapping between 1877 and 1993.
Recycling centre (MA02-107)	North-west of Middlewich, 200m from land required for construction of the Proposed Scheme.	Active Local Authority recycling centre on historical recorded landfill site.

10.3.29 Contaminants commonly associated with sites in tables 2, 3 and 4 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

10.3.30 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). There was one significant incident reported within the study area between 1991 and 2016.

10.3.31 The Holford Brinefield site is registered as a Control of Major Accident Hazards (COMAH) site in relation to gas storage, although it is understood that the wellheads associated with the site are not located within in the study area.

10.3.32 This significant pollution incident to water (Category 2), occurred in 2004 to the Trent and Mersey Canal north-east of Bostock Hall, and involved the release of suspended solids.

10.3.33 The Environment Agency reports that there are no consented discharges to groundwater within the study area. Further details on the groundwater in the Wimboldsley to Lostock Gralam study area can be found in Section 15, Water resources and flood risk.

10.3.34 There are 14 discharge consents to surface water within the study area, none of which are within the area of land required for the Proposed Scheme.

10.3.35 There are nationally significant ecological designations, as defined in the land quality section of the SMR[71], located within the study area. These are:

- two SSSI: Wimboldsley Wood SSSI is located 20m from land required for the construction of the Proposed Scheme but across the Shropshire Union Canal, and Plumley Lime Beds SSSI is located 1m from land required for the construction of the Proposed Scheme to the east of Lostock Gralam;
- thirteen Local Wildlife Sites (LWS): including four located within the land required for the construction of the Proposed Scheme and nine located within the study area; and
- eight Ancient Woodland Inventory Sites (AWIS): including five located within the land required for the construction of the Proposed Scheme, and three located within the study area.

10.3.36 Further information on ecological designations can be found in Section 7 Ecology and biodiversity.

Mining/mineral resources

10.3.37 There are a range of mining and mineral resources located within the study area that have the potential to be affected by the Proposed Scheme. These can include sand, gravel, clay, stone, lime, salt, gypsum and coal, which can be protected via local or county level mineral plans and by the Coal Authority, as well as other forms of petroleum hydrocarbons such as shale gas and oil which are regulated by the Oil & Gas Authority (OGA) via the issue of Petroleum Exploration Development Licences (PEDLs).

Mineral plans

10.3.38 Cheshire County Council was responsible for the overall mineral and waste local plans for the study area. The Cheshire Replacement Minerals Local Plan[80] was adopted in June 1999 and sets out the policies aimed at controlling mineral related developments within the Cheshire East and Cheshire West and Chester Boroughs up to the year 2006. No further revisions of the plan were published by Cheshire County Council prior to its dissolution in 2009.

10.3.39 A consultation[81] of safeguarding of minerals and minerals infrastructure was undertaken for CWAC in 2012 as part of the update to the local plan. This presents an update to areas of mineral safeguarding.

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

Sand, gravel and clay deposits

10.3.41 There are a limited number of recorded quarries within the study area; quarrying glaciofluvial sheet deposits for sand, and glacial till for clay.

10.3.42 There are three mineral safeguarding areas (MSA) within the Wimboldsley to Lostock Gralam area comprising superficial sand and gravel. MSA would be crossed by the route of the Proposed Scheme where it crosses the River Dane, and others would be crossed by the route of the Proposed Scheme associated with Wade Brook to the south of Lostock Gralam and Wincham Brook to the north of Lostock Gralam. Another MSA is located within the study area associated with the River Weaver but is not located with the land required for the construction of the Proposed Scheme.

Salt deposits

10.3.43 The Cheshire Mineral Resource Information map[82] presents the extent of all mineral extraction planning permissions and brinefields[83]. In the study area, the Northwich Halite Member is used for salt extraction.

10.3.44 The route of the Proposed Scheme is located above the Meadow Bank and Winsford Rock Salt Mine underground extraction permissions, to the north-east of Winsford. Winsford mine has a capacity of 2.25 million tonnes per year although production is estimated to be about 0.9 million tonnes per year. The implemented planning consent for Winsford Salt Mine expires in 2021. The route of the Proposed Scheme is also located above the currently active Holford Brinefield, to the south of Lostock Gralam.

10.3.45 The following resource allocations are recorded in the study area in the Cheshire Replacement Minerals Local Plan and the CWCC Local Plan:

- a preferred extension to the Warmingham controlled brinefield to the west of Warmingham, underlying the land required for the Proposed Scheme;

[80] Cheshire County Council (1999) *The Cheshire Replacement Minerals Local Plan*.
[81] Cheshire West and Chester Council (2012) *Local Plan: Consultation on safeguarding of minerals and minerals infrastructure – Outcomes report*.
[82] 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.
[83] Brine denotes a high concentration solution of salt in water

- a preferred extension to the Winsford rock salt mine, including land predominantly to the south-east of the existing mine to the north-east of Winsford; and
- the entire study area is within a mineral safeguarding area (MSA) for salt.

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

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

Coal mining

Open cast coal mining

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

Deep coal mining

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

10.3.50 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

10.3.51 The OGA indicates that the route of the Proposed Scheme passes through three PEDL areas; PEDL292, PEDL294 and PEDL296. The PEDL areas are associated with extraction wells for conventional oil and gas. However, none of the extraction wells associated with the PEDL are located in the study area.

Geo-conservation resources

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

Receptors

10.3.53 The sensitive receptors that have been identified within the study area are summarised in Table 19. A definition of receptor sensitivity is given in the SMR.

Table 19: 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 properties	Moderate
		Workers at and visitors to industrial premises	Low
	Groundwater	Secondary A aquifers (river terrace deposits, alluvium and the glaciofluvial sheet deposits)	Moderate
		Secondary (Undifferentiated) aquifer (glacial till), Secondary B aquifer (Mercia Mudstone Group)	Low
	Surface waters	Shropshire Union Canal (Middlewich Branch), Trent and Mersey Canal, River Dane, Wade Brook, Peover Eye and Smoker Brook	High
		Puddinglake Brook, Gad Brook, tributary of Smoker Brook	Moderate
		The Dingle, other tributaries and unnamed watercourses	Low
	Built environment	Underground structures and buried services	Low
	Ecological designations	SSSI (Wimboldsley Woods and Plumley Lime Beds)	High
		Several AWIS and LWS	Moderate
Impacts on mining/mineral and petroleum (gas) sites (severance and sterilisation)	Mining/mineral sites	Consented brine extraction, consented rock salt mine, salt MSA, sand and gravel MSA, areas of preferred extension to salt mine and brinefield, PEDL	Moderate

10.4 Effects arising during construction

Avoidance and mitigation measures

10.4.1 The construction assessment takes into account the mitigation measures described in the draft Code of Construction Practice (CoCP)[84]. 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:

[84] Supporting document: Draft Code of Construction Practice

- methods to control noise, waste, dust, odour, gases and vapours (Sections 5, 7, 11, 13, 14 and 15);
- methods to control spillage and prevent contamination of adjacent areas (Sections 5, 11 and 16);
- the management of human exposure for both construction workers and people living and working nearby (Sections 5, 7, 11, 13 and 14);
- methods for the storage and handling of excavated materials (both contaminated and uncontaminated) (Sections 6, 7, 11 and 15);
- management of any unexpected contamination found during construction (Sections 11 and 15);
- a post-remediation permit to work system (Section 11);
- storage requirements for hazardous substances such as oil (Sections 5, 11 and 16);
- 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[85] and British Standards BS10175[86] and BS8576[87].

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[88]. 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

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

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: MA02 Map Book.

Land contamination

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

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

- whether the site is located on or off the route of the Proposed Scheme or associated off line works;
- 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 20. 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 20: Summary of baseline CSM for sites which may pose a contaminative risk for the Proposed Scheme

Area reference[89]	Area name	Human health risk	Ground water risk	Surface water risk	Ecosystem risk	Buildings risk
On-site[90]						
MA01-230, MA02-46, MA02-137, MA02-206, MA02-210	Railway land	Very low to Moderate/low	Very low	Low to moderate/low	N/A[91]	Very low to low
MA02-11, MA02-41, MA02-53, MA02-66, MA02-75, MA01-93, MA02-113, MA02-118, MA02-121, MA02-152, MA02-169, MA02-191	Marshland	Very low to moderate/low	N/A	N/A	N/A	Low
MA02-72, MA02-134, MA02-141, MA02-146, MA02-189	Farms including tanks	Low to moderate/low	Very low to moderate/low	Moderate/low	N/A	Low
MA02-124, MA02-181	Landfill/deep storage facility	Low	Very low	N/A	N/A	N/A
MA02-16, MA02-102, MA02-193, MA02-218	Industrial estate, tanks, electricity sub-station, metal manufacturing and plating	Very low to moderate/low	Low to moderate/low	Low	N/A	Low to moderate/low
MA02-200, MA02-211	Ammonia soda works and chemical works	Very low to moderate/low	Low	N/A	Very low	Low
Off-site[92]						
MA02-107, MA02-183	Landfill	Moderate/low to moderate	Moderate	Moderate/low	N/A	Very low to moderate/low
MA02-10, MA02-81, MA02-86, MA02-91, MA02-132,	Tanks for likely fuel storage, petrol filling station and garage	Low to moderate/low	Very low to moderate/low	N/A	N/A	Low

[89] Each potentially contaminated site is allocated a unique reference number.
[90] 'On-site' is within the area of land required for construction of the Proposed Scheme.
[91] Risks are deemed to be not applicable when the pollutant linkage is not considered to exist between the source and receptor, for example due to distance.
[92] 'Off-site' is beyond the land required for construction of the Proposed Scheme but within 250m of it.

MA02-160, MA02-175						
MA02-192	Farm, including tanks	Very low to moderate/low	Moderate/low	Low	N/A	Low
MA02-215	Infilled land	Very low to moderate/low	Low to moderate	N/A	Very low	Low
MA02-18, MA02-142, MA02-224	Marshland	Very low to moderate/low	N/A	N/A	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 20 have been assessed for the change in impact associated with the construction stage of the work and were found to have non-significant (neutral) effects

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

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

Permanent effects

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

10.4.18 The magnitude of the permanent effects and their significance have been determined by assessing the change in risk between the main baseline risk and the main post-construction risk. Therefore, where there is no change between the main baseline risk

and the main post-construction risk, the permanent effect significance is deemed to be negligible even if the risk is assessed to remain as high. This would be the case where the construction of the Proposed Scheme does not alter the risks from an existing potentially contaminated site that is outside the construction boundary. As noted above, a worsening would result in negative effects and an improvement would result in positive effects.

10.4.19 All of the sites set out in Table 20 have been assessed for the change in impact associated with the permanent post construction stage. There are no locations where there would be a significant permanent effect from the construction of the Proposed Scheme.

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[93] 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 a preferred extension to the Warmingham Brinefield, Winsford Rock Salt Mine and the area of preferred extension to this, Holford Brinefields, an extensive MSA for salt and two MSA for sand and gravel.

Temporary effects

10.4.22 There are no identified 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

10.4.23 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.

Salt deposits

10.4.24 The effect of construction of the Proposed Scheme on the identified salt deposits would be negligible. Whilst the Winsford Rock Salt Mine and Holford Brinefield are very high value receptors the Proposed Scheme would be required to maintain a minimum distance from these resources in order for their continued extraction. Impacts and corresponding effects would therefore be negligible.

10.4.25 There may be a temporary adverse effect where construction compounds are proposed within the MSA or preferred extensions. In such cases, there would be a temporary sterilisation of the resource during construction works, but this is not

[93] 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.

considered to represent a significant effect and the resource would not be lost permanently.

10.4.26 As the MSA covers the whole area, all compounds within the Wimboldsley to Lostock Gralam area will fall within the MSA.

Coal mining - deep

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

Petroleum Extraction Development Licences (PEDL)

10.4.28 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.

Permanent effects

10.4.29 There are no identified shallow coal resources in the study area; therefore, there would be no permanent effects from the Proposed Scheme on this resource.

Sand and gravel deposits

10.4.30 The effects of construction of the Proposed Scheme on the sand and gravel MSA would be permanent where the MSA is located beneath the footprint of the permanent works, with a strip of mineral becoming sterilised. However, as a proportion of the total MSA, these strips are small, 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, CWCC and the mineral owner.

Salt deposits

10.4.31 The Winsford Rock Salt Mine and Holford Brinefield, are very high value receptors. However, the Proposed Scheme would be required to maintain a minimum vertical distance from these resources in order for their continued extraction and a lateral offset from existing caverns. The effects on the Winsford Rock Salt Mine and Holford Brinefield would be negligible and therefore not significant.

10.4.32 The Proposed Scheme and associated safeguarding area would potentially sterilise a narrow strip of areas of preferred extension to the Warmingham Brinefield (less than 3%) and preferred extension to the Winsford Rock Salt Mine (less than 10%). These are minor impacts on high value resources, resulting in minor adverse effects.

10.4.33 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 on a medium value resource resulting in a negligible effect, 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 would be no effects on deep coal resources as a result of the Proposed Scheme.

Petroleum Extraction Development Licences (PEDL)

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 21 reports the assessment of permanent effects from construction on the mining and mineral resources identified.

Table 21: Summary of effects for mining and mineral resources

Site name	Status	Description	Sensitivity/ value	Magnitude of impact	Effect and significance (Y/N)
Winsford Rock Salt Mine, Winsford	Strategic mineral resource currently being worked	Active rock salt mine. Planning consent expires in 2021.	Very high	Negligible	Negligible (N)
Holford Brinefield	Strategic mineral resource currently being worked	Consented brine extraction, defined by CWAC	Very high	Negligible	Negligible (N)
Warmingham Brinefield preferred extension	Mineral site	Preferred extension to the controlled brinefield at Warmingham, defined by CEC	High	Minor	Minor adverse (N)
Winsford Rock Salt Mine preferred extension, Winsford	Mineral site	Area of preferred extension to the controlled brinefield, defined by CWAC	High	Minor	Minor adverse (N)
Salt MSA, Cheshire	MSA	MSA for salt extraction, defined by CWAC	Medium	Minor	Negligible (N)
Sand and gravel MSA, Crewe	MSA	MSA for sand and gravel extraction, defined by CWAC	Medium	Minor	Negligible (N)
PEDL292, PEDL294, PEDL296	PEDL	Petroleum exploration and development licence areas	Medium	Negligible	Negligible (N)
Deep coal	No designation	Deep coal at more than 1,200m	Low	Negligible	Negligible (N)

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

Geo-conservation sites

10.4.38 No geo-conservation areas such as SSSI or LGS are present 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 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 CWCC and any other relevant parties to assist in achieving an effective management of minerals within the affected locations.

Summary of likely residual significant effects

10.4.41 Based on the information currently available and with the application of the mitigation measures detailed above, no likely significant residual effects are anticipated with respect to land quality.

10.5 Effects arising from operation

10.5.1 Users of the Proposed Scheme (i.e. rail passengers) are at all routine times within a controlled environment (i.e. within trains), and have therefore been scoped out of the assessment.

Avoidance and mitigation measures

10.5.2 Maintenance and operation of the Proposed Scheme would be in accordance with environmental legislation and good practice. Spillage and pollution response procedures similar to those to be outlined in the draft CoCP would be established for all high risk activities and employees would be trained in responding to such incidents.

Assessment of impacts and effects

10.5.3 The Proposed Scheme within this area would include Crewe North rolling stock depot (RSD) which may result in minor contamination, although effects will be minimised through compliance with environmental legislation and good practice. Additionally, there will be three auto-transformer stations; A530 Nantwich Road mid-point auto-transformer station, Bostock Road auto-transformer station and Crowder's Lane express feeder auto-transformer station. Auto-transformer 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 Wimboldsley to Lostock Gralam area, summarises the baseline conditions found within and around the route of the Proposed Scheme and describes the likely impacts and significant effects during construction and operation on landscape and visual receptors.

11.1.2 The operational assessment section refers not just to the running of the trains, vehicles on roads and any associated lighting but also the presence of the new permanent infrastructure associated with the Proposed Scheme.

11.1.3 Engagement with the Canal & River Trust (CRT), Cheshire East Council (CEC) and Cheshire West and Chester Council (CWCC) 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: MA02 Map Book shows the locations of key environmental features (Map Series CT-10) and the key construction (Map Series CT-05) and operational (Map Series CT-06) features of the Proposed Scheme. It also shows the locations of landscape and visual impact mitigation measures (Map Series CT- 06), viewpoints that would potentially be significantly affected at the construction (Map Series LV-03) and operation (Map Series LV-04) phases and Landscape Character Areas (LCA) that would potentially be significantly affected at the construction and operation phases (Map Series LV-02).

11.1.5 A separate, but related, assessment of effects on the setting of heritage assets is reported in Section 9, Historic environment.

11.2 Scope, assumptions and limitations

11.2.1 The scope, key assumptions and limitations for the landscape and visual assessment are set out in full in Volume 1, Section 8 and the Scope and Methodology Report (SMR)[94].

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

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

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

11.2.3 The extent of the study area has been informed by construction and operational phase zones of theoretical visibility (ZTV). The ZTV have been produced in line with the methodology described in the SMR and are an indication of the theoretical visibility of the Proposed Scheme. In some locations, extensive vegetation cover 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 route of the Proposed Scheme have been assessed as part of the study area. This includes long distance views from settlement edges such as at Middlewich, Clive, Bostock Green and Higher Wincham.

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

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

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

11.3 Environmental baseline

Existing baseline

Landscape baseline

11.3.1 The study area extends from Wimboldsley in the south to Lostock Gralam and Wincham Brook in the north. It is a lowland landscape of gently undulating or, in places, flat farmland set amongst the towns of Middlewich, Winsford and Northwich.

11.3.2 Typical of a large proportion of the Cheshire landscape, it forms part of a wider lowland plain, broadly separated by sandstone ridges and locally cut by shallow river valleys that converge north and west towards Northwich and the Mersey Estuary. The valley of the River Weaver to the west is prominent by virtue of its flanking woodlands, while the less distinct River Wheelock connects with the River Dane between Middlewich and Northwich. Recorded ancient woodland is located in the valley fringes of the rivers Weaver and Dane.

11.3.3 The agricultural and industrial prosperity of the plain owes much to its glacial origins, with an underlying geology rich in rock salt covered by a thick layer of glacial till and productive clay soils. From the early medieval period the settlements of Northwich and Middlewich were the main urban centres, with a focus on salt extraction. The development of dairy farming and associated cheese making practices in the 16th century led to the improvement of agricultural land for grazing and to larger and more regular fields, while later industrial prosperity from salt extraction in the 18th and 19th centuries brought further urban expansion. The construction of the Trent and Mersey Canal and the Shropshire Union Canal in the late 18th century for the transport of pottery, coal and salt played a significant role in this urbanisation. The canal network today is a valuable recreational resource and an important heritage legacy; the whole of the Trent and Mersey Canal corridor being designated a Conservation Area.

11.3.4 The relatively flat agricultural landscape of the plain incorporates a pattern of fields which vary in regularity and size, with generally well-maintained hedgerows. These hedges are often dense, with large and mature hedgerow trees giving the appearance of a well-wooded landscape, despite woodland being relatively scarce in the area. Large farmsteads are locally prominent, as are large landed estates, notably at Bostock Hall, Whatcroft and Wimboldsley. Beyond the main urban areas, the settlement pattern is of small villages and scattered individual properties.

11.3.5 The landscape is punctuated by ponds and meres[95]. Subsidence from salt abstraction is evident from the presence of other open water bodies and flashes[96], such as at Billinge Green near Northwich and along the line of the Trent and Mersey Canal corridor.

11.3.6 The West Coast Main Line (WCML) rail corridor with its locally prominent overhead line equipment crosses the landscape between Crewe, Middlewich and Northwich. The primary roads and bypasses that link the towns are highly trafficked, in contrast to the surrounding network of rural lanes and paths. The landscape maintains a largely tranquil and rural quality, with skylines of hedgerows and mature trees. On occasion the distant horizon of the Peak District hills are visible to the east and the Peckforton hills to the west. Settlements are generally well screened by trees and woodland within the landscape.

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

[95] Mere: a pond or pool of shallow depth in relation to breadth, created over flooded glacial till which is transitioning to fen and bog.
[96] Flash: a shallow water body, created as a result of subsidence due to the solution of underlying salt deposits.

refined, as appropriate, upon review of available historic landscape characterisation data and will be included in the formal ES.

11.3.8 Use has been made of published landscape character assessments and a wide range of supporting GIS data, aerial photography and Ordnance Survey mapping, plus desk study and fieldwork. Landscape character assessments reviewed include the relevant National Landscape Character Areas[97] and the Cheshire Landscape Character Assessment[98].

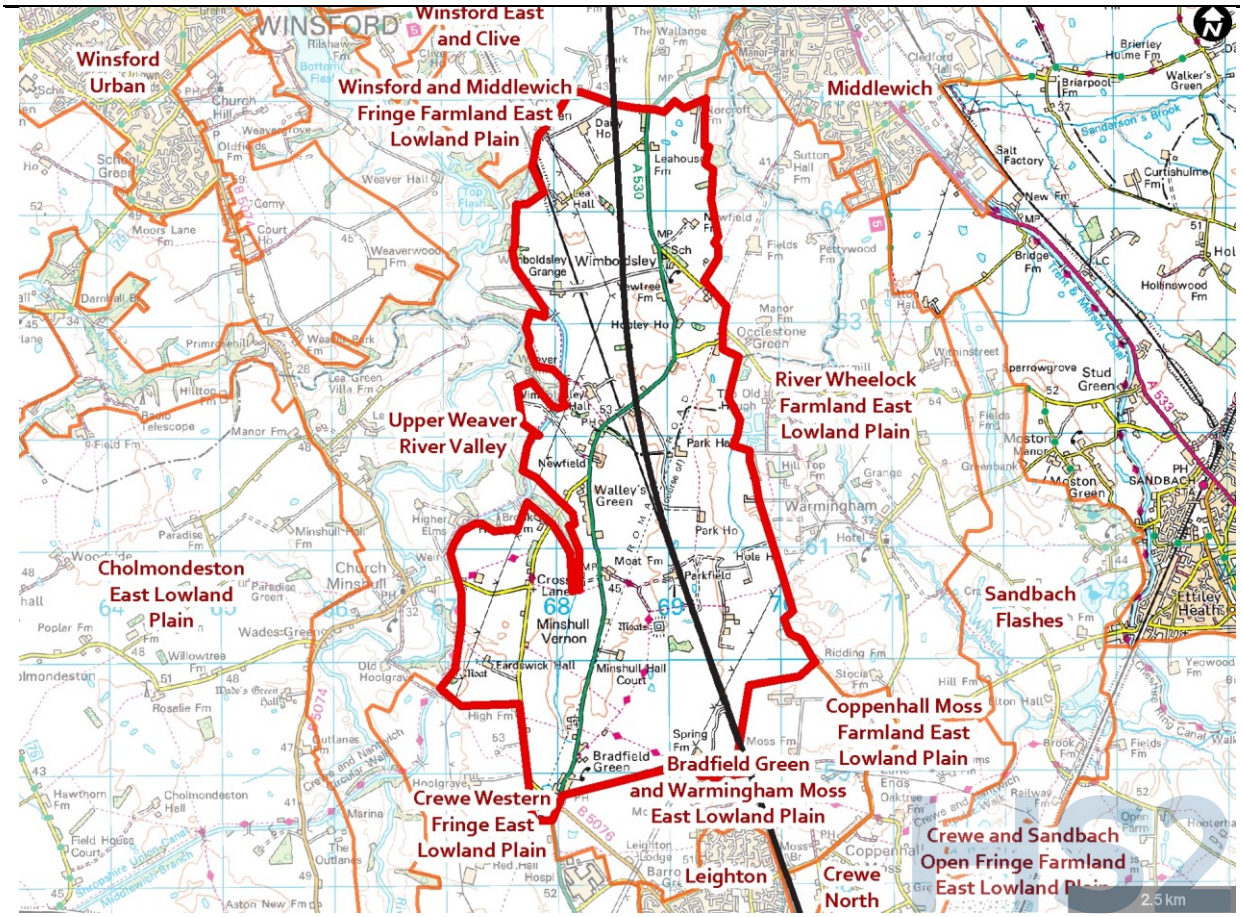
11.3.9 These published LCAs have been adapted for this assessment to provide LCAs of an appropriate and consistent scale. Minor amendments have also been made to some published LCA boundaries to reflect existing conditions.

11.3.10 For the purposes of this assessment, the Wimboldsley to Lostock Gralam study area has been subdivided into twenty 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. Sixteen of the twenty LCAs would not be significantly affected by the Proposed Scheme on account of their relative proximity, and/or sensitivity to this type of development. A summary of the remaining four LCAs that would be significantly affected within the Wimboldsley to Lostock Gralam area is provided in Table 22. This includes Wimboldsley Open Farmland East Lowland Plain LCA which also extends to the neighbouring Hough to Walley's Green area (MA01) to the south. It is reported here as the features of the Proposed Scheme that give rise to significant effects, the construction of the Crewe North rolling stock depot (RSD), are primarily located in the MA02 Wimboldsley to Lostock Gralam area.

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

Table 22: Summary of significantly affected LCAs

Wimboldsley Open Farmland East Lowland Plain



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

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

The Wimboldsley Open Farmland East Lowland Plain LCA is a mainly flat agricultural landscape, characterised by medium and large fields of a semi-regular pattern bound by well-maintained hedges and mature hedgerow trees. There are also occasional small clumps of woodland and individual mature trees. The LCA lies between the rivers Weaver to the west and Wheelock to the east. The incised valley of the River Weaver is well wooded along its margins, forming a distinct alignment, whereas that of the River Wheelock in the neighbouring LCA is of a less distinct form.

The settlement pattern is of scattered properties and hamlets, with large individual residential properties and farmhouses, a regular and recurrent features of the landscape. The Middlewich Branch of the Shropshire Union Canal is a distinctive feature within the landscape, a contour canal that follows the landform of the valley with few locks and level changes.

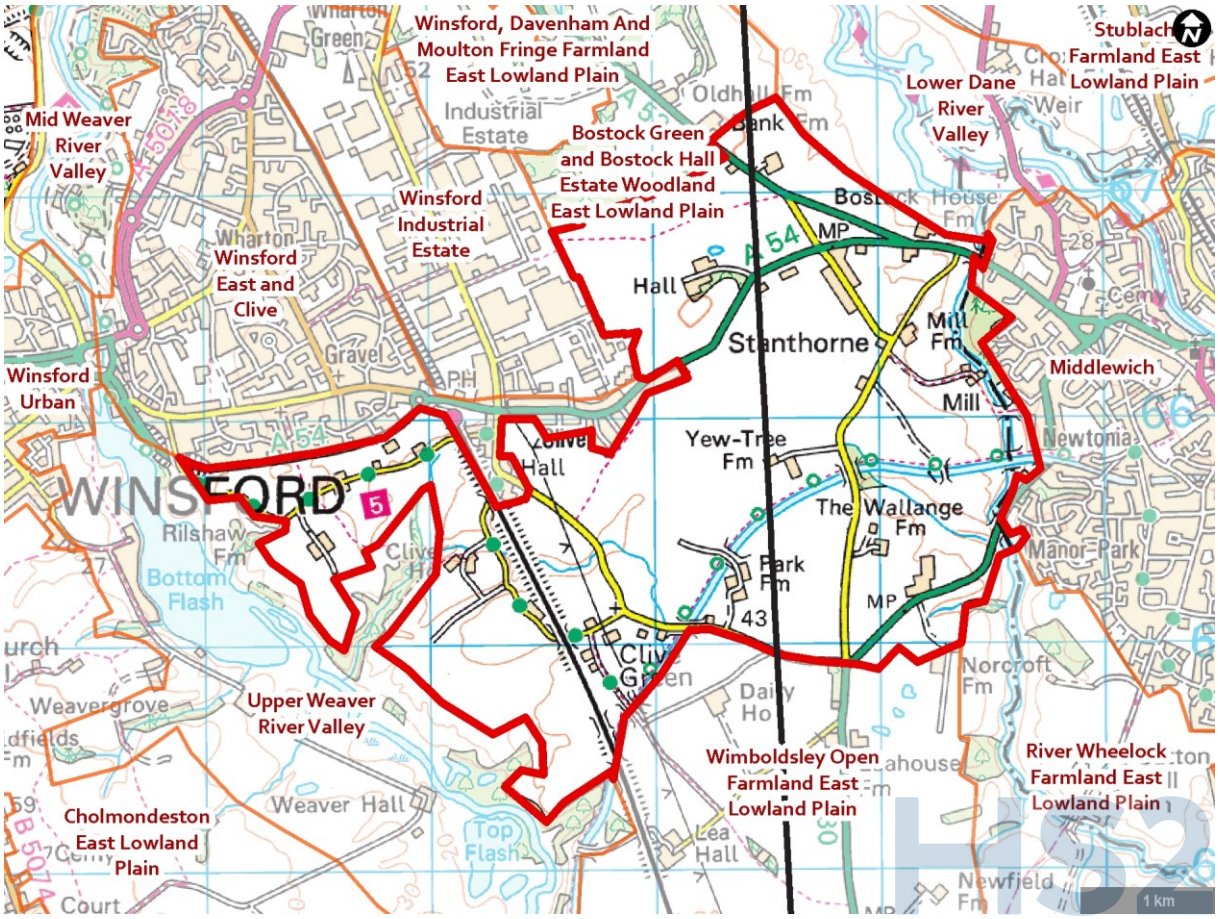
The relatively flat landscape (and thus absence of vantage points) in combination with a succession of hedgerows contains

local views, but the scenic Peak District hills and the sandstone ridge of the Peckforton Hills are visible in the distance, contributing to a wider sense of place.

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

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

Winsford and Middlewich Fringe Farmland East Lowland Plain



Established hedgerows with mature trees and isloated field trees viewed from the residential edge of Clive Green.

Long-standing, isolated properties towards Stanthorne, between Middlewich and Winsford.

The Winsford and Middlewich Fringe Farmland East Lowland Plain LCA forms a northern continuation of the Wimboldsley Open Farmland East Lowland Plain and its relatively open agricultural landscape to the south. It is set within an area of farmland which separates the towns of Winsford and Middlewich.

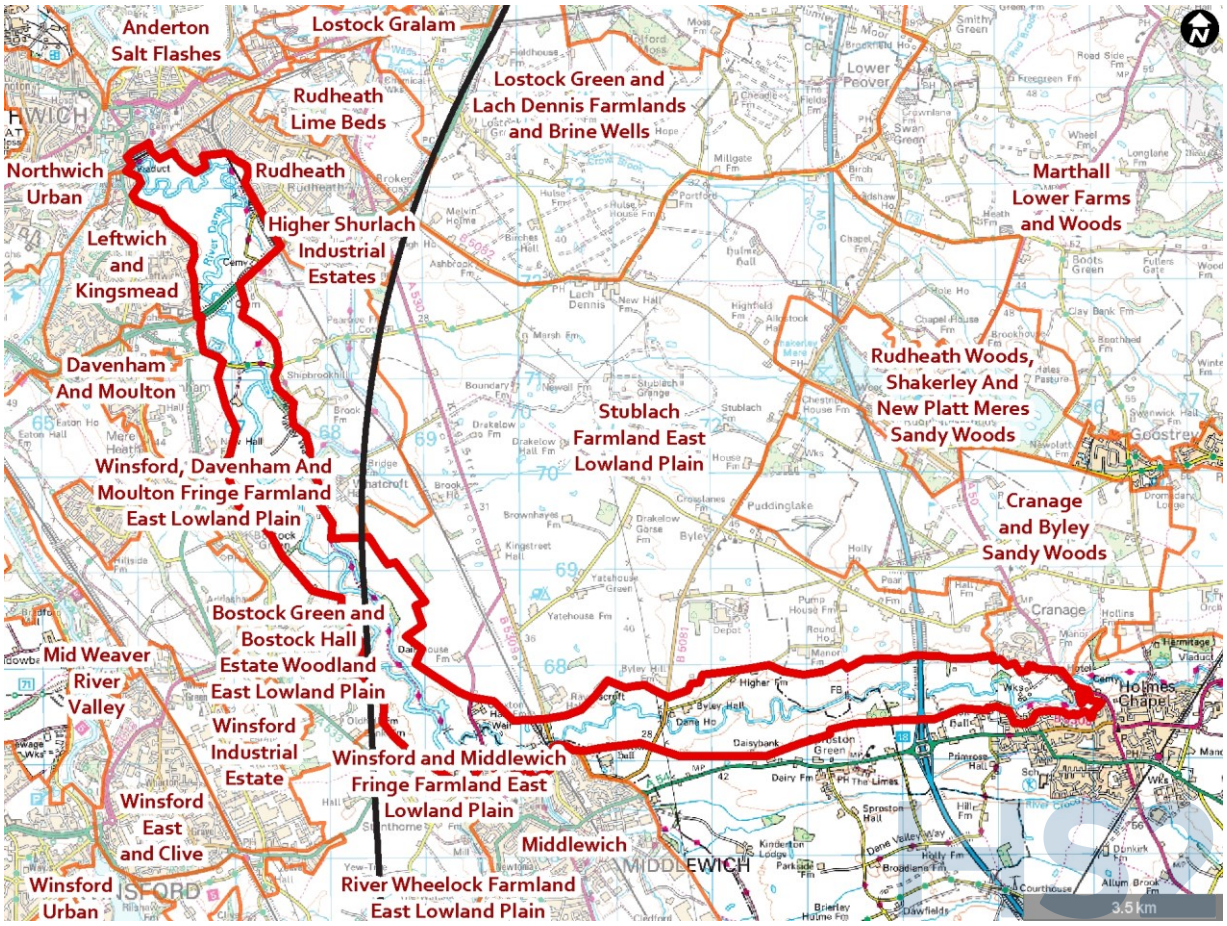
The fields here are of a variety of sizes from small to medium, and most have well managed boundary hedges and mature hedgerow trees. There are numerous individual mature trees set within fields. The terrain is almost flat although there is some degree of undulation where watercourses converge. Along these watercourses, marginal vegetation contributes to a sense of enclosure and helps to buffer the edges of Middlewich and Winsford.

The settlement pattern is dispersed, being characterised by large individual houses including farmsteads, and groups of residential properties. On the periphery of the LCA are the urban fringes of Middlewich and Winsford. Despite the proximity of these towns, the landscape retains a largely rural character without significant urban influence. The notable exception to this is the abrupt and visible appearance of Winsford Industrial Estate along the eastern edge of the town. The WCML, and overhead power lines border the LCA, while the A530 Croxton Lane, the A533 Bostock Road and the A54 Middlewich Road corridors radiate out from Middlewich.

The Shropshire Union Canal Middlewich Branch contributes to a sense of place and historic continuity within the landscape and is a well used recreational route. The field pattern appears long established and the landscape retains some sense of tranquillity despite its position in relation to urban centres.

The overall value of this LCA is medium based on its rural character, historic field patterns and canal with its associated history and modern day recreational function.

Lower Dane Valley



Mature woodland belts surrounding Bostock Hall, viewed from the Trent and Mersey Canal.

The rural and tranquil Dane Valley, viewed from the Trent and Mersey Canal at Whatcroft.

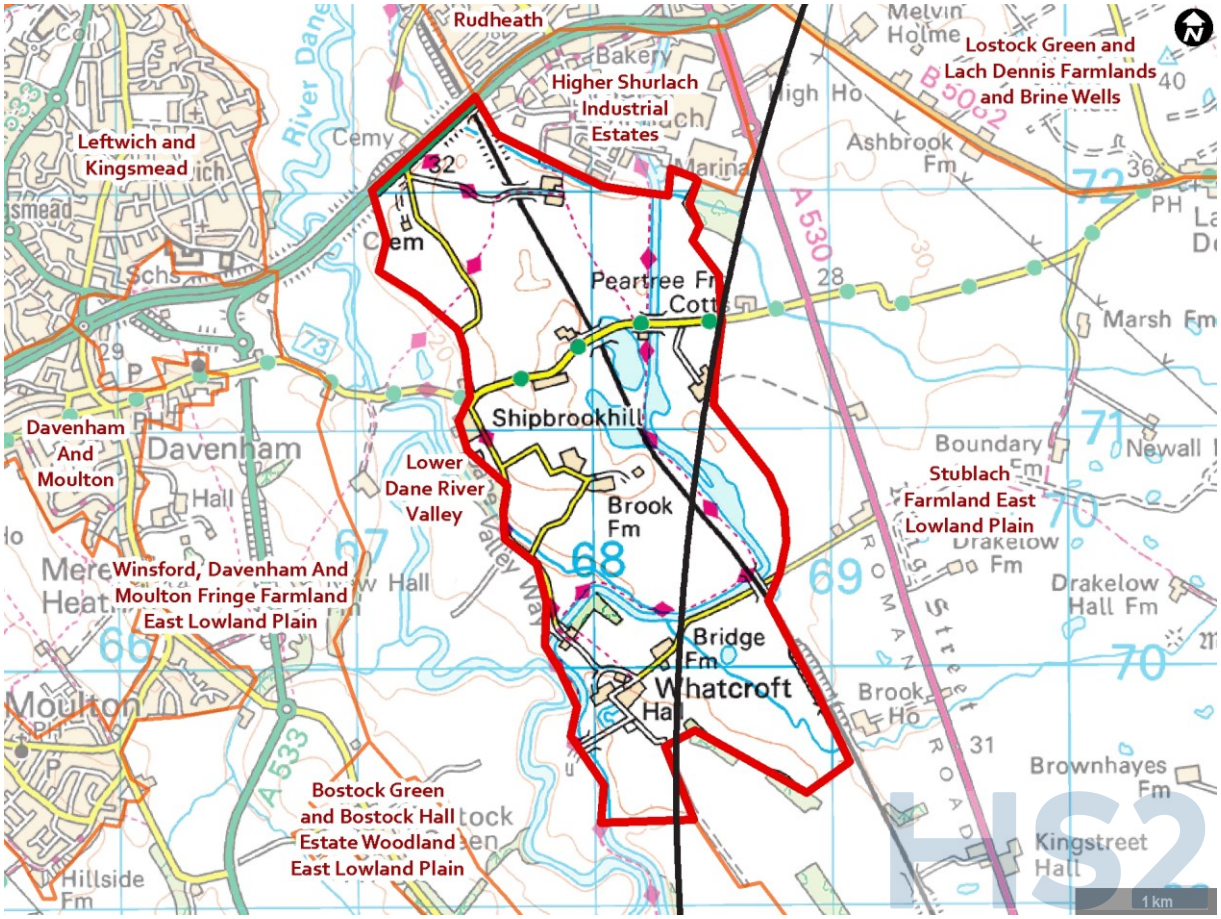
The Lower Dane Valley LCA is a quiet rural area between Middlewich and Northwich, with the River Dane accompanied for much of its length by the Trent and Mersey Canal. The floodplain is occupied by the widely meandering river with its low, steep sided and tree-lined banks. The valley is flanked to the west by the estate woodlands of Bostock Hall and Davenham Hall (some of which are classified as ancient woodland) and along its eastern fringe by the well vegetated canal corridor. Bostock Hall estate, its neighbouring village of Bostock Green and the Trent and Mersey Canal are situated within Conservation Areas.

There are few significant road crossings or prominent visible developments within the valley, with only isolated houses including farmsteads along the valley edge. Bostock Hall and nearby Bostock Green on the western flank of the valley are largely screened by estate woodland and other vegetation, while to its east, several large farms and properties, including the Grade II* Whatcroft Hall, punctuate the skyline. St Wilfrid's Parish Church at Davenham provides a distant focal point to the north, along the line of the valley.

The Trent and Mersey Canal adds a historical dimension to the landscape and provides a well-used recreation corridor. Despite its relative proximity to the urban fringes of Middlewich and Winsford, the valley appears remote and tranquil as far north as Davenham and the urban fringes of Northwich.

The overall value of this LCA is medium-high based on its tranquil and rural character which is largely uninfluenced by built development.

Whatcroft and Billinge Green Flashes Lower Dane



The Trent and Mersey Canal corridor north of Whatcroft.

Flashes near Billinge Green.

The Whatcroft and Billinge Green Flashes Lower Dane LCA is a distinctive rural landscape bordering the River Dane valley. It is an area largely characterised by the canal, with its linked open water bodies and nearby open flashes created by subsidence following salt extraction.

The Trent and Mersey Canal diverts from the River Dane at the Grade II* listed Whatcroft Hall, through a stretch of farmland adjoining Puddinglake Brook. This contour canal adds a strong sense of place and continuity to the landscape; historically takes a sinuous route, circumnavigating the Hall, its lodges, the nearby Dairy Farm and Brook Farm before connecting with several water bodies (subsidence flashes) near Billinge Green. The buildings form a prominent grouping on the margin of the Dane valley, complementing the character of other large houses and isolated farmsteads in this open agricultural landscape.

This is a scenic landscape, with water bodies set within a flat, open farmland of medium sized fields and managed hedges with mature trees. The settlement pattern beyond the large farmsteads comprises the established small hamlets of Billinge Green and Shipbrook which are characterised by vernacular buildings. There are some recent water-related recreational developments, including a new mooring basin at Park Hall Marina and off-side moorings (under construction at the time of writing) near Higgins Lane Farm. The elevated Mid Cheshire Line railway bisects the area.

The overall value of this LCA is medium-high based on the relative tranquillity of the canal corridor and its connecting water bodies, their recreational value and the historic dimension and scenic qualities provided by these features.

Visual baseline

11.3.11 A summary description of the distribution and types of receptors most likely to be affected is provided below. The viewpoints are numbered to identify their locations and are shown on the viewpoint location maps (see Volume 2: MA02 Map Book, Map Series LV-03 and LV04). In each case, the middle number (xxx.**xx**.xxx) identifies the type of receptor that is present in this area – 1: Protected views (none within this area), 2: Residential, 3: Recreational[99], 4: Transport, 5: Hotels/healthcare/education and 6: Employment (none within this area).

11.3.12 Views from residential properties occur at the following locations: the residential fringes of the larger settlements of Winsford, Middlewich and Northwich (Rudheath and Lostock Gralam); villages and hamlets including Wimboldsley, Clive Green, Stanthorne, Bostock Green, Whatcroft, Lostock Green and Higher Wincham; numerous individual properties, often large farmsteads and houses set within landed estates throughout the Cheshire Plain around Wimboldsley, Stanthorne, Bostock Hall and Whatcroft; and individual and clustered properties alongside primary roads (the A530 Nantwich Road, the A530 King Street, the A54 Middlewich Road, the A533 Bostock Road and the A556 Chester Road) and properties next to rural lanes.

11.3.13 The views experienced by occupants of the majority of residential properties are of the locally undulating, open agricultural landscape of the Cheshire Lowland Plain. Views tend to be near or middle distance in extent, limited by the surrounding terrain, field pattern and presence of hedgerows and associated trees. Views become longer wherever the field pattern is of a larger scale, notably in the agricultural landscape north of Crewe and towards Wimboldsley. The hill crests of the Peak District to the east and the sandstone ridgeline of Peckforton Hills to the west are occasionally evident on the distant horizon.

11.3.14 Views from the canals and towpaths of the Shropshire Union Canal Middlewich Branch and the Trent and Mersey Canal and Cheshire Ring Canal Walk and Dane Valley Way are typically limited by canalside vegetation and local terrain, although there are occasional open prospects, in particular along the Dane valley between Middlewich and Northwich.

11.3.15 Views from National Cycle Route 5 (between Winsford and Middlewich and along the towpath of the Shropshire Union Canal to Middlewich) are across the open farmland. There are open views from National Cycle Route 573 (between Davenham and Lach

[99] Reference to specific civil parish numbers for footpaths is provided where available otherwise the adjacent road name is used as a reference to the footpath.

Dennis) where it crosses the Dane valley across the shallow and open farmlands to the east of Northwich.

11.3.16 Most views from the PRoW network are of the mainly flat, agricultural landscape of the Cheshire Plain, filtered by mature hedgerows and occasional stretches of riverside and plantation woodland.

11.3.17 Views experienced by road users on primary routes are mainly contained by high hedges and roadside planting, but where views are open across the shallow Cheshire Plain farmland, there are distant skyline views of the Peak District hills to the east and the sandstone ridgeline of the Peckforton Hills to the west.

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 peak construction stage in this area are generally considered to be medium-term, based on the indicative construction programme in Section 2.3. It is currently anticipated that the peak civil engineering stage in this area would be undertaken between the start of 2025 and the end of 2030. Effects during other stages of works are likely to be less intensive due to less construction equipment being required at the time and a reduced intensity of construction activity.

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

Avoidance and mitigation measures

11.4.4 Measures that have been incorporated into Sections 12 and 14 of the draft Code of Construction Practice (CoCP)[100] 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[101];
- use of well-maintained hoardings and fencing;

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

- 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 construction of the Crewe North RSD, auto-transformer stations, embankments, viaducts, overbridges, retaining walls, the demolition of buildings, removal of vegetation and the realignment or closure of existing public highways and PRoW.

Landscape assessment

11.4.7 Based on the current design it is anticipated that the LCAs set out in Table 23 would be significantly affected during construction of the Proposed Scheme.

Table 23: Summary description and assessment of effects on LCAs

Wimboldsley Open Farmland East Lowland Plain	**Medium susceptibility and sensitivity**
Susceptibility to change: The rural qualities, intactness and tranquillity of the landscape have a medium susceptibility to change arising from the Proposed Scheme. The construction of the Crewe North RSD would create a large-scale intervention in an intact agricultural landscape. At a local scale there would be a noticeable severance of the existing field pattern, with the removal of hedgerows, isolated mature trees and pockets of woodland, thus affecting its scenic quality. Temporary closures and diversions of PRoW would reduce access and connectivity within the wider countryside. The landscape would be adversely affected by construction vehicle movements, construction activity, lighting in a largely dark environment and noise which would further reduce the tranquillity of the rural landscape. There would be extensive loss of rural landscape features and the introduction of uncharacteristic elements over a substantial area of the LCA, at considerable variance with the existing character. There would therefore be an overall high magnitude of change and major adverse effect.	Level of effect Major adverse (significant)
Winsford and Middlewich Fringe Farmland East Lowland Plain	**Medium susceptibility and sensitivity**
Susceptibility to Change: The relatively intact rural quality between urban settlements and sense of historic continuity relating to the Shropshire Union Canal, as well as the settlement and field pattern have a medium susceptibility to change arising from the Proposed Scheme. The extent of construction works for the Stanthorne embankment and reception tracks, the A54	Level of effect: Major adverse (significant)

Middlewich Road, A533 Bostock Road diversion, A54 Middlewich Road overbridge, Shropshire Union Canal underbridges and Clive Green Lane realignment and overbridge would substantially alter the landscape character. These works would change the landscape pattern and reduce pedestrian and vehicular connectivity between Winsford and Middlewich. The scale of the works between the A54 Middlewich Road and A533 Bostock Road in particular would be prominent, with tree removal around Stanthorne Grange noticeable. Construction of the Shropshire Union Canal underbridges would adversely influence the character of the canal corridor between Coalpit Lane and Clive Green. Construction works would adversely affect a substantial part of the LCA and the Proposed Scheme during construction would be at considerable variance with existing landscape character. There would therefore be an overall high magnitude of change and major adverse effect.	
Lower Dane Valley	**Medium-high susceptibility and sensitivity**
Susceptibility to Change: The rural qualities, sense of tranquillity and historic continuity of the river valley and canal corridor landscape have a medium-high susceptibility to change arising from the Proposed Scheme. The construction works for the River Dane viaduct would substantially alter landscape character along this length of the river valley, affecting the rural grain and tranquillity of the area. The vertical scale of the viaduct construction and its spanning of the valley means the works would be prominent and uncharacteristic of the enclosed valley landscape of the Trent and Mersey Canal corridor between Middlewich and Whatcroft. Construction works would represent a substantial alteration to key characteristics associated with the LCA. There would therefore be an overall high magnitude of change and a major adverse effect.	Level of effect: Major adverse (significant)
Whatcroft and Billinge Green Flashes Lower Dane	**Medium-high susceptibility and sensitivity**
Susceptibility to Change: The sense of tranquillity, historic continuity and recreational value of the Trent and Mersey Canal corridor with its associated flashes and the pattern of local settlement in this location means this LCA has a medium-high susceptibility to change arising from the Proposed Scheme. The construction works for the Dane Valley embankment and Whatcroft accommodation overbridge, Whatcroft embankment, Puddinglake Brook viaduct, Whatcroft (Railway) underbridge and Trent and Mersey Canal underbridge would substantially alter the landscape character and grain of the Trent and Mersey Canal corridor at this location, both in a sense of tranquillity and of historic continuity in relation to surrounding historic properties and connecting water bodies. The construction of the two new bridging points would adversely influence the character of the canal corridor between Whatcroft and Rudheath. Construction works would adversely affect a substantial part of the LCA. There would therefore be an overall high magnitude of change and 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.

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 Night-time surveys will be undertaken to inform the assessment in the formal ES. Potential visual impacts arising from additional lighting at night during construction within the area may arise from continuous working and/or overnight working. Assessment of these effects will be reported in the formal ES on completion of the night time assessment.

11.4.11 Assessment of these effects will be reported in the formal ES on completion of the night time assessment. Table 24 describes the construction 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: MA02 Map Book.

Table 24: Construction phase potentially significant visual effects

Views from Wimboldsley Grange, Trent and Mersey Canal, Wimboldsley Hall and the Verdin Arms and PRoW Wimboldsley Footpath 5 (VPs 306-02-003, 307-02-001, 307-03-004, 306-03-006) **Map Numbers LV-03-306b and 307**	**High and medium-high sensitivity receptors**
Residents and users of the footpath would have open views across the WCML towards the construction works for the Crewe north RSD (including the A530 Nantwich Road satellite compound and Crewe rolling stock depot satellite compound) along with the A530 Nantwich Road realignment and overbridge. The construction works would be prominent in near and middle distance views and highly visible across much of the view, with the construction of the A530 Nantwich Road overbridge locally prominent from Wimboldsley Hall and the Verdin Arms public house. For recreational users of the Shropshire Union Canal Middlewich Branch, the removal of vegetation and construction activity would be noticeable against the skyline. There would therefore be an overall high magnitude of change and major adverse effect.	Level of effect: Major adverse (significant)
Views from residences bordering the A530 Nantwich Road at Wallange Paddocks Farm, Lea House Farm, Wimboldsley, Hopley House, Bellsmithy, PRoW Wimboldsley Footpath 1, Wimboldsley Community Primary School and Yewtree Farm, Rose Cottage (VPs 307-02-009, 307-02-006, 307-02-002, 306-02-005) **Map Numbers LV-03-306b and 307**	**High, medium-high and medium sensitivity receptors**
Residents would have open views towards the construction works for the Crewe North RSD, Walley's Green embankment, Clive Green Lane overbridge, Clive Green embankment, and the A530 Nantwich Road, Clive Green Lane and Crewe North RSD satellite compounds. The construction works, requiring the removal of established hedgerows with mature trees and pockets of woodland would be highly apparent in the near distance and substantially change the open agricultural character and skyline. The construction of the Clive Green Lane overbridge would be locally prominent from residential properties around Lea House Farm. The Proposed Scheme would be highly visible across the majority of the view and not in character within the open agricultural setting. There would therefore be an overall high magnitude of change and major adverse effect.	Level of effect: Major adverse (significant)
Views from Lea Hall Farm House and PRoW Wimboldsley Footpath 1 (VP 307-02-005) **Map Number LV-03-307**	**High and medium-high sensitivity receptors**
Residents and users of the footpath would have open views towards the construction works for the Crewe North RSD and Walley's Green embankment. The works would require the removal of established hedgerows with mature trees and the nearby Store Room Wood. They would be change the skyline and	Level of effect: Major adverse

would be prominent in existing near-distance views of the rural landscape. There would therefore be an overall high magnitude of change and major adverse effect.	(significant)
Views from the Shropshire Union Canal Middlewich Branch, residences at Park Farm and Stanthorne Park Mews, PRoW Wimboldsley Footpath 9, Wimboldsley Footpath 49 and NCN5 (VPs 308-03-001, 307-03-010, 307-02-007) **Map Numbers LV-03-307 and 308**	**High and medium-high sensitivity receptors**
Residents at Park Farm and Stanthorne Park Mews would have open or partially screened views towards the construction works for the Clive Green embankment, reception tracks for Crewe North RSD and Clive Green Lane realignment and overbridge. The works would be apparent in the near distance and visible across much of the view, with the construction of the Clive Green Lane overbridge locally prominent. Sequential views from the Shropshire Union Canal Middlewich Branch would be influenced by the construction of the Shropshire Canal Underbridges and flanking earthworks. This would substantially change the character of the canal and its landscape context and restrict longer distant linear views along the canal. Construction of the Proposed Scheme would result in a substantial change in proximity to visual receptors. There would therefore be an overall high magnitude of change and major adverse effect.	Level of effect: Major adverse (significant)
Views from residences along Birch Lane, the A54 Middlewich Road and Coalpit Lane (VPs 308-02-008, 308-02-004, 308-02-006, 308-02-009) **Map Number LV-03-308**	**High sensitivity receptors**
Residents near the junction of Birch Lane and the A54 Middlewich Road would have open or partially screened views of the construction works for the Stanthorne embankment, the A54 Middlewich Road and A533 Bostock Road diversion and the A54 Middlewich Road overbridge. The scale and proximity of the construction works would substantially foreshorten views and change the skyline. The A54 Middlewich Road satellite compound and transfer node would be a prominent feature of views from properties facing the A54 Middlewich Road. Occupants of residential properties on Coalpit Lane and from upper storeys of properties south of Birch Lane would have open views towards the construction works for Stanthorne embankment. Views across the open agricultural landscape would be interrupted by the presence of construction activity as a noticeable middle-distance feature across much of the view. There would therefore be an overall high magnitude of change and major adverse effect.	Level of effect: Major adverse (significant)
Views from Stanthorne Hall (VP 308-02-007) **Map Number LV-03-308**	**High sensitivity receptors**
The large-scale and proximity of the construction works for the A54 Middlewich Road and A533 Bostock Road diversion and the A54 Middlewich Road overbridge means they would be apparent in the near-distance in views of open farmland, substantially changing the visual depth and appearance of the skyline. Those experiencing open, framed views of the agricultural landscape south from Stanthorne Hall, would see the extent of construction works as a continuous component, visible across much of the middle-distance. There would therefore be an overall high magnitude of change and major adverse effect.	Level of effect: Major adverse (significant)
Views from residences along the A54 Middlewich Road at Clive and PRoW Winsford Footpath37 (VPs 308-03-010, 308-02-005, 308-02-003) **Map Number LV-03-308**	**High and medium-high sensitivity receptors**
Residents to the east of Clive and users of the footpath would have open views of the construction works for the A54 Middlewich Road and A533 Bostock Road diversion, the A54 Middlewich overbridge and Stanthorne embankment. The road realignment works and overbridge construction would be prominent in the near distance and would noticeably change the skyline of middle distance views. Residents to the southern edge of Clive would have oblique and filtered views across undulating farmland towards the construction works for the Clive Green embankment, Stanthorne embankment and Shropshire Union Canal underbridges. The construction elements, including the Shropshire Union Canal satellite compound, would	Level of effect: Major adverse (significant)

be visible in the middle-distance on the skyline. There would therefore be an overall high magnitude of change and major adverse effect.	
Views from residences on A533 Bostock Road (VPs 308-02-014, 308-03-012) **Map Number LV-03-308**	**High sensitivity receptors**
Residents would have open, filtered or partially screened middle distance views towards the construction works for the Stanthorne embankment, the A54 Middlewich Road and A533 Bostock Road diversion, the A54 Middlewich overbridge along with the A54 Middlewich Road satellite compound and transfer node. The scale and proximity of the construction works would be apparent in views and would substantially change the skyline as viewed from these properties. There would therefore be an overall high magnitude of change and major adverse effect.	Level of effect: Major adverse (significant)
Views from the Trent and Mersey Canal within the Dane Valley (part of the Cheshire Ring Canal Walk) (VPs 309-03-001, 309-03-004, 309-03-005) **Map Number LV-03-309**	**High sensitivity receptors**
Users of the Trent and Mersey Canal corridor would have sequential views along the line of the Dane Valley towards the construction works for the River Dane viaduct and Stanthorne embankment. Current views along the canal are predominantly contained and filtered by mature boundary hedges and canalside vegetation, although these open out at gaps in the vegetation. These views would be interrupted by the large- scale construction works for the Dane Valley viaduct. The removal of vegetation for the Dane Valley embankment would substantially change the skyline across the open valley. There would therefore be an overall high magnitude of change and major adverse effect.	Level of effect: Major adverse (significant)
Views from properties at Brook Farm, Brook Farm Cottage, Manor Farm and Manor Farm Cottage (VP 310-02-005) **Map Number LV-03-310**	**High sensitivity receptors**
Residents would have open or partially screened views towards the construction works for Whatcroft embankment, the Whatcroft (Railway) underbridge and Trent and Mersey Canal underbridge between Whatcroft and Higginslane Farm. They would form features in the middle-distance across much of the view. Residents at Manor Farm and Brook Farm Cottages in particular would have framed views across the Trent and Mersey Canal towards the Trent and Mersey Canal underbridge satellite compound. There would therefore be an overall medium magnitude of change and major adverse effect.	Level of effect: Major adverse (significant)
Views from the Trent and Mersey Canal at Whatcroft Flash and new moorings at Higginslane, Trent and Mersey Canal (part of the Cheshire Ring Canal Walk) (VPs 310-03-004, 310-03-007) **Map Number LV-03-310**	**High sensitivity receptors**
Users of the canal corridor would have views towards the construction works for the Whatcroft embankment, the Trent and Mersey Canal underbridge and Whatcroft (Railway) underbridge. The construction works would be prominent in open views across the flashes from both directions of approach along the canal. The works would substantially change the skyline and restrict the depth of view along the canal corridor. The Trent and Mersey Canal underbridge satellite compound would be a near distance element in views from the new mooring facilities at Higginslane Farm. There would therefore be an overall high magnitude of change and major adverse effect.	Level of effect: Major adverse (significant)
Views from residences along the A530 King Street near Whatcroft Lane, PRoW Rudheath Restricted Byway 8 (VP 310-02-006) **Map Number LV-03-310**	**High sensitivity receptors**
Residents on A530 King Street would have oblique or filtered views across A530 King Street towards the construction works for Whatcroft embankment, Dane Valley embankment and Whatcroft accommodation overbridge, including the Davenham Road underbridge satellite compound and transfer node. The	Level of effect: Moderate adverse

construction of these elements would appear sequentially as a middle distance, low skyline feature across much of the view. There would therefore be an overall medium magnitude of change and moderate adverse effect	(significant)
Views from Pear Tree Farm Cottages (VP 310-02-008) **Map Number LV-03-310**	**High sensitivity receptors**
Residents at Pear Tree Farm Cottages would have direct and open views west towards the construction works for Marshall's Gorse embankment, Billinge Green embankment and retaining wall, Whatcroft embankment and Davenham Road underbridge, along with the Davenham Road underbridge satellite compound and transfer node, located immediately south of Davenham Road. The scale and proximity of the construction works means that they would screen existing views to the west from the properties, creating a new, near-distance skyline. The satellite compound would similarly restrict views across the landscape to the south of the properties. There would therefore be an overall high magnitude of change and major adverse effect.	Level of effect: Major adverse (significant)
Views from residences at Whatcroft, the Trent and Mersey Canal (part of the Cheshire Ring Canal Walk) and PRoW Whatcroft Footpath 2 (VPs 310-03-002, 310-03-003, 310-02-001) **Map Number LV-03-310**	**High and medium-high sensitivity receptors**
Residents and users of the footpath would have open views towards the construction works for Dane Valley embankment, Whatcroft accommodation overbridge and Puddinglake Brook viaduct, along with Puddinglake Brook viaduct satellite compound. Views from residences at Whatcroft Hall and Dairy Farm would be largely screened by farm outbuildings and heavily filtered by mature garden and boundary vegetation. The construction works would be prominent in near-distance views from Bridge Farm and change the skyline views for users of the recreational footpath. Users of the canal corridor would have mainly channelled views, limited by towpath boundary hedges and vegetation. The construction of Puddinglake Brook viaduct would be prominent in views along the canal approaches toward Bridge Farm, with Puddlinglake Brook viaduct satellite compound adjoining the canal corridor. There would therefore be an overall high magnitude of change and major adverse effect.	Level of effect: Major adverse (significant)
Views from residences bordering the A556 Chester Road at Broken Cross (VP 311-02-002) **Map Number LV-03-311**	**High sensitivity receptors**
Residents on the A556 Chester Road/A559 Manchester Road would have open, mainly upper storey views across existing roads towards the construction works for Rudheath embankment, the A530 King Street underbridge and B5082 Penny's Lane underbridge. The Rudheath embankment satellite compound and transfer node, situated to the immediate south of the A556/A559 Chester Road, would be prominent in near distance, while in the middle distance, the construction of Rudheath embankment would be visible on the skyline in open views from residential properties. There would therefore be an overall high magnitude of change and major adverse effect.	Level of effect: Major adverse (significant)
Views from residences on B5082 Penny's Lane (VP 311-02-001) **Map Number LV-03-311**	**High sensitivity receptors**
Residents along B5082 Penny's Lane would have open or partially screened views towards the construction works for the Rudheath embankment, Gad Brook viaduct, A530 King Street underbridge and B5082 Penny's Lane diversion and underbridge. The A556 Chester Road transfer node would be close to Melvin Holme, while the Rudheath embankment satellite compound and transfer node in the middle distance would extend to the junction of the A530 King Street and A556 Chester raod/A559 Manchester Road at Broken Cross. The extent of views across the relatively flat agricultural landscape would be foreshortened by the large-scale of the works and the construction of the Rudheath embankment and Gad Brook viaduct would introduce new features across the skyline of much of the view. The construction works for the B5082 Penny's Lane diversion and the presence of the A556 Chester Road transfer node would represent large changes close to visual receptors.	Level of effect: Major adverse (significant)

There would therefore be an overall high magnitude of change and major adverse effect.	
Views from PRoW Lostock Gralam Footpath 4, Fieldhouse Farm and surrounding residences, PRoW Lostock Gralam Restricted Byway 1 and residences on the western fringes of Lostock Green (VP 312-03-006, 311-02-003, 312-03-003) **Map Numbers LV-03-311 and 312**	**High and medium high sensitivity receptors**
Residents and walkers would have widespread and open views towards the construction works for Lostock Gralam embankment, Rudheath embankment, Wade Brook viaduct, the A556 Chester Road realignment and Birches Lane diversion, with the Lostock Gralam underbridge satellite compound situated in proximity to Fieldhouse Farm and Smoker Brook viaduct south satellite compound and transfer node to the south-west in the middle distance. There would be widespread removal of established vegetation bordering the existing A556 Chester Road and at Long Wood, which would expose views to the industrial fringe of Northwich. There would therefore be an overall high magnitude of change and major adverse effect.	Level of effect: Major adverse (significant)
Views from residences on Birches Lane (VP 312-02-001) **Map Number LV-03-312**	**High sensitivity receptors**
Residents along Birches Lane would have open views towards the construction works for Rudheath embankment, Lostock Gralam embankment, the A556 Chester Road realignment and Wade Brook viaduct. The A556 Chester Road satellite compound and transfer node would be a prominent near distance component of views across Birches Lane, displacing the existing view of agricultural fields and middle distance skyline of mature roadside trees along the A556 Chester Road/A559 Manchester Road. The scale of construction works, in combination with the removal of mature vegetation bordering the A556 Chester Road would be prominent in near to middle-distance views, substantially changing the character of view from residential properties and along Birch Lane. There would therefore be an overall high magnitude of change and major adverse effect.	Level of effect: Major adverse (significant)
Views from residences on Birch Lane, Paulden Road and Harris Road, Lostock Gralam and rail users at Lostock Gralam (VP 312-02-005) **Map Number LV-03-312**	**High and low sensitivity receptors**
Residents would have open, mainly upper storey views towards the construction works for Rudheath embankment, Lostock Gralam embankment, the A556 Chester Road realignment and Wade Brook viaduct. The A556 Chester Road satellite compound and transfer node would be a feature in the middle distance, while the removal of mature roadside trees bordering the A556 Chester Road would alter the appearance of the skyline across much of the view. The scale of construction works, in particular the works associated with the A556 Chester Road realignment would be a noticeable change in the middle distance. There would therefore be an overall medium magnitude of change and moderate adverse effect.	Level of effect: Moderate adverse (significant)
Views from residences bordering the A556 Chester Road, hotel and leisure facilities (Travelodge Northwich, The Watermead) and offices at Cheshire Business Park (VP 312-02-007, 312-02-009) and from residences adjoining the A556 Chester Road (VP 313-02-002) **Map Numbers LV-03-312 and 313a)**	**High and medium sensitivity receptors**
Residents and users of hotel and leisure facilities would have open or partially filtered views towards the construction works for Lostock Gralam embankment and Smoker Brook viaduct. The Smoker Brook viaduct south satellite compound and transfer node would be visible immediately east of the A556 Chester Road, emphasised by the removal of roadside vegetation and mature tree cover at the western edge of Long Wood. Occupiers of residences at Salary Row would have open views mainly from upper floors, with existing timber boundary fencing and vegetation providing a screen at ground level. Construction of the Proposed Scheme would introduce new features that are continuously highly visible. There would therefore be an overall high magnitude of visual change and major adverse effect.	Level of effect: Major adverse (significant)
Residents of properties on the A556 Chester Road with views west towards the Proposed Scheme would have oblique and narrow views along the line of the A556 towards construction activity for Smoker Brook	Level of effect:

viaduct and the removal of mature trees at Winnington Wood. Changes would be noticeable in the middle ground of views, filtered by existing vegetation bordering the properties to the west and north. There would therefore be an overall medium magnitude of change and moderate adverse effect.	Moderate 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 cycle routes 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 four landscape character areas;
- major adverse effects in relation to 25 residential viewpoint locations;
- major adverse effects in relation to 15 recreational viewpoint locations; and
- moderate adverse effects in relation to three residential viewpoint locations.

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 at Crewe North RSD, Stanthorne embankment and the A54 Middlewich Road diversion) 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;

- compensatory woodland planting in areas of loss, using the same species composition and planting types (and appropriate planting density), such as woodland planting to compensate for the partial loss of woodland (such as at Long Wood near Lostock Gralam and Stove Room Wood near Wimboldsley), and to provide habitat connectivity, enhanced landscape/green infrastructure connectivity, as well connectivity of historic landscape features, where reasonably practicable, and to soften embankments and viaduct abutments; and
- hedgerow replacement and restoration in areas of loss to restore connectivity and landscape pattern, where reasonably practicable, and using an appropriate palette of hedgerow types and species to tie the Proposed Scheme mitigation into the wider landscape character; compensation for loss of field ponds with new wetlands, ecological ponds and biodiversity wetland features and wetland enhancement (such as at Whatcroft Flash and Wade Brook).

Assessment of impacts and effects

11.5.3 The likely effects on landscape and visual receptors during operation of the Proposed Scheme relate to the presence of new structures and elements in the landscape including the route of the Proposed Scheme on embankment; overhead line equipment; viaducts; overbridges; the Crewe North RSD, Crewe North RSD reception tracks and the realignment of highways/access/PRoW and associated infrastructure.

Landscape assessment

11.5.4 Based on the current design, it is currently anticipated that the LCAs described in Table 25 would be significantly affected during operation of the Proposed Scheme.

Table 25: Operational phase significant landscape effects

Wimboldsley Open Farmland East Lowland Plain	**Medium susceptibility and sensitivity**
Susceptibility to change: The rural qualities, intactness and tranquillity of the landscape have a medium susceptibility to change arising from the Proposed Scheme. Year 1: The Proposed Scheme would be similar in character to the existing WCML railway infrastructure and contained to an extent by the flat terrain, frequent field boundaries and mature trees of this LCA which give it some ability to absorb development impact. The Crewe North RSD would, however, result in a substantial change to landscape character and field patterns and would be a prominent and uncharacteristic new feature in an otherwise intact agricultural landscape. At a local scale there would be a noticeable change to landuse, with the loss of arable land and reduction in hedgerows, isolated mature trees and pockets of woodland, affecting the scenic quality of the landscape. The demolition of Railway Cottages with the realignment of the A530 Middlewich Road would represent a loss of railway-associated architecture and associated cultural value. The bridge realignment would be perceived as a new element within the local landscape initially, although similar in scale to the existing bridge structure. There would therefore be an overall high magnitude of change and major adverse effect.	Level of effect Major adverse (significant)
Year 15: The landscape mitigation planting and ecological hedgerow planting along the boundaries of the Proposed Scheme would be sufficiently established to assist with landscape integration. However the presence of the large-scale of the Crewe North RSD would continue to result in a substantial	Level of effect Major adverse

alteration to the landscape character of the LCA. The magnitude of change would remain high and there would be a major adverse effect.	(significant)
Winsford and Middlewich Fringe Farmland East Lowland Plain	**Medium susceptibility and sensitivity**
Susceptibility to Change: Its relatively intact rural quality between urban settlements and sense of historic continuity related to the Shropshire Union Canal Middlewich Branch, along with its settlement distribution and field pattern means this LCA has a medium susceptibility to change arising from the Proposed Scheme. Year 1: The LCA would be directly affected through disruption of the field pattern and changes to landform and vegetation cover. The Proposed Scheme would occupy a wide corridor of land, necessary to accommodate both the route of the Proposed Scheme and the reception tracks for the Crewe North RSD to the south. The Proposed Scheme would be partially contained by the largely flat terrain, frequent field boundaries and mature trees of this landscape which give this LCA some ability to absorb development. However the Proposed Scheme would include embankments and grade separated crossings to connect the reception tracks to the Crewe North RSD, for the A54 Middlewich Road and A533 Bostock Road diversion and for the A54 Middlewich Road overbridge. These changes to landform would result in uncharacteristic and features, in particular on the skyline between Winsford and Middlewich. The sense of place and historic continuity provided by the Shropshire Union Canal Middlewich Branch would be further eroded by the introduction of the Shropshire Union Canal underbridges and the Clive Green Lane realignment and overbridge. These would be new and prominent, uncharacteristic features of the landscape. The overall fragmentation and severance of the rural landscape between communities would represent a noticeable alteration to the character of the LCA. There would therefore be an overall medium magnitude of change and moderate adverse effect.	Level of effect: Moderate adverse (significant)
Year 15: The maturing of landscape mitigation planting to the A54 Middlewich Road and A533 Bostock Road Diversion, A54 Middlewich Road overbridge and along the embankments to the route of the Proposed Scheme and reception tracks would assist with some integration of the structures into the landscape. Ecological woodland planting in the vicinity of the Shropshire Union Canal, near the Shropshire Union Canal underbridges, would help integrate the structures into their setting. However, the severance of landscape pattern between settlements and influence on the historic integrity of the canal would remain. There would continue to be a medium magnitude of change and a moderate adverse effect.	Level of effect: Moderate adverse (significant)
Lower Dane Valley	**Medium-high susceptibility and sensitivity**
Susceptibility to Change: The rural qualities, sense of tranquillity and historic dimension of the river valley and canal corridor landscape have a medium-high susceptibility to change arising from the Proposed Scheme. Year 1: The LCA would be influenced by the Proposed Scheme as it crosses the valley via the River Dane viaduct, east of Bostock Hall and towards Whatcroft Hall. The Proposed Scheme, although not directly disrupting the landscape pattern would form a widely visible built feature and a prominent skyline element across this tranquil river valley, including the canal corridor. Its presence would alter the open aspect of the valley and represent a new and artificial feature in an otherwise rural and secluded setting. The Proposed Scheme would significantly influence the sense of tranquillity, seclusion and scenic quality of this landscape. It would be at considerable variance with the existing character of the river valley. There would therefore be an overall high magnitude of change and major adverse effect.	Level of effect: Major adverse (significant)

Year 15: The maturing landscape mitigation planting around the viaduct abutments would help integrate the Dane Valley viaduct into the valley landscape. The appearance of the Proposed Scheme within the valley would not substantially change from year 1. The magnitude of change would remain high and there would be a major adverse effect.	Level of effect: Major adverse (significant)
Whatcroft and Billinge Green Flashes Lower Dane	**Medium susceptibility and medium-high sensitivity**
Susceptibility to Change: The sense of tranquillity, historic continuity and recreational value of the Trent and Mersey Canal corridor with its associated flashes and the pattern of local settlements in this location means this LCA has a medium-high susceptibility to change arising from the Proposed Scheme. Year 1: The Whatcroft and Dane Valley embankments, Trent and Mersey Canal underbridge, Whatcroft (Railway) underbridge and Puddinglake Brook viaduct would be new and prominent features within the LCA. The disruption to the canal corridor landscape, along with the influence of the Proposed Scheme on Whatcroft would result in a substantial alteration to the key characteristics of the setting, with an impact on the associated sense of historic continuity and tranquillity. There would therefore be an overall high magnitude of change and major adverse effect.	Level of effect: Major adverse (significant)
Year 15: The maturing landscape mitigation planting alongside the embankments, in combination with wetland habitat creation around the margins of the canal flashes would assist with some integration of the Proposed Scheme into the wider landscape. However the Trent and Mersey Canal underbridge, Whatcroft (Railway) underbridge and Puddinglake Brook viaduct would still be prominent and uncharacteristic landscape features in the context of the canal and flash setting. The magnitude of change would remain high and there would be a major adverse effect.	Level of effect: Major 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 Potential visual impacts arising from additional lighting at night during operation of the Proposed Scheme within the area may arise from continuous working and/or overnight working associated with the Crewe North RSD. Night time surveys will be undertaken to inform the assessment in the formal ES.

11.5.8 Table 26 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: MA02 Map Book.

Table 26: Operation phase significant visual effects

Views from Wimboldsley Grange, Wimboldsley Hall and the Verdin Arms, PRoW Wimboldsley Footpath 5 (VPs 306-02-003, 307-02-001) **Map Numbers LV-04-306b and 307**	**High sensitivity receptors**
Year 1 - winter and summer Residents at Wimboldsley Grange, Wimboldsley Hall and the Verdin Arms, along with footpath users would experience a substantial change in near to middle distance views as a result of the Proposed Scheme. The Crewe North RSD would be located close to the properties and footpath, with an corresponding loss of a large expanse of agricultural land and associated hedgerows, mature trees and woodland at Store Room Wood to the east of the WCML. Although the WCML would remain a feature in the near distance, the Crewe North RSD would represent a large-scale additional component in views to the east. The realignment of the A530 Nantwich Road overbridge would be a nearby component of view from Wimboldsley Hall and the Verdin Arms. There would therefore be an overall high magnitude of change and major adverse effect.	Level of effect: Major adverse (significant)
Year 15 - summer The maturing mitigation planting alongside the WCML would provide a partial screen to views from residential properties and the footpath. However, the Proposed Scheme would remain evident to the east as a prominent feature of views in this direction. The magnitude of change would remain high for residents, lowering to medium for footpath users, and there would be an overall major adverse effect.	Level of effect: Major adverse (significant)
Views from residences bordering the A530 Nantwich Road at Wallange Paddocks Farm, Lea House Farm, Wimboldsley, Hopley House, Bellsmithy, PRoW Wimboldsley Footpath 1 and Wimboldsley Community Primary School (VPs 307-02-009, 307-02-006, 307-02-002, 306-02-005) **Map Numbers LV-04-306b and 307**	**High and medium-high sensitivity receptors**
Year 1 - winter and summer Residents would experience a substantial change in the near to middle distance as a result of the Proposed Scheme. The Proposed Scheme would pass along Walley's Green embankment to Clive Green embankment between the A530 Nantwich Road overbridge and the Shropshire Union Canal Middlewich Branch. The Crewe North RSD would be located to the west, between the route of the Proposed Scheme and the WCML. Residences along Coalpit Lane and the A530 Nantwich Road, users of the footpath and children, staff and parents at the school would see overhead line equipment and the movement of trains as a middle distance, largely continuous feature across a wide field of view, partially screened by mitigation earthworks. Views from upper storeys of properties would be more open across the route of the Proposed Scheme and the Crewe North RSD area, with a substantial alteration to key characteristics and components highly visible across much of the view. There would therefore be an overall high magnitude of change and major adverse effect.	Level of effect: Major adverse (significant)
Year 15 - summer Views of the Walley's Green embankment, Crewe North RSD, overhead line equipment and the movement of trains would be partially screened by maturing landscape mitigation planting in conjunction with screening earthworks. However, the Proposed Scheme would remain evident with a substantial alteration of key characteristics of the view. The magnitude of change would remain high and there would be a major adverse effect.	Level of effect: Major adverse (significant)

Views from the Shropshire Union Canal Middlewich Branch, residences at Park Farm, Lea Hall Farm House and Stanthorne Park Mews, PRoW Wimboldsley Footpath 1, Wimboldsley Footpath 9, Wimboldsley Footpath 49 and NCN5 (VPs 308-03-001, 307-03-010, 307-02-007) **Map Numbers LV-04-307 and 308**	**High and medium-high sensitivity receptors**
Year 1 - winter and summer Residents at Park Farm and Stanthorne Park Mews would experience a substantial change in the near and middle distance as a result of the Proposed Scheme. Overhead line equipment and the movement of trains would be visible over a wide field of view along the Stanthorne Embankment, which would include the reception tracks for Crewe North RSD, the Clive Green Lane overbridge and the Shropshire Union Canal underbridges. Crewe North RSD and its arrival and departure lines would be located in the near distance of the properties and footpath, with the loss of a large expanse of agricultural land and associated hedgerows, mature trees and woodland plantation at Store Room Wood. The Crewe North RSD would represent a large scale and uncharacteristic feature that would extend across much of the view to the south and south-east. The mitigation planting to the northern boundary of the Crewe North RSD would not contribute to any visual integration or enclosure at this stage. Recreational users of the canal would experience similar, if more distant, views of the same features of the Proposed Scheme. The Shropshire Union Canal underbridges and their approach embankments would form a prominent, large scale feature at the point of crossing the canal, which while not uncharacteristic of the canal corridor landscape would erode its open and rural character. There would therefore be an overall high magnitude of change and major adverse effect.	Level of effect: Major adverse (significant)
Year 15 - summer The maturing landscape mitigation and woodland habitat planting would help provide a partial screen to views from residential properties at Park Farm, Stanthorne Park Mews and Lea Hall Farm House, and towards the bridge abutments at the Shropshire Union Canal underbridges. However, the proximity of the Proposed Scheme to residential properties and its prominence at the crossing of the Shropshire Union Canal Middlewich Branch would remain. The magnitude of change would remain high and there would be a major adverse effect.	Level of effect: Major adverse (significant)
Views from Lea Hall Farm House and PRoW Wimboldsley FP1 (VP 307-02-05) **Map Number LV-04-307**	**High and medium-high sensitivity receptors**
Year 1 - winter and summer Residents at Lea Hall Farm and footpath users would experience a substantial change in near to middle ground views as a result of the Proposed Scheme. Crewe North RSD and the reception tracks would be located in the near vicinity of the properties and footpath, with an accordant loss of a large expanse of agricultural land and associated hedgerows, mature trees and woodland plantation at Store Room Wood. The Crewe North RSD would represent a large scale and uncharacteristic component that would extend across much of the view to the south and south-east. The landscape woodland planting to the northern boundary of the Crewe North RSD would not contribute to any visual integration or enclosure at this stage. The Proposed Scheme would appear as a middle ground feature to the east and north-east of the residences and footpath, with both the line of the Proposed Scheme and the Crewe North RSD arrival/departure lines running close to grade along Clive Green embankment. There would therefore be an overall high magnitude of change and major adverse effect.	Level of effect: Major adverse (significant)
Year 15 - summer The maturing landscape woodland planting would provide a continuous screen to views from residential properties and the footpath towards the Crewe North RSD, reinstating a sense of the woodland cover previously provided by Store Room Wood and nearby copses lost to the development. The Proposed Scheme would remain evident to the east and north-east as a	Level of effect: Moderate adverse (significant)

middle ground feature of views in this direction The magnitude of change would be reduced to medium and there would be a moderate adverse effect.	
Views from residences along the A54 Middlewich Road at Clive, and PRoW Winsford Footpath 37 (VPs 308-03-010, 308-02-005) **Map Number LV-04-308**	**High and medium-high sensitivity receptors**
Year 1 - winter and summer Residents along the A54 Middlewich Road would experience a noticeable change in near distance views as a result of the Proposed Scheme. The realignment of the A54 Middlewich Road and A533 Bostock Road diversion and A54 Middlewich Road overbridge would alter the existing characteristic views of open agricultural land from residences and for users of the recreational footpath. The line of the Proposed Scheme would be visible in the middle distance, although with an oblique line of view from residences. There would therefore be an overall medium magnitude of change and moderate adverse effect.	Level of effect: Moderate adverse (significant)
Year 15 - summer The maturing landscape mitigation planting and earthworks would integrate the A54 Middlewich Road and A533 Bostock Road diversion and route of the Proposed Scheme to the east. However the presence of the A54 Middlewich Road overbridge would remain evident in middle distance views. There would continue to be a medium magnitude of change and a moderate adverse effect.	Level of effect: Moderate adverse (significant)
Views from Stanthorne Hall (VP 308-02-007) **Map Number LV-04-308**	**High sensitivity receptor**
Year 1 - winter and summer Residents at Stanthorne Hall would experience a substantial change in near to middle distance views as a result of the Proposed Scheme. The A54 Middlewich Road and A533 Bostock Road diversion would run to the west, with the A54 Middlewich Road overbridge to the north and the route of the Proposed Scheme to the east, which would include the reception tracks for Crewe North RSD. The components surrounding the residences would substantially alter the existing characteristic views of open agricultural land. The primary views from Stanthorne Hall are to the west and south, with heavily filtered or screened views to the east. The Proposed Scheme would form an uncharacteristic feature along the line of view south across open farmland, while the road junction re-alignment would interrupt views west and north, introducing new elements within the field of view. There would therefore be an overall medium magnitude of change and major adverse effect.	Level of effect: Major adverse (significant)
Year 15 - summer The maturing landscape mitigation planting and earthworks would integrate the A54 Middlewich Road, the A533 Bostock Road Diversion, the A54 Middlewich Road overbridge and the route of the Proposed Scheme to the east. However the presence of the re-aligned road junction would remain evident within near to middle distance views, and the proximity of overhead line equipment and movement of trains would remain evident in views to the south from this property. There would continue to be a medium magnitude of change and the effect would reduce to moderate adverse.	Level of effect: Moderate adverse (significant)
Views from residences along Birch Lane, the A54 Middlewich Road and Coalpit Lane (VPs 308-02-008, 308-02-004, 308-02-006)	**High sensitivity receptors**

Map Number LV-04-308	
Year 1 - winter and summer Residents would experience changes in near and middle distance views as a result of the Proposed Scheme. The Stanthorne embankment, overhead line equipment and the movement of trains would be seen in middle distance views from The Cottage and Millview Cottage both on Coalpit Lane, and mainly upper storey views from residences to the south of Birch Lane. This would be partially offset by the inclusion of screening earthworks. Residents at the northern end of Birches Lane and along the A54 Middlewich Road would view A54 Middlewich Road and A533 Bostock Road diversion and the A54 Middlewich Road overbridge crossing the route of the Proposed Scheme, which would include the reception tracks for Crewe North RSD. There would be a noticeable loss of mature tree cover on the skyline as seen from properties on Birches Lane. There would therefore be an overall high magnitude of change and major adverse effect.	Level of effect: Major adverse (significant)
Year 15 - summer The maturing landscape mitigation planting and earthworks would help integrate the Proposed Scheme into the landscape. However the Proposed Scheme would remain as highly visible in the middle distance views, with the A54 Middlewich Road overbridge and route of the Proposed Scheme still partially visible against the skyline. The magnitude of change would be reduce to medium and there would be a moderate adverse effect.	Level of effect: Moderate adverse (significant)
Views from residences on A533 Bostock Road (VPs 308-02-14, 308-03-012) **Map Number LV-04-308**	**High sensitivity receptors**
Year 1 - winter and summer At year 1, residents along the A533 Bostock Road between Middlewich and Winsford would experience a substantial change in near distance views as a result of the Proposed Scheme. Stanthorne embankment, comprising the reception tracks for Crewe North RSD would be situated close to residences. The overhead line equipment and movement of trains would be visible where they pass the properties. To the west, residents between Oldhall Farm and Bank Farm would experience views south towards the A54 Middlewich Road overbridge and the A54 Middlewich Road and A533 Bostock Hall diversion. Views would be partially screened by existing vegetation which would help to fragment the appearance of the Proposed Scheme within the field of view. There would therefore be an overall high magnitude of change and major adverse effect.	Level of effect: Major adverse (significant)
Year 15 - summer By summer year 15, views of the Stanthorne embankment, overhead line equipment and movement of trains would be partially screened and filtered by maturing landscape mitigation planting. However the proximity to these residences would still result in a substantial alteration to key characteristics of views. Landscape mitigation planting associated the A54 Middlewich Road and A533 Bostock Road Diversion would integrate the junction area with the well wooded characteristic of the surrounding landscape; however the vertical scale of the A54 Middlewich Road overbridge would remain as a substantial alteration to views. The magnitude of change would remain high and there would be a major adverse effect.	Level of effect: Major adverse (significant)
Views from the Trent and Mersey Canal within the Dane Valley (VPs 309-03-001, 309-03-004, 309-03-005) **Map Number LV-04-309**	**High sensitivity receptors**

Year 1 - winter and summer Recreational users of the Trent and Mersey Canal would experience a substantial change in the near distance as a result of the Proposed Scheme. The River Dane viaduct would cross the Dane valley at elevation and over a distance of approximately 1km, passing over the Trent and Mersey Canal at the northernmost extent of this span. The Proposed Scheme as it crosses the River Dane viaduct, whilst allowing permeability of the view under the structure would represent a large-scale and uncharacteristic feature within the tranquil valley setting occupied by the canal corridor. The structure would be visible across a wide field of view, and would be seen on the skyline when approaching along the canal corridor from both directions. There would therefore be an overall high magnitude of change and major adverse effect.	Level of effect: Major adverse (significant)
Year 15 - summer The maturing landscape mitigation planting to the River Dane viaduct abutment areas would help to integrate the structure where it connects with the valley edges. However the Proposed Scheme would still represent a highly visible feature in the local setting of the river valley and canal corridor, visible against the skyline. The magnitude of change would remain high and there would be a major adverse effect.	Level of effect: Major adverse (significant)
Views from properties at Brook Farm, Brook Farm Cottage, Manor Farm and Manor Farm Cottage (VP 310-02-005) **Map Number LV-04-310**	**High sensitivity receptors**
Year 1 - winter and summer Residents would experience a marked change in middle distance views as a result of the Proposed Scheme. The route of the Proposed Scheme would pass over the Trent and Mersey Canal, along the Whatcroft embankment to the east of the residences. The embankment, train movement and overhead line equipment would be seen against the middle distance skyline of Higginslane Farm. There would therefore be an overall medium magnitude of change and moderate adverse effect.	Level of effect: Moderate adverse (significant)
Year 15 - summer Although the maturing landscape mitigation planting along the Whatcroft embankment would soften its appearance, the Proposed Scheme would remain evident to open views from residences across the Trent and Mersey Canal. There would continue to be a medium magnitude of change and moderate adverse effect.	Level of effect: Moderate adverse (significant)
Views from Pear Tree Farm Cottages (VP 310-02-008) **Map Number LV-04-310**	**High sensitivity receptors**
Year 1 - winter and summer Residents at Pear Tree Farm Cottages would experience a substantial change in near distance views as a result of the Proposed Scheme. The Whatcroft embankment, Marshall's Gorse embankment, Billinge Green embankment and retaining wall would all be located near to the residences, forming a screen to views west from the properties. Train movement and overhead line equipment would be seen against the skyline close to the elevated embankment lengths and across a wide field of view. There would therefore be an overall high magnitude of change and major adverse effect.	Level of effect: Major adverse (significant)
Year 15 - summer The maturing landscape mitigation planting would create a partial visual screen close to the boundaries of Pear Tree Farm Cottages. However, the Proposed Scheme would be highly visible,	Level of effect: Major adverse

in particular the Billinge Green retaining wall which would be located immediately west of the properties. The magnitude of change would remain high and there would be a major adverse effect.	(significant)
Views from residences at Whatcroft, from the Trent and Mersey Canal and from PRoW Whatcroft Footpath 2 (VPs 310-03-002, 310-03-003, 310-02-001) **Map Number LV-04-310**	**High and medium-high sensitivity receptors**
Year 1 - winter and summer Residents at Whatcroft Hall, Bridge Farm and Dairy Farm would experience a substantial change in near distance views as a result of the Proposed Scheme. The Dane Valley embankment would be situated close to Bridge Farm, Dairy Farm and the Trent and Mersey Canal at Puddinglake viaduct, with Whatcroft accommodation overbridge to the immediate south. Screening earthworks would reduce the amount of overhead line equipment and train movement visible from Bridge Farm, although the route of the Proposed Scheme would be evident on the immediate skyline. To the west, views for occupants at Dairy Farm and Whatcroft Hall would be largely screened by vegetation and farm buildings, although where open views to the south are possible then the route of the Proposed Scheme would be visible in the middle distance, along with Whatcroft accommodation overbridge. Walkers would experience views towards the Proposed Scheme in the middle distance, seen against the skyline beyond the residences and farm buildings of Whatcroft. Users of the Trent and Mersey Canal would experience a similar context of view from the west, although the approaches to Puddinglake viaduct would be directly influenced by this additional crossing point over the canal at Whatcroft. While the Mid-Cheshire Link Line railway already provides a visible component of railway infrastructure as seen from the canal corridor, the Proposed Scheme would introduce a large-scale and uncharacteristic feature across much of the existing, framed line of view. There would therefore be an overall high magnitude of change and major adverse effect.	Level of effect: Major adverse (significant)
Year 15 - summer The maturing landscape mitigation and ecological planting would help integrate the Proposed Scheme within the local setting. However the presence of the Proposed Scheme would be clearly visible from residences, in particular Bridge Farm and a prominent feature of views along the canal corridor. The magnitude of change would remain high and there would be a major adverse effect.	Level of effect: Major adverse (significant)
Views from the Trent and Mersey Canal at Whatcroft Flash and from new moorings at Higginslane, Trent and Mersey Canal (VPs 310-03-004, 310-03-007) **Map Number LV-04-310**	**High sensitivity receptors**
Year 1 - winter and summer Recreational users of the Trent and Mersey Canal would experience a substantial change in near distance views as a result of the Proposed Scheme. The route of the Proposed Scheme would cross the Trent and Mersey Canal at Whatcroft Flash, running along the Whatcroft embankment and through the site of Higginslane Farm. The Trent and Mersey Canal underbridge crossing, along with the Whatcroft embankment would form uncharacteristic and highly visible features as viewed from the canal corridor. Overhead line equipment and train movement along the route of the Proposed Scheme would be seen against the skyline. While the Mid-Cheshire Link Line railway already provides a component of railway infrastructure visible along the canal corridor, the Proposed Scheme would represent a large-scale and uncharacteristic feature across much of the existing view. There would therefore be an overall high magnitude of change and major adverse effect.	Level of effect: Major adverse (significant)

Year 15 - summer The maturing landscape mitigation and ecological planting around Whatcroft Flash would help integrate the Proposed Scheme within the local setting. However the Proposed Scheme would still represent a permanent change to the local setting of the canal corridor and visible against the skyline. The magnitude of change would remain high and there would be a major adverse effect.	Level of effect: Major adverse (significant)
Views from residences bordering the A556 Chester Road at Broken Cross (VP 311-02-002) **Map Number LV-04-311**	**High sensitivity receptors**
Year 1 - winter and summer Residents would experience a noticeable change in the middle distance as a result of the Proposed Scheme. The route of the Proposed Scheme would cross on Rudheath embankment, with train movement and overhead line equipment visible on the skyline, viewed beyond an immediate foreground of existing traffic movement along the A556 Chester Road. There would therefore be an overall medium magnitude of change and moderate adverse effect.	Level of effect: Moderate adverse (significant)
Year 15 - summer The maturing landscape mitigation planting alongside the A556 Chester Road and Rudheath embankment would create a vegetation framework that would help soften the appearance of the embankment form, although the physical presence of the Proposed Scheme and train movement as a skyline element would remain. There would continue to be a medium magnitude of change and moderate adverse effect.	Level of effect: Moderate adverse (significant)
Views from residences on B5082 Penny's Lane (VP 311-02-001) **Map Number LV-04-311**	**High sensitivity receptors**
Year 1 - winter and summer Residents would experience a noticeable change in the near and middle distance as a result of the Proposed Scheme. The loss of mature vegetation at Marshall's Gorse and the elevated route of the Proposed Scheme along the Whatcroft embankment, Marshall's Gorse embankment, Gad Brook viaduct and Rudheath embankment would be visible across a wide field of view. There would therefore be an overall medium magnitude of change and moderate adverse effect.	Level of effect: Moderate adverse (significant)
Year 15 - summer: Due to the maturing landscape mitigation planting present in the view, effects would reduce to non-significant by year 15.	Level of effect: Non-significant
Views from residences on Birches Lane, Paulden Road and Harris Road, Lostock Gralam and rail users at Lostock Gralam (VP 312-02-005) **Map Number LV-04-312**	**High and low sensitivity receptors**
Year 1 - winter and summer Residents would experience a noticeable change in the middle and long distance of views as a result of the Proposed Scheme. The realignment of the A556 Chester Road would be evident, with the loss of associated mature roadside vegetation. Overhead line equipment and train movement would be seen against the skyline where the route of the Proposed Scheme would pass along Rudheath embankment, Wade Brook viaduct and Lostock Gralam embankment. The route of the Proposed Scheme would be viewed in the same context as that of the existing A556 Chester Road alignment There would therefore be an overall medium magnitude of change and moderate adverse effect.	Level of effect: Moderate adverse (significant)

Year 15 - summer: Due to the maturing landscape mitigation planting present in the view, effects would reduce to non-significant by year 15.	Level of effect: Non-significant
Views from residences on Birches Lane (VP 312-02-001) **Map Number LV-04-312**	**High sensitivity receptors**
Year 1 - winter and summer Residents would experience a substantial change in the near distance views as a result of the Proposed Scheme. The A556 Chester Road realignment would be a prominent feature, particularly in light of the loss of mature roadside vegetation during construction. Overhead line equipment and train movements would be seen against the skyline where the Proposed Scheme would pass on Rudheath embankment and Wade Brook viaduct. The Proposed Scheme would represent a new large-scale feature, viewed alongside the A556 Chester Road Realignment across much of the existing line of view. There would therefore be an overall high magnitude of change and major adverse effect.	Level of effect: Major adverse (significant)
Year 15 - summer The maturing landscape mitigation planting alongside the A556 Chester Road Realignment and the route of the Proposed Scheme would create a vegetation framework similar to that previously associated with the A556 Chester Road. Train movements and overhead line equipment would remain partially visible on the Rudheath embankment and Wade Brook viaduct. The magnitude of change would be reduced to medium and there would be a moderate adverse effect.	Level of effect: Moderate adverse (significant)
Views from PRoW Lostock Gralam Restricted Byway 1 (and residences on the western fringes of Lostock Green (VPs 311-02-003, 312-03-003) **Map Numbers LV-04-311 and LV-04-312**	**High and medium-high sensitivity receptors**
Year 1 - winter and summer Residents and footpath users would experience a substantial change in near distance of views as a result of the Proposed Scheme. The A556 Chester Road would be re-aligned further away from the village, screened by the landform of the Rudheath embankment and earthworks to the west of the village. The overhead line equipment and train movement would be seen against the skyline where the route of the Proposed Scheme passes the village, while Birches Lane would be re-aligned to the north of the village to pass beneath Wade Brook viaduct. The Proposed Scheme would represent a new large-scale feature that would be highly visible, emphasised by the loss of existing vegetation during construction, along the A556 Chester Road, although one which replaces an existing transport infrastructure alignment. Mitigation planting would not provide any visual integration at this stage. There would therefore be an overall medium magnitude of change and moderate adverse effect.	Level of effect: Moderate adverse (significant)
Year 15 - summer: Due to the maturing landscape mitigation planting, effects would reduce to non-significant by year 15.	Level of effect: Non- significant
Views from residences bordering the A556 Chester Road, hotel and leisure facilities (Travelodge Northwich, The Watermead) and offices at Cheshire Business Park (VP 312-02-007, 312-02-009) **Map Number LV-04-312**	**High, medium and low sensitivity receptors**

Year 1 - winter and summer Residents and users of the hotel and leisure facilities bordering the A556 Chester Road would experience a substantial change in the near to middle distance views. The route of the Proposed Scheme would be elevated on the Lostock Gralam embankment, its exposure emphasised by the partial loss of mature vegetation at Long Wood and along the A556 Chester Road, in particular to views from the upper storeys of residences. Mitigation planting would not provide any visual integration at this stage, although the landscape earthworks would soften the appearance of the Lostock Green embankment close to the Mid Cheshire Line. There would therefore be an overall high magnitude of change and major adverse effect.	Level of effect: Major adverse (significant)
Year 15 - summer: The maturing landscape mitigation planting would begin to reinstate a vegetation framework of a scale and location similar to that previously associated with Long Wood and along the margins of the A556 Chester Road. It would be largely characteristic of the existing view from residences, although overhead line equipment would remain visible in the near to middle distance. Longer distance views for visitors and staff at the hotel facility would remain interrupted by the elevated line of the Proposed Scheme along Lostock Green embankment and Smoker Brook viaduct. The magnitude of change would be reduced to medium and there would be a moderate adverse effect.	Level of effect: Moderate adverse (significant)
Views from PRoW Lostock Gralam Footpath 4, FieldHouse Farm and surrounding residences (VP 312-03-006) **Map Number LV-04-312**	**High and medium-high sensitivity receptors**
Year 1 - winter and summer Residents and users of the footpath would experience a noticeable change in the middle distance views. The route of the Proposed Scheme would be closer than existing A556 Chester Road and its margins of mature tree cover, being closer to those experiencing the view where it passes along Lostock Gralam embankment. The loss of mature tree cover associated with the A556 Chester Road would be evident to the south, replaced by the route of the Proposed Scheme along Rudheath embankment and Wad Brook viaduct. Views for walkers towards the Proposed Scheme would be across a wide field of view, while those from residences would vary from open to filtered views dependent on aspect and localised vegetation. There would therefore be an overall medium magnitude of change and moderate adverse effect.	Level of effect: Moderate adverse (significant)
Year 15 - summer: Due to the maturing landscape mitigation planting present in the view, effects would reduce to non-significant by year 15.	Level of effect: Non-significant

Other mitigation measures

11.5.9 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 further reduced through establishing planting early or in advance of the main construction programme. Other features such as additional earthworks, planting or greenspace will be considered as part of the ongoing development of the 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

11.5.10 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 effects in relation to four landscape character areas;
- major adverse effects in relation to 10 residential viewpoint locations;
- major adverse effects in relation to 10 recreational viewpoint locations;
- moderate adverse effects in relation to 11 residential viewpoint locations; and
- moderate adverse effects in relation to one recreational viewpoint location.

Monitoring

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

11.5.12 There are no area-specific requirements for monitoring landscape and visual mitigation during the operation of the Proposed Scheme in the Wimboldsley to Lostock Gralam 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 Wimboldsley to Lostock Gralam 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: MA02 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 SMR.

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 Wimboldsley to Lostock Gralam area. It lies within the administrative areas of CEC and CWCC. It also falls entirely within the Cheshire and Warrington Local Enterprise Partnership (LEP) area[102] and the north-west region.

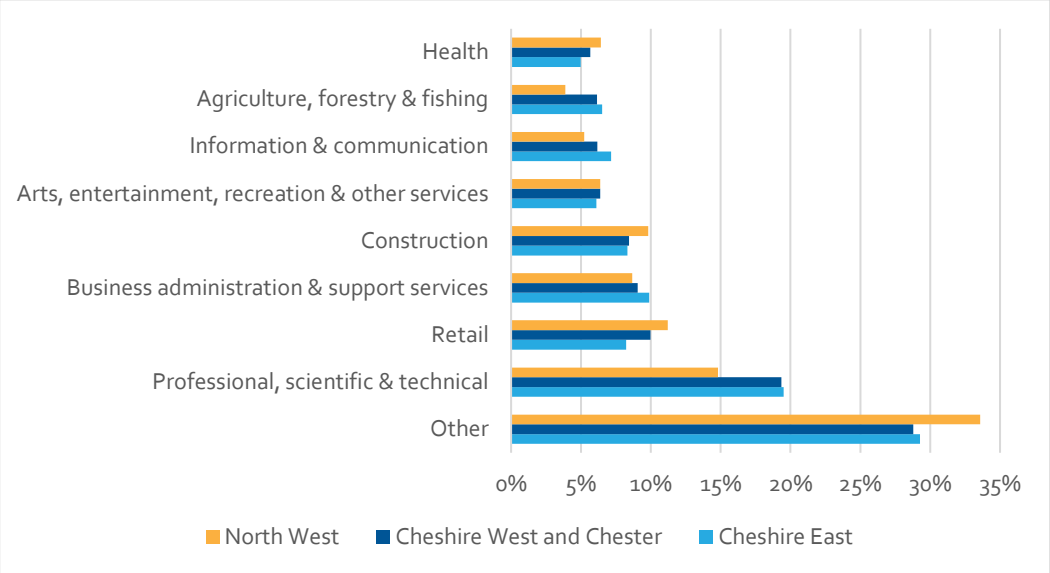
[102] Cheshire and Warrington Local Enterprise Partnership. Available online at: http://www.871candwep.co.uk/

Business and labour market

12.3.2 Within the CEC area there is a wide spread of organisation types which reflects a diverse range of commercial activities. In 2017, the professional, scientific and technical sector accounted for the largest proportion of organisations (20%). Business administration and support services was the second largest (10%), followed by both 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%)[103].

12.3.3 This is shown in Figure 8. For comparison, in the north-west region, the largest sector was 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[104, 105]

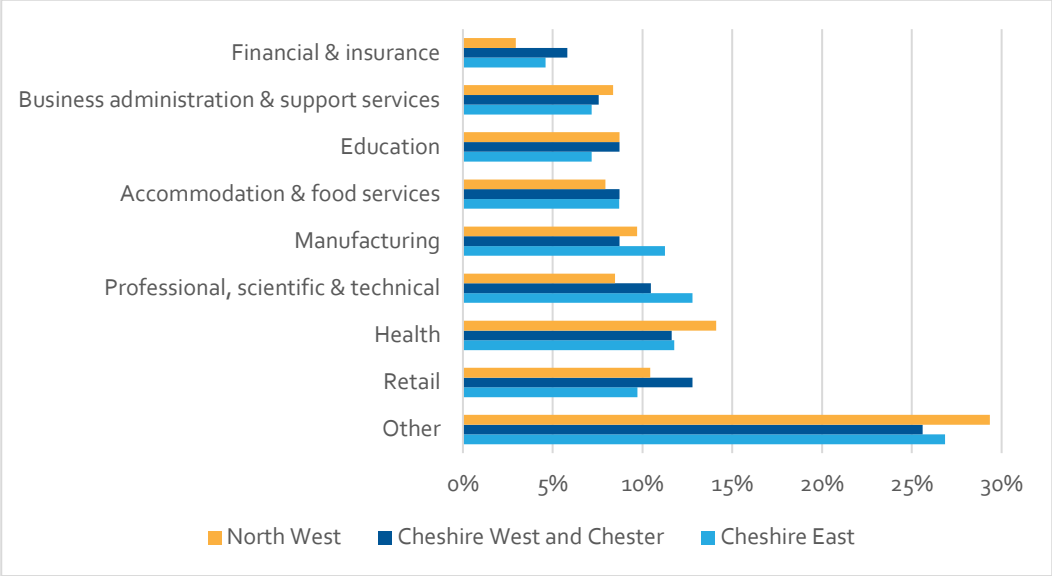


12.3.4 In 2016, approximately 195,000 people worked in the CEC area, and approximately 171,000 people worked in the CWCC area[106]. According to the Office for National Statistics Business Register and Employment Survey (2016)[107] the top sectors in terms of share of employment in the CEC area were: 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%).

[103] Office for National Statistics; (2017); UK Business Count – Local Units; http://www.nomisweb.co.uk
[104] Office for National Statistics; (2017); UK Business Count – Local Units; http://www.nomisweb.co.uk
[105] 'Other' includes: Accommodation and food services; Manufacturing; Transport and storage (including postal); Wholesale; Property; Motor trades; Financial and insurance; Education; Public administration and defence; Mining, quarrying and utilities
[106] Office for National Statistics; (2016); Business Register and Employment Survey; http://www.nomisweb.co.uk; this number includes both residents and non-residents of CWCC who work within its boundaries
[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 CEC who work within its boundaries

12.3.5 These compare with the top sectors for the north-west region, which were: health (14%), retail, and manufacturing (both 10%) and education (9%). This is shown in Figure 9.

Figure 9: Employment by industrial sector in the CEC and CWCC areas and the north-west[108, 109]



12.3.6 According to the Annual Population Survey (2016)[110], the employment rate[111] 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%).

12.3.7 The survey 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 and 9% of CWCC residents had no qualifications, both being lower than the north-west (10%) and one being lower for England (8%).

Property

12.3.8 A review of employment land in 2012[112] identified a need for 15.4ha a year to 2030 for general business in the CEC area. Middlewich has one of the largest employment land supplies in the CEC area and was not identified as a location of potential shortfall. Middlewich also has one of the highest availabilities of industrial space in the CEC area.

[108] 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
[109] Percentage of employees within broad industrial groups. 'Other' includes: Transport and storage (including postal); Arts, entertainment, recreation and other services; Construction; Public administration and defence; Wholesale; Information and communication; Motor trades; Property; Mining, quarrying and utilities; Agriculture, forestry and fishing
[110] Annual Population Survey (2016), NOMIS. Available online at https://www.nomisweb.co.uk
[111] The proportion of residents aged 16-64 that are in employment
[112] Arup (2012), *Cheshire East Employment Land Review*. Based on upper range (includes 30% flexibility factors) covering 2009-2030

12.3.9 CWCC has estimated a need for future employment land of up to 72ha for office uses to 2030 (approximately 4ha a year from 2013-2030)[113]. The need for traditional manufacturing space and warehousing has been declining. In both Winsford and Northwich there is currently a good balance of sites available including both industrial and office space, for example, Winsford Industrial Estate.

12.3.10 In Northwich there is little land remaining for future development[114]. Lostock Triangle (Cheshire Business Park) is a high quality office location, although there is limited land remaining for development of further employment space.

12.3.11 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[115].

12.4 Effects arising during construction

Avoidance and mitigation measures

12.4.1 The draft CoCP[116] 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:

[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 West and Chester Council (2013). *Cheshire West and Chester Council Local Plan: Employment Land Study Update 2013*.
[115] 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
[116] Supporting document: Draft Code of Construction Practice

- premises demolished with their occupants and employees needing to relocate to allow for construction of the Proposed Scheme;
- in-combination effects (e.g. air quality, noise, vibration, construction traffic and visual impacts) and isolation of an area, which could affect business operations, 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 14 satellite compounds and four rail system compounds in the Wimboldsley to Lostock Gralam area. The works undertaken at and managed from these sites would result in the creation of up to 2,800 person years of construction employment[117], which is broadly equivalent to 280 full-time jobs[118]. 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).

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: Route-wide effects).

Permanent effects

Businesses

12.4.6 Businesses directly affected, comprising those that lie within land required for the Proposed Scheme, are reported in groups, where possible, to form defined resources based on their location and operational characteristics. A group could contain either one or a number of businesses reflecting the fact that a building may have more than one occupier or that similar businesses and resources are clustered together.

12.4.7 Four business accommodation units or sites in the study area would experience direct impacts as a result of the Proposed Scheme. These four units or sites, together, form four defined resources including:

[117] 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
[118] Based on the convention that 10 employment years is equivalent to one full time equivalent job

- part of a Morrisons Distribution Centre car park (one unit engaged in distribution to regional supermarkets);
- Lostock Gralam (one unit engaged in provision of catering services at a Picnic Area);
- Birches Lane (one unit engaged in provision of driving lessons); and
- Birches Lane (one unit engaged in provision of architectural services).

12.4.8 The two businesses on Birches Lane are located at residential properties.

12.4.9 Of the four resources identified, one business could potentially experience significant direct effects on business activities and employment, as set out in Table 27.

Table 27: Resource which would potentially experience significant direct effects

Resource	Description of business activity
Morrisons Distribution Centre	Distribution to regional supermarkets

Impact magnitude

12.4.10 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

12.4.11 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

12.4.12 Taking account of the sensitivity of the resource and the magnitude of impact, it is currently expected that the significance of the resulting effects would be as set out in Table 28. It should be noted that a precautionary approach has been taken in this assessment as outlined earlier in this section and the conclusions may change in the formal ES.

Table 28: Significance of effects on resources

Resource	Impact magnitude	Sensitivity	Significance of effect
Morrisons Distribution Centre	High	Medium	Major adverse

12.4.13 The construction of Gad Brook viaduct satellite compound would require land currently used for car parking at Morrisons Distribution Centre. The viability of the business might be affected by the loss of approximately 40% of the existing staff car park facilities. Given the current land ownership boundary, it is unlikely there could be reconfiguration of the site to make up for this short fall in parking. The loss of parking is considered to be major adverse and is therefore significant.

12.4.14 Employment related to mining and gas storage may be directly affected by the construction of the Proposed Scheme. Any effects of the Proposed Scheme on mines and underground gas storage facilities in this area will be reported in the formal ES.

12.4.15 Among all the affected resources (excluding employment associated with mining/gas storage activities) whether significantly affected or not, it is estimated that 1,130 jobs[119] would either be displaced or possibly lost within the Wimboldsley to Lostock Gralam area. There is a reasonable probability that most businesses would be able to relocate to places that would still be accessible to residents within the travel to work areas due to the general availability of vacant premises. The impact on the local economy from the loss and/or relocation of jobs is considered to be 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.

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

Other mitigation measures

12.4.17 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.

12.4.18 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

12.4.19 Any likely residual significant socio-economic effects will be reported in the formal ES.

[119] Employment within businesses has been estimated through a combination of sources, for example, 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 Operational employment would be created at the Crewe North RSD. The Crewe North RSD would be used as an operational and maintenance hub for train servicing, located within the Wimboldsley to Lostock Gralam area. It is likely that some of these jobs would be accessed by local residents.

12.5.4 Direct operational employment created by the Proposed Scheme could lead to indirect employment opportunities for local businesses in terms of potentially supplying the Proposed Scheme or benefiting from expenditure of directly employed workers on goods and services.

12.5.5 The impact of operational employment creation will be assessed and reported at a route-wide level in Volume 3: Route-wide effects.

Other mitigation measures

12.5.6 Any further mitigation measures will be reported in the formal ES.

Summary of likely residual significant effects

12.5.7 Any likely residual significant socio-economic effects will be reported in the formal ES.

Monitoring

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

12.5.9 There are no area-specific requirements for monitoring socio-economic effects during the operation of the Proposed Scheme in the Wimboldsley to Lostock Gralam 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 Wimboldsley to Lostock Gralam 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[120]; and
- 'non-residential receptors'[121] such as:
  - community facilities including schools, hospitals, places of worship and 'quiet areas'[122]; 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[123], planning policy, planning practice guidance on noise (PPGN) [124] and EIA Regulations as described in the Scope and Methodology Report[125] (SMR).

13.1.3 Engagement has been undertaken with Cheshire East Council (CEC) and Cheshire West Council and Chester Council (CWCC) 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 Wimboldsley to Lostock Gralam 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: MA02 Map Book. Map series SV-01

[120] '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.
[121] Non-residential receptors with multiple uses would be assessed either based on the most noise sensitive use or would be subject to multiple assessments as appropriate
[2] 'quiet areas' are defined as either Quiet Areas as identified under the Environmental Noise Regulations 2007 (as amended) or are resources which are prized for providing tranquillity as noted in the NPPF and are therefore designated as such under the relevant local plan or are designated under local plans or neighbourhood development plans as local green spaces.
[123] Noise Policy Statement for England, (2015) Department for Environment, Food & Rural Affairs (Defra)
[124] Department for Communities and Local Government (DCLG) (2014), Planning Practice Guidance – Noise. Available online at: https://www.gov.uk/guidance/noise--2
[125] 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 Wimboldsley to Lostock Gralam area is characterised by a mix of small towns, villages, hamlets and isolated residential properties in a predominantly semi-rural setting, although there are also some urban environments in the larger settlements of Northwich, Winsford and Middlewich. The sound environment is generally dominated by local and distant road traffic, with contributing aircraft, local neighbourhood sources and natural and agricultural sounds.

13.3.3 There are several main roads within the Wimboldsley to Lostock Gralam area: the A530 Nantwich Road that runs through Wimboldsley, Middlewich and Rudheath; the A54 Middlewich Road that runs through Winsford and Middlewich; the A533 Bostock Road that runs through Middlewich, Bostock, Moulton, Davenham and Northwich; the A556 Chester Road that runs through Davenham, Northwich, Rudheath and Lostock Gralam; and the A559 Manchester Road that runs through Northwich, Lostock Gralam, Wincham and Marston. There are also a number of railways contributing to the sound environment in the Wimboldsley to Lostock Gralam area, including the West Coast Main Line (WCML) running in a south to north direction, the Middlewich to Northwich railway (part of the Mid Cheshire Line) and the Northwich to Knutsford railway.

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[126], Roads[127] or Railways[128]. HS2 Ltd will engage with the Competent Authorities responsible for the relevant Important Areas. Map Series SV-01 (Volume 2: MA02 Map Book) shows any noise Important Areas in the Wimboldsley to Lostock Gralam 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)[129]. 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.

[126] Noise Action Plan: Agglomerations (large urban areas) (2014) Department for Environment, Food & Rural Affairs (Defra)
[127] Noise Action Plan: Roads (including major roads) (2014) Department for Environment, Food & Rural Affairs (Defra)
[128] Noise Action Plan: Railways (including major railways) (2014) Department for Environment, Food & Rural Affairs (Defra)
[129] Supporting document: Draft Code of Construction Practice

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[130].
- As part of BPM, mitigation measures are applied in the following order:
  - noise and vibration control at source: for example, the selection of quiet and low vibration equipment, review of construction methodology to consider quieter methods, location of equipment on-site, control of working hours, the provision of acoustic enclosures and the use of less intrusive alarms, such as broadband vehicle reversing warnings;
  - screening: for example, local screening of equipment or perimeter hoarding or the use of temporary stockpiles; and
  - where, despite the implementation of BPM, the noise exposure exceeds the criteria defined in the draft CoCP, noise insulation or ultimately temporary re-housing would be offered at qualifying properties.
- Lead contractors will seek to obtain prior consent from the relevant local authority under Section 61 of the CoPA for the proposed construction works. The consent application will set out BPM measures to minimise construction noise and vibration, including control of working hours, and provide a further assessment of construction noise and vibration, including confirmation of noise insulation/temporary re-housing provision.
- Contractors would undertake and report such monitoring as is necessary to assure and demonstrate compliance with all noise and vibration commitments. Monitoring data would be provided regularly to, and be reviewed by, the nominated undertaker and made available to the local authorities.
- Contractors would be required to comply with the terms of the CoCP and appropriate action would be taken by the nominated undertaker as required to ensure compliance.

13.4.4 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.

[130] Including local businesses and quiet areas designated by the local authority.

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: MA02 Map Book):

- Occleston Green, including the residential properties in the vicinity of the A530 Nantwich Road between Walley's Green and Occleston Green, arising from construction activities such as overbridge construction, embankment formation, road realignments, use of transfer nodes and Crewe North rolling stock depot (RSD) railway systems construction;
- Wimboldsley arising from construction activities such as embankment formation, use of transfer nodes and Crewe North RSD railway systems construction, with some of these works potentially being undertaken at night;
- Clive Green including Stanthorne Park Mews arising from construction activities such as overbridge formation, embankment formation, road realignments and Crewe North RSD railway systems construction;
- Clive village arising from construction activities such as viaduct formation, overbridge formation, embankment formation and road realignments;
- Stanthorne arising from construction activities such as viaduct formation, overbridge formation, embankment formation and road realignments;
- the west of the Newtonia area of Middlewich arising from construction activities such as viaduct formation, overbridge formation, embankment formation and road realignments;
- Whatcroft arising from construction activities such as viaduct formation and embankment formation;
- Pear Tree Farm Cottages on Davenham Road arising from construction activities associated with the underbridge construction, embankment formation and importation of fill material for the embankment;
- B5082 Penny's Lane arising from construction activities such as road realignments;
- Broken Cross in Rudheath arising from construction activities such as road realignments;
- Lostock Green arising from construction activities associated with road realignments and embankment formation;
- Lostock Gralam arising from construction activities associated with road realignments, underbridge construction and embankment formation; and

- Ascol Drive to the East of Lostock Gralam, arising from construction activities associated with viaduct construction.

13.4.7 Map Series SV01 (Volume 2: MA02 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):

- Wimboldsley Community Primary School;
- Travelodge Northwich, Lostock Gralam; and
- Lostock Lodge Care Home.

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:

- Clive Green Lane from the A530 Nantwich Road to Clive Lane;
- Clive Lane from Clive Green Lane to the A54 Middlewich Road;
- the B5309 King Street/Centurion Way from the A54 Middlewich Road to the A530 Nantwich Road;
- Whatcroft Lane from the A530 Nantwich Road to Manor Lane;
- Davenham Road from the A530 Nantwich Road to Billinge Green; and
- Station Road, Lostock Hollow and Lostock Green from the A559 Manchester Road to A556 Chester Road.

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

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

13.5.2 Passenger services will start at or after 05:00 from the terminal stations. In this area, with Phase One and Phase Two in operation, after 05:00 services will progressively increase to nine trains per hour in each direction on the main lines with an operating speed of 330kph for 90% of services and 360kph for 10% of services. This number of services is assumed to operate every hour from 07:00 to 21:00. The number of services will progressively decrease after 21:00 and the last service will arrive at terminal stations by midnight. Further information is presented in Volume 1, Section 4.

Local assumptions – Crewe North rolling stock depot (RSD)

13.5.3 The Crewe North RSD would operate throughout the day and night, but with the majority of operations occurring during the night. Night-time operations that generate noise would be reduced insofar as reasonably practicable. Passenger trains would be prepared and dispatched to Manchester Piccadilly High Speed station from approximately 05:00, before passenger services start each day at approximately 05:30. Trains would return to Crewe North RSD during the evening as passenger services decrease on the operational railway, with the last train expected to arrive back from service at approximately 00:30. Trains would arrive at Crewe North RSD depot during the night for routine inspections and maintenance. Trains would undergo planned maintenance (generally inside maintenance sheds) during the daytime. Where night-time inspections identify urgent maintenance, that maintenance would be undertaken at night, if necessary.

Avoidance and mitigation measures

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

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

Airborne noise

13.5.6 Through the procurement process for the trains and the track, the use of proven international technology will enable the railway to be quieter than implied by current minimum European standards. Details of operational train noise will be provided in

the formal ES. This will include reduction of aerodynamic noise from the pantograph that otherwise would occur above 300kph (186mph) with current pantograph designs, drawing on proven technology in use in East Asia where reasonably practicable. Overall it is assumed that proven international technology would reduce noise emissions by approximately 3dB at 360kph (225mph) compared to the current minimum European standards[131].

13.5.7 The Proposed Scheme would incorporate noise barriers, in the form of either landscape earthworks and/or noise fence barriers to avoid or reduce significant adverse airborne noise effects. The assessment has been based on the assumption that noise fence barriers are acoustically absorbent on the railway side and are located 5m from the outer rail. The envisaged noise barrier locations based upon the currently available information are shown on Map Series SV-01 (Volume 2: MA02 Map Book) and described in Section 2.2.

13.5.8 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.

13.5.9 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.

13.5.10 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[132] noise from the use of the Proposed Scheme measured outside a dwelling exceeds the Interim Target defined by the World Health Organization's (WHO) Night Noise Guidelines for Europe[133] or the maximum noise level criteria[134] defined in the SMR. Noise insulation is designed to avoid residents experiencing any residual significant effect on health and quality of life from resulting noise inside their dwelling.

13.5.11 The Crewe North RSD would be designed and operated to control noise and vibration and hence avoid significant effects.

Ground-borne noise and vibration

13.5.12 Significant ground-borne noise or vibration effects would be avoided or reduced through the design of the track and track-bed.

[131] Technical Specification for Interoperability (TSI) Noise – EU Commission Regulation No 1304/2014
[132] Following Government's National Planning Practice Guidance. Available online at: https://www.gov.uk/government/collections/planning-practice-guidance
[133] World Health Organization (2010), *Night time Noise Guidelines for Europe*
[134] Dependent on the number of train passes

Assessment of impacts and effects

13.5.13 Map Series SV-01 (Volume 2: MA02 Map Book) indicates the likely long-term daytime noise level (defined as the equivalent continuous sound level from 07:00 to 23:00 or $L_{pAeq,day}$) from HS2 operations alone. The contours are shown in 5dB steps from 50dB to 70dB. With the train flows described in Volume 1, the night-time noise level (defined as the equivalent continuous noise level from 23:00 to 07:00 or $L_{pAeq,night}$) from the Proposed Scheme would be approximately 10dB lower than the daytime sound level. The 50dB contour, therefore, indicates the distance from the Proposed Scheme at which the night time noise level would be 40dB. This contour represents where adverse noise effects may start to be observed during the day (with respect to annoyance) and night (with respect to sleep disturbance). With regard to sleep disturbance the assessment also takes account of the maximum noise levels generated by each train pass by as defined in the SMR.

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

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

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

13.5.17 Likely significant noise or vibration effects arising from the operation of Crewe North RSD, will be reported in the formal ES.

Other mitigation measures

13.5.18 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

13.5.19 Mitigation, including landscape earthworks and noise fence barriers, described in Volume 1, Section 9, section 2.2 and presented in Map Series SV-01 (Volume 2: MA02 Map Book) and Map Series CT-06 (Volume 2: MA02 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.

13.5.20 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:

- Clive Green: occupants of residential properties on Stanthorne Park Mews and Clive Green Lane, located closest to the Proposed Scheme, identified by MA02-C01 on Map SV-01-305;
- Stanthorne: occupants of residential properties on Birch Lane, located closest to the Proposed Scheme, identified by MA02-C02 on Map SV-01-305;
- Whatcroft: occupants of residential properties on Whatcroft Hall Lane, located closest to the Proposed Scheme, identified by MA02-C03 on Map SV-01-307;
- Pear Tree Farm Cottages: occupants of residential properties on Davenham Road, located closest to the Proposed Scheme, identified by MA02-C04 on Map SV-01-307;
- Lostock Green: occupants of residential properties on Birches Lane, Greenside Drive and Birch Grove, located closest to the Proposed Scheme, identified by MA02-C05 on Map SV-01-308;
- Lostock Gralam: occupants of residential properties on Cheshire Avenue, Pack Horse Close, Pavillion Avenue and Wells Avenue, located closest to the Proposed Scheme, identified by MA02-C06 on Map SV-01-308; and
- Ascol Drive: occupants of residential properties on Ascol Drive, located closest to the Proposed Scheme, identified by MA02-C07 on Map SV-01-309a.

13.5.21 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 at or around:

- Park Farm on Clive Green Lane (identified on Map SV-01-305 in Volume 2: MA02 Map Book);
- Heyescroft on Bostock Road (identified on Map SV-01-306 in Volume 2: MA02 Map Book);
- Canal Cottage, Bridge Cottage and The Barn at Bridge Farm on Whatcroft Hall Lane (identified on Map SV-01-307 in Volume 2: MA02 Map Book); and
- Lostock Green in the vicinity of Birches Lane (identified on Map SV-01-308 in Volume 2: MA02 Map Book).

13.5.22 Map Series SV01 (Volume 2: MA02 Map Book) shows key non-residential properties for the assessment of operational airborne noise impacts in the formal ES. Of these, the following are most likely to experience significant effects:

- Chrysalis Day Nursery, Rudheath; and
- Lostock Green Methodist Church.

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

13.5.24 HS2 Ltd will continue to seek reasonably practicable measures to further reduce or avoid these significant effects. In doing so HS2 Ltd will continue to engage with stakeholders to fully understand the potentially affected receptor, its use and the benefit of the measures.

Monitoring

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

13.5.26 Operational noise and vibration monitoring would be carried out at different times during the lifetime of the Proposed Scheme at a combination of carefully selected monitoring locations including: adjacent or attached to moving vehicles, at fixed positions or in the vicinity of individual assets; and locations within the surrounding areas and communities alongside the railway corridor.

13.5.27 The expected noise and vibration performance of the Proposed Scheme, operational noise and vibration measurement data, associated asset information, description of corrective actions, results of measured performance compared to expected conditions, and monitoring reports would be shared with the relevant local authorities at appropriate intervals.

14 Traffic and transport

14.1 Introduction

14.1.1 This section considers the likely impacts on all forms of transport and the potential likely significant effects identified to date on transport users arising from the construction and operation of the Proposed Scheme through the Wimboldsley to Lostock Gralam area.

14.1.2 Engagement with Highway England, Cheshire West and Chester Council (CWCC) and Cheshire East Council (CEC) has been undertaken. An important focus of this engagement has been to obtain relevant baseline information and discuss transport survey requirements and assessment methodology. This engagement process will continue as part of the development of the Proposed Scheme.

14.1.3 Maps showing the location of the key environmental features (Map Series CT-10) and the key construction (Map Series CT-05) and key operational (Map Series CT-06) features of the Proposed Scheme are provided in the Volume 2: MA02 Map Book.

14.2 Scope, assumptions and limitations

14.2.1 The scope, key assumptions and limitations for the traffic and transport assessment are set out in Volume 1, Section 8 and the Scope and Methodology Report (SMR)[135].

14.2.2 The study area for traffic and transport includes the communities of Bostock Green, Byley, Davenham, Lach Dennis, Lostock Gralam, Middlewich, Plumley, Rudheath, Stanthorne and Wimboldsley and Winsford together with stations at Winsford, Greenback, Northwich, Lostock Gralam and Plumley.

14.2.3 The study area also includes all roads potentially affected by the Proposed Scheme. The only strategic road in this area is the M6.

14.2.4 The local roads in the study area include: the A530 Middlewich Road/Nantwich Road/ King Street/Griffiths Road, the A54 Chester Road/ Middlewich Road /Saint Michael's Way/ Holmes Chapel Road/Kinderton Street, the A533 Bostock Road, the A556 Chester Road, the A559 Manchester Road, the B5309 King Street/Centurion Way, Birches Lane, Clive Green Lane, Clive Lane, Davenham Road, London Road, Lostock Hollow, Lostock Green, Road One, Station Road (Lostock Gralam) and Whatcroft 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.

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

14.3 Environmental baseline

Existing baseline

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

Surveys

14.3.2 Traffic surveys, comprising junction turning counts and queue surveys and automatic traffic counts, were undertaken in June, July and November 2017. These data have been supplemented by existing traffic data from other sources, including from CWCC and CEC. Assessment of the data indicates that the peak hours in the area are 07:30-08:30 and 16:45-17:45. 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, which are the periods when HS2 construction traffic movements and workforce arrivals and departures would have the maximum impact. Consequently, the 08:00-09:00 and 17:00-18:00 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 strategic road network in and around Wimboldsley to Lostock Gralam 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 A530 Middlewich Road/Nantwich Road/ King Street/Griffiths Road, the A54 Chester Road/ Middlewich Road /Saint Michael's Way/ Holmes Chapel Road/ Kinderton Street, the A533 Bostock Road, London Road, the A556 Chester Road, the A559 Manchester Road, the B5309 King Street/Centurion Way, Birches Lane, Clive Green Lane, Clive Lane, Davenham Road, London Road, Lostock Hollow, Lostock Green, Road One, Station Road (Lostock Gralam), and Whatcroft Lane.

14.3.6 Relevant accident data for the road network subject to assessment have been obtained from the Department for Transport[136]. Data for the three-year period (2014-2016) have been assessed and any identified clusters (i.e. where there are nine or more accidents in the three-year period) have been examined.

[136] STAT19 Road Safety Data 2014-2016 Department for Transport

14.3.7 No accident clusters were identified within the Wimboldsley to Lostock Gralam area.

14.3.8 The route of the Proposed Scheme would cross five roads with footways within the Wimboldsley to Lostock Gralam area. These are the A54 Middlewich Road, the A533 Bostock Road, the A556 Chester Road, the A559 Manchester Road and the A530 King Street.

Parking and loading

14.3.9 The parking spaces at Morrison's Distribution Centre, Gadbrook could be affected by the Proposed Scheme.

Public transport network

14.3.10 Three bus routes operate on two roads that are crossed by the route of the Proposed Scheme in the Wimboldsley to Lostock Gralam 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 includes:

- the A530 Nantwich Road: Route 42 (Crewe - Leighton Hospital - Congleton); and
- the A54 Middlewich Road: Route 37 (Winsford – Northwich) and X81 (Winsford - Sandbach - Hanley).

14.3.11 National and local rail services are accessible via Winsford station with local rail services accessible via Greenback, Northwich, Lostock Gralam and Plumley stations. Hartford Station lies just outside the periphery of the Wimboldsley to Lostock Gralam area. Winsford and Hartford provide services to Crewe, Warrington and beyond. Greenbank, Northwich, Lostock Gralam and Plumley stations provide access to local services to Chester, Stockport and Manchester Piccadilly.

Non-motorised users

14.3.12 There are pedestrian footways adjacent to many of the roads in the built up areas of Bostock Green, Byley, Davenham, Lach Dennis, Lostock Gralam, Middlewich, Plumley, Rudheath, Stanthorne and Wimboldsley and Winsford. 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 six PRoW within the Wimboldsley to Lostock Gralam area that could be affected either temporarily or permanently due to, for example, temporary diversion of PRoW during construction and permanent upgrades, including for maintenance access to the Proposed Scheme. The surveys undertaken to inform the assessment showed that there were fewer than 50 people a day recorded on all the PRoW on the surveyed days.

14.3.14 National Cycle Route 5 (running from Winsford to the west of the Proposed Scheme to south of Middlewich), Route 551 (through Winsford and to the south-west) and Route 573 (running from Davenham in the west to M6 in the east) pass through the Wimboldsley to Lostock Gralam area.

Waterways and canals

14.3.15 There are two navigable waterways in the Wimboldsley to Lostock Gralam area; the Shropshire Union Canal (Middlewich Branch) and the Trent and Mersey Canal.

Air transport

14.3.16 There is no relevant air transport in the Wimboldsley to Lostock Gralam area. Consequently, this topic is not considered further in this assessment.

14.4 Effects arising during construction

Avoidance and mitigation measures

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

- new highways (roads and PRoW) would be constructed and operational prior to the permanent closure of any existing highways, insofar as reasonably practicable;
- the majority of roads crossing the route of the Proposed Scheme would be maintained or locally diverted during construction to limit the need for diversion of traffic onto alternative routes;
- traffic management measures would be implemented to limit any disruption;
- road closures would be restricted to overnight and weekends, insofar as reasonably practicable;
- temporary alternative routes for PRoW would be provided during construction, insofar as reasonably practicable, where either the existing or final proposed route is not available;
- where reasonably practicable, site haul routes would be created adjacent to the route of the Proposed Scheme to transport construction materials and equipment to reduce heavy goods vehicle (HGV) movements on public roads with access taken via the main road network;
- HGV would be routed, insofar as reasonably practicable, along the strategic and/or primary road network;
- the use of the local road network would, insofar as reasonably practicable, be limited to use for site set-up, access for surveys and on-going servicing (including refuse collection and general deliveries to compounds) during construction;
- the reuse of excavated material along the route of the Proposed Scheme, insofar as reasonably practicable;
- highway measures, including junction improvements, passing places and carriageway widening, would be provided, as required, to manage the safe passing of construction vehicles on construction HGV routes; and

- on-site welfare facilities would be provided which would reduce daily travel by site workers.

14.4.2 Section 14 of the draft Code of Construction Practice (CoCP)[137] includes measures that aim to reduce the adverse impacts and effects on local communities and maintain public access. This includes the impacts of deliveries of construction materials and equipment.

14.4.3 The measures in the draft CoCP include controls on vehicle types, hours of site operation and routes for 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[138] to be produced that would include a range of potential measures to mitigate the impacts of traffic and transport movements associated with construction of the Proposed Scheme.

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

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

[137] Supporting document: Draft Code of Construction Practice
[138] Construction and operational travel plans would promote the use of sustainable transport modes as appropriate to the location and types of trip. They would include measures such as: provision of information on and promotion of public transport services; provision of good cycle and pedestrian facilities; liaison with public transport operators; promotion of car sharing; and the appointment of a travel plan coordinator to ensure suitable measures are in place and are effective.

Assessment of impacts and effects

Temporary effects

14.4.8 The traffic and transport impacts during the construction period within the Wimboldsley to Lostock Gralam area are likely to include:

- construction vehicle movements to and from the various construction compounds;
- road closures and associated realignments and diversions;
- alternative routes for PRoW; and
- possessions on the conventional rail network.

14.4.9 The construction assessment has also considered any impacts in the Wimboldsley to Lostock Gralam area that arise from construction of the Proposed Scheme in the adjoining community areas.

14.4.10 Construction vehicle movements required to construct the Proposed Scheme would include the delivery of plant and materials, movement of excavated materials and site worker trips. Works would include utilities diversions, earthworks, underpass, viaduct, bridge and highway construction.

14.4.11 Construction activities would be managed from compounds. Details of the construction compounds are provided in Section 2.3. The locations of the compounds are shown in Map Series CT-05 in the Volume 2: MA02 Map Book.

Strategic and local highway network

14.4.12 The primary HGV access routes for construction vehicles would be the strategic and/or primary road network with the use of the local road network limited, where reasonably practicable. The construction routes would also provide access to compounds. Where reasonably practicable, 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 A530 Griffiths Road/King Street /Nantwich Road;
- the A533 Bostock Road/ Road One Roundabout to London Road;
- the A556 Chester Road;
- the A559 Manchester Road;
- the A54 Chester Road / Middlewich Road /Saint Michael's Way/Holmes Chapel Road/ Kinderton Street;
- the B5309 King Street/Centurion Way;
- Birches Lane;
- Clive Green Lane;
- Clive Lane;

- Davenham Road;
- London Road;
- Lostock Hollow;
- Lostock Green;
- Road One;
- Station Road (Lostock Gralam); and
- Whatcroft Lane.

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

- the A530 Nantwich Road (between Brookhouse Lane and Chapel Lane);
- the A533 Bostock Road (between South Lodge and Coalpit Lane);
- the A54 Middlewich Road (between Seaton Street and Coalpit Lane);
- the A556 Chester Road (Winnington Belt to Rudheath Roundabout);
- Bell Lane (between A533 Bostock Road and A54 Middlewich Road);
- Clive Green Lane (between Shropshire Union Canal middle Branch and Coalpit Lane); and
- Whatcroft Lane (east of Bridge Farm).

14.4.14 Permanent changes to highways are reported under operation.

14.4.15 Changes in traffic have the potential, at some locations, to result in increased travel distance, congestion and delays and increased traffic severance for non-motorised users. The assessment of these changes will be reported in the formal ES.

14.4.16 Assessment of the traffic and transport impacts from utilities works, either separately or in combination with other works, will be reported in the formal ES.

Accidents and safety

14.4.17 Changes in traffic as a result of the Proposed Scheme could result in changes in accident risk. The impacts on accident risk during construction of the Proposed Scheme will be reported in the formal ES.

Parking and loading

14.4.18 It is expected that the Proposed Scheme could have impacts on parking. There will be temporary impacts on parking at Morrisons Distribution centre at Gadbrook 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

14.4.19 It is expected that construction of the Proposed Scheme would require bus route diversions, including bus routes 37 (Winsford – Northwich) and X81 (Winsford - Sandbach – Hanley) on the A54 Middlewich Road. This could result in increased journey times and the need to relocate bus stops. Any consequent effects will be reported in the formal ES.

14.4.20 There are interfaces with the existing rail network in this area, in particular on the operation of the WCML and its rail freight services. Rail possessions would be required to undertake localised works associated with construction of the Crewe North rolling stock depot (RSD) and the Proposed Scheme. This could result in disruption to services, although many of the interventions would be combined to reduce the frequency of potential disruption. The effects of railway possessions will be assessed and reported in the formal ES.

Non-motorised users

14.4.21 The construction works associated with the Proposed Scheme would require the temporary closure or diversion/realignment of PRoW and roads. There would be temporary alternative routes for a number of PRoW in the vicinity of the Proposed Scheme. Where necessary, PRoW would be re-routed around construction compounds.

14.4.22 There would be temporary alternative routes for a number of PRoW in the vicinity of the Proposed Scheme. It is currently expected that the following PRoW would be temporarily diverted/realigned or closed:

- Davenham Footpath 6, east of Bridge Farm, to be temporarily closed; and
- Stanthorne Footpath 3, south of Yew Tree Farm, to be temporarily closed.

14.4.23 Permanently diverted PRoW are reported under operation although these PRoW could also be subject to temporary closure or diversion/realignment.

14.4.24 The changes to PRoW are likely to result in some increases in travel distance with the potential for adverse significant effects. The assessment of these will be reported in the formal ES.

Waterways and canals

14.4.25 It is currently expected that the construction of the Proposed Scheme could have impacts upon users of the Shropshire Union Canal (Middlewich Branch) and the Trent and Mersey Canal and their towpaths in the Wimboldsley to Lostock Gralam area. The assessment of these will be reported in the formal ES.

Permanent effects

14.4.26 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

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

14.4.28 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

14.4.29 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: the A530 Griffiths Road /King Street /Nantwich Road; the A533 Bostock Road; the A556 Chester; the A559 Manchester Road; the A54 Chester Road / Middlewich Road /Saint Michael's Way/Holmes Chapel Road/ Kinderton Street; the B5309 King Street/Centurion Way; Birches Lane; Clive Green Lane; Clive Lane; Davenham Road; London Road; Lostock Hollow; Lostock Green; Road One; Station Road (Lostock Gralam); and Whatcroft Lane. Increases in traffic could also result in increased traffic severance for non-motorised users of the routes and changes in traffic could result in changes in accident risk.

14.4.30 Construction of Proposed Scheme is expected to result in temporary closure and associated diversions of the A530 Nantwich Road; the A533 Bostock Road; the A54 Middlewich Road; the A556 Chester Road (Winnington Belt to Rudheath Roundabout); Bell Lane; Clive Green Lane; and Whatcroft Lane.

14.4.31 Construction of the Proposed Scheme is expected to result in some temporary suspension of parking spaces at Morrisons Distribution centre at Gadbrook.

14.4.32 Construction of the Proposed Scheme is expected to result in temporary diversion of bus routes 37 and X81.

14.4.33 Construction of Proposed Scheme is expected to include works that would require possessions of network rail infrastructure for short periods.

14.4.34 Construction of the Proposed Scheme is expected to result in the temporary diversion of Davenham Footpath 6 and Stanthorne Footpath 3.

14.4.35 Construction of the Proposed Scheme could affect users of the Shropshire Union Canal (Middlewich Branch) and the Trent and Mersey Canal, including their towpaths.

14.4.36 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.

14.5.2 A depot travel plan for the Crewe North RSD would include measures that aim to reduce the impacts and effects of traffic and transport movements.

Assessment of impacts and effects

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

Key operation transport issues

14.5.4 There would be potential impacts of additional users on the local transport networks from the traffic generated by the operations of the Crewe North RSD. However, the vehicular trips generated for the maintenance of the Proposed Scheme would be limited and the effects not expected to be significant.

14.5.5 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

14.5.6 The Proposed Scheme would result in a number of permanent highway changes. These include:

- the A530 Nantwich Road realignment;
- the A533 Bostock Road diversion;
- the A54 Middlewich Road diversion;
- the A556 Chester Road realignment (Winnington Belt to Rudheath Roundabout);
- Birches Lane diversion;
- Clive Green Lane realignment; and
- B5082 Penny's Lane diversion (alternative connection would be provided via an existing roundabout on the A530).

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

14.5.8 The proposed Crewe North RSD would generate additional vehicle movements due to staff, servicing and operational traffic. However, the weekday peak hour trip generation is expected to be low since the depot is expected to operate a shift pattern, with changeover times that would not coincide with the morning and evening peak periods on the local road network. There would also only be limited operational traffic. Consequently, any traffic and transport impacts due to the depot would primarily be during off-peak periods. The wider maintenance of the Proposed Scheme would generate limited vehicular trips. The effects of operational traffic will be reported in the formal ES.

Accidents and safety

14.5.9 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

14.5.10 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 Morrisons Distribution centre at Gadbrook. Where car parking is lost that would have served facilities that are displaced by the Proposed Scheme this is not considered a material effect.

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

Public transport network

14.5.12 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 Wimboldsley to Lostock Gralam area.

Non-motorised users

14.5.13 A number of PRoW that cross the route of the Proposed Scheme would be either permanently realigned/diverted or closed including:

- Wimboldsley Footpath 1, north of Wimboldsley Community Primary School, to be permanently realigned;
- Winsford Footpath 37 (also known as Stanthorne Footpath 1), north-west of Stanthorne Hall Farm, to be permanently diverted;
- Rudheath Footpath 3 (also known as Lach Dennis Footpath 3X), north-west of Melvin Holme Farm, to be permanently diverted; and
- Lostock Gralam Footpath 14 to be permanently diverted where the Proposed Scheme crosses the Mid-Cheshire Railway Line.

14.5.14 The realignment of some 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 Wimboldsley Footpath 1. The assessment of PRoW changes will be reported in the formal ES.

Waterways and canals

14.5.15 It is not currently expected that the operation of the Proposed Scheme would have a significant effect upon navigable waterways or canals in the Wimboldsley and Lostock Gralam area.

Other mitigation measures

14.5.16 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.

14.5.17 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

14.5.18 Operation of the Proposed Scheme would require the permanent diversion of the A533 Bostock Road, the A54 Middlewich Road; the A556 Chester Road, Birches Lane, Clive Green Lane and Penny's Lane. Increases in traffic could also result in increased traffic severance for non-motorised users of these routes.

14.5.19 Operation of the Proposed Scheme is expected to result in permanent loss of parking spaces at Morrisons Distribution centre at Gadbrook.

14.5.20 Operation of the Proposed Scheme is expected to permanently divert the following PRoW: Wimboldsley Footpath 1; Winsford Footpath 37/Stanthorne Footpath 1; Rudheath Footpath 3/Lach Dennis Footpath 3X and Lostock Gralam Footpath 1.

14.5.21 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

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

14.5.23 A workforce travel plan will detail monitoring of travel associated with operation of the Crewe North RSD.

14.5.24 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 Wimboldsley to Lostock Gralam 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, Canal & River Trust (CRT), Cheshire West and Cheshire Council (CWCC) and Cheshire East Council (CEC), which are Lead Local Flood Authorities (LLFA), and United Utilities Limited (the local water and sewerage undertaker). The purpose of this engagement has been to obtain relevant baseline information and to discuss the Proposed Scheme and potential effects. Engagement with these stakeholders will continue as part of the development of the Proposed Scheme.

15.1.3 Maps showing the location of the key environmental features (Map Series CT-10), and the key construction (Map Series CT-05) and key operational (Map Series CT-06) features of the Proposed Scheme can be found in the Volume 2: MA02 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)[139].

15.2 Scope, assumptions and limitations

15.2.1 The scope, assumptions and limitations for the water resources and flood risk assessment are set out in Volume 1, Section 8 and the Scope and Methodology Report SMR[140].

15.2.2 Unless indicated otherwise, the spatial scope of the assessment (the study area) is based upon the identification of surface water and groundwater features within 1km

[139] DCLG (2015), *National Planning Policy Framework*
[140] Supporting document: HS2 Phase 2b Environmental Impact Assessment Scope and Methodology Report

of the centre line of the route of the Proposed Scheme, as described in Section 2.2 of this report.

15.2.3 This assessment is based on desk study information, including information provided to date by consultees and stakeholders, as well as surveys of accessible water features.

15.2.4 Where surveys have not been undertaken due to land access constraints, a precautionary approach has been adopted in the assessments of receptor value and impact magnitude.

15.2.5 Hydraulic analysis is currently being undertaken of watercourses and key structures within flood risk areas.

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 management catchment of the North West river basin district (RBD).

15.3.2 The river basin management plan[141] identifies the chemical[142] and ecological[143] status of surface water bodies, and the quantitative[144] and chemical[145] 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

[141] Environment Agency (2015), *Water for life and livelihoods Part 1: North West river basin district: River basin management plan*
[142] The chemical status of surface waters reflects concentrations of priority and hazardous substances present
[143] 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.

[144] 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
[145] 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

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 29. The receptor value attributed to each individual water body is based on the methodologies set out in the SMR.

Table 29: Surface water body receptors

Water body name and location[146]	**Designation**	**Q95 value (m^3/s)[147]**	**Receptor value**	**Parent WFD water body name and identification number[148]**	**Current WFD status / Objective[149]**
Tributary of River Weaver 2 WR-01-302b E5	Ordinary watercourse	<0.002	Low	Weaver (Marbury Brook to Dane) GB112068060460	Poor / Good by 2027
The Dingle WR-01-302b F5	Ordinary watercourse	<0.002	Low		
Shropshire Union Canal – Middlewich Branch WR-01-302b F4 I6	Canal	n/a	Very high	Shropshire Union Canal, Market Drayton to Ellesmere Port GB71210133	Moderate / Good by 2021
Tributary of River Wheelock 3 WR-01-302b H5	Ordinary watercourse	<0.002	Low	Wheelock (Fowle Brook to Dane) GB112068055380	Poor / Good by 2027
Tributary of River Wheelock 5 WR-01-302b I6	Ordinary watercourse	<0.002	Low		
Tributary of River Dane 2 WR-01-303 C6	Ordinary watercourse	<0.002	Low	Dane (Wheelock to Weaver) GB112068060470	Bad / Moderate by 2027
River Dane WR-01-303 D5 D6	Main river	0.8	Very high		
Tributary of Trent	Ordinary	<0.002	Low		

[146] The feature locations are indicated by the grid coordinates on the relevant Volume 2: MA02 Map Book figure (in this case WR-01).
[147] This is the flow within the watercourse that is exceeded for 95% of the time
[148] The Environment Agency has attributed each surface water and groundwater body a unique water body identification (ID) number
[149] Status and objectives are based on those set out in the 2015 River basin management plan

and Mersey Canal WR-01-303 E5	watercourse				
Puddinglake Brook WR-01-303 F5	Main river	0.008	Moderate	Puddinglake Brook GB112068060220	Poor / Good by 2027
Trent and Mersey Canal WR-01-303 E5 F5	Canal	n/a	Very high	Trent and Mersey Canal, summit to Preston Brook Tunnel GB71210247	Moderate / Moderate by 2015
Gad Brook WR-01-303 H5	Main river	0.004	Moderate	Wade Brook GB112068060370	Poor / Good by 2027
Wade Brook WR-01-304a B6	Main river	0.08	High		
Tributary of Peover Eye WR-01-303 C7	Ordinary watercourse	<0.002	Low	Peover Eye GB112068060390	Poor / Good by 2027
Peover Eye WR-01-303 C7	Main river	0.2	High		
Smoker Brook WR-01-303 D7	Main river	0.07	High	Smoker Brook (Gale Brook to Wincham Brook) GB112068060410	Bad / Good by 2027
Tributary of Smoker Brook 1 WR-01-303 D7	Ordinary watercourse	0.007	Moderate		
Tributary of Smoker Brook 2 WR-01-303 D8	Reported in MA03 Pickmere to Agden and Hulseheath (see Volume 2: Community area MA03 report, Pickmere to Agden and Hulseheath)				

Abstractions and permitted discharges (surface water)

15.3.6 There are no licensed surface water abstractions in the study area.

15.3.7 Records of private unlicensed surface water abstractions, which comprise those for quantities less than 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 38[150] consented discharges to surface waters within the study area, none of which are within the land required for the Proposed Scheme. These have been assessed as being receptors of low value.

Groundwater

15.3.9 The geology of the study area is described in Section 10, Land quality, and the superficial and bedrock hydrogeology is summarised in Table 30. Unless stated otherwise, the geological groups listed would all be crossed by the Proposed Scheme. Table 30 also identifies the receptor values attributed to each groundwater receptor based on the methodologies set out in the SMR.

Table 30: 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 River Dane, Gad Brook, Wade Brook and Wincham Brook	Clay, silt, sand and gravel	Secondary A	Weaver and Dane Quaternary sand and gravel aquifer (GB41202G991700) Poor	Good by 2027	Moderate
River terrace deposits	Present along the valleys of the River Dane and Wade Brook	Sand and gravel	Secondary A			Moderate
Glaciofluvial sheet deposits	Isolated areas particularly along the valleys of Wade Brook, River Dane, Smoker Brook and Peover Eye	Sand and gravel	Secondary A			Moderate
Glacial till	Present across the majority of the study area.	Sandy silty clay	Secondary (undifferentiated)			Moderate
Bedrock						

[150] Note that the number of consents listed in Section 10: Land quality may be different to that stated here. This is because the Water resources and flood risk study area comprises all the land within 1km of the centreline of the Proposed Scheme, whereas the Land quality study area for surface water comprises all land with 250m of the boundary of the Proposed Scheme. The default study area may be extended where potential for wider pathways exists

[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

Mercia Mudstone Group – Sidmouth Mudstone Formation	Two areas, south of Lea Hall and Lea House Farm, and between Rudheath and Lostock Gralam	Mudstone siltstone and sandstone	Secondary B	Not assessed by the Environment Agency	Not assessed by the Environment Agency	Moderate
Mercia Mudstone Group – Northwich Halite Member	Outcrops to the south at Lea Hall, extending north towards Rudheath and Whatcroft	Halite stone and 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 30, is outlined briefly as alluvium, river terrace deposits, glaciofluvial sheet deposits and glacial till. These aquifers may be capable of supporting water supplies at a local rather than regional scale and may also form an important source of baseflow to 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 30 is outlined briefly as follows:

- the Mercia Mudstone Group has traditionally been regarded as predominantly impermeable, or at best a poor aquifer. Limited quantities of groundwater, suitable for domestic or agricultural use, are however obtainable in some locations from the Mercia Mudstone and it has therefore been classified as a moderate value receptor; and
- the Northwich Halite Member (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 superficial groundwater body within the study area is provided in Table 30. The value attributed to each of these receptors is also indicated.

Abstraction and permitted discharges (groundwater)

15.3.13 There are no groundwater abstractions licensed for public water supply within the study area. There are no source protection zones (SPZs) associated with public water supplies within the study area.

15.3.14 There are no private groundwater abstraction licences registered in the study area, as shown on Map WR-02-302.

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. Information obtained from the local authorities indicates that there is one unlicensed private groundwater abstraction registered within the study area at Coalpit Lane. Access to confirm the nature and source of this abstraction has not yet been obtained. As there is no obligation to register private water supplies, unregistered private groundwater supplies may also be present. Private water supplies would be assessed as high value receptors unless details obtained from the owner indicate otherwise.

15.3.16 There are no[154] consented discharges to groundwater in the study area.

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 15 features within the study area that had potential to be springs. Access was possible to inspect one of these features, which was verified as being a low value receptor as it provides baseflow to Tributary of River Weaver 2 which is identified as a low value receptor.

15.3.18 The remaining 14 potential spring features that have yet to be inspected are assumed to be high value receptors on a precautionary basis. One of the potential spring features yet to be inspected is within the land required for the Proposed Scheme, 140m north of Yew Tree Farm on Coalpit Lane.

15.3.19 There are 37 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:

- Wimboldsley Wood Site of Special Scientific Interest (SSSI) and Ancient Woodland Inventory Site (AWIS) located on the eastern bank of the Shropshire Union Canal (Middlewich Branch), east of Weaver Hall Farm. The site is noted for its extensive wet areas, which may potentially be groundwater fed by the glacial till aquifer, open water and a saline spring (likely fed by the Northwich Halite Member) which feeds a brackish marsh; and
- Plumley Lime Beds SSSI located between Plumley and Lostock Gralam. It is unclear if this site is groundwater dependent (possibly dependent on groundwater from the glacial till). The site has been included on a

[154] 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.

precautionary basis, until further investigation on the water dependence can be carried out.

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)[155] 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[156] 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[157]. The British Geological Survey's (BGS) Groundwater flooding susceptibility data set[158], 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 West and Chester Preliminary Flood Risk Assessment (PFRA) (2011)[159];
- Cheshire West and Chester Level 1 Strategic Flood Risk Assessment (SFRA) (2016)[160]; and
- Cheshire West and Chester Local Flood Risk Management Strategy (LFRMS) (2016)[161].

River flooding

15.3.26 The study area includes substantial areas of floodplain (Flood Zone 2 or 3) associated with the River Dane. Other floodplains that would be crossed by the route of the Proposed Scheme include those associated with Gad Brook, Puddinglake Brook, Wade Brook, Peover Eye and Smoker Brook. Table 31 shows all relevant watercourses within the study area with receptors that would potentially be affected by any

[155] Gov.uk (2018) Flood map for planning. Available online at: https://flood-map-for-planning.service.gov.uk/
[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] 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/
[158] British Geological Survey (2017) BGS groundwater flooding. Available online at: http://www.bgs.ac.uk/products/hydrogeology/groundwaterFlooding.html
[159] Jacobs (2011), *Cheshire West and Chester Preliminary Flood Risk Assessment (PFRA)*
[160] JBA Consulting (2016), *Cheshire West and Chester Level 1 Strategic Flood Risk Assessment (SFRA)*
[161] Cheshire West and Chester County Council (2016), *Cheshire West and Chester Local Flood Risk Management Strategy (LFRMS)*

changes in flood magnitude. The value of these receptors, based on the definitions in Table 57 of the SMR, is also indicated.

Table 31: River flood risk sources and receptors

Source	Location description and figure/coordinate[162]	Receptor potentially affected	Receptor value / sensitivity to flooding
Puddinglake Brook	Puddinglake Brook WR-01-303 F5	Cottage on the left bank of the Brook just downstream of the crossing	High
Gad Brook	Gad Brook WR-01-303 H5	Davenham Road	Moderate
Peover Eye	Peover Eye WR-01-304a C7	Residential property	High
		A559 Manchester Road	Moderate
		Mill Lane	Moderate
Smoker Brook	Smoker Brook WR-01-304a D7	Linnards Lane	Moderate

Surface water flooding

15.3.27 There are numerous areas that are susceptible to surface water flooding within the study area. The key sources and receptors with potential to be affected are shown in Table 32. The value of these receptors, based on Table 57 of the SMR, is also indicated.

Table 32: Surface water flood risk sources and receptors

Source	Location description and figure/coordinate163	Receptor potentially affected	Receptor value
Surface water flow path at Clive Green	South of Green Lane Bridge WR-01-302b H5	Grazing land	Low
	East of Clive Green WR-01-302b H5	Residential property	High
Surface water flow path near Rudheath	Close to intersection of the A556 Chester Road and B5082 Penny's Lane WR-01-303 I6	Instrument house and telecoms mast	Very 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. Artificial water bodies with potential

[162] This is the location at which the source intersects the Proposed Scheme, as indicated by the grid coordinates on the relevant Volume 2: MA02 Map Book figure (in this case WR-01).
[163] This is the location at which the source intersects the Proposed Scheme, as indicated by the grid coordinates on the relevant Volume 2: MA02 Map Book figure (in this case WR-01).

implications for flood risk within the study area are limited to Shakerley Mere located to the east of the route. Other artificial water bodies outside of the study area, but with potential to affect flood risks of relevance to the Proposed Scheme are Bosley Reservoir, Redes Mere and Tabley Mere. As these are large raised reservoirs or impounded water bodies[164], subject to the requirements of reservoir safety legislation[165], the inundation risk posed by them is considered negligible.

Groundwater flooding

15.3.29 Information related to historical incidents of groundwater flooding in the Wimboldsley to Lostock Gralam area is included in the CWCC SFRA[160] and LFRMS[161]. The SFRA and LFRMS state that there is no history of groundwater flooding within the study area.

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): Wimboldsley, Clive Green, Whatcroft, Rudheath and Wincham.

Land drainage

15.3.31 Existing topography, soils and land drainage systems within the study area are described in Section 4, Agriculture, forestry and soils. The rivers and watercourses within the area are connected to an extensive network of existing open drains. Subsurface drainage systems are also likely to be present in fields used for agriculture. The land drainage function of these systems, which is important for crop productivity, is potentially sensitive to increases in water levels within the receiving watercourses.

15.4 Effects arising during construction

Avoidance and mitigation measures

15.4.1 The principal strategy adopted to limit the temporary and permanent effects of the Proposed Scheme is through avoidance of sensitive receptors wherever reasonably practicable. Where receptors could not be avoided, mitigation measures have been incorporated where appropriate and reasonably practicable, to limit the potential effects. Section 16 of the draft Code of Construction Practice (CoCP)[166] includes a range of mitigation measures that aim to reduce construction impacts as far as is reasonably practicable. The avoidance and mitigation measures that are of particular 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:

[164] Meres listed have been analysed for dam breach by the Environment Agency and are included in the Reservoir Flood Maps dataset
[165] Gov.uk (2018), Reservoirs: owner and operator requirements. Available online at: https://www.gov.uk/guidance/reservoirs-owner-and-operator-requirements
[166] Supporting documents: Draft Code of Construction Practice.

- 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 the River Dane, Puddinglake Brook, Gad Brook, Wade Brook, Peover Eye and Smoker 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: MA02 Map Book have been informed by a detailed consideration of the water resources constraints and have sought to avoid sensitive features wherever reasonably practicable.

15.4.5 Watercourse realignments are proposed on minor watercourses associated with culverts. 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 watercourses are natural channels, the design aim will be to incorporate appropriate features to retain and, where reasonably practicable, enhance their hydromorphological condition[167].

15.4.6 Watercourse diversions, which would result in changes in flow regime within discrete sections of channel, have been avoided wherever possible. There are no diversions proposed within this study area.

15.4.7 For watercourses that are not in their natural condition, the design aim for realignments 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.

[167] "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.

15.4.9 The draft CoCP includes requirements to protect water bodies and their associated water resources from the potential impacts of pollution from construction site runoff, including where appropriate:

- provision of maps showing sensitive areas and buffer zones where no pollutants are to be stored or used; and
- preparation of method statements for silt management, site drainage at compounds and satellite compounds, for the storage and control of oils and chemicals and the prevention of accidental spillages, in consultation with the Environment Agency, and if appropriate, the LLFA and other relevant authorities as part of the approvals process. These method statements will cover, where applicable:
  - the avoidance of discharges of site runoff to ditches, watercourses, drains, sewers or soakaways without the prior approval of the appropriate authority;
  - measures to prevent silt-laden runoff and other pollutants entering the water environment; and
  - restrictions or controls on excavation within watercourses to limit effects on water quality, sedimentation, fisheries and aquatic ecology.

15.4.10 Method statements will be required for all watercourse crossings and channel realignments required for site haul routes. The method statements will describe how potential changes to flood risk, water quality and channel hydromorphology will be managed during the establishment, use and decommissioning of all site haul routes.

15.4.11 Permanent culverts proposed on the smaller watercourse crossings within this study area include those proposed on surface water flow paths (which are not defined surface water bodies) and the following watercourses: Tributary of River Weaver 2, Tributary of River Dane 2 and Tributary of the Trent and Mersey Canal. There may be localised watercourse realignments associated with these culverts. 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[168] structures around excavations;
- ensuring cut-off structures are driven to sufficient depths to meet an underlying strata or zone of lower permeability;
- promoting groundwater recharge, such as discharging pumped water to recharge trenches around excavations to maintain baseline groundwater and surface water conditions; and
- incorporating passive bypasses within the design, which could comprise a 'blanket' of permeable material, such as gravel, placed around temporary structures allowing groundwater to bypass the below-ground works, without a rise in groundwater levels on the upstream side.

15.4.15 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 highway realignments of Clive Green Lane and A530 Middlewich Road, which intersect various surface flow paths, and the A556 Chester Road, which would cross over the Wade Brook floodplain. 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: MA02 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

[168] Impermeable barrier preventing water flow

paths where reasonably practicable. This will be achieved using perimeter drainage and culverts, with their inverts set below the likely level of any upstream field subsurface drainage systems;

- in locations where the route of the Proposed Scheme will cross watercourses, the design aim is for structures to accommodate flood flows up to and including the 1 in 100 (1%) annual probability flood with an allowance for climate change based on latest guidance issued by the Environment Agency[169];
- runoff from the footprint of the infrastructure could occur more rapidly post-construction due to steeper slope angles and the permeability of the newly-created surfaces. The design of drainage systems aims to ensure that there will be no significant increases in flood risk downstream, during storms up to and including the 1 in 100 (1%) annual probability design event, with an allowance for climate change based on the latest guidance issued by the Environment Agency;
- balancing ponds for new sections of highway and railway drainage have been sized on a precautionary basis, pending more detailed information about the permeability and runoff characteristics of existing and proposed ground surfaces;
- where the Proposed Scheme will pass in cutting, drainage measures will be provided with the aim of preventing flow into the cutting and diverting this water into its natural catchment. Where reasonably practicable, runoff from the cuttings will also be drained to the catchments to which this water would naturally drain, avoiding transfer of water from one water body to another, which could increase flood risk or impact on land drainage systems; and
- measures will be introduced to reduce any potentially significant effects on groundwater flood risk as far as is reasonably practicable, including the incorporation of passive hydraulic bypasses at cuttings and other below ground structures. These could for example comprise a 'blanket' of permeable material such as gravel.

15.4.17 The nominated undertaker will, insofar as reasonably practicable, ensure that flood risk is managed throughout the construction period and will consider flooding issues when planning sites and storing materials. If necessary, temporary provision will be made to reduce to the potential for impacts on existing land drainage systems during construction. Some of the specific measures referred to in the draft CoCP, include:

- preparation of flood risk assessments and method statements for temporary works, including main construction and satellite compound drainage, watercourse crossings and realignments and temporary realignments in consultation with the Environment Agency, and where applicable, the LLFA and other relevant regulators;

[169] Environment Agency (2016) *Adapting to Climate Change. Advice for Flood and Coastal Erosion Risk Management Authorities*

- location of storage, machinery, equipment and temporary buildings outside flood risk areas where reasonably practicable;
- construction of outfalls during periods of low flow to reduce the risk of scour and erosion;
- design of temporary watercourse realignments with equivalent hydraulic capacity to the existing channels, ensuring that field subsurface drainage systems can be adapted to discharge into the new channel; and
- having regard to the requirement for construction activities to avoid any increases in flood risk to vulnerable receptors.

15.4.18 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 realignment of the A556 Chester Road would intersect 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 this aquifer 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 No impacts on groundwater abstractions have been identified within this area.

Groundwater - surface water interactions

15.4.24 No significant temporary effects on groundwater-surface water interactions have been identified.

15.4.25 No significant temporary effects on springs have been identified.

Water dependent habitats

15.4.26 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

15.4.27 Construction of the River Dane viaduct, Puddinglake Brook viaduct, Gad Brook viaduct, Wade Brook viaduct, and Peover Eye and Smoker Brook viaduct would require temporary working within flood zones. Construction sequencing and temporary works design would 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

15.4.28 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

15.4.29 The 1.1km long River Dane viaduct, which would have three crossings over the river, has the potential to cause a moderate impact on the hydromorphology of this very high value receptor. This would potentially result in a major adverse effect, which is significant.

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 realignment of the A556 Chester Road on water levels and quality in the glacial till Secondary (undifferentiated) aquifer.

15.4.31 Where cuttings 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

15.4.32 The assessment has not identified any permanent significant effects on groundwater abstractions.

Groundwater - surface water interactions

15.4.33 The potential spring feature north of Yew Tree Farm, east of Clive would be incorporated into the drainage system for the Proposed Scheme. This feature is assumed to be a high value receptor on a precautionary basis. If the spring is lost as a result of the construction of the drainage system, this would potentially result in a permanent major adverse effect, which is significant.

Water dependent habitats

15.4.34 No permanent impacts on water dependent habitats are anticipated in this study area as a result of construction of the Proposed Scheme.

Permanent effects - Flood risk and land drainage

15.4.35 Hydraulic analysis of River Dane, as well as of a surface water flow path at Clive Green is currently being undertaken to assess potential permanent effects related to flood risk. It is currently anticipated that the Proposed Scheme would result in negligible impacts on flood levels in the case of River Dane. In the case of the surface water flow path at Clive Green, the Proposed Scheme would result in a moderate impact on flood levels. This would potentially affect a residential property, which is a high value receptor, resulting in a moderate adverse effect, which is significant.

Other mitigation measures

15.4.36 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

15.4.37 The embedded mitigation proposed in the design of viaducts, bridges, culverts and any localised realignments, will be developed further in consultation with the Environment Agency informed by the results of survey. Monitoring would be undertaken to ensure successful establishment of the mitigation proposals developed.

Groundwater - surface water interactions

15.4.38 A survey of the potential spring feature north of Yew Tree Farm, east of Clive, will be undertaken to determine its value and to identify whether further mitigation is required. If this spring is confirmed to be a spring of high or moderate value, measures will be identified to reduce any adverse effects as far as is reasonably practicable.

15.4.39 Any such additional measures will be designed in consultation with the Environment Agency.

Flood risk and land drainage

15.4.40 Hydraulic modelling is currently being undertaken for the Proposed Scheme and its interaction with a surface water flow path at Clive Green. Any requirement for mitigation identified from the modelling will be developed in consultation with the LLFA.

Summary of likely residual significant effects

15.4.41 In the absence of the other mitigation measures set out above, the Proposed Scheme would potentially result in residual significant effects as follows:

- a major adverse effect on hydromorphology related to multiple crossings by the River Dane viaduct of the geomorphologically active River Dane floodplain, which is significant;
- a major adverse effect related to the alteration of a potential spring feature north of Yew Tree Farm, east of Clive, which is significant; and
- a moderate adverse effect on flood risk on a surface flow path at Clive Green, which is significant.

15.4.42 It is currently anticipated that it should be possible to develop the means of mitigating these impacts, to ensure that there are no residual significant effects arising from construction of the Proposed Scheme.

15.5 Effects arising from operation

Avoidance and mitigation measures

15.5.1 The principal issue of concern during operation of the Proposed Scheme is the potential for accidental spillages to occur that could result in the release of contaminants into the water environment. This issue has been assessed on a route-wide basis in Volume 3: Route-wide effects (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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