HS2

October 2018

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

Working Draft Environmental Statement

Volume 2: Community Area report

MA05: Risley to Bamfurlong

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Department for Transport

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

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Preface

The working draft Environmental Statement

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

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

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

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

Consultation on the working draft Environmental Statement

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

Structure of the HS2 Phase 2b working draft Environmental Statement

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

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

The working draft ES comprises the following documents:

Non-technical summary

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

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

Glossary of terms and list of abbreviations

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

Volume 1: Introduction and methodology

This provides:

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

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

Volume 2: Community area reports and map books

These cover the following community areas:

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

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

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

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

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

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

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

Volume 3: Route-wide effects

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

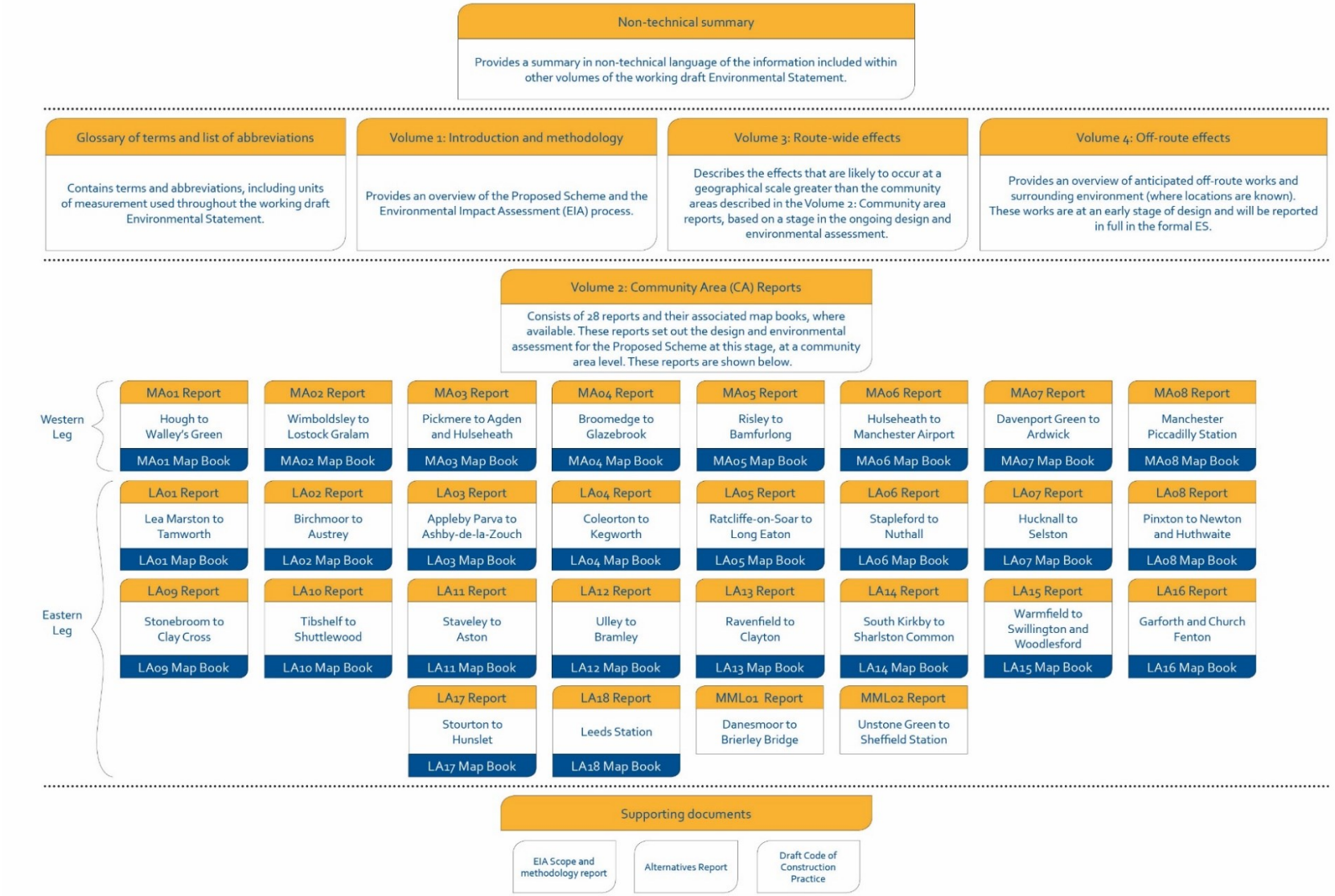
Volume 4: Off-route effects

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

Supporting documents

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

Figure 1 Structure of the working draft Environmental Statement



1 Introduction

1.1 Introduction to HS2

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

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

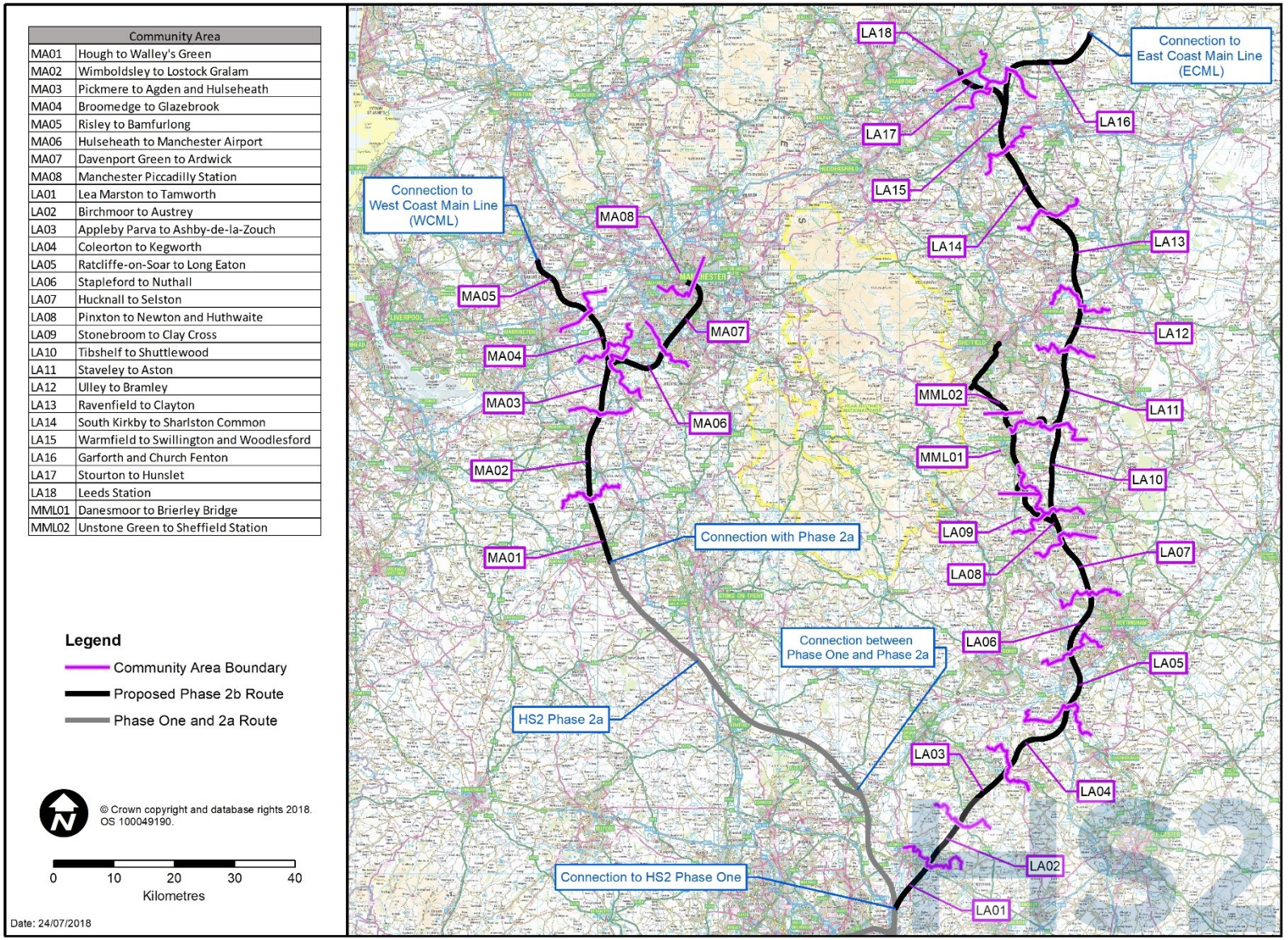
1.1.3 Phase Two of HS2 will extend the route from Phase One in the West Midlands to the north-west to Manchester (approximately 80km (50 miles) with connections to the West Coast Main Line (WCML) at Crewe and Golborne, and to the north-east to Leeds with a connection to the Erewash Valley Line and Midland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

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

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

1.1.6 For environmental assessment and community engagement purposes, the Proposed Scheme has been divided into 28 community areas (CA). These are shown in Figure 2. This CA report relates to the Risley to Bamfurlong area (CA number MA05) 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 Risley to Bamfurlong area. The report also describes the proposed mitigation measures that have been identified, at this stage, to avoid, reduce or manage the likely significant adverse effects of the Proposed Scheme on the environment within the area, along with proposed monitoring measures.

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

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

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

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

1.3 Structure of this report

1.3.1 This report is divided into the following sections:

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

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

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

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

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

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

1.3.4 The maps relevant to the Risley to Bamfurlong area are provided in a separate corresponding document entitled Volume 2: MA05 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: MA05 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 Risley to Bamfurlong area covers an approximately 13km section of the route of the Proposed Scheme passing through the parishes of Birchwood, Croft, Culcheth and Glazebury, within the local authority areas of Warrington Borough Council (WBC) and Wigan Metropolitan Borough Council (WMBC), which is within the Greater Manchester Combined Authority. The boundary between Rixton-with-Glazebrook and Birchwood parishes forms the southern boundary of this section. The connection between the Proposed Scheme and the West Coast Main Line (WCML) within WMBC forms the northern extent of this section.

2.1.2 As shown in Figure 3, the Broomedge to Glazebrook area (MA04) lies to the south. The route of the Proposed Scheme would continue north towards Bamfurlong where it would connect with the existing WCML. There would be associated works to the WCML to facilitate the new connection to the Proposed Scheme.

Settlement, land use and topography

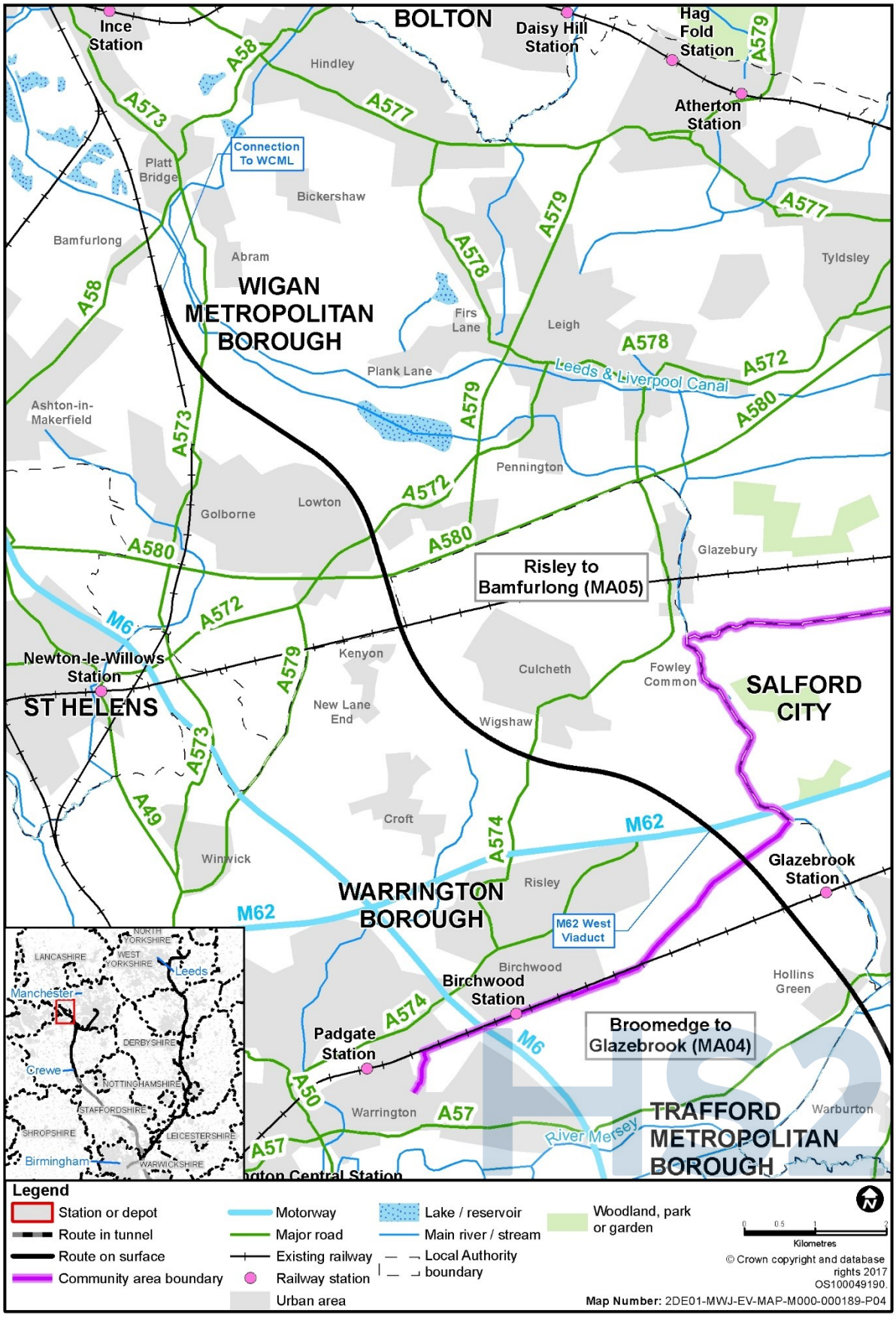
2.1.3 The area is predominantly rural in character, with agriculture being the main land use. This is interspersed with woodland, small to large villages and a number of larger towns combined with a scattering of isolated dwellings and farmsteads. Larger settlements include Warrington, Leigh, Ashton-in-Makerfield, Ince-in-Makerfield and Wigan. Much of the area encompasses mainly flat and gently undulating arable and pasture land with medium to large fields and many watercourses, with occasional lowland bog and floodplain pasture at lower levels. The area has a prolonged history of coal mining where historic localised subsidence has formed a number of flooded topographic depressions called 'flashes'.

2.1.4 At the southern end of area are the settlements of Risley and Gorse Covert in Birchwood, which lie to the west of the area and the villages of Culcheth and Wigshaw which lie to the east.

2.1.5 The towns of Golborne, Lowton, Leigh, Ashton-in-Makerfield, Ince-in Makerfield and Wigan all lie to the north of the area. The villages of Bamfurlong, Abram and Platt Bridge which is a suburb of the larger town of Wigan are all located to the north of the area.

2.1.6 The topography is approximately 20m above Ordnance Datum (AOD) in the south of the area, rising to 35m AOD, to the west of Culcheth. It remains broadly flat at around 30m to 35m AOD to the north of the area.

Figure 3: Community area context map



Key transport infrastructure

2.1.7 Principal highways in this area include the M62 that passes through the south of the area in an east west direction, connecting the cities of Liverpool, Manchester, Bradford, Leeds and beyond into East Riding of Yorkshire. The M6 is to the west of the area and provides links to Preston and Lancaster in the north and Newcastle-under-Lyme and Stoke-on Trent to the south. The A580 East Lancashire Road (known locally as the East Lancs Road), also passes through the area in an east west direction, connecting the cities of Liverpool and Manchester and other major settlements along its route such as St. Helens and Ashton-in-Makerfield. Other main transport routes include the A574 Warrington Road connecting Birchwood and Warrington to Leigh (via Culcheth), the A579 and the A572 Newton Road, which connects Newton-Le-Willows and Warrington with Leigh via Golborne and the A58 Lily Lane, which connects Ashton-in Makerfield with Wigan.

2.1.8 The Liverpool to Manchester (Chat Moss) railway line is located to the south of the A580 East Lancashire Road running in an east west direction. The West Coast Mainline (WCML) also passes through the area, running in a north south direction to the west of the area.

2.1.9 The Leeds and Liverpool Canal is also present in this area and runs between Wigan Flashes Nature Reserve, Abram Flashes Site of Special Scientific Interest (SSSI) and Pennington Flashes at Pennington Country Park.

2.1.10 The route would cross several Public Rights of Way (PRoW) including local access roads, bridleways, public footpaths and promoted routes[4], which provide important links between surrounding settlements and provide access to countryside. To the east of the area The Glazebrook Timberland Trail connects Pennington with Cadishead which is outside the area to the south.

Socio-economic profile

2.1.11 Within the WBC area, the professional, scientific and technical sector accounts for the largest share of businesses (21%). The next largest sectors are construction, retail and business administration and support services (9% each), followed by information and communication (7%)[5].

2.1.12 According to the Annual Population Survey (2016)[6], the employment rate[7] within the WBC area was 76% (100,900 people) and unemployment was 3.2%.

2.1.13 According to the Annual Population Survey (2016), 38% of WBC area residents aged 16-64 were qualified to National Vocational Qualification Level 4 (NVQ4) and above, while 7% of residents had no qualifications.

[4] Promoted route refers to those PRoW which are 'promoted' destinations in their own right as a recreational resource
[5] Office for National Statistics (2017) UK Business Count – Local Units. Available online at https://www.nomisweb.co.uk
[6] Annual Population Survey (2016), NOMIS. Available online at https://www.nomisweb.co.uk
[7] The proportion of residents aged 16-64 that are in employment

2.1.14 Within the WMBC area, the construction sector accounts for the largest proportion of businesses (14%). The next largest sectors are professional, scientific and technical (13%) and retail (11%)[8].

2.1.15 According to the Annual Population Survey (2016), the employment rate within the WMBC area was 75% (152,100 people) and unemployment was 4.8%.

2.1.16 According to the Annual Population Survey (2016), 27% of WMBC area residents aged 16-64 were qualified to National Vocational Qualification Level 4 (NVQ4) and above, while 11% of residents had no qualifications.

Notable community facilities

2.1.17 The main concentrations of community facilities are centred around the larger settlements of Birchwood and Risley, Culcheth, Golborne and Lowton, Pennington (a suburb of Leigh), Plank Lane and Firs Lane, and Ashton-in-Makerfield. Croft (and Little Town), Wigshaw, New Lane End and Kenyon, Fowley Common, Bamfurlong, Abram, Bickershaw and Platt Bridge are smaller villages and hamlets and provide a smaller number of local services.

2.1.18 Birchwood is a suburb of Warrington and is located south of the M62 and accessed principally by the A574. Notable community facilities include primary schools, as well as the Fox Wood School for children with Special Education Needs, a secondary school and a college. Birchwood is also home to Gorse Covert Day Centre for adults with learning and physical disabilities.

2.1.19 Culcheth is a large village located to the north of the M62. Notable community facilities are mainly clustered around the A574 Warrington Road and the B2507 Common Lane, comprising primary schools, a high school, a sports club with various facilities, junior football club, and a youth and community centre. HMP Risley Remand Centre is located on the A574 Warrington Road, south of Culcheth.

2.1.20 The town of Golborne and settlement of Lowton, including Wash End, are located to the north of the A580 East Lancashire Road. Notable community facilities within these settlements include several nurseries, primary schools and secondary schools, including: Lowton Junior and Infant School, St Mary's Church of England School Lowton, Lowton High School, Lowton Children's Centre, Lowton Youth and Community Centre, GymEtc gymnasium, and a civic hall (the Rose).

2.1.21 Ashton-in-Makerfield is a town located to the east of the M6 and north of the A580 East Lancashire Road. Notable community facilities in the area include nurseries, primary schools and secondary schools, including Landgate School for children with Special Education Needs and Cansfield High Specialist Language College. There is also a youth and community centre, which provides a venue for children's and adult activities.

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

Recreation, leisure and open space

2.1.22 The area has a mix of urban and rural communities, with open space, woodland and some farmland interspersed between the settlements. It is crossed by several PRoW including the Glazebrook Timberland Trail which passes to the east of the Culcheth and Glazebury and then south of Pennington, leading to Pennington Flash. Waterways include the Leeds and Liverpool Canal, which passes between Pennington and Leigh to the east of the Proposed Scheme and then north towards Abram.

2.1.23 Other notable recreation, leisure and open space facilities include:

- Risley Moss Country Park and Local Nature Reserve;
- Birchwood Forest Park;
- Holcroft Moss SSSI;
- Culcheth Linear Park;
- Leigh Golf Club (which includes the Grade II listed Kenyon Hall clubhouse);
- Lowton Common;
- Pennington Flash Country Park;
- University of Manchester Yacht Club (which uses Pennington Flash);
- Byrom Hall Wood;
- Viridor Wood;
- The Three Sisters Recreation Area and Local Nature Reserve; and
- a recreation ground in Bamfurlong which is immediately adjacent to the Proposed Scheme.

2.1.24 Additionally, there are other sports fields, clubs, recreation grounds and fisheries in many of the towns and villages in the area, which offer leisure opportunities to residents.

Policy and planning context

Planning framework

2.1.25 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.

2.1.26 The following local policies have been considered and referred to where appropriate to the assessment:

- Adopted Warrington Local Plan Core Strategy 2012-2027 (2014)[9];

[9] Warrington Local Plan Core Strategy 2012-2027 (Adopted 2014). Available online at: https://www.warrington.gov.uk/info/200564/planning_policy/1903/local_plan

- Adopted Wigan Local Plan Core Strategy 2011-2026 (2013)[10];
- Adopted Wigan Unitary Development Plan (2006) (saved policies)[11];
- Adopted Greater Manchester Joint Waste Development Plan Document 2012-2027 (2012)[12];
- Adopted Greater Manchester Joint Minerals Development Plan Document 2012-2027 (2013)[13];
- Adopted Warrington Local Transport Plan 3 2011-2030 (2011)[14];
- Adopted Greater Manchester Transport Strategy 2040 (2017)[15]; and
- Wigan Transport Strategy 2011-2026 (2013)[16].

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

Committed development

2.1.28 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.

2.1.29 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.

2.1.30 Where there are committed developments that are considered likely to be constructed between 2023 and 2033, i.e. at the same time as the Proposed Scheme, they would be considered as receptors for the operation of HS2, but also potentially to give rise to cumulative impacts with the Proposed Scheme during construction. Any cumulative impacts and likely significant effects will be reported in the formal ES.

2.1.31 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.

[10] Wigan Local Plan Core Strategy 2011-2026 (Adopted 2013). Available online at: https://www.wigan.gov.uk/Council/Strategies-Plans-and-Policies/Planning/Local-plan/CoreStrategy.aspx
[11] Wigan Unitary Development Plan (Adopted 2006). Available online at: https://www.wigan.gov.uk/Council/Strategies-Plans-and-Policies/Planning/Local-plan/ReplacementWiganUDP.aspx
[12] Greater Manchester Joint Waste Development Plan Document 2012-2027 (Adopted 2012). Available online at: http://www.gmwastedpd.co.uk/doclib.html#Adopted_Waste_Plan_Documents
[13] Greater Manchester Joint Minerals Development Plan Document 2012-2027 (Adopted 2013). Available online at: http://www.gmmineralsplan.co.uk/docs.html#ADOPTED_MINERALS_PLAN
[14] Warrington Local Transport Plan 3 2011-2030. Available online at: https://www.warrington.gov.uk/downloads/download/367/local_transport_plan_3
[15] Greater Manchester Transport Strategy 2040 (Adopted 2017). Available online at: https://www.tfgm.com/2040
[16] Wigan Transport Strategy Final Draft for Consultation 2011-2026 (2013). Available online at: https://www.wigan.gov.uk/Council/Strategies-Plans-and-Policies/Transport-strategy.aspx

Ongoing design development

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

- review of the proposed lengths and heights of viaducts and other river crossing structures and associated replacement floodplain storage areas;
- temporary and permanent utility diversions;
- refinement of the realignment of roads and PRoW crossing the Proposed Scheme;
- refinement of drainage features required for rail and highways;
- refinement of maintenance access routes and access to balancing ponds;
- additional environmental features required to mitigate likely significant environmental effects;
- accommodation works and crossings of the route for private means of access;
- refinement of construction compound locations and site haul routes;
- refinement of the alignment and foundation options as the route of the Proposed Scheme passes Holcroft Moss SSSI; and
- refinement of 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 Risley to Bamfurlong 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 Risley to Bamfurlong area covers an approximately 13km section of the Proposed Scheme passing through the parishes of Birchwood, Croft, Culcheth and Glazebury, and the district of Wigan, within the local authority areas of WBC and WMBC within the Greater Manchester Combined Authority. The boundary between Rixton-with-Glazebrook and Birchwood parishes form the southern boundary of this section. The

connection between the Proposed Scheme and the West Coast Main Line (WCML) within the WMBC forms the northern extent of this section.

2.2.5 This section of route is illustrated on maps CT-06-326b to CT-06-334 in the Volume 2: MA05 Map Book.

2.2.6 All dimensions in the sections below are approximate.

2.2.7 In the Risley to Bamfurlong area, the route of the Proposed Scheme would be carried on the following features:

- viaduct for a total length of 72m (M62 West viaduct);
- cuttings for a total length of 3.6km (Culcheth and Lowton cuttings); and
- embankments for a total length of 9km (Glazebrook, Culcheth South, Culcheth North and Pennington embankments).

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

In general, features are described along the route of the Proposed Scheme from south-east to north-west and to the southern and northern sides of the route as they cross the Proposed Scheme, as shown on Map Series CT-06 in the Volume 2: MA05 Map Book.

Glazebrook embankment to the A574 Warrington Road

2.2.9 The route of the Proposed Scheme would continue from the Broomedge to Glazebrook area (MA04) on the Glazebrook embankment north-west to cross the M62 West viaduct before passing onto the Culcheth South embankment. The Proposed Scheme would then enter the Culcheth cutting, past the Taylor Business Park to the crossing of the A574 Warrington Road.

2.2.10 This section of route is illustrated on maps CT-06-326b to CT-06-328 in the Volume 2: MA05 Map Book.

2.2.11 Key features of this 3.3km section would include:

- Glazebrook embankment, 620m in length and up to 8m in height. Landscape mitigation planting would be provided on both sides to provide a visual screen and to help integrate the Proposed Scheme with the surrounding landscape (see Volume 2: Map CT-06-326b H3 to CT-06-327 B7);
- grassland habitat creation adjacent to the western and southern sides of Holcroft Moss SSSI. The habitat creation would include species-rich grassland with fen type habitat around the edges of the SSSI (see Volume 2: Map CT-06-326b H7 to H3 and CT-06-326b H7 to CT-06-327 B7). For further information, please see Section 7 Ecology and biodiversity;
- a balancing pond for highway drainage on the eastern side of the Proposed Scheme located within the grassland habitat creation adjacent to Holcroft Moss. Access would be provided from the south and east via Church Farm accommodation access road (Volume 2: Map CT-06-326b H4);

- two areas of woodland habitat creation each side of the Proposed Scheme and on the north side of the M62 (see Volume 2: Map CT-06-327 B8 and D6);
- the M62 West viaduct, 72m in length and up to 11m in height (see Volume 2: Map CT-06-327 B7 to C7);
- Culcheth South embankment, which would be 2km in length and up to 9m in height. Landscape mitigation earthworks and planting would be provided on both sides for visual screening and to help integrate the Proposed Scheme into the surrounding landscape (see Volume 2: Map CT-06-327 C7 to Map CT-06-328 E6);
- Risley East underbridge, 16m in length, and up to 5m height clearance (see Volume 2: Map CT-06-327 F7);
- Moss Side drain diversion which would divert an unnamed watercourse (see Volume 2: Map CT-06-327 H7);
- realignment of Croft Footpath 13 which would be realigned 50m east of its current alignment for 350m, passing beneath the route of the Proposed Scheme via the Croft Footpath 27 accommodation underbridge (see Volume 2: Map CT-06-327 H6 to I7);
- an area of wetland habitat creation which would be to the north of the Proposed Scheme (see Volume 2: Map CT-06-327 I7 to J8);
- Croft Footpath 27 accommodation underbridge, 17m in length, with a height clearance of 5m. The underbridge would include the realignment of the existing tracks to take Croft 27 Footpath, Croft 13 Footpath and farm accommodation access under the Proposed Scheme (see Volume 2: Map CT-06-327 I7);
- a balancing pond for track drainage which would be located north of the route of the Proposed Scheme, 150m to the south of the dismantled railway line. The pond would be accessed from the B5121 Holcroft Lane and along an unnamed track (see Volume 2: Map CT-06-327 I8);
- the Silver Lane Brook culvert, 70m in length and 70m north of the Croft Footpath 13 accommodation underbridge, for diversion of the Silver Lane Brook. The watercourse would be diverted north of its existing alignment, which would divert the Silver Lane Brook under the Proposed Scheme (see Volume 2: Map CT-06-327 I7);
- a noise fence barrier 530m in length and 2m in height along the northern side of the route of the Proposed Scheme extending from Croft Footpath 27 to New Hall Lane. The noise fence barrier would provide acoustic screening for properties at Culcheth (see Volume 2: Map CT-06-327 A7 to D6);
- an area of grassland habitat creation located around an existing pond on the northern side of the Proposed Scheme and Risley landfill. Part of the pond would be infilled by the Proposed Scheme (see Volume 2: Map CT-06-327 J7);

- an area of landscape mitigation planting to the south of the existing New Hall Lane next to the disused railway line which would integrate the Proposed Scheme into the surrounding landscape (see Volume 2: Map CT-06-326b to CT-06-327);
- creation of an ecological mitigation pond located to the north of Croft Footpath 28 and south of the Proposed Scheme to provide replacement habitat for the ponds lost within Silver Lane Ponds Local Wildlife Site (LWS) (see Volume 2: Map CT-06-328 C5 and C6);
- New Hall accommodation underbridge, 19m in length, with a height clearance of 5m. Landscape mitigation planting would be provided to help integrate the structure with the surrounding landscape (see Volume 2: Map CT-06-328 to D6);
- a diversion of an unnamed ordinary watercourse at New Hall Lane (see Volume 2: Map CT-06-328 D6);
- an area of grassland habitat creation which would be located on the northern side of the Proposed Scheme between the New Hall accommodation underbridge and Taylor Business Park (see Volume 2: Map CT-06-328 to D7 to F6);
- an area of woodland habitat creation on the south side of the Proposed Scheme to mitigate provide replacement habitat and integrating with grassland, wetland and woodland creation areas (see Volume 2: Map CT-06-328 E6 to E4);
- Culcheth cutting, 500m in length, up to 4m in depth and with a width of 45m in this section. On the south side of the route of the Proposed Scheme there would be landscape earthworks with landscape mitigation planting on the northern side to provide a visual screen and integrate the Proposed Scheme with the surrounding landscape (see Volume 2: Map CT-06-328 E6 to CT-06-327 F4);
- landscape mitigation earthworks to provide a visual screen and integrate the Proposed Scheme into the surrounding landscape. The landscape mitigation earthworks and landscape mitigation planting would continue beyond the cutting slopes on both sides of the Proposed Scheme north of the A574 Warrington Road overbridge; and
- creation of an ecological mitigation pond located to the north of the Proposed Scheme and to the south of Croft Footpath 15 to provide replacement habitat for the ponds lost within Silver Lane Ponds Local Wildlife Site (LWS) (see Volume 2: Map CT-06-328 E7).

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

2.2.13 Construction of this section would be managed from the M62 West Viaduct North Satellite Compound and Transfer Node, Warrington Road auto-transformer satellite compound and A574 Warrington Road satellite compound, which are described in Section 2.3, and shown on map CT-05-327 and map CT-05-328 in the Volume 2: MA05 Map Book.

A574 Warrington Road to the Liverpool to Manchester (Chat Moss) railway line

2.2.14 From the A574 Warrington Road, this section of the Proposed Scheme would continue along the Culcheth cutting for 1.2km. The Proposed Scheme would then transition on to embankment for 1.4km as it passes to the south and west of Culcheth and approaches the Liverpool to Manchester (Chat Moss) railway line.

2.2.15 This section of route is illustrated on maps CT-06-328 to CT-06-330 in the Volume 2: MA05 Map Book.

2.2.16 Key features of this 2.6km section would include:

- continuation of the Culcheth cutting, 1.3km in length, up to 3m in depth and with a width of 45m in this section. On the south side of the route of the Proposed Scheme there would be landscape earthworks with landscape mitigation planting on the northern side to provide a visual screen and integrate the Proposed Scheme with the surrounding landscape. The cutting and earthworks on the south side would provide noise reduction (see Volume 2: Map CT-06-328 E6 to CT-06-327 F4);
- a realignment of New Hall Lane on the northern side of the Proposed Scheme to connect with the realigned A574 Warrington Road. The length of the realignment would be 170m (see Volume 2: Map CT-06-328 F6);
- diversion of Croft Footpath 15. The footpath would be closed and permanently diverted along the realigned New Hall Lane to connect with the realigned A574 Warrington Road and over the A574 Warrington Road overbridge. The length of the diversion would be 820m (see Volume 2: Map CT-06-328 G7);
- a balancing pond for highway drainage to the south of the Proposed Scheme on the eastern side of the A574 Warrington Road and accessed from the A574 Warrington Road (see Volume 2: Map CT-06-328 G3);
- the Warrington Road auto-transformer station which would be located on the southern side of the Proposed Scheme 40m to the east of the A574 Warrington Road overbridge. Access would be provided along a section of the existing A574 and New Hall Lane (see Volume 2: Map CT-06-328 H6);
- a noise fence barrier, 450m in length and 2m in height along the northern side of the route of the Proposed Scheme extending from the existing A574 to the south of Wigshaw to provide acoustic screening for properties at Culcheth (see Volume 2: Map CT-06-327 H6 to CT-06-328 A6);

- Croft Footpath 19 would be diverted over the A574Warrington Road overbridge connecting to Culcheth Linear Park (see Volume 2: Map CT-06-328 H7);
- the A574 Warrington Road overbridge including the permanent realignment of the A574Warrington Road over the Proposed Scheme. The overbridge would be up to 8.5m in height from the existing ground level and 47m in length. The realignment would be 50m west from the existing alignment. A new access would be provided for the Taylor Business Park to the south-west of Culcheth and access would be maintained to Newchurch Old Rectory, Bates and Yew Tree farms. The junction to Glaziers Lane would be rearranged to connect to the A574 Warrington Road to the west of the Proposed Scheme (see Volume 2: Map CT-06-328 H5);
- a new diversion of Wigshaw Lane that would run broadly parallel to the Culcheth Linear Park and would connect to the A574 Warrington Road to the north of the Proposed Scheme. Landscape planting would be provided on the approach embankments to provide visual screening for the Grade II listed Newchurch Old Rectory on the A574 Warrington Road and integrating the Proposed Scheme into the surrounding landscape (see Volume 2: Map CT-06-328 H6);
- a balancing pond for highway drainage to the north of the Proposed Scheme south of Culcheth Linear Park and accessed from the A574 Warrington Road (see Volume 2: Map CT-06-328 H9);
- a permanent realignment of Glaziers Lane for a length of 970m to run parallel with the southern side of the Proposed Scheme. The sides of the realignment would be planted with landscape mitigation woodland planting to provide visual screening for nearby residents (see Volume 2: Map CT-06-328 to H9 CT-06-329 C3);
- an area of landscape woodland mitigation planting along the south side of the Culcheth Linear Park to would provide visual screening of the Proposed Scheme and the proposed roadway realignment (see Volume 2: Map CT-06-328 G9 to CT-06-329 B7);
- a noise fence barrier 540m in length and 3m in height on the northern side of the route of the Proposed Scheme extending from the south of Wigshaw to north of Wigshaw to provide acoustic screening for properties at Culcheth (see Volume 2: Map CT-06-329 A6 to CT-06-329 D5);
- a noise fence barrier, 1km in length and 2m in height on the northern side of the route of the Proposed Scheme extending from the north of Wigshaw to the north of the Croft Footpath 108 to provide acoustic screening for properties at Culcheth (see Volume 2: Map CT-06-329 D5 to CT-06-329 I5);
- Wigshaw Lane would be closed where it would cross the route of the Proposed Scheme and diverted via the A574 Warrington Road crossing of the Proposed

Scheme and along the realigned Glaziers Lane (see Volume 2: Map CT-06-329 B5);

- diversion of Wigshaw Lane to connect Wigshaw Lane with the A574 Warrington Road to the north of the Proposed Scheme and to the south of the Culcheth Linear Park (see Volume 2: Map CT-06-328 H9 to CT-06-329 B7);
- diversion of an unnamed watercourse south east of Blakely Farm (see Volume 2: Map CT-06-329 D5);
- a diversion and realignment of Croft Footpath 8. The Croft Footpath 8 would be diverted 250m to the north-west over the Proposed Scheme via the Croft Footpath 8a accommodation overbridge. The length of diversion would be 800m (see Volume 2: Map CT-06-329 C5 to E5);
- Croft Footpath 8a accommodation overbridge, 62m in length and 15m in height from the existing ground level (see Volume 2: Map CT-06-329 E5);
- Culcheth North embankment, which would be a 1.4km long embankment to the west of Culcheth. The embankment would be up to 10m in height (see Volume 2: Map CT-06-329 F5 to 330 C5);
- an area of landscape mitigation woodland planting would be located between the route of the Proposed Scheme and the Culcheth Linear Park. The planting would provide visual screening and integrate the Proposed Scheme into the existing landscape (see Volume 2: Map CT-06-329 F5 to CT-06-330 C5);
- an area of woodland habitat creation to provide replacement habitat connected to mitigate the impacts of habitat loss connects to the existing Culcheth Linear Park running from Leigh Golf Club to the south side of the Liverpool to Manchester (Chat Moss) railway line (see Volume 2: Map CT-06-329 F5 to CT-06-330 C6);
- diversion of Croft Footpath 108 along the western side of the Proposed Scheme. The footpath would be diverted 530m to the south to cross over the Proposed Scheme via Croft Footpath 8a overbridge (see Volume 2: Map CT-06-329 H4); and
- the Kenyon culvert to convey surface water drainage under the route of the Proposed Scheme located to the south of the existing Liverpool to Manchester (Chat Moss) railway line (see Volume 2: Map CT-06-328 to CT-06-330 C6).

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

2.2.18 Construction of this section would be managed from the A574 Warrington Road satellite compound and the Liverpool to Manchester Railway South satellite compound, which are described in Section 2.3, and shown on map CT-05-328 and map CT-05-330 in the Volume 2: MA05 Map Book.

Liverpool to Manchester (Chat Moss) railway line to Lowton

2.2.19 The Proposed Scheme would continue north from the crossing of the Liverpool to Manchester (Chat Moss) railway line into 1.8km long cutting through Lowton, with a depth of up to 10m below the existing ground level.

2.2.20 This section of route is illustrated on maps CT-06-330 to CT-06-331 in the Volume 2: MA05 Map Book.

2.2.21 Key features of this 2km section would include:

- Culcheth North (Railway) underbridge, 18.5m in length, with a height clearance of 7m and would take the Proposed Scheme over the Liverpool to Manchester (Chat Moss) railway line to the south of the B5207 Wilton Lane (see Volume 2: Map CT-06-330 C5);
- the Lowton cutting, would be 1.75km in length, up to 105m wide and up to 11.5m in depth as the Proposed Scheme passes through the east of Lowton and Wash End. On the eastern side of the route of the Proposed Scheme there would be a noise fence barrier up to 3m in height for 430m and 2m high for 400m running along the top of the cutting. On the western side of the route of the Proposed Scheme there would also be a noise fence barrier up to 2m in height for 640m running along the top of the cutting. The noise fence barrier would provide acoustic screening for properties at Wash End and Lowton (see Volume 2: Map CT-06-329 A6 to CT-06-329 D5);
- landscape mitigation woodland planting on the eastern and western sides of the cutting slope to provide visual screening and to help integrate the Proposed Scheme in to the existing landscape (see Volume 2: Map CT-06-330, to 331);
- a balancing pond for highway drainage to the east of the Proposed Scheme south of the B5027 Wilton Lane realignment with access off the B5027 Wilton Lane (see Volume 2: Map CT-06-330 D10);
- the B5027 Wilton Lane overbridge, 50m in length and up to 7m in height from the existing ground level to carry the realigned B5027 Wilton Lane over the Proposed Scheme. The road would be realigned 200m to the north. The embankments of the overbridge would be planted with landscape mitigation woodland planting to help integrate the overbridge into the existing landscape (see Volume 2: Map CT-06-328 to CT-06-330 E5);
- a balancing pond for highway drainage to the east of the Proposed Scheme north of the B5027 Wilton Lane realignment with access off the B5027 Wilton Lane (see Volume 2: Map CT-06-330 E1);
- the A580 East Lancashire Road overbridge, 75m in length and up to 1m in height from the existing ground level. The A580 East Lancashire Road would be diverted on its existing alignment (see Volume 2: Map CT-06-328 to CT-06-330 G5);

- a balancing pond for track drainage on the eastern side of the Proposed Scheme located to the south of Pocket Nook Lane with access provided from Carr Lane (see Volume 2: Map CT-06-330 I6);
- the Carr Brook aqueduct, located 260m south of A572 Newton Road, to convey an unnamed tributary of the Carr Brook watercourse over the Proposed Scheme. (see Volume 2: Map CT-06-330 I5);
- the A572 Newton Road would be realigned 40m south of its existing alignment, crossing the route of the Proposed Scheme on the A572 Newton Road overbridge (see Volume 2: Map CT-06-330 J5); and
- the A572 Newton Road overbridge, 35m in length and up to 1.5m in height from the existing ground level (see Volume 2: CT-06-330 J5).

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

2.2.23 Construction of this section would be managed from the Liverpool to Manchester Railway North satellite compound, B5027 Wilton Lane satellite compound, A580 East Lancashire Road satellite compound, A580 East Lancashire Road main compound and A527 Newton Road satellite compound, which are described in Section 2.3, and shown on map CT-05-330 and map CT-05-331 in the Volume 2: MA05 Map Book.

Lowton to Lily Lane

2.2.24 The Proposed Scheme would continue north from the northern end of the Lowton cutting in a north-westerly direction mostly on embankment to the north of the town of Golborne to connect with the WCML to the south of the settlement of Bamfurlong.

2.2.25 This section of route is illustrated on maps CT-06-331 to CT-06-334 in the Volume 2: MA05 Map Book.

2.2.26 Key features of this 5.3km section would include:

- the Pennington embankment, 4.8km in length and up to 18m in height as the Proposed Scheme passes to the north of Golborne and would include areas of landscape mitigation planting to provide a visual screen and integrate the Proposed Scheme into the surrounding landscape (see Volume 2: CT-06-331 D5 to Map CT-06-333 I4);
- a noise fence barrier, 1.5km in length and 2m in height, on the western side of the route of the Proposed Scheme, extending from the Lowton cutting along the Pennington embankment to provide acoustic screening for properties at Lowton (see Volume 2: CT-06-331 D5 to Map CT-06-333 C8);
- an area of woodland habitat creation in a severed field parcel west of the Proposed Route and adjacent to the disused railway line at Lowton Common (see Volume 2: Map CT-06-331 D5);

- the disused railway would also be planted alongside the southern side for 550m to create a green corridor and promote habitat connectivity (see Volume 2: Map CT-06-331 D5);
- the Small Brook culvert would divert the Small Brook under the Proposed Scheme 10m north of the existing watercourse (see Volume 2: CT-06-331 D5);
- realignment of the Golborne Footpath 63 which would be realigned 40m north over the Golborne Footpath 63 accommodation overbridge (see Volume 2: Map CT-06-331 D5);
- the Golborne Footpath 63 accommodation overbridge, which would be a footbridge 55m in length and up to 16m in height from the existing ground level (see Volume 2: Map CT-06-331 E5);
- permanent closure of Golborne Footpath 39 where the footpath crosses the route of the Proposed Scheme. The footpath would be permanently diverted 250m to the south over the Golborne Footpath 63 accommodation overbridge and diverted alongside the Proposed Scheme for 750m (see Volume 2: CT-06-331 F5 and G5);
- permanent closure of Golborne Footpath 37 where the footpath crosses the route of the Proposed Scheme. The footpath would be permanently diverted 250m to the south over the Golborne Footpath 63 accommodation overbridge and be diverted alongside the Proposed Scheme for 750m (see Volume 2: CT-06-331 F5 and G5);
- the Slag Lane auto-transformer station which would be located on the north side of the Proposed Scheme 70m to the east of Slag Lane. Access would be provided via an access road from the realigned Slag Lane (see Volume 2: CT-06-331 G4 and G5);
- realignment of Slag Lane which would be realigned 40m to the south east crossing the Proposed Scheme under the Slag Lane underbridge. The existing Slag Lane would be closed where it would cross the route of the Proposed Scheme although access to residential properties at Little Byrom Hall Farm and Rowbottom House 106 Slag Lane would be retained (see Volume 2: Map CT-06-331 H2 to I7);
- the Slag Lane underbridge which would take the realigned Slag Lane under the Proposed Scheme. The underbridge would be 20m in length with limited height clearance. The cuttings on each side of the Proposed Scheme would be planted with landscape mitigation woodland planting to help integrate the structure into the surrounding landscape (see Volume 2: Map CT-06-331 G5);
- Garton Common culvert, 230 meters north-west of Slag Lane. The culvert would divert an unnamed watercourse under the Proposed Scheme (see Volume 2: CT-06-331 H5);
- realignment of Golborne Footpath 33 and accommodation access for Little Byrom Hall Farm which would be realigned 70m to the south east crossing the

Proposed Scheme under the Golborne Footpath 33 accommodation underbridge. Alternative access to Byrom Hall Wood would also be provided via Golborne Footpath 33 accommodation underbridge (see Volume 2: Map CT-06-331 I4);

- a balancing pond for track drainage located on the eastern side of the Proposed Scheme within an area of landscape woodland planting and access provided from Slag Lane and along Golborne Footpath 33 (see Volume 2: Map CT-06-331 I5);
- Golborne Footpath 33 accommodation underbridge, 19.5m in length, with a height clearance of 4.5m. The underbridge would also provide accommodation access for Byrom Hall Farm;
- an area of landscape mitigation planting to provide a visual screen for nearby residential properties at Golborne and integrate the Proposed Scheme into the surrounding landscape (see Volume 2: Map CT-06-331 I4);
- a balancing pond for track drainage located on the northern side of the Proposed Scheme within an area of landscape mitigation planting and access provided from Golborne Footpath 33 via Slag Lane (see Volume 2: Map CT-06-332 C8);
- Critchley culvert which would divert an unnamed watercourse for 45m crossing under the Proposed Scheme (see Volume 2: Map CT-06-332 C8);
- realignment of Golborne Footpath 31. The realigned footpath would cross the Proposed Scheme under the Proposed Scheme via the Golborne Footpath 31 accommodation underbridge (see Volume 2: Map CT-06-332 C7 to C8;
- an area of grassland habitat creation on the north side of the Proposed Scheme, adjacent to the Proposed Scheme and Lightshaw Lane to provide replacement habitat (see Volume 2: Map CT-06-332 D10 to G8);
- an area of landscape mitigation woodland planting which would be on the south side of the Proposed Scheme to the west of Byrom Hall Wood. The planting would provide a visual screen and integrate the Proposed Scheme into the existing landscape (see Volume 2: Map CT-06-332 C7 to E7);
- an area of grassland habitat creation which would be on the south side of the Proposed Scheme to the east of the A573 Wigan Road to provide replacement habitat (see Volume 2: Map CT-06-332 F6 and F7 to G5, G6 and G7);
- closure of Golborne Footpath 30 where it would cross the route of the Proposed Scheme with access to properties retained on both the southern and northern sides of the route of the Proposed Scheme. Users would be diverted 350m north-west along the A573 Wigan Road, over the A573 Wigan Road and along Lightshaw Lane (see Volume 2: Map CT-06-332 G5);
- realignment of the A573 Wigan Road, 300m to the south east of its existing alignment. The realigned A573 Wigan Road would cross the route of the Proposed Scheme on the A573 Wigan Road overbridge, 65m in length and up

to 12m in height above existing ground level. The existing A573 Wigan Road would be closed where it would cross the route of the Proposed Scheme and retained as access for Wigan Road Farm, Windy Bank Farm and Balmer's Farm to the south. (see Volume 2: Map CT-06-332 G2 to G5);

- the approach embankments on the northern and southern sides would be planted with landscape mitigation planting to provide visual screening and integrate the overbridge with the surrounding landscape (see Volume 2: Map CT-06-332 H8);
- accommodation access and realignment of Lightshaw Lane to provide farm access from the A573 Wigan Road to the existing Lightshaw Lane (see Volume 2: Map CT-06-332 H8 to I10);
- a balancing pond for highway drainage, to the north of the realignment of Lightshaw Lane and access would be provided from the A573 Wigan Road (see Volume 2: Map CT-06-332 I10);
- Windy Bank Brook South culvert for the diversion of the Windy Bank Brook watercourse under the Proposed Scheme (see Volume 2: Map CT-06-328 to CT-06-332 I8);
- an area of woodland habitat creation on the northern side of the Proposed Scheme between the Proposed Scheme and the realigned A573 Wigan Road (see Volume 2: Map CT-06-332 I8);
- a balancing pond for track drainage, partially within the area of woodland habitat creation, to the north of the route of the Proposed Scheme and access provided from the A573 Wigan Road (see Volume 2: Map CT-06-332 I8);
- an area of landscape mitigation woodland planting to the north of Balmer's Farm to visually screen the Proposed Scheme (see Volume 2: Map CT-06-332 J8);
- an area of wetland habitat creation to the north of the Proposed Scheme between the existing A573 Wigan Road and adjacent to Nan Holes Brook to provide replacement habitat and improve habitat value and mitigate the impacts of habitat loss due to the Proposed Scheme (see Volume 2: Map CT-06-333 A5 to B5);
- Windy Bank Brook North culvert, 46m in length would be located to the south of Aye Bridge Farm for the diversion of Windy Bank Brook watercourse under the Proposed Scheme (see Volume 2: Map CT-06-333 A4);
- Nan Holes Brook culvert, 50m in length would be located to the south of Aye Bridge Farm to divert the Nan Holes Brook watercourse under the Proposed Scheme (see Volume 2: Map CT-06-333 B4);
- the Pennington (Railway) underbridge, 10m in length with a height clearance of up to 13m and would take the realigned section of the WCML under the Proposed Scheme (see Volume 2: Map CT-06-333 D3);

- Viridor Wood South culvert, 88m in length located to the north of Aye Bridge Farm. The culvert would divert an unnamed watercourse under the Proposed Scheme (see Volume 2: Map CT-06-333 D3);
- Viridor Wood North culvert, 79m in length located to the north of Aye Bridge Farm. The culvert would divert an unnamed watercourse under the Proposed Scheme (see Volume 2: Map CT-06-333 E3);
- an area of landscape mitigation woodland planting which would be on the eastern side of the Proposed Scheme. The woodland planting would integrate the Proposed Scheme with the surrounding landscape and connect with the larger area of woodland habitat creation to the north (see Volume 2: Map CT-06-333 E4 and E5 to G4 and G5);
- an area of woodland habitat creation which would be to the east of the Proposed Scheme and to the south of the Coffin Lane Brook. The habitat creation would integrate with existing habitat along Coffin Lane Brook (see Volume 2: Map CT-06-333 E4 and E5 to G4 and G5);
- a balancing pond for track drainage, within the area of woodland habitat creation, to the east of the route of the Proposed Scheme and access provided from the A58 Lily Lane and along the diverted Abram Footpath 02/10 (see Volume 2: Map CT-06-333 F4);
- an area of grassland habitat creation which would be on the north side Coffin Lane Brook and Ashton-in-Makerfield Footpath 22 to provide habitat replacement (see Volume 2: Map CT-06-333 G5);
- realignment of Ashton-in-Makerfield Footpath 22, which would be realigned 50m to the east via the Ashton-in-Makerfield Footpath 22 accommodation underbridge to run alongside the eastern side of the Proposed Scheme (see Volume 2: Map CT-06-333 G4);
- realignment of Abram Footpath 02 from alongside the WCML to run parallel to the eastern side of the Proposed Scheme for 1km, before crossing the Proposed Scheme via the Ashton-in-Makerfield Footpath 22 accommodation underbridge (see Volume 2: Map CT-06-333 G4);
- Ashton-in-Makerfield Footpath 22 accommodation underbridge, 35.6m in length with a height clearance of up to 4.5m which would be located at the northern extent of the woodland habitat creation area adjacent to Coffin Lane Brook. The underbridge would also take Ashton-in-Makerfield Footpath 23 under the Proposed Scheme and provide farm accommodation access (see Volume 2: Map CT-06-333 G4);
- Coffin Lane Brook culvert, 50m in length which would divert the Coffin Lane Brook under the Proposed Scheme (see Volume 2: Map CT-06-333 G4);
- the Hey Brook culvert, 45m in length which would divert a tributary of the Hey Brook under the Proposed Scheme (see Volume 2: Map CT-06-333 I4); and

- a balancing pond for track drainage, located within the area of woodland habitat creation to the east of the route of the Proposed Scheme and access would be provided from the A58 Lily Lane and along the diverted Abram Footpath 02/10 (see Volume 2: Map CT-06-333 J5).

Connection to the WCML

2.2.27 To facilitate the connection of the Proposed Scheme to the existing WCML, modifications would be required to the south and west of Wigan.

2.2.28 The WCML existing track layout at the site of the proposed Lily Lane Junction consists of four tracks, two slow and fast tracks running north south.

2.2.29 A 2.5km section of the WCML from Haydock Branch Junction to Bamfurlong Junction would be modified. This would include:

- the WCML southbound fast line would be realigned up to 100m to the east of its existing alignment and would connect with the southbound line of the Proposed Scheme. The WCML southbound line would cross under the Proposed Scheme via the Pennington (Railway) underbridge (see Volume 2: Map CT-06-333 A2 to J4);
- the WCML northbound line would be realigned to the east within the existing railway corridor to connect to the northbound line of the Proposed Scheme. The realigned WCML northbound fast line would be similar to the existing levels and gradients (see Volume 2: Map CT-06-333 A2 to J4); and
- the existing A58 Lily Lane overbridge structure would be retained (see Volume 2: Map CT-06-334 B4).

2.2.30 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.

2.2.31 Construction of this section would be managed from the Slag Lane satellite compound, A573 Wigan Road Slag Lane satellite compound and Pennington satellite compound, which are described in Section 2.3, and shown on map CT-05-331 to CT-05-334 in the Volume 2: MA05 Map Book.

Demolitions

2.2.32 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.

2.2.33 At this stage of the design development, it is anticipated that demolition of 19 existing residential properties, 19 commercial/business properties (including farm outbuildings) and two other structures would be required to construct the Proposed Scheme in the Risley to Bamfurlong 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 Risley to Bamfurlong area. The construction arrangements described in this section provide the basis for the assessment presented in this 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[17] which sets out how HS2 Ltd and its contractors, as well as their sub-contractors, would undertake

[17] 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; haul routes, site preparation and enabling works; main earthworks and structure works; site restoration; removal of construction compounds where the compound is not required for railway installation works; and associated utility diversions;
- railway installation works including: establishment of construction compounds; infrastructure installation; connections to utilities; changes to the existing rail network; and removal of construction compounds;
- site finalisation works; and
- systems testing and commissioning.

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

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

Advance works

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

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

Engineering works

Introduction

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

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

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

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

General overview of construction compounds

2.3.16 Main compounds would be used for core project management staff (i.e. engineering, planning and construction delivery) and commercial and administrative staff.

These teams would directly manage some works and coordinate the works at the satellite compounds. In general, a main compound would include:

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

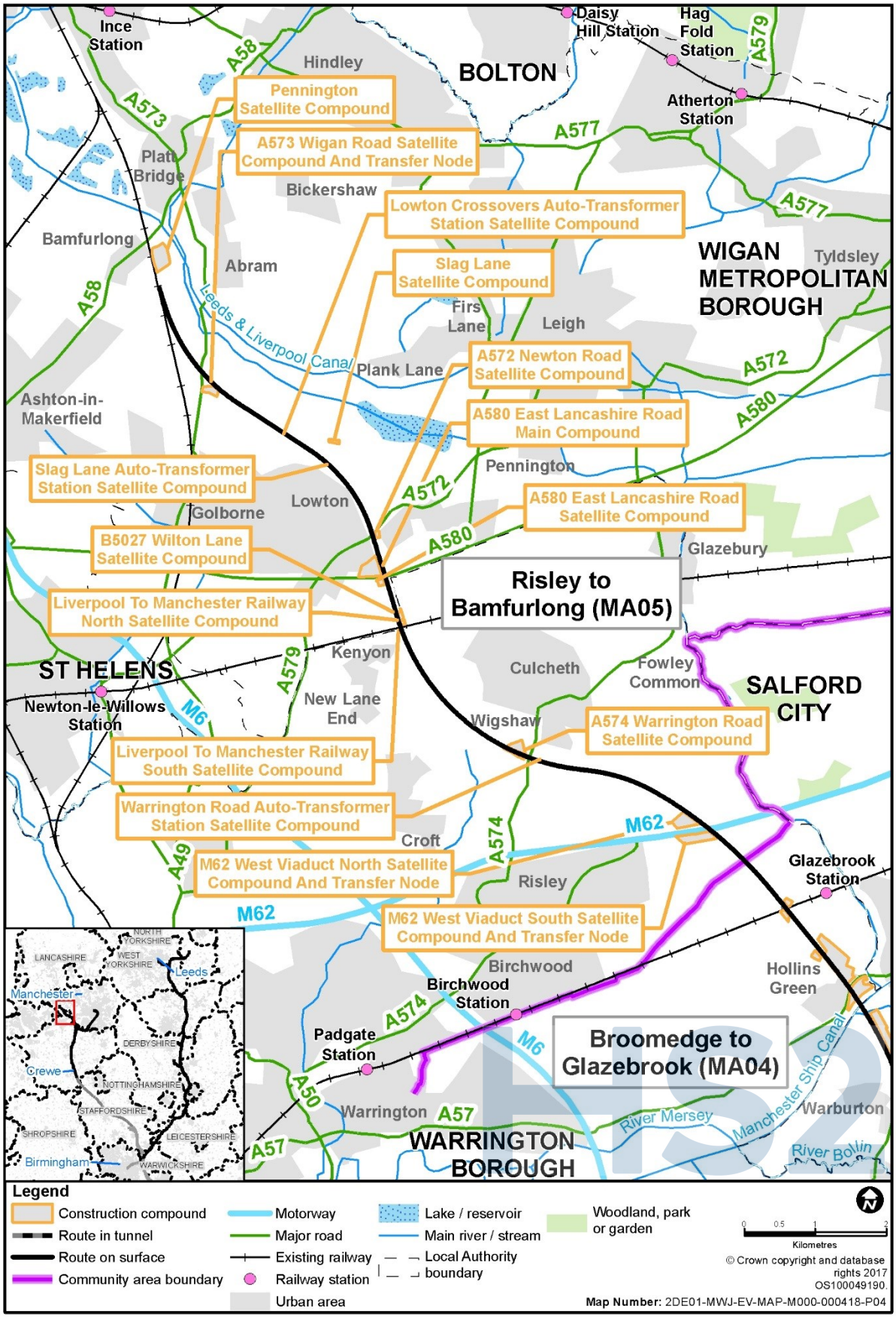
2.3.17 Satellite compounds would be used as the base to manage specific works along a section of the route. Depending on the nature and extent of the works to be managed, these satellite compounds could include office accommodation for staff, local storage for plant and materials, car parking for staff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

2.3.18 One main civil engineering compound, the A580 East Lancashire Road main compound, would be located in the Risley to Bamfurlong area which would manage eleven civil engineering satellite compounds.

2.3.19 Three additional railway systems satellite compounds for railway installation works only would be located in the area. These railway systems satellite compounds would be managed from the Manchester Airport Station main compound in the Hulseheath to Manchester Airport area (MA06).

2.3.20 The location of construction compounds in the Risley to Bamfurlong area is shown on Figure 4. Map Series CT-05 (in the Volume 2: MA05 Map Book) show in detail the locations of the construction compounds described below.

Figure 4: Location of construction compounds in the Risley to Bamfurlong 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 Risley to Bamfurlong area there would be no worker accommodation for the construction workforce.

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-05-326b to CT-05-334, in the Volume 2: MA05 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 haul routes within the 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 Risley to Bamfurlong 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 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-05-327 and Map CT-05-332 in the Volume 2: MA05 Map Book.

2.3.29 There would be three transfer nodes located within the following compounds in the Risley to Bamfurlong area:

- M62 West Viaduct South satellite compound;
- M62 West Viaduct North satellite compound; and
- A573 Wigan Road satellite compound.

Construction compounds

2.3.30 This section provides a summary of the works to be managed from the construction compounds in the Risley to Bamfurlong area, as illustrated in Figure 5 and Figure 6.

2.3.31 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.

Figure 5: Construction compounds for civil engineering works

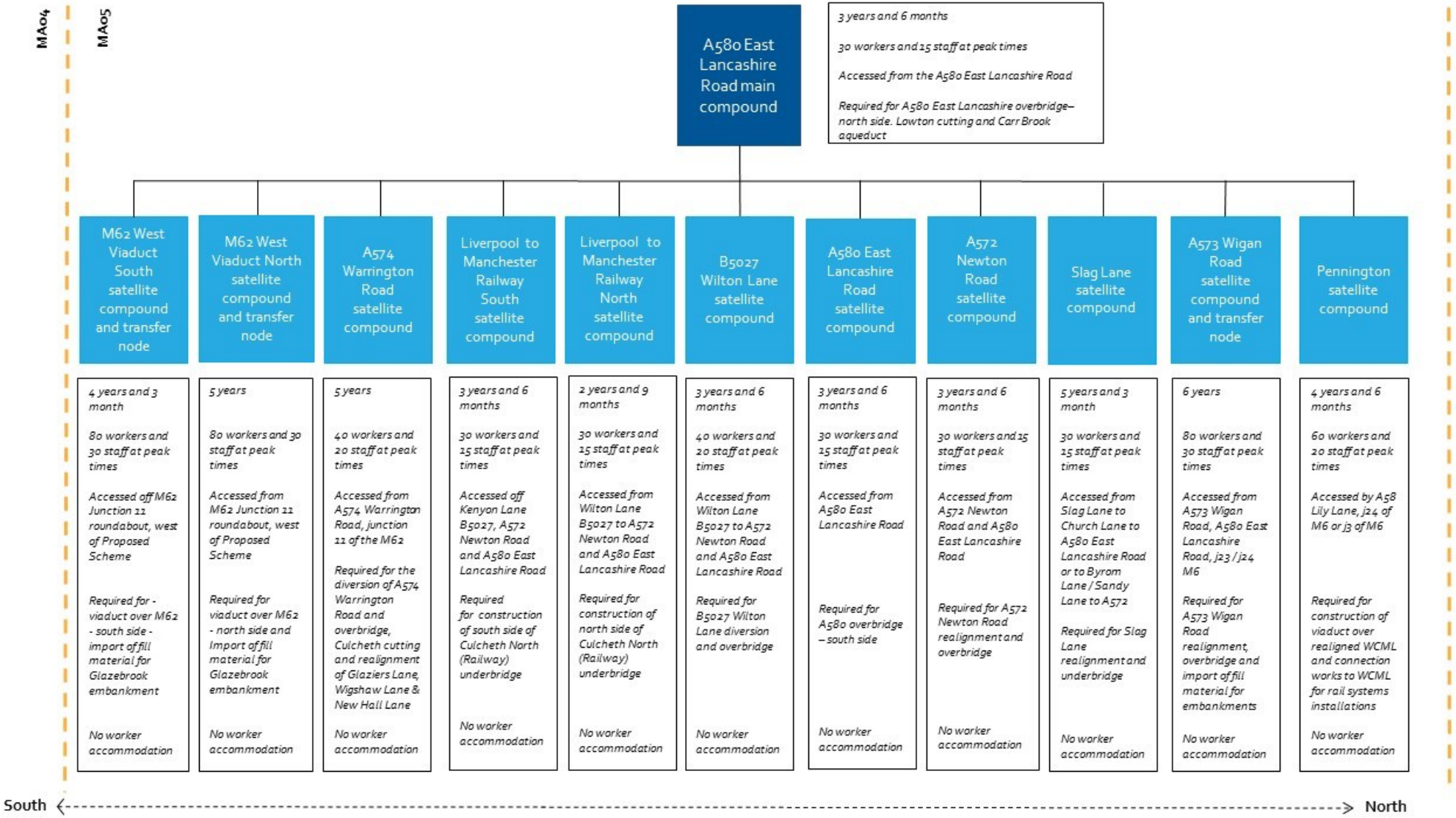
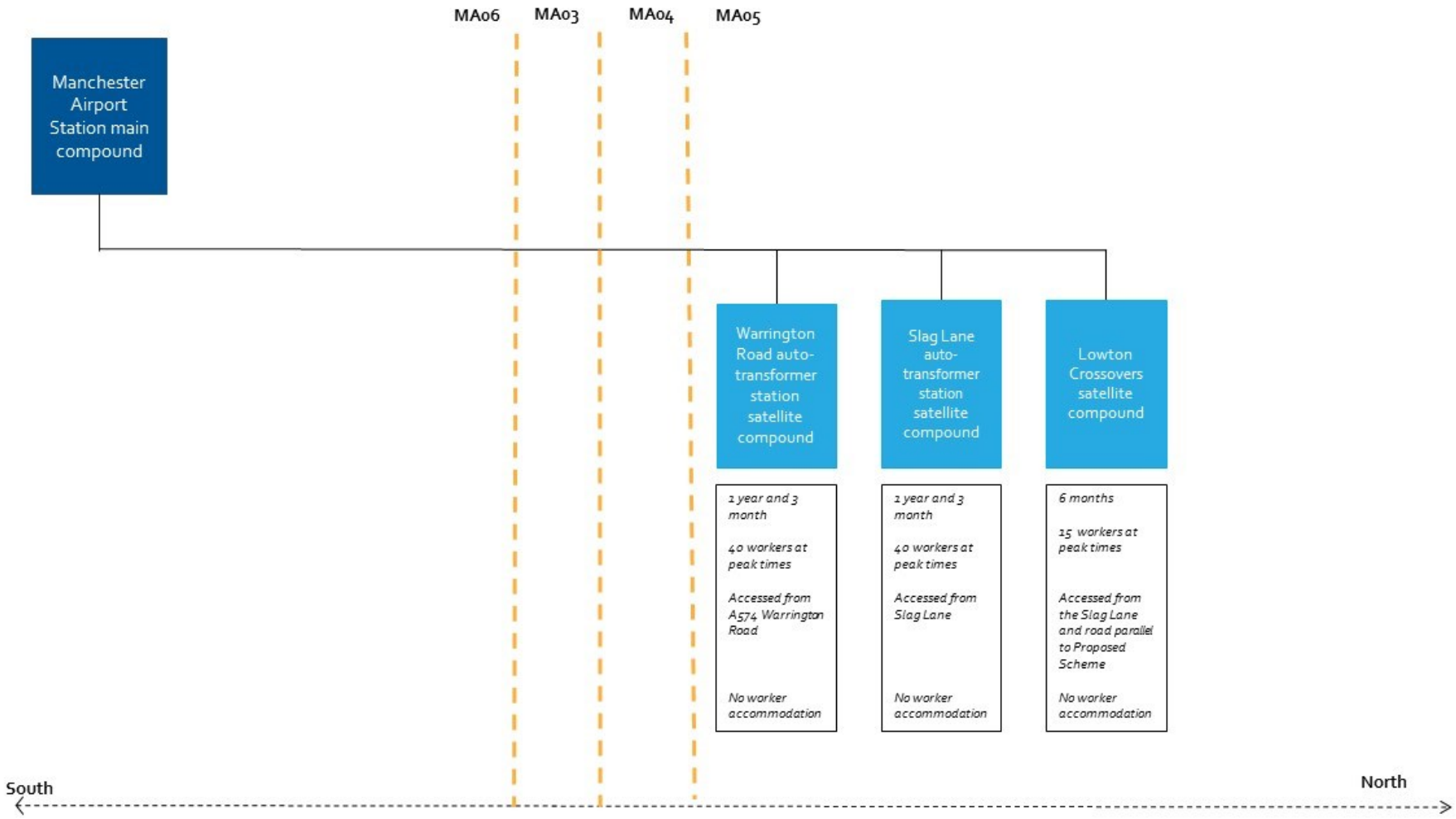


Figure 6: Construction compounds for railway systems works



A580 East Lancashire Road main compound

2.3.32 This compound (Volume 2: Map CT-05-330 H3) would be used to manage civil engineering works and provide main compound support to 11 satellite compounds in the Risley to Bamfurlong area, as illustrated in Figure 5 for the civil engineering works.

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

Table 1: Demolitions required as a result of the works to be managed from the A580 East Lancashire Road main compound

Description	Location	Feature resulting in the demolition
Residential		
Eight residential properties on Newton Road	Newton Road, Lowton	Lowton cutting
Commercial		
Commercial property	Enterprise Way, Lowton	Lowton cutting
Eight commercial properties at Automation House	Automation House, Newton Road, Lowton	Lowton cutting
Commercial property at Pocket Nook Way	Pocket Nook Way, Lowton	Lowton cutting
Other		
Telecommunication mast	AT Group Ltd, Telecommunication Mast, Automation House, Newton Road, Lowton	Lowton cutting

2.3.34 The compound would be used to manage the construction of the Lowton cutting, which would take two years and three months to complete.

2.3.35 This main compound would also be used to manage the construction of A580 East Lancashire Road overbridge on the north side which would take two years to complete.

2.3.36 A pre-cast laydown area to manufacture and store concrete elements, such as aqueduct beams for construction of the Carr Brook aqueduct, would be located within this compound for a period of nine months.

2.3.37 This compound would manage the provision to the A580 East Lancashire Road which would take two years to complete.

2.3.38 The works to be managed from this compound would require the temporary diversion of Golborne Footpath 78. During construction users would be diverted around the perimeter of the A580 East Lancashire Road main compound linking up with an unnamed PRoW 600m to the east. On completion Golborne Footpath 78 would be reinstated on its existing alignment.

2.3.39 Works to Golborne Footpath 80 would be managed from this compound, and would be subject to ongoing design development and identification of alternative routes. It is currently expected that alternative temporary routes would be required.

2.3.40 The works to be managed from this compound would require the following works to watercourses:

- infilled pond;
- Carr Brook Aqueduct; and
- the unnamed watercourse (drain) which crosses the compound would be temporarily channelled during occupation of the compound.

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

M62 West Viaduct South satellite compound and transfer node

2.3.42 This compound (see Volume 2: Map CT-05-327 B6 to D4) would be used to manage civil engineering works in the Risley to Bamfurlong area, as illustrated in Figure 5.

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

2.3.44 This compound would be used for the construction of the viaduct over the M62 on the south side which would take two years to complete.

2.3.45 The compound would also be used to manage the construction of the Glazebrook embankment, which would take one year and six months to complete.

2.3.46 A pre-cast yard and pre-cast laydown area to manufacture and store concrete elements, such as viaduct beams and decks to facilitate the construction of the M62 viaduct would be located at this compound for a period of two years and six months. The compound would be accessed from junction 11 of M62.

2.3.47 The works to be managed from this compound would require temporary lane closures and partial realignment of the M62 to construct the viaduct and would take between 12 and 18 months. The construction of the motorway crossing in this area would be coordinated to reduce the overall duration of disruption to users of the motorway. The traffic management which would be in place for 12 to 18 months and would include temporary speed restrictions for safety. Temporary use of the hard shoulder, and reduced lane widths including night-time closures are also likely to be required.

2.3.48 The works to be managed from this compound would require the temporary closure of the farm accommodation access to Frank's Farm which crosses the proposed compound, with managed access through the compound to the crossing over the motorway when required. There are no other PRoW or accommodation access works to be managed from this compound.

2.3.49 There would also be utilities works managed from this compound.

M62 West Viaduct North satellite compound and transfer node

2.3.50 This compound (see Volume 2: Map CT-05-327 D6 to E5) would be used to manage civil engineering works in the Risley to Bamfurlong area, as illustrated in Figure 5.

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

2.3.52 This satellite compound would be required for the construction of the viaduct over the north side of the M62 which would take two years to complete.

2.3.53 The compound would also be used to manage the construction of the Culcheth South embankment, which would take two years to complete.

2.3.54 The compound would be used to manage the construction of the Culcheth cutting, which would take two years to complete. The compound would be accessed from the M62 junction 11

2.3.55 The works to be managed from this compound would require the temporary lane closures and partial realignment of the M62 to accommodate the construction of the M62 viaduct for a period of between 12 to 18 months. The construction of the motorway crossing in this area would be coordinated to reduce the overall duration of disruption to the motorway. The traffic management would operate for a period of between 12 to 18 months and would be likely to include temporary speed restrictions for safety. Temporary use of the hard shoulder, and reduced lane widths including night-time closures are also likely to be required.

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

- an unnamed accommodation access via Risley East underbridge;
- Croft Footpath 13;
- Croft Footpath 28;
- Croft Footpath 27; and
- New Hall Lane via New Hall accommodation underbridge.

2.3.57 The works to be managed from this compound would require the following works to water bodies:

- infilled pond;
- Moss Side Drain diversion;
- Silver Lane Brook culvert;
- infilled unnamed watercourse; and
- infilled lakes.

2.3.58 There would also be utilities works managed from this compound.

A574 Warrington Road satellite compound

2.3.59 This compound (see Volume 2: Map CT-05-327 D6 to E5 I7) would be used to manage civil engineering works in the Risley to Bamfurlong area, as illustrated in Figure 5.

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

Table 2: Demolitions required as a result of the works to be managed from the A574 Warrington Road satellite compound

Description	Location	Feature resulting in the demolition
Residential		
Residential property and outbuildings (including Caravan Club)	Yew Tree Farm, Warrington Road, Risley	Culcheth cutting
Residential property and outbuildings	Glaziers Lane Farm, Glaziers Lane, Culcheth, Warrington	Culcheth cutting
Residential property and outbuildings	Wigshaw Lane, Culcheth, Warrington	Culcheth cutting
Residential property	Phillips Farm, understood to be part of Partridge Lakes Fishery, Glaziers Lane, Culcheth	Culcheth cutting
Residential property and outbuildings	Swallow Barn, Glaziers Lane, Croft	Culcheth cutting
Commercial		
Office building	Taylor Business Park, Taylor Industrial Estate, Croft	Culcheth cutting
Five commercial properties at The Warehouse Studios	The Warehouse Studios, Glaziers Lane, Croft	Culcheth cutting
Other		
Community facility buildings	Culcheth Athletic junior football club, The Oaks Playing Fields	Culcheth cutting

2.3.61 The compound would be used to manage the construction of the Culcheth cutting which would take two years to complete.

2.3.62 The compound would also be used to manage the construction of Culcheth North embankment which would take two years and nine months to complete.

2.3.63 The compound would also be used to manage the construction of A574 Warrington Road overbridge which would take one year and nine months to complete.

2.3.64 The compound would also be used to manage the construction of the earthworks and foundations for the Warrington Road auto-transformer station which would take one year to complete

2.3.65 The works to be managed from this compound would require the following works to public/private roads:

- permanent realignment of the A574 Warrington Road which would take two years and nine months to complete and would be constructed offline[18]. On completion of construction, temporary lane restrictions and traffic

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

management measures would be implemented for three months to enable connection between the realigned road and the existing road; and

- New Hall Lane realignment, which would take one year and six months to complete.

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

- Wigshaw Lane; and
- Glaziers Lane.

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

- Croft Footpath 15;
- Croft Footpath 19;
- Croft Footpath 8;
- Croft Footpath 8a via; and
- Croft Footpath 108.

2.3.68 The works to be managed from this compound would require the following works to watercourses:

- unnamed watercourse diversion;
- unnamed watercourse diversion; and
- the Kenyon culvert.

2.3.69 There would also be utilities works managed from this compound.

Warrington Road auto-transformer station satellite compound

2.3.70 This compound would be used to manage railway systems works in the Risley to Bamfurlong area, as illustrated in Figure 5 .

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

2.3.72 Key railway systems works would be delivered from the Warrington auto-transformer station satellite compound located on the south side of the A574.The works would include construction and installation of the Warrington Road auto-transformer station, which would take one year and three months to complete. The Warrington Road auto-transformer station satellite compound would be accessed from the same route as the major civils compound via A574 Warrington Road.

2.3.73 There would also be utilities works managed from this compound.

Liverpool to Manchester Railway South satellite compound

2.3.74 This compound (see Volume 2: Map CT-05-330 C5) would be used to manage civil engineering works in the Risley to Bamfurlong area, as illustrated in Figure 5.

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

2.3.76 The compound would be used to manage the construction of the Culcheth North (Railway) underbridge which would take two years and nine months to complete. The underbridge would be constructed online over the existing railway.

2.3.77 There would also be utilities works managed from this compound.

Liverpool to Manchester Railway North satellite compound

2.3.78 This compound (see Volume 2: Map CT-05-330 D5) would be used to manage civil engineering works in the Risley to Bamfurlong area, as illustrated in Figure 5.

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

2.3.80 The compound would manage the construction of the Culcheth North (Railway) underbridge which would take two years and nine months to complete. The underbridge would be constructed online over the existing railway with most components prefabricated off site. The bridge would be supported on bored piled foundations, reinforced pile caps and concrete piers.

2.3.81 There would also be utilities works managed from this compound.

B5027 Wilton Lane satellite compound

2.3.82 This compound (see Volume 2: Map CT-05-330 D5) would be used to manage civil engineering works in the Risley to Bamfurlong area, as illustrated in Figure 5 .

2.3.83 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 B5027 Wilton Lane satellite compound

Description	Location	Feature resulting in the demolition
Residential		
Residential property	Willowpool, Wilton Lane, Culcheth	Lowton cutting
Residential property and outbuildings	Birchalls Farm, Wilton Lane, Culcheth	Lowton cutting

2.3.84 The compound would be used to manage the construction of the Lowton cutting, which would take two years and three months to complete.

2.3.85 The works to be managed from this compound would require construction of the B5027 Wilton Lane overbridge and realignment. Works would include a phased road realignment and associated traffic management works, which would be constructed offline and 200m north of the existing B5207. The overbridge would take two years and nine months to complete.

2.3.86 There would also be utilities works managed from this compound.

A580 East Lancashire Road satellite compound

2.3.87 This compound (see Volume 2: Map CT-05-330 G4 and G5) would be used to manage civil engineering works in the Risley to Bamfurlong area, as illustrated in Figure 5.

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

2.3.89 The compound would be used to manage the construction of the Lowton cutting, which would take two years and three months to complete.

2.3.90 The compound would be used to manage the construction of the A580 East Lancashire Road overbridge, which would take two years to complete. The compound would be accessed from the A580 East Lancashire Road.

2.3.91 This compound would manage the provision of the A580 East Lancashire Road which would take two years to complete.

2.3.92 The works to be managed from this compound would require the temporary diversion of Golborne Footpath 78. During construction users would be diverted around the perimeter of the A580 East Lancashire Road main compound linking up with an unnamed PRoW 600m to the east. On completion Golborne Footpath 78 would be reinstated on its existing alignment.

2.3.93 Works to Golborne Footpath 80 would be managed from this compound, and are subject to ongoing design development and identification of alternative routes. It is currently expected that alternative temporary routes would be required.

2.3.94 There would also be utilities works managed from this compound.

A572 Newton Road satellite compound

2.3.95 This compound (see Volume 2: Map CT-05-331 A4) would be used to manage civil engineering works in the Risley to Bamfurlong area, as illustrated in Figure 5.

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

2.3.97 The compound would be used to manage the construction of the A572 Newton Road overbridge, which would take two years to complete.

2.3.98 The compound would also be used to manage the construction of the Lowton cutting, which would take two years and three months to complete.

2.3.99 The works to be managed from this compound would require the permanent realignment of the A572 Newton Road. Works would take two years to complete. On completion of construction, temporary road restrictions and traffic management measures would be implemented for two months to enable connection between the realigned road and the existing road.

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

Slag Lane satellite compound

2.3.101 This compound (see Volume 2: Map CT-05-331 H7) would be used to manage civil engineering works in the Risley to Bamfurlong area, as illustrated in Figure 5 .

2.3.102 The works to be managed from this compound would require demolition of the following buildings and structures, as described in Table 4.

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

Description	Location	Feature resulting in the demolition
Residential		
Two residential properties and outbuildings	Slag Lane, Lowton	Pennington embankment

2.3.103 The compound would be used to manage the construction of a section of track bed near Pennington which would take one year to complete.

2.3.104 The compound would also be used to manage the construction of the Pennington embankment, which would take one year and nine months to complete.

2.3.105 The compound would also be used to manage the construction of the earthworks and foundations for the Slag Lane auto-transformer station, which would take one year and three months to complete.

2.3.106 The works to be managed from this compound would require the permanent realignment of Slag Lane and construction of the Slag Lane underbridge. Works would take two years and three months to complete. On completion of construction, temporary road restrictions and traffic management measures would be implemented for two months to enable connection between the realigned road and the existing road.

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

- Golborne Footpath 63;
- Golborne Footpath 39;
- Golborne Footpath 37;
- Golborne Footpath 33;
- Golborne Footpath 38; and
- Golborne Footpath 35.

2.3.108 The works to be managed from this compound would require the following works to watercourses:

- Small Brook culvert;
- unnamed watercourse diversion;
- Ganton Common culvert;
- unnamed watercourse diversion;
- an infilled pond; and
- Crow Wood Avenue watercourse diversion.

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

Slag Lane auto-transformer station satellite compound

2.3.110 This compound (see Volume 2: Map CT-05-331 G6) would be used to manage railway systems works in the Risley to Bamfurlong area, as illustrated in Figure 5.

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

2.3.112 Key railway systems works which would be delivered from the Slag Lane auto-transformer station satellite compound located on the south side of the Slag Lane. These works would include the construction and installation of the Slag Lane auto-transformer station. The installation of the Slag Lane auto-transformer station equipment would take one year and three months to complete. The compound would be accessed from Slag Lane.

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

Lowton Crossovers satellite compound

2.3.114 This compound (see Volume 2: Map CT-05-332 B8) would be used to manage railway systems works in the Risley to Bamfurlong area, as illustrated in Figure 5.

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

2.3.116 Railway systems works would be delivered from the Lowton Crossovers satellite compound. These works would include construction and installation of the Lowton crossovers. The installation of the Lowton crossovers would take six months to complete. The satellite compound would be accessed from Slag Lane.

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

A573 Wigan Road satellite compound and transfer node

2.3.118 This compound (see Volume 2: Map CT-05-332 H7) would be used to manage civil engineering works in the Risley to Bamfurlong area, as illustrated in Figure 5.

2.3.119 The works to be managed from this compound would require demolition of the following buildings and structures, as described in Table 5.

Table 5: Demolitions required as a result of the works to be managed from the A573 Wigan Road satellite compound and transfer node

Description	Location	Feature resulting in the demolition
Residential		
Two residential properties and outbuildings	Lightshaw Lane, Golborne	Pennington Embankment
Commercial		
Three agricultural buildings	Aye Bridge Farm, Abram	Pennington Embankment

2.3.120 This compound would be used to manage the construction of the Pennington embankment, which would take four years and six months to complete. The compound would manage the importation of fill material for the construction of the Pennington embankment.

2.3.121 The works to be managed from this compound would also require the permanent realignment of the A573 Wigan Road including a new overbridge. The overbridge would be constructed by a temporary offline road alignment 250m to the east of the existing road. The works would take two years and three months to complete. On completion of construction, temporary road restrictions and traffic management measures would be implemented for three months to enable connection between the realigned road and the existing road.

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

- Golborne Footpath 31 and accommodation access;
- Golborne Footpath 30; and
- Lightshaw Lane accommodation access.

2.3.123 The works to be managed from this compound would require the following works to water bodies:

- Critchley culvert;
- an infilled pond;
- Windy Bank Brook culverts and diversion; and
- Nan Holes Brook diversion.

2.3.124 The above works would be carried out in conjunction with the Pennington embankment and A573 Wigan Road realignment works.

2.3.125 There would also be utilities works managed from this compound.

Pennington satellite compound

2.3.126 This compound (see Volume 2: Map CT-05-333 I5 to J5) would be used to manage civil engineering works in the Risley to Bamfurlong area, as illustrated in Figure 5.

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

2.3.128 The compound would be used to manage the construction of the Pennington embankment which would take four years and six months to complete.

2.3.129 The compound would also be used to manage the construction of the Pennington (Railway) underbridge, which would take two years to complete.

2.3.130 The compound would also be used to manage the connection works to WCML and railway systems installation works.

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

- Ashton-in-Makerfield Footpath 22; and
- Abram Footpath 02.

2.3.132 The works to be managed from this compound would require the following works to watercourses:

- Viridor Wood South Culvert;
- Viridor Wood North Culvert;
- Coffin Lane Brook Culvert; and
- Hey Brook Culvert.

2.3.133 The above works would be carried out in conjunction with the Pennington embankment and retained embankment works.

2.3.134 There would also be minor utilities works managed from this compound

Construction waste and material resources

2.3.135 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.

2.3.136 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.

2.3.137 Local excess or shortfall of excavated material within the Risley to Bamfurlong 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.

Commissioning of the railway

2.3.138 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

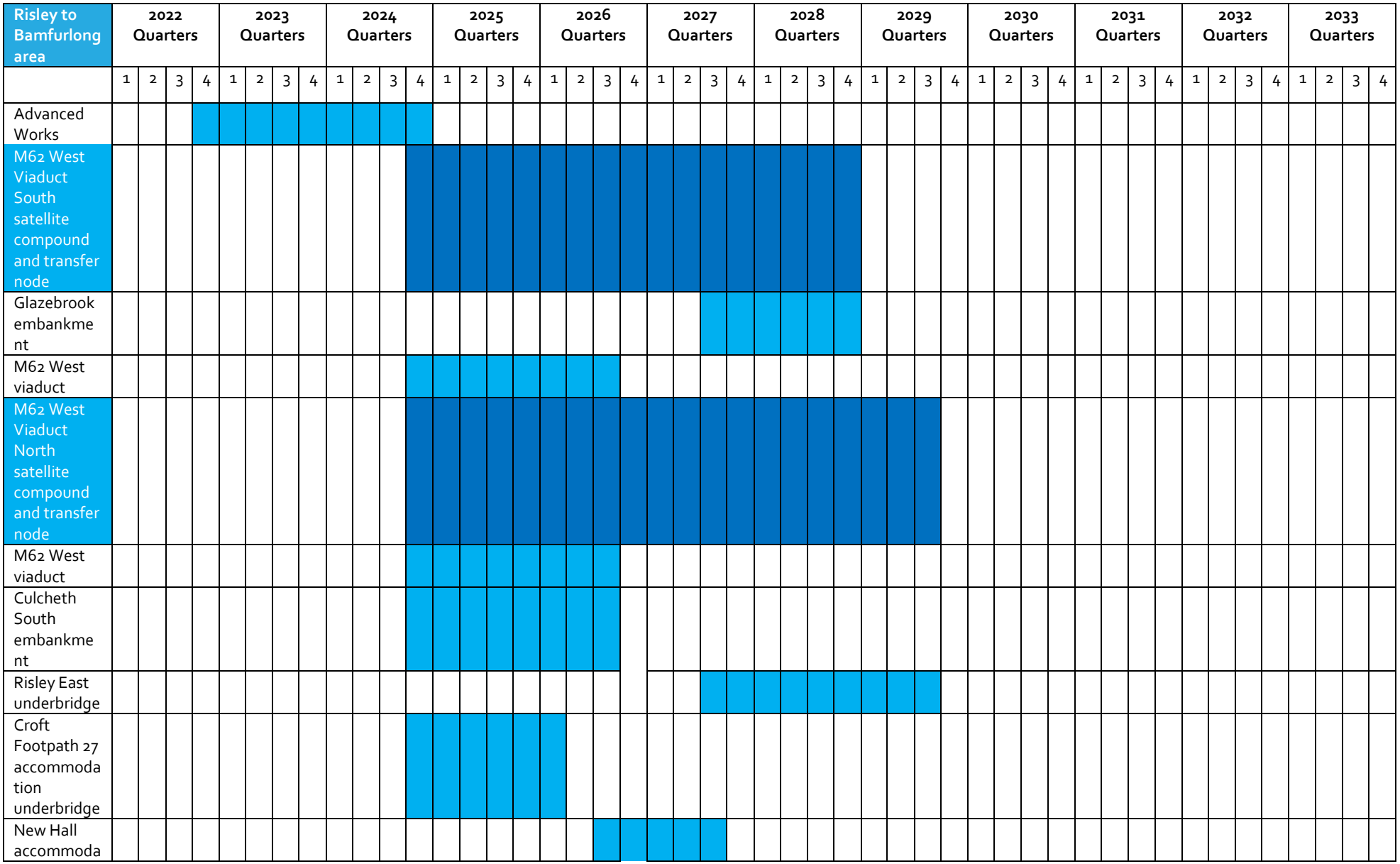
2.3.139 A construction programme illustrating indicative periods for each of the core construction activities described above is provided in Figure 7. Construction durations referred to in the following sections of this report are based on this indicative programme.

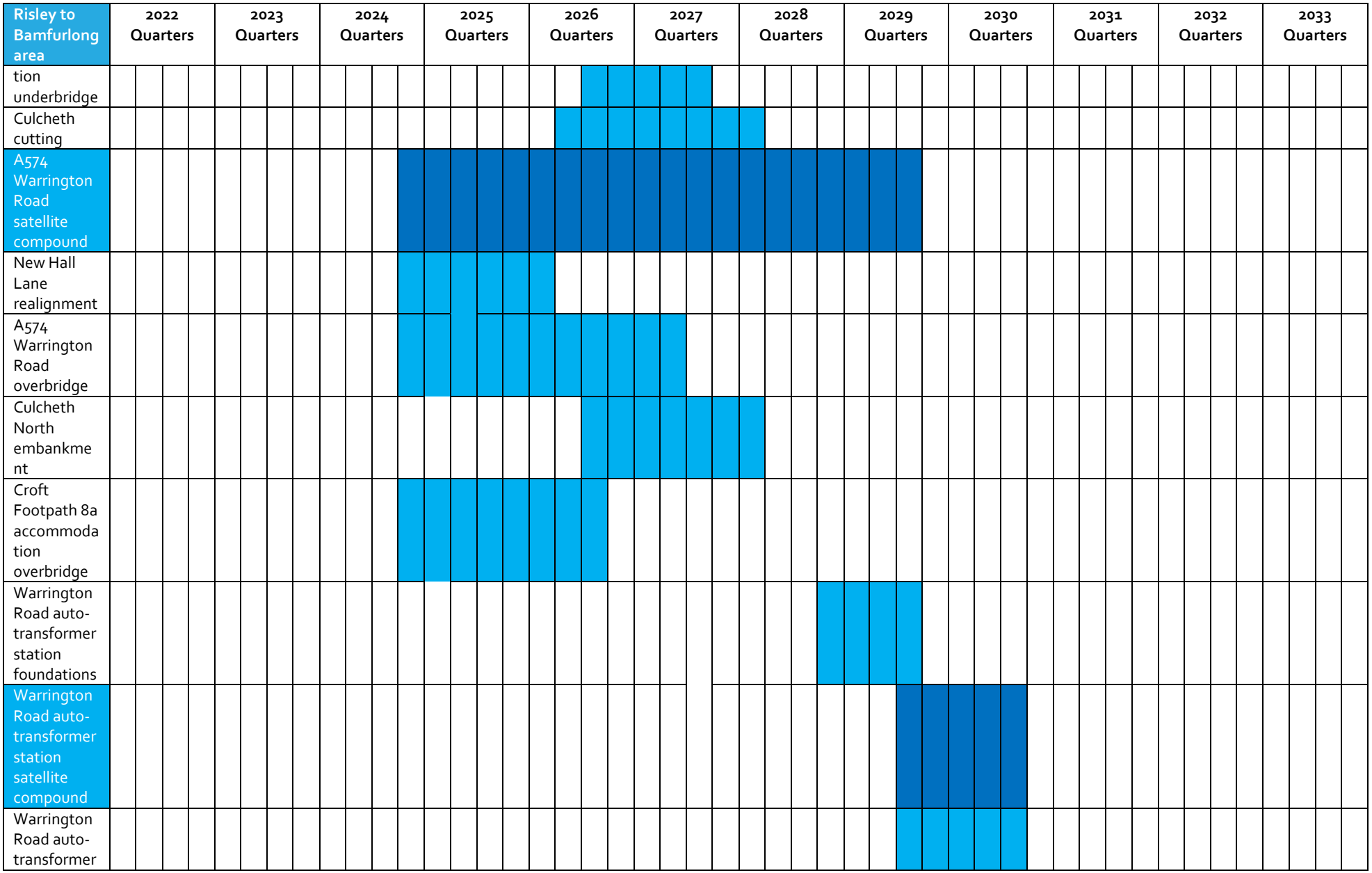
Monitoring during construction

2.3.140 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.

2.3.141 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




Risley to Bamfurlong area
2022 Quarters
2023 Quarters
2024 Quarters
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2027 Quarters
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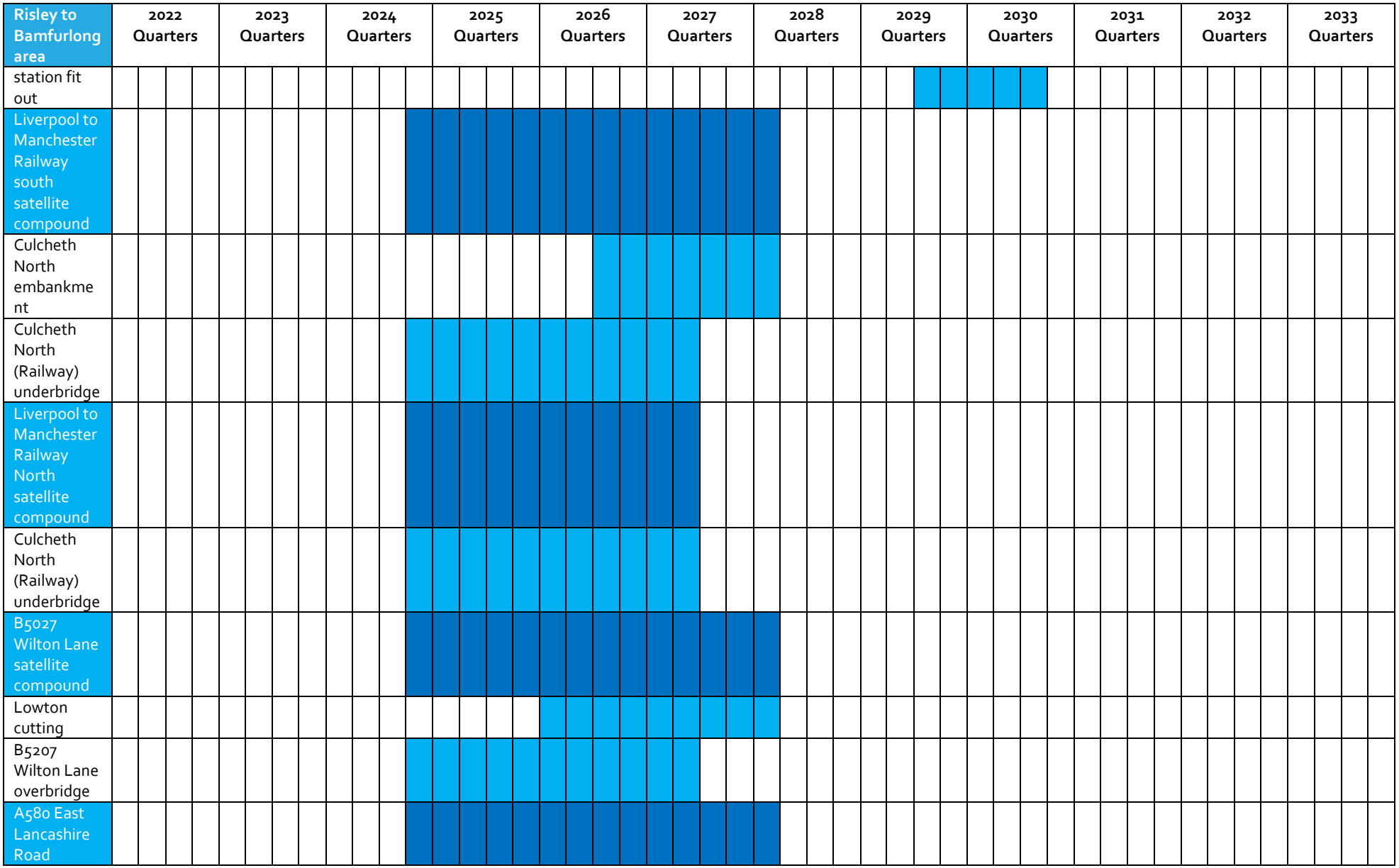
2030 Quarters
2031 Quarters
2032 Quarters
2033 Quarters
tion underbridge
Culcheth cutting
A574 Warrington Road satellite compound
New Hall Lane realignment
A574 Warrington Road overbridge
Culcheth North embankment
Croft Footpath 8a accommodation overbridge
Warrington Road auto-transformer station foundations
Warrington Road auto-transformer station satellite compound
Warrington Road auto-transformer


Risley to Bamfurlong area
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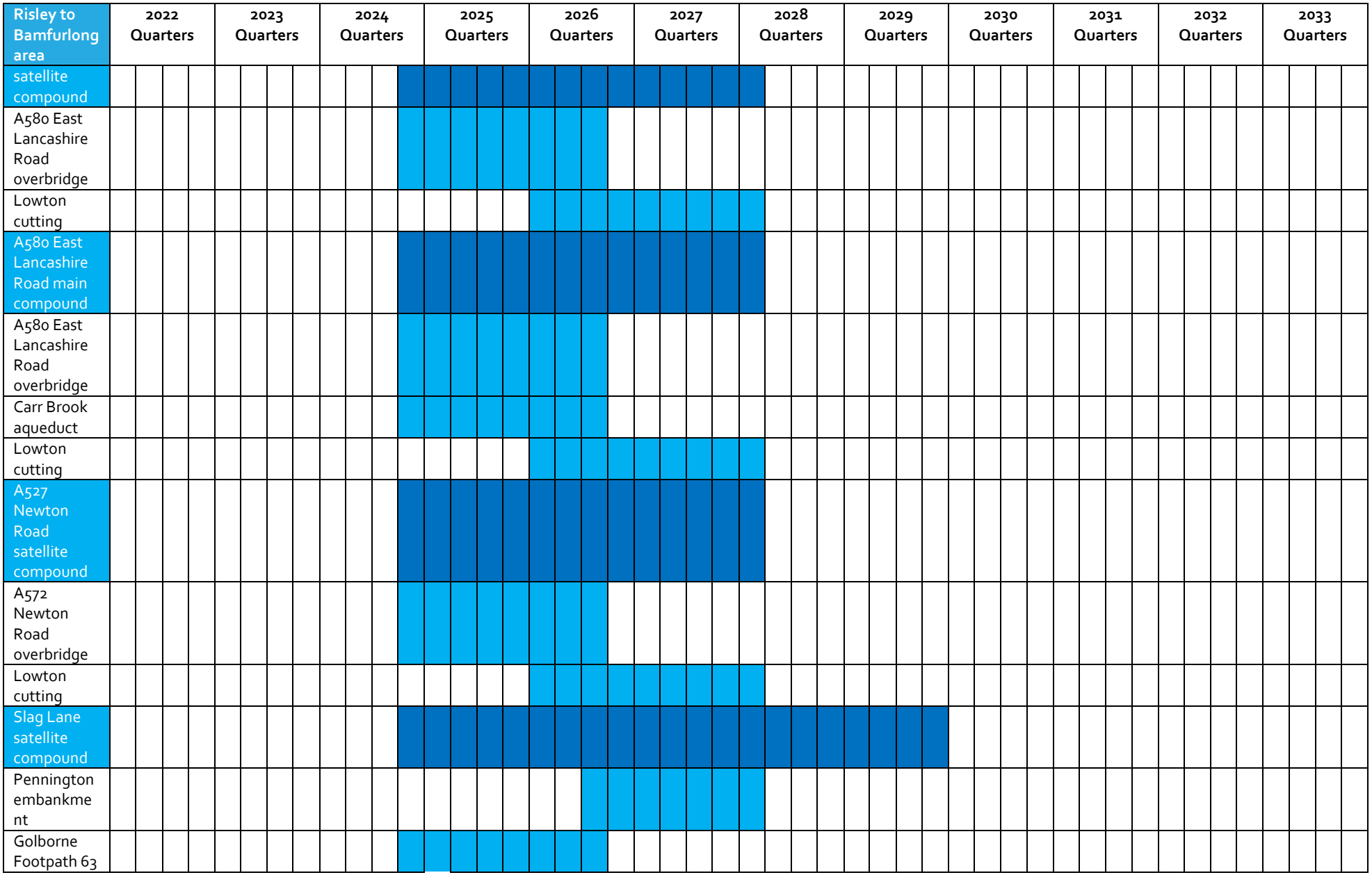
2030 Quarters
2031 Quarters
2032 Quarters
2033 Quarters
station fit out
Liverpool to Manchester Railway south satellite compound
Culcheth North embankment
Culcheth North (Railway) underbridge
Liverpool to Manchester Railway North satellite compound
Culcheth North (Railway) underbridge
B5027 Wilton Lane satellite compound
Lowton cutting
B5207 Wilton Lane overbridge
A580 East Lancashire Road


Risley to Bamfurlong area
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2023 Quarters
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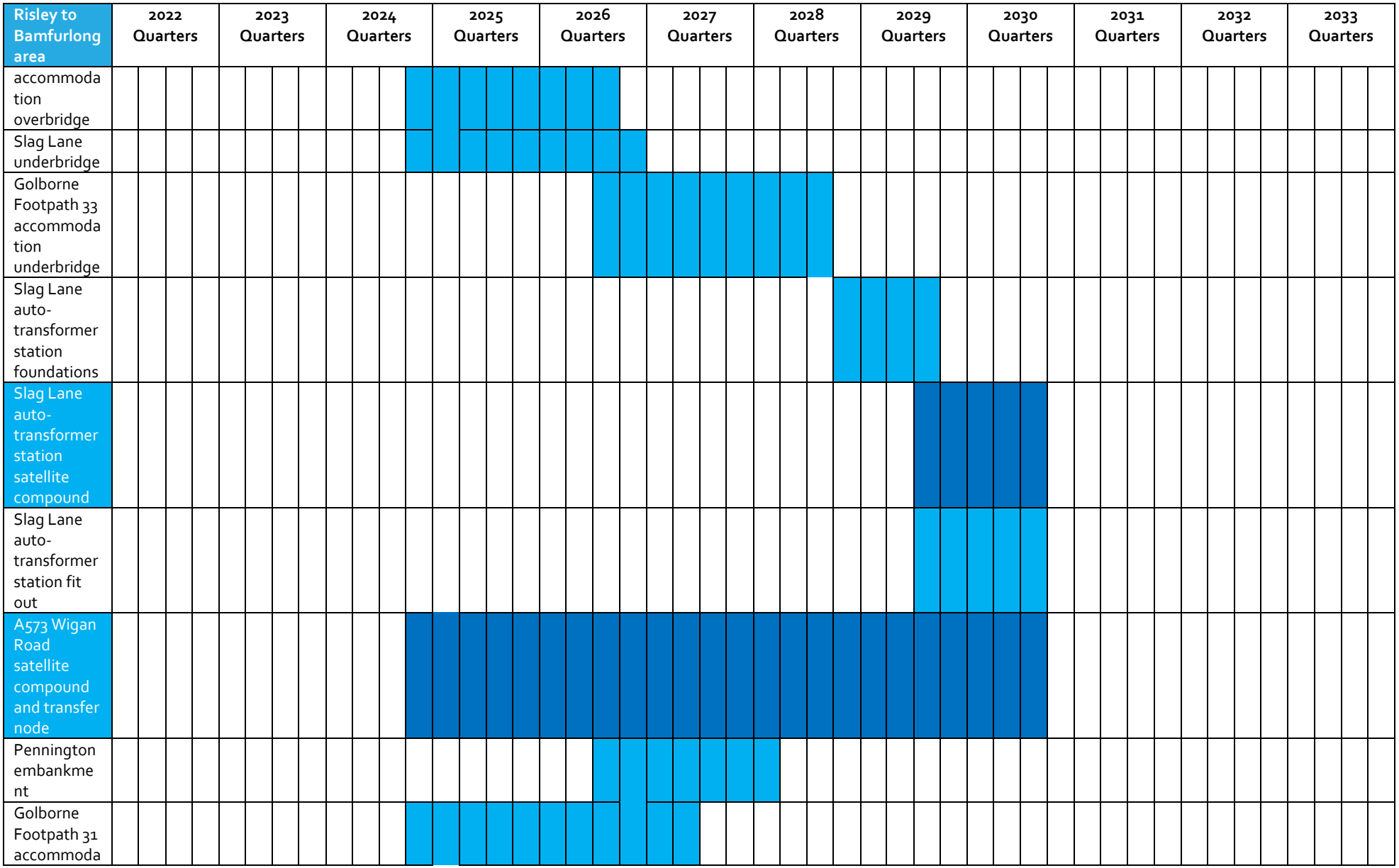
2031 Quarters
2032 Quarters
2033 Quarters
satellite compound
A580 East Lancashire Road overbridge
Lowton cutting
A580 East Lancashire Road main compound
A580 East Lancashire Road overbridge
Carr Brook aqueduct
Lowton cutting
A527 Newton Road satellite compound
A572 Newton Road overbridge
Lowton cutting
Slag Lane satellite compound
Pennington embankment
Golborne Footpath 63


Risley to Bamfurlong area
2022 Quarters
2023 Quarters
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2026 Quarters
2027 Quarters
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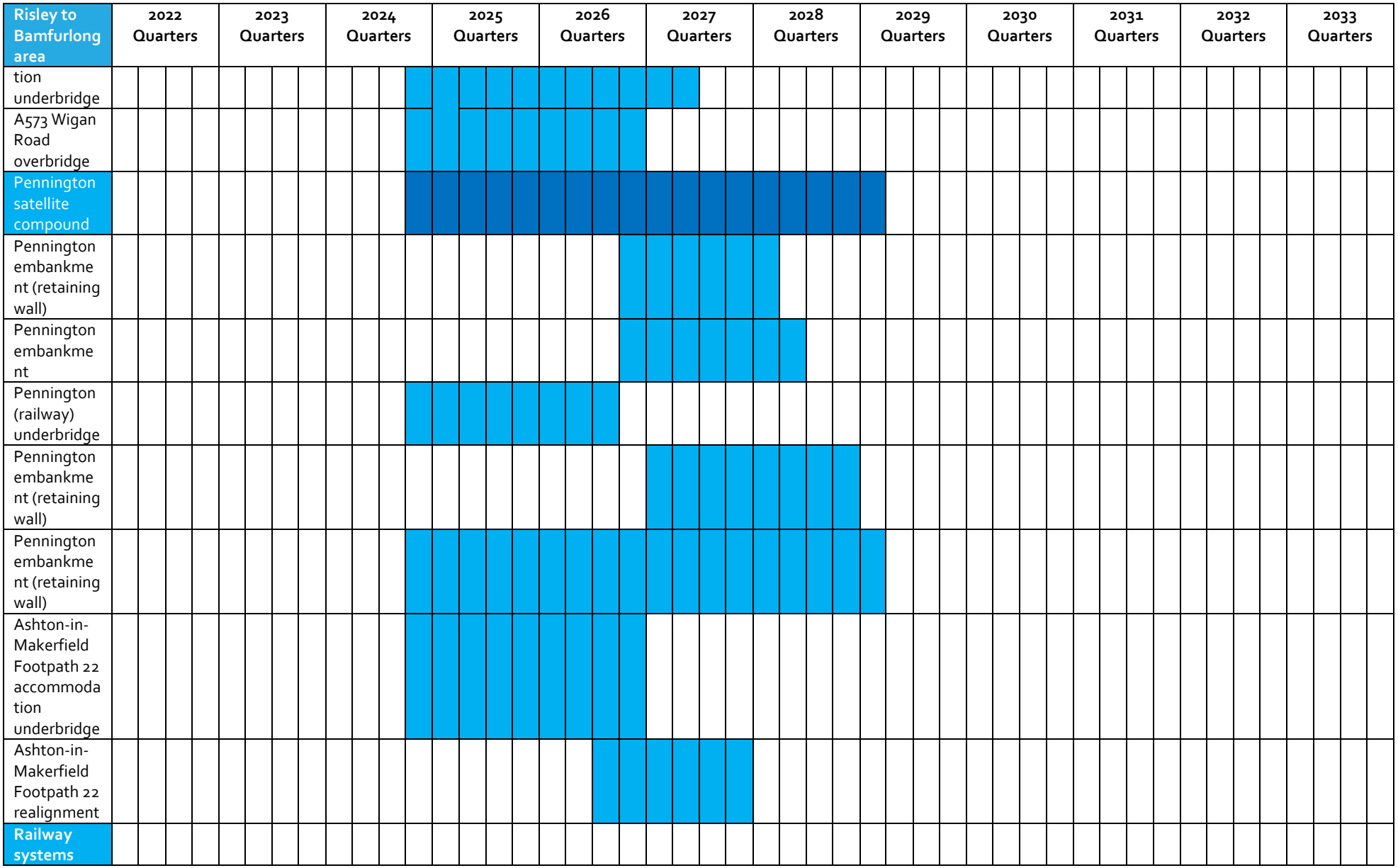
2029 Quarters
2030 Quarters
2031 Quarters
2032 Quarters
2033 Quarters
accommodation overbridge
Slag Lane underbridge
Golborne Footpath 33 accommodation underbridge
Slag Lane auto-transformer station foundations
Slag Lane auto-transformer station satellite compound
Slag Lane auto-transformer station fit out
A573 Wigan Road satellite compound and transfer node
Pennington embankment
Golborne Footpath 31 accommoda


Risley to Bamfurlong area
2022 Quarters
2023 Quarters
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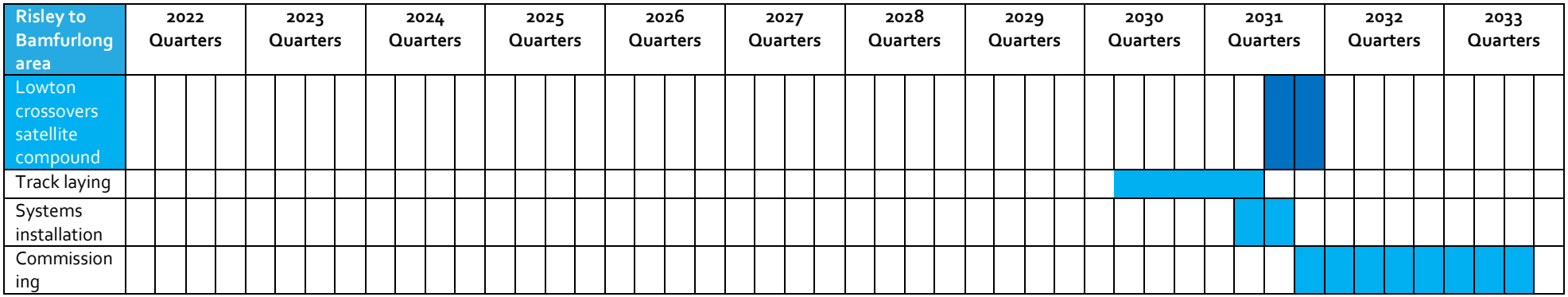
2031 Quarters
2032 Quarters
2033 Quarters
tion underbridge
A573 Wigan Road overbridge
Pennington satellite compound
Pennington embankment (retaining wall)
Pennington embankment
Pennington (railway) underbridge
Pennington embankment (retaining wall)
Pennington embankment (retaining wall)
Ashton-in-Makerfield Footpath 22 accommodation underbridge
Ashton-in-Makerfield Footpath 22 realignment
Railway systems


Risley to Bamfurlong area
2022 Quarters
2023 Quarters
2024 Quarters
2025 Quarters
2026 Quarters
2027 Quarters
2028 Quarters
2029 Quarters
2030 Quarters
2031 Quarters
2032 Quarters
2033 Quarters
Lowton crossovers satellite compound
Track laying
Systems installation
Commissioning

2.4 Operation of the Proposed Scheme

Introduction

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

HS2 services

2.4.2 It is anticipated that there would be up to three trains per hour each way passing through the Risley to Bamfurlong 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 Rolling Stock Depot in the Wimboldsley to Lostock Gralam area (MA02). Further information on the Crewe North Rolling Stock depot can be found in Volume 2: Community area report MA02 Wimboldsley to Lostock Gralam.

Operational waste and material resources

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

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

Monitoring during operation

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

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

2.5 Route section alternatives

Culcheth highway alternatives

2.5.1 As part of the design development process since July 2017, consideration has been given to the design of the highway realignments and diversions at Culcheth and to reducing potential adverse impacts on local residents and users of the highways. At present there are two highway routes to access Culcheth from the south and west; Wigshaw Lane and the A574 Warrington Road.

2.5.2 The Proposed Scheme would require the permanent realignment of the A574 Warrington Road to the west of its existing alignment, and the permanent closure of Wigshaw Lane. Users of Wigshaw Lane would be diverted to cross the Proposed Scheme via the A574 Warrington Road, with realignments to Glaziers Lane and construction of a new northern link road parallel to the Culcheth Linear Park forming the connection between Wigshaw Lane and the A574 Warrington Road north of the Proposed Scheme.

2.5.3 As part of the development of the design, further work is being undertaken to consider the overall highway configuration in this location, taking into account direct impacts on local receptors as a consequence of highway diversions and operational impacts upon highway users including non-motorised users.

2.5.4 Further studies will be carried out to consider the location and the design of the highway diversions to be included in the Proposed Scheme and the outcome of these studies will be reported in the formal ES.

Lily Lane junction

2.5.5 As part of the design development process since July 2017, consideration has been given to reducing potential environmental impacts while providing a connection from the HS2 main line to the WCML, which would reduce the impact upon the operation of that WCML.

2.5.6 The Proposed Scheme would connect to the WCML via a grade separated junction, which would necessitate realignment of the north and southbound WCML fast lines. The realignment of the northbound fast line would be minor and within the existing conventional rail corridor. The realignment of the southbound fast line would be outside of the existing conventional rail corridor.

2.5.7 As part of the development of the design, further work is being undertaken to consider the junction configuration, with a view to further reduce the area of land required, impacts on agricultural land holdings and disruption to the WCML.

2.5.8 Further studies will be carried out to consider the configuration of the Lily Lane junction to be included in the Proposed Scheme and the outcome of these studies will be reported in the formal ES.

A573 Wigan Road highway realignment

2.5.9 As part of the design development process since July 2017, consideration has been given to impacts on agricultural land holdings, access and landscape and visual impacts as a result of the realignment of the A573 Wigan Road.

2.5.10 The Proposed Scheme would require the A573 Wigan Road, which is located to the north of Golborne, to be realigned to the east over the Proposed Scheme. Lightshaw Lane would need to be realigned further north to connect with the realigned A573 Wigan Road.

2.5.11 As part of the development of the design, further work is being undertaken to consider alternative highway alignment options for the A573 Wigan Road, which seek to reduce land requirements, severance of agricultural land holdings and landscape and visual impacts. Alternative highway options will be considered in the context of options for the WCML junction at Lily Lane to identify an overall solution for the area.

2.5.12 Further studies will be carried out to consider the alignment of the A573 Wigan Road included in the Proposed Scheme and the outcome of these studies will be reported in the formal ES.

3 Stakeholder engagement and consultation

3.1 Introduction

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

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

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

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

3.2 Key stages of Phase 2b engagement and consultation

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

3.3.2 The main themes to emerge from stakeholder engagement in the Risley to Bamfurlong 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 and operation;
- impact of construction traffic on already congested local highways, as well as temporary and permanent highway diversions;
- impact on local amenities such as recreational playing fields south of Culcheth, Culcheth Linear Park, Byrom Hall Woods and Abram Flashes;
- impact on local Public Rights of Way (PRoW);
- impact on local businesses at Partridge Lakes and Taylor Business Park (both Culcheth) and Automation House (Lowton);
- proximity of the Proposed Scheme to Holcroft Moss (SSSI) and Abram Flashes (SSSI) and potential impacts on hydrological interfaces at both sites;

- impact to the setting of the Grade II* Listed Lightshaw Hall and Grade II Listed Byrom Hall; 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 Risley to Bamfurlong area include a range of local interest groups, local facility and service providers, places of worship, schools and educational establishments, cultural, leisure and sports stakeholders.

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

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

3.4.4 As part of the consultation process for this working draft ES, public events are being held in communities across the route of the Proposed Scheme. Communities have been notified of these events through a range of publicity in the Risley to Bamfurlong 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
Culcheth and District Rail Action Group (CADRAG)	Engagement over concerns raised regarding permanent road closures and the impact on local traffic movements; visual and noise impacts both during construction and operation; loss of recreational green space; impact on Partridge Lakes fisheries and associated businesses
Lowton East Neighbourhood Development Forum	Engagement over community concerns regarding impact of construction traffic in terms of pollution, traffic issues and safety on the local road network. A number of community destinations are serviced by the A572 (Newton Road) including a care home, five primary schools, a community hub and business park. Discussion on the impact on Lowton recreational green space close to the former Civic Centre
Wigan Area Communities Manager	Meetings to discuss community impacts and how to connect with hard to reach groups
British Cycling	Discussion over potential impact on the cycle network, connecting communities and improving provision

Local authorities and parish councils

3.4.7 Direct engagement has been offered to and undertaken with county, borough, district and parish councils within the Risley to Bamfurlong 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.

3.4.8 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.

3.4.9 Key issues identified during engagement with local authorities and parish councils include those summarised in Table 8.

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

Stakeholder	Area of focus
Warrington Borough Council (WBC)	General introductory and project update meetings including discussion regarding the Proposed Scheme to Golborne and alternative proposals as presented by Warrington Borough Council. Confirmation of the services that Warrington would receive and how HS2 can support wider regeneration within the area.
	Meetings with technical leads to collate data and discuss key assessment topics including: air quality; geotechnics; highways; land quality; sound, noise and vibration and waste.
Wigan Borough Council	General introductory and project update meetings including meetings with transport teams, housing and regeneration. Regular interaction with ward councillors and breakfast briefing to councillors and local businesses about the positive impacts of HS2.
	Meetings with technical leads to collate data and discuss key assessment topics including air quality; geotechnics; highways; land quality; landscape and visual; sound, noise and vibration and noise.

3.4.10 Councils will continue to be engaged as part of the design development of the Proposed Scheme with ongoing dialogue on key topics such as highways, PRoW and the draft Code of Construction Practice (CoCP)[19].

Expert, technical and specialist groups

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

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

[19] Supporting document: Draft Code of Construction Practice

3.4.12 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.

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

Utilities

3.4.14 Engagement is also ongoing with utility companies and statutory stakeholders such as National Grid Transmission (Gas), United Utilities, BT Openreach, Virgin Media, Vodafone Ltd (Below Ground Assets), Vodafone and O2 Mobile Masts, EE and Three Mobile Masts, Cadent Gas, GeneSYS, Instalcom and Electricity North West to establish what infrastructure exists in the Risley to Bamfurlong area and how it may need to be modified as part of the Proposed Scheme.

Directly affected individuals, ~~and~~ major asset owners and businesses

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

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

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

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

3.4.19 A route-wide programme of engagement is ongoing, in parallel to the working draft ES process. This engagement provides affected individuals, major asset owners and businesses the opportunity to raise issues and opportunities in relation to the Proposed Scheme and to gain an understanding of compensation and assistance available for property owners. Within the Risley to Bamfurlong area, information events were held at Culcheth Sports Centre on 2 July and Lowton Social Club on 3 July 2018. Facilities were available at the events for affected individuals, major asset owners and businesses to have private meetings with HS2 staff.

3.4.20 Engagement has been undertaken with Taylor Business Park, Lowton Business Park, Fontaine Europe Ltd and Foilco.

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

4 Agriculture, forestry and soils

4.1 Introduction

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

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

4.1.3 Maps showing the location of the key environmental features (Map Series CT-10) and the key construction (Map Series CT-05) and key operational (Map Series CT-06) features of the Proposed Scheme are provided in the Volume 2: MA05 Map Book.

4.2 Scope, assumptions and limitations

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

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

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

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

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

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

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

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

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

4.3 Environmental baseline

Existing baseline

4.3.1 This section sets out the main baseline features that influence the agricultural and forestry use of land within the Risley to Bamfurlong 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 Risley to Bamfurlong area is provided in Section 10, Land quality and Section 15, Water resources and flood risk.

4.3.3 With regard to superficial deposits, there is an area of peat that is located at the southern end of the study area (Glazebrook Moss) approximately 500m north of the M62. Bands of glaciofluvial sheet deposits, comprising sand and gravel, are present intermittently along the Proposed Scheme between the M62 and south of Culcheth. Glacial till[23] (Devensian) deposits comprising sandy silt clay with gravel are located from Culcheth to the northern end of the study area. Glaciolacustrine deposits, comprising clay and silt, are present to the west of the A574 Warrington Road (around Yew Tree Farm and Glaziers Lane Farm) and just south of Lowton Junior and Infant School.

4.3.4 The bedrock geology in the study area comprises sandstone and conglomerate interbedded siltstones and mudstones, which are part of the Sherwood Sandstone Group. The Cumbrian Coast Group and Appleby Group are present in the north of the study area. The Cumbrian Coast Group typically comprises mudstones and the Appleby Group typically comprises sandstones. The Pennine Middle Coal Measures Formation is located in the northern extent of the study area and comprises coal seams, mudstone, siltstone and sandstone.

4.3.5 The Mercia Mudstone Group underlies the majority of the Proposed Scheme and comprises mudstone and siltstone; it is present in the study area from Glazebrook Moss to the A573 Wigan Road.

4.3.6 The Cumbrian Coast Group is present from just west of the A573 Wigan Road to Aye Bridge Farm, and the Appleby Group underlies the Proposed Scheme from Aye Bridge Farm to Bryn Gates.

4.3.7 The Pennine Middle Coal Measures Formation underlies the Proposed Scheme from Bryn Gates to the northern end of the study area.

4.3.8 The Helsby Sandstone Formation (part of the Sherwood Sandstone Group) comprises sandstone and is present from the southern end of the Proposed Scheme in the study area, around Glazebrook Moss to just south of Franks Farm.

4.3.9 The Wilmslow Sandstone Formation (part of the Sherwood Sandstone Group) comprises sandstone and is present from just south of Franks Farm to Lowton St Mary's.

4.3.10 The Chester Formation (part of the Sherwood Sandstone Group) comprises sandstone and is present from Lowton St Mary's to the A573 Wigan Road.

[23] 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

4.3.11 The Kinnerton Sandstone Formation (formerly named the Lower Mottled Sandstone) comprises sandstone and a thin band is present just west of the A573 Wigan Road.

4.3.12 The Manchester Marls Formation (Cumbrian Coast Group) comprises interbedded mudstone, siltstone and sandstone and is present just west of the A573 Wigan Road to Aye Bridge Farm.

4.3.13 The Collyhurst Sandstone Formation (Appleby Group) comprises sandstone and is present from Aye Bridge Farm to Bryn Gates.

4.3.14 The Pennine Middle Coal Measures (no parent group) comprises coal seams, mudstone, siltstone and sandstone and is present from Bryn Gates to the end of the Proposed Scheme in this area (around Bamfurlong).

Topography and drainage

4.3.15 At the southern end of the study area, the topography is broadly flat and rises in elevation from approximately 25m above Ordnance Datum (AOD) near the M62, to approximately 35m AOD to the south of Culcheth. This section of the Proposed Scheme comprises some peat land, including Holcroft Moss, and there are several peat workings, man-made lakes and ponds and a landfill site at Risley.

4.3.16 Between Culcheth and Golborne, the land undulates over gentle gradients (approximately two to three degrees) between elevations of approximately 35m AOD to 40m AOD. The land comprises fields which are enclosed by hedgerows and dotted with small ponds. The land use is a mixture of grassland and arable. This type of topography, elevation and land use continues north of Golborne to the northern end of the area and it includes a block of scrubland near Byrom Hall. There are no slopes within the study area with an angle exceeding seven degrees.

4.3.17 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 Holcroft Lane Brook and a tributary of Hey Brook. Other floodplains within the area that would be crossed by the route of the Proposed Scheme include those associated with Carr Brook, Small Brook, Windy Bank Brook, Nan Holes Brook and Coffin Lane Brook. Further details are provided in Section 15, Water resources and flood risk.

Description and distribution of soil types

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

4.3.19 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 published soil survey data.

[24] Soil Survey of England and Wales (1984), *Soils and their use in Midland and Western England*, Soil Survey of England and Wales, Bulletin No. 12, Harpenden
[25] Cranfield University (2001), *The National Soil Map of England and Wales 1:250,000 scale.* Cranfield University: National Soil Resources Institute

Soils grouped in the Salop association are predominant in this area. This association comprises slowly permeable and seasonally waterlogged clay loams over clay soils (Wetness Class[26] (WC) III to IV). They are developed in reddish glacial deposits, i.e. till and glaciofluvial sand and gravel deposits.

4.3.20 From the southern boundary at Glazebrook Moss to approximately 500m north of the M62 there is an area of peat, in which deep, earthy peat soils of the Turbary Moor association are formed. If these soils are improved for arable crops, usually by pumped ditches combined with field drains, they are well drained (WC I). Wetness class will vary depending on the level of the water-table and duration of waterlogging during the winter months. These peat soils hold large amounts of water available for crops.

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

4.3.22 In the far north of the study area, there are loamy and clayey soils in the Brickfield 3 association. These surface-water gley soils are waterlogged for long periods during the winter (WC IV). Much of this association is under permanent grass for livestock and dairying.

Soil and land use interactions

Agricultural land quality

4.3.23 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.

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

4.3.25 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.

4.3.26 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

[26] The Wetness Class of a soil is classified according to the depth and duration of waterlogging in the soil profile and has six categories from WC I which is well drained to WC VI which is very poorly drained
[27] A measure of the likely moisture stress in a crop arising from the crop's requirement for water exceeding the available water capacity in the soil
[28] Meteorological Office (1989), *Grid point Meteorological data for Agricultural Land Classification of England and Wales and other Climatological Investigations*

show climate in the area to be cool and moist. The number of Field Capacity Days[29] (FCDs), when the moisture deficit[30] is zero, ranges from 207 to 217 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.

4.3.27 The quality of agricultural land in this study area is not limited by gradient, i.e. angle of slope less than seven degrees, or microrelief[31]. Flood risk limits the quality of agricultural land to Subgrade 3b or Grade 4 along the Nan Holes Brook in the far northern end of the study area. Further details are provided in Section 15, Water resources and flood risk.

4.3.28 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 content and moisture deficits.

4.3.29 The clay loam over clay soils in the predominant Salop association are slowly permeable and seasonally waterlogged for long periods during the winter (WC IV). In a climate area with between 207 to 217 FCDs, soil profiles with heavy clay loam topsoil are limited by soil wetness to Grade 4. Where the topsoil is medium clay loam, the soil profiles are limited to Subgrade 3b. Salop soil profiles in WC III are limited by soil wetness to Subgrade 3b where the topsoil is heavy clay loam, and to Subgrade 3a where the topsoil is medium clay loam.

4.3.30 Deep earthy peat soil of the Turbary Moor association (WC I) is classified as Grade 1 where the topsoil is peat, or Grade 2 where the topsoil is organic medium clay loam. The peaty soils are limited by soil wetness to Grade 2 (WC III), or Subgrade 3a (WC IV).

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

4.3.32 Loamy and clayey soils in the Brickfield 3 association which are waterlogged for long periods during the winter (WC IV) are limited by soil wetness to Subgrade 3b where

[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

the topsoil is medium clay loam, and Grade 4 where the topsoil is heavy clay loam or clay.

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

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

Other soil interactions

4.3.35 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.

4.3.36 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.

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

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

Land use

Land use description

4.3.38 Agricultural land use in this study area is predominantly arable, although some grassland farms (with dairy and beef cattle) are also present. Around Glazebrook, Culcheth and Lowton some smaller equestrian holdings are also found.

4.3.39 Woodland is sparse and limited to small parcels of tree planting across the study area. No commercial forestry has thus far been identified in this study area though there are parcels of land north of Golborne that are understood to be owned by the Forestry Commission that will be being managed for their forestry resource. Full details will be reported in the formal ES. A number of environmental designations influence land use within the study area. The whole area is a nitrate vulnerable zone, where statutory land management measures apply limiting the average amount of nitrogen from manufactured fertiliser and organic manures that can be applied to agricultural land in order to reduce nitrogen losses from agricultural sources to the natural water environment.

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

4.3.41 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

4.3.42 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 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.

4.3.43 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**
Franks Farm	Arable	188	Physiotherapy clinic	HLS	Medium
Ratcliffe Hall Farm	Arable and beef cattle	50	Equestrian livery	Woodland Grant Scheme	Medium
New Hall Farm	Arable and beef cattle	21	Caravan storage	None	Medium
New Hey Farm	Beef cattle	130	None	ELS	Medium
Bates Farm[35]	Arable, beef cattle and sheep	102	None	None	Medium
Yew Tree Farm*	Grassland	1	Caravan Club	Not known	Low
Partridge Lakes Fishery	Fishing lakes	27	Commercial lets	None	Medium
Land at Blakeley Farm*	Arable and grassland	32	Not known	Not known	Medium
Southwall Hall Farm	Arable	546	Hay/straw merchant	None	Medium
Johnsons Farm	Organic dairy	59	Property rental	Mid-tier (Organic)	High
Land at Broseley Hall*	Arable and grassland	45	Not known	Not known	Medium

[35] Multiple land owners, but occupied by the same lessee

Holding name	Holding type	Holding size (ha)	Diversification	Agri-environment scheme	Sensitivity to change
White's Farm	Equestrian grazing and hay	15	Waste disposal (skips)	None	Medium
Birchalls Farm	Arable and beef cattle	100	Agricultural contracting	None	Medium
Land at Lowton*	Grassland	11	Not known	None	Medium
Red House Farm	Beef cattle	13	None	None	Medium
Bancroft Kennels	Dog kennels	2	Kennels and cattery	None	Low
Land at Laburnum Farm*	Grassland	5	Not known	None	Medium
72 Slag Lane	Grassland, sheep and equestrian	26	Haulage	None	Medium
Land north of 72 Slag Lane*	Grassland	5	Not known	None	Low
Byrom Hall	Grassland	5	None	None	Low
Forestry land at Golborne*	Forestry and access land	35	Not known	None	Low
Wigan Road Farm	Beef cattle	22	None	None	Medium
Windy Bank Farm	Arable and grassland	36	None	None	Medium
Lightshaw Hall	Arable and grassland	23	None	None	Medium
Land at Balmer's Farm*	Grassland	26	Not known	None	Medium
Land at Aye Bridge Farm*	Grassland	28	Not known	None	Medium

Holding name	Holding type	Holding size (ha)	Diversification	Agri-environment scheme	Sensitivity to change
Land at Bamfurlong Hall Farm*	Grassland	40	Not known	None	Medium

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

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)[36] will avoid or reduce environmental impacts during construction. Those measures that are particularly relevant to agriculture, forestry and soils are set out in the draft CoCP and relate to:

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

[36] Supporting document: Draft Code of Construction Practice

- 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: or mitigate adverse impacts on agriculture, forestry or soils:

- agricultural crossing provided at Risley East underbridge (CT-06-327);
- agricultural crossing incorporated into the Croft Footpath 27 accommodation underbridge to mitigate severance for Ratcliffe Hall Farm (CT-06-327);
- agricultural and forestry crossing incorporated into the Golborne Footpath 33 accommodation underbridge (CT-06-331);
- revised access to agricultural land at Lightshaw Hall (CT-06-332); and
- agricultural crossing provided at Ashton-in-Makerfield Footpath 22 accommodation underbridge (CT-06-333).

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.

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 soils in the Salop and Brickfield 3 associations) 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 shows that the Proposed Scheme is likely to require approximately 239ha of agricultural land within the Risley to Bamfurlong area during the construction phase, of which approximately 96ha (40%) are likely to be classified as BMV land (Grades 1, 2 and 3a). This is a medium magnitude of impact on BMV land.

4.4.9 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 will 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[37]. These principles would be followed throughout the construction period.

4.4.13 Peaty, clayey and seasonally waterlogged soils (including soils in the Salop, Turbary Moor and Brickfield 3 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 The disturbance of peat soils has implications for carbon emissions and biodiversity. Design development of the Proposed Scheme would seek to reduce disturbance of any deep peat soils as far as possible. Where disturbance cannot be avoided, the peat soils would be handled with particular care to avoid compaction when wet and wind erosion when dry. When reinstated, opportunities would be taken to use peat soils to create habitats, enhance biodiversity and build carbon reserves.

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

Impacts on holdings

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

4.4.17 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.

4.4.18 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.

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

4.4.19 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**
Franks Farm Medium sensitivity	Medium	Low	Moderate adverse
Ratcliffe Hall Farm Medium sensitivity	Medium	Low	Moderate adverse
New Hall Farm Medium sensitivity	High	Negligible	Major/moderate adverse
New Hey Farm Medium sensitivity	Negligible	Negligible	Negligible
Bates Farm Medium sensitivity	High	Medium	Major/moderate adverse
Yew Tree Farm Low sensitivity	High	High	Moderate adverse
Partridge Lakes Fishery Medium sensitivity	Negligible	Negligible	Negligible
Land at Blakeley Farm Medium sensitivity	Medium	High	Major/moderate adverse
Southwall Hall Farm Medium sensitivity	Negligible	Negligible	Negligible
Johnsons Farm High sensitivity	Low	Negligible	Moderate adverse
Land at Broseley Hall Medium sensitivity	Medium	Negligible	Moderate adverse
White's Farm Medium sensitivity	High	Negligible	Major/moderate adverse
Birchalls Farm Medium sensitivity	High	Medium	Major/moderate adverse
Land at Lowton Medium sensitivity	High	Negligible	Major/moderate adverse
Red House Farm Medium sensitivity	High	High	Major/moderate adverse
Bancroft Kennels Low sensitivity	High	Medium	Moderate adverse
Land at Laburnum Farm Medium sensitivity	High	Medium	Major/moderate adverse
72 Slag Lane Medium sensitivity	High	Medium	Major/moderate adverse

Holding name/ sensitivity to change	Land potentially required	Potential severance impact	Potential scale of effect
Land north of 72 Slag Lane Low sensitivity	High	Medium	Moderate adverse
Byrom Hall Low sensitivity	Negligible	Negligible	Negligible
Forestry land at Golborne Low sensitivity	Medium	Medium	Minor
Wigan Road Farm Medium sensitivity	Low	Medium	Moderate adverse
Windy Bank Farm Medium sensitivity	High	Negligible	Major/moderate adverse
Lightshaw Hall Medium sensitivity	Low	Negligible	Minor
Land at Balmer's Farm Medium sensitivity	High	High	Major/moderate adverse
Land at Aye Bridge Farm Medium sensitivity	High	Negligible	Major/moderate adverse
Land at Bamfurlong Hall Farm Medium sensitivity	High	High	Major/moderate adverse

4.4.20 Overall, the construction of the Proposed Scheme could potentially affect 27 holdings temporarily in the Risley to Bamfurlong area. On the basis of information currently available, 21 holdings could experience moderate or major/moderate temporary effects from construction the majority due to the proportion of land required, which would be significant for each holding.

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

Permanent effects of construction

Impacts on agricultural land

4.4.22 Interpretation of publicly available data shows that the Proposed Scheme is likely to require approximately 151ha of agricultural land permanently within the Risley to Bamfurlong area, of which approximately 60ha (40%) are likely to be classified as BMV land (Grades 1, 2 and 3a). This is a medium magnitude of impact on BMV land.

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

Impacts on forestry land

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

Impacts on holdings

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

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

Table 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**
Franks Farm Medium sensitivity	Medium	Low	Low	Moderate adverse
Ratcliffe Hall Farm Medium sensitivity	Medium	Low	Low	Moderate adverse
New Hall Farm Medium sensitivity	Medium	Negligible	Low	Moderate adverse
New Hey Farm Medium sensitivity	Negligible	Negligible	Negligible	Negligible
Bates Farm Medium sensitivity	Medium	Medium	Low	Moderate adverse
Yew Tree Farm Low sensitivity	High	High	High	Moderate adverse
Partridge Lakes Fishery Medium sensitivity	Negligible	Negligible	High	Major/moderate adverse
Land at Blakeley Farm Medium sensitivity	Medium	High	Low	Major/moderate adverse
Southwall Hall Farm Medium sensitivity	Negligible	Negligible	Low	Minor adverse
Johnsons Farm High sensitivity	Negligible	Negligible	Low	Moderate adverse
Land at Broseley Hall Medium sensitivity	Medium	Negligible	Low	Moderate adverse
White's Farm Medium sensitivity	Medium	Negligible	Low	Moderate adverse

Holding name/ Sensitivity to change	Land potentially required	Potential severance impact	Potential impact on farm infrastructure	Potential scale of effect
Birchalls Farm Medium sensitivity	Medium	Medium	High	Major/moderate adverse
Land at Lowton Medium sensitivity	High	Negligible	Negligible	Major/moderate adverse
Red House Farm Medium sensitivity	Medium	High	Low	Major/moderate adverse
Bancroft Kennels Low sensitivity	High	Medium	High	Moderate adverse
Land at Laburnum Farm Medium sensitivity	High	Medium	High	Major/moderate adverse
72 Slag Lane Medium sensitivity	Medium	Medium	Low	Moderate adverse
Land north of 72 Slag Lane Low sensitivity	High	Medium	Negligible	Moderate adverse
Byrom Hall Low sensitivity	Negligible	Negligible	Negligible	Negligible
Forestry land at Golborne Low sensitivity	Medium	Medium	Negligible	Minor adverse
Wigan Road Farm Medium sensitivity	Low	Medium	Low	Moderate adverse
Windy Bank Farm Medium sensitivity	High	Negligible	Low	Major/moderate adverse
Lightshaw Hall Medium sensitivity	Low	Negligible	Low	Minor adverse
Land at Balmer's Farm Medium sensitivity	High	High	Low	Major/moderate adverse
Land at Aye Bridge Farm Medium sensitivity	High	Negligible	High	Major/moderate adverse
Land at Bamfurlong Hall Farm Medium sensitivity	High	High	Low	Major/moderate adverse

4.4.27 Overall, the construction of the Proposed Scheme could potentially affect 27 holdings in the Risley to Bamfurlong area permanently. On the basis of information currently available, 22 holdings could experience moderate, major/moderate or major adverse permanent effects from construction, which would be significant for each holding. For the majority of the holdings it is the proportion of land required that is most significant but for six holdings (Yew Tree Farm, Partridge Lakes Fishery, Birchalls Farm, Bancroft Kennels, Laburnum Farm and Aye Bridge Farm) property demolition is also significant.

4.4.28 Although financial compensation would 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

4.4.29 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.

4.4.30 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

4.4.31 Although the final extent of land required permanently by ALC grade is not yet known in the Risley to Bamfurlong area, current indications are that the temporary effect on BMV agricultural land would be moderate adverse temporarily during construction, which would be significant, and moderate adverse permanently from construction, which is significant.

4.4.32 Twenty-one of the 27 farm holdings identified are anticipated to experience moderate or major/moderate temporary effects during construction, which would be significant for each holding. Twenty-two[38] holdings are anticipated to experience moderate, major/moderate or major adverse permanent effects during construction, which would be significant.

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

4.5 Effects arising from operation

Avoidance and mitigation measures

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

Assessment of impacts and effects

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

[38] The effect of demolition is only reported as a permanent effect; it does not appear in the assessment of temporary effects and explains in part why more holdings are permanently significantly affected than during the temporary construction phase

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

4.5.3 Six sets of farm buildings at Land at Blakeley Farm, White's Farm, 72 Slag Lane, Balmer's Farm, Aye Bridge Farm and Bamfurlong Hall 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 Risley to Bamfurlong 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 Risley to Bamfurlong area. Oxides of nitrogen (NOx) including nitrogen dioxide (NO2), fine particulate matter[39] (PM10, PM2.5) and dust have been considered in the assessment. Emissions of all or some of these air pollutants are likely to arise from construction activities, demolition, site preparation works and the use of site haul routes. Emissions would also arise from road traffic during construction and operation of the Proposed Scheme.

5.1.2 Engagement with Warrington Borough Council (WBC) and Wigan Metropolitan Borough Council (WMBC) 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: MA05 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)[40].

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[41]:

- 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.

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

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

5.3 Environmental baseline

Existing baseline

Background air quality

5.3.1 The main sources of air pollution in the Risley to Bamfurlong area are emissions from road vehicles and agricultural activities. The main roads within the area are the A49, A577, A58, A578, A580, M62 and M6.

5.3.2 There are six industrial installations (regulated by the Environment Agency) with permits for emissions to air, namely Greencore Prepared Meals Limited, the Risley Landfill Site, Diggle Green Farm composting facility, the Lyme and Woods Pits, Chemviron Carbon Limited and the Electric Glass Fiber plant. 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)[42] 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 Risley to Bamfurlong area.

Local monitoring data

5.3.4 There are currently 24 local authority diffusion tube sites located within the Risley to Bamfurlong area for monitoring NO2 concentrations. Measured concentrations in 2016[43] were within the air quality standard for most sites, except for two sites along the A577 Manchester Road and the A580 East Lancashire Road, both of which are within the Greater Manchester Combined Authority Air Quality Management Area (AQMA).

5.3.5 There are currently three automatic monitoring stations located within the Risley to Bamfurlong area for monitoring NO2 concentrations. These are located at Wigan Centre, Newton-le-Willows High Street and Southworth Road, close to the M6. Measured concentrations in 2016 were within the air quality standard for two of the monitors, but were above the standard at the Southworth Road site.

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

5.3.6 The Wigan Centre automatic monitoring station also carries out measurements of PM10 concentrations. Measured concentrations in 2016 were within the air quality standard at this site.

Air quality management areas

There are four AQMA within the Risley to Bamfurlong area: the Greater Manchester Combined Authority AQMA, M6 AQMA No. 1, Newton High Street AQMA No. 2 and Warrington AQMA No. 1. All AQMAs have been designated for exceedances of the annual mean NO2 standard.

5.3.7 The Greater Manchester Combined Authority AQMA covers a number of areas in the Greater Manchester area and was declared in May 2016. The M6 AQMA No. 1 covers an area encompassing the M6 for its entire length within St Helens Metropolitan Borough and was declared in April 2009. The Newton High Street AQMA No. 2 covers an area along the A49 Newton-le-Willows High Street, between the junctions of Ashton Road and Church Street and was declared in April 2009. Warrington AQMA No. 1 covers a 50m continuous strip on both sides of the M6, M62 and M56 corridors and was declared in November 2001.

Receptors

5.3.8 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.

5.3.9 Most of the receptors which may be affected by the Proposed Scheme are residential. Other receptors include HMP Risley Remand Centre, Bamfurlong Recreation Ground and numerous schools.

5.3.10 There are seven statutory designated ecological sites identified within the Risley to Bamfurlong area, namely Risley Moss Site of Special Scientific Interest (SSSI), Manchester Mosses Special Area of Conservation (SAC), Holcroft Moss SSSI, Astley and Bedford Mosses SSSI, Highfield Moss SSSI, Abram Flashes SSSI and Bryn Marsh and Ince Moss SSSI.

5.3.11 Other non-statutory sensitive ecological sites identified close to the Proposed Scheme include Risley Moss Local Nature Reserve (LNR), Silver Lane Ponds Local Wildlife Site (LWS), Gorse Covert Mounds LWS, Eleven Acre Common LWS, Lightshaw Lane SBI, the Wigan Flashes LNR, Horrock's Flash SBI and the Carr Brook watercourse habitat. 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 Code of Construction

Practice (CoCP)[44] includes a range of mitigation measures that are accepted by the Institute of Air Quality Management (IAQM) as being suitable to reduce impacts to as low a level as is reasonably practicable. These measures are generally sufficient to avoid any significant effects from dust during construction.

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

- contractors' being required to manage dust, air pollution, odour and exhaust emissions during construction works;
- inspection and visual monitoring, undertaken in consultation with the local authorities, to assess the effectiveness of the measures taken to control dust and air pollutant emissions;
- cleaning (including watering) of vehicle routes and designated vehicle waiting areas to suppress dust;
- the use of water spray systems on demolition sites to dampen down fugitive dust;
- keeping soil stockpiles away from sensitive receptors where reasonably practicable, also taking into account the prevailing wind direction relative to sensitive receptors;
- the use of enclosures to contain dust emitted from construction activities; and
- soil spreading, seeding and planting of completed earthworks as soon as reasonably practicable following completion of earthworks.

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

Assessment of impacts and effects

Temporary effects

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

Construction dust effects

5.4.5 The risks of demolition of existing buildings, earthworks, construction of new structures and trackout[45] have been assessed for their effect on dust soiling, human

[44] Supporting document: Draft Code of Construction Practice
[45] 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

health[46] and ecological sites. There are residential and ecological receptors located within the Risley to Bamfurlong area.

5.4.6 For demolition, the risk of dust and human health effects would range from negligible to high within this area, depending on the location of sensitive receptors and the magnitude of the activities. For earthworks, the risk of dust effects would range from low to high, depending on the location of sensitive receptors and the magnitude of the construction activities. There would also be a low to medium risk of human health effects from earthworks. For construction, the risk of dust effects and human health effects would range from negligible to medium within this area, depending on the location of sensitive receptors and the magnitude of the activities. For trackout, the risk of dust effects would range from low to high, depending on the location of sensitive receptors and the magnitude of the activities. There would also be a low to medium risk of human health effects from trackout. The risk of ecological effects from all dust generating activities would range from negligible to high, depending on the location of sensitive receptors and the magnitude of the activities. No demolition activities would affect any ecological receptors.

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

Construction traffic effects

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

5.4.9 The M62, M6, A49 Warrington Lane/A49 Lodge Road, A49 Wigan Road, A572 Newton Road, A573, A574, A58, A580 East Lancashire Road and B5207 would likely provide the primary access for construction vehicles in this area. An increase in traffic flows as a result of construction traffic, temporary closures or diversions is anticipated on the A574 Warrington Road, A573 Aye Bridge Road, A572 Newton Road, B5207 Wilton Lane, Glaziers Lane, Slag Lane and A573 Wigan Road. 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.

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

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 and changes in road alignment.

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

Operational traffic effects

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

Other mitigation measures

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

Summary of likely residual significant effects

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

Monitoring

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

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

6 Community

6.1 Introduction

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

6.1.2 The assessment draws on information gathered from engagement with the users and operators of community facilities and open spaces including Partridge Lakes Fishery, Culcheth Linear Park and Manchester City of Trees. 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: MA05 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)[47].

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

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

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

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

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

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

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

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

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

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

6.3 Environmental baseline

6.3.1 The route of the Proposed Scheme through the Risley to Bamfurlong area would be approximately 13km in length and lies within the local authority areas of Warrington Borough Council (WBC) and Wigan Metropolitan Borough Council (WMBC). The route of the Proposed Scheme passes through a predominantly rural area.

6.3.2 The route of the Proposed Scheme passes through or near to the settlements of Birchwood (a suburb of Warrington), Culcheth, Wigshaw, Little Town, Kenyon, Lowton, Golborne, Abram and Bamfurlong. Most of the urban settlements in the area, where the majority of community resources are located, border existing key transport routes, namely the M6, M62, A574 Wigan Road and the A580 East Lancashire Road (known locally as the East Lancs Road). Areas between larger settlements are characterised by smaller settlements with few community resources, small clusters of dwellings, and individual farms.

Birchwood, Culcheth and surrounds

6.3.3 This area covers the settlements of Birchwood, Culcheth and surrounds, from the southern boundary of the Risley to Bamfurlong area to the A580 East Lancashire Road.

6.3.4 Birchwood, which has approximately 5,000 residential properties, is located to the south-west of the route of the Proposed Scheme. The nearest residential properties would be approximately 850m from the route of the Proposed Scheme. There are many community resources within Birchwood, including schools (such as Gorse Covert Primary School and Birchwood Church of England Primary School), places of worship, medical facilities, care homes, cafes, and recreational facilities such as Birchwood Golf Club.

6.3.5 Culcheth, which has approximately 3,000 residential properties, is located to the east of the route of the Proposed Scheme. The nearest residential properties would be approximately 400m from the route of the Proposed Scheme. There are many community resources within Culcheth, including schools (such as Newchurch Community Primary School, Culcheth Community Primary School and Culcheth High School), places of worship (such as Culcheth Methodist Church), medical facilities, and recreational facilities such as Shaw Street Recreational Grounds, Culcheth Linear Park and Leigh Golf Club. The Oaks, on the outskirts of Culcheth, comprises six football pitches and is the site for the Culcheth Athletic Junior Football Club – a football club for children. Adjacent to The Oaks is the site of Yew Tree Farm Caravan Club site, a caravan site accommodating five caravans/motorhomes which is open all year round.

6.3.6 The village of Wigshaw, with approximately 20 residential properties, would be situated on the route of the Proposed Scheme. Wigshaw is the Partridge Lakes Fishery – a recreational fishing facility comprising 15 coarse fishing lakes across 28ha is located in Wigshaw.

6.3.7 Risley Moss Site of Special Scientific Interest (SSSI) and Nature Reserve is an 83ha peat bog located to the east of Birchwood and an important wildlife habitat. Risley Moss is publicly accessible with woodland walk routes, picnic areas and a visitor centre.

Lowton, Golborne and surrounds

6.3.8 This area covers the settlements of Lowton, Golborne and surrounds, from the A580 East Lancashire Road north to the A573 Wigan Road.

6.3.9 The suburban village of Lowton has approximately 3,200 residential properties and a range of community facilities. The nearest residential properties would be on the route of the Proposed Scheme.

6.3.10 The A580 East Lancashire Road runs to the south of the village. First Steps Private Day Nursery, Lowton Junior and Infant School, St. Luke's Church of England Primary School, St. Catherine's Catholic Primary School and Green Meadow Independent Primary School would be to the west of the route of the Proposed Scheme. Two retirement living housing estates, Lowton Saint Luke church, Lowton Community Hub

(a youth and community centre) and three GP surgeries would also be located to the west of the route of the Proposed Scheme.

6.3.11 Lowton Church of England High School, Glided Hollins Community School, Lowton St Mary's Parish Church and Independent Methodist Church Lowton would be located to the east of the route of the Proposed Scheme.

6.3.12 Hesketh Meadow Playing Fields, a recreational open space with seven football pitches and home to East Leigh Junior Football Club is located within land required for the route of the Proposed Scheme. GymEtc, a gym with membership options for children, is located within land required for the route of the Proposed Scheme. The gym offers swimming facilities and range of fitness classes and is open seven days a week.

6.3.13 Golborne is a town to the west of the route of the Proposed Scheme with approximately 7,300 residential properties. The nearest residential properties would be located approximately 700m from the route of the Proposed Scheme. Golborne has a wide range of community facilities including schools (such as Rainbow Day Nursery, Golborne Community Primary School, All Saints Catholic Primary School, St Thomas CE Junior and Infant School and Golborne High School); several places of worship (such as All Saints Roman Catholic Church and Heath Street Methodist Church) and a number of doctors' surgeries. The A573 (Bridge Street/High Street/Church Street) runs through the centre of Golborne.

6.3.14 Pennington Flash is a 200ha country park with lake and marshland located between Lowton and Pennington. Community facilities such as Pennington Golf Course, Leigh and Lowton Sailing Club, horse riding and fishing facilities, walking routes, play areas and picnic areas are all located at the site. Directly east of Pennington Flash is Byrom Hall Wood, an area of approximately 27ha of publicly accessible woodland and walking routes.

6.3.15 Promoted PRoW in the area include the Glazebrook Timberland Trail, a long-distance walking route which links Pennington Flash Country Park to the Manchester Ship Canal in Cadishead and the Leeds to Liverpool Canal.

Bamfurlong and surrounds

6.3.16 The village of Bamfurlong, with 400 residential properties, is situated to the west of the route of the Proposed Scheme, where the A58 Lily Lane intersects with the West Coast Main Line (WMCL). The nearest residential properties would be approximately 500m from the route of the Proposed Scheme. There are a small number of community facilities in Bamfurlong, including Abram Bryn Gates Primary School, Bamfurlong Methodist Church, Church of the Good Shepherd, Bamfurlong Police Station, a post office, a convenience store, Bryn Hall pubic house and Bamfurlong Recreation Ground. Viridor Wood is an area of approximately 100ha of open space and woodland. Viridor Wood includes several leisure walking routes and is located adjacent to the route of the Proposed Scheme south of Bamfurlong.

6.4 Effects arising during construction

Avoidance and mitigation measures

6.4.1 The draft Code of Construction Practice (CoCP)[48] includes a range of provisions that will help mitigate community effects associated with construction within this area, including:

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

Assessment of impacts and effects

Temporary effects

Residential properties

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

Community facilities

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

Recreational facilities

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

[48] Supporting document: Draft Code of Construction Practice

Open space and PRoW

6.4.5 Construction of the Culcheth north embankment and associated culvert construction, drainage outfalls and PRoW diversions would temporarily restrict access to the northern half of Culcheth Linear Park, a 2.5km linear walking route. The Linear Park stretches from the A574 Warrington Road to the Liverpool to Manchester (Chat Moss) railway line and can be accessed at various points along the route, with car parking available on Wigshaw Lane. Approximately 50% of the park would be inaccessible for approximately one year and nine months. It is expected that all of the land would be returned to its previous use following completion of the construction activity.

6.4.6 Proposed mitigation and an assessment of the likely effects will be reported in the formal ES.

Permanent effects

Residential properties

6.4.7 Construction of the Culcheth cutting would require the demolition of one residential property on A574 Warrington Road at Risley, one residential property on Wigshaw Lane in Wigshaw and three residential properties on Glaziers Lane in Wigshaw. These residential properties would be permanently lost.

6.4.8 Land required for the Proposed Scheme including the Lowton cutting would require the demolition of two residential properties on B5207 Wilton Lane, south-east of Lowton. These residential properties would be permanently lost.

6.4.9 Land required for the Lowton cutting would require the demolition of eight properties on Newton Road, Lowton. The permanent loss of these eight properties would result in a moderate adverse effect, which is significant.

6.4.10 Land required for the Pennington embankment would require the demolition of two residential properties on Lightshaw Lane, on the outskirts of Golborne. These properties would be permanently lost.

6.4.11 Land required for the Proposed Scheme including Pennington embankment would require the demolition of two properties on Slag Lane, near Lowton. These residential properties would be permanently lost.

Community facilities

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

Recreational facilities

6.4.13 In the area around Culcheth, land required for the A574 Warrington Road overbridge and associated road realignment would require all 0.12ha of land currently used by Yew Tree Farm Caravan Club site. Yew Tree Farm Caravan Club site is a caravan site located on a working farm. The Club has five pitches and is open all year. On site facilities include an information room, laundry, shower and toilet facilities. There are several other farms and caravan/camping sites offering similar facilities in proximity to Yew Tree Farm. Therefore, the permanent loss of Yew Tree Farm Caravan Club site

and the services it provides has been identified as a minor adverse effect which is not considered to be significant.

6.4.14 Land required for the route of the Proposed Scheme and Lowton cutting would require the demolition of GymEtc - a gym in Lowton with over 130 exercise stations, dedicated weights areas, a specialist cardio room, heated swimming pool, steam room and sauna. The gym is open seven days a week and offers a range of classes, including child swimming lessons and child membership. There are no similar facilities in Lowton (the nearest alternative, Leigh Sports Village, is located approximately 2.5km north west of GymEtc) and while there are alternative gyms in Golborne, these do not have swimming facilities, nor do they have child membership. Therefore, the permanent loss of GymEtc and the services it provides has been identified as a moderate adverse effect, which would be significant.

6.4.15 Land required for the route of the Proposed Scheme and Glaziers Lane realignment would permanently restrict access to Partridge Lakes Fishery in Wigshaw. The fishery would therefore close as a result of the Proposed Scheme. The fishery is a recreational fishing facility comprising 15 course fishing lakes across 28ha. Regular fishing events take place at the site, with smaller matches held almost daily at the fishery, including dedicated matches for those over 60 years of age and for people who are disabled. The nearest alternative is located approximately 5km away at Pennington Flash Country Park and Moss Side Farm. The permanent closure of Partridge Lakes Fishery has been identified as a major adverse effect, which would be significant.

Open space and PRoW

6.4.16 The A574 Warrington Road overbridge and realignment would result in the permanent loss of approximately 1ha of The Oaks playing fields on the outskirts of Culcheth, including its sole access point and car park, three outbuildings, and four football pitches. The Oaks is a privately owned six-pitch football playing field, covering approximately 4.5ha, which was established for the Culcheth Athletic Junior Football Club. The Club provides children with the opportunity to play football and develop teamwork skills. The Club currently has 23 teams (ranging from under 7 to under 17), over 350 members and over 40 managers/coaches. There is adjacent land, with the same ownership, which has the potential to be used for football pitches. More widely, within 2km of The Oaks, there are several venues with football pitches, including several schools, Shaw Street Recreation Ground and Culcheth Sports Club. However, in the absence of mitigation, the loss of land at The Oaks would impact the viability of Culcheth Athletic Junior Football Club and would result in the loss of outdoor playing fields for children in the local area. This is considered to be a moderate adverse effect, which would be significant.

6.4.17 In Lowton, works to construct the route of the Proposed Scheme adjacent to the A572 Newton Road overbridge would require approximately 5ha of the Hesketh Meadows playing fields located on Hesketh Meadow Lane. The playing fields, which cover a total area of approximately 5ha, and comprise seven football pitches, are located behind the former Lowton Civic Hall. Hesketh Meadows is used regularly by East Leigh Junior Football Club, a football club for children up to the age of 18. The Club presently has 17 teams (ranging from under seven to under 18) and an academy for

children aged under six. There are limited publicly accessible alternative resources on this scale that provide a similar service within Lowton. Therefore, the permanent loss of Hesketh Meadows playing fields has been identified as a major adverse effect, which would be significant.

6.4.18 Land required for the route of the Proposed Scheme and construction of Golborne Footpath 33 underbridge and Golborne Footpath 31 underbridge would lead to Byrom Hall Wood being bisected. Byrom Hall Wood located to the north-east of Golborne, is approximately 27ha of woodland with footpaths offering a 1.5km circular route. The area is accessible via Slag Lane and footpaths provide pedestrian access at each of the four corners of the woodland. The Proposed Scheme would require approximately 4ha of land, south to north, through the centre of the woods. Following construction, the underbridges would provide pedestrian access between the two halves of the remaining woodland. The nearest alternative open space is located at Pennington Flash, which is approximately 1km away. The permanent requirement for land at Byrom Hall Wood has been identified as a moderate adverse effect, which would be significant.

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 likely to result in temporary residual significant effects on Culcheth Linear Park in Culcheth.

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

- loss of residential properties on Newton Road in Lowton;
- demolition of GymEtc on Newton Road in Lowton;
- the loss of Partridge Lakes Fishery in Wigshaw;
- the loss of The Oaks playing fields near Culcheth;
- the loss of Hesketh Meadows playing fields in Lowton; and
- the loss of land at Byrom Hall Wood near Golborne.

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

7.1.3 Maps showing the location of the key environmental features (Map Series CT-10) and the key construction (Map Series CT-05) and key operational (Map Series CT-06) features of the Proposed Scheme are provided in the Volume 2: MA05 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)[49].

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 The land required for the Proposed Scheme in this area consists largely of low lying land in mixed agricultural use with areas of woodland and wet grassland and abundant

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

ponds. The route of the Proposed Scheme crosses several small watercourses and numerous drainage ditches throughout the area. An area of mossland is located in the south of the area and there is a series of wetlands near Wigan. The Risley to Bamfurlong area is within the Greater Manchester Wetlands Nature Improvement Area. The M62 runs east to west at the southern end of the Proposed Scheme in this area.

7.3.3 Statutory and non-statutory designated sites are shown on Map Series CT-10, Volume 2: MA05 Map Book.

Designated sites

7.3.4 There is one internationally important Special Area of Conservation (SAC) of potential relevance to the assessment in the Risley to Bamfurlong area. Manchester Mosses SAC is 170.5ha in size and consists of three constituent sites located to the west of Manchester. The SAC is designated for the degraded raised bog which is considered an Annex I Habitat[50]. Holcroft Moss Site of Special Scientific Interest (SSSI) is the nearest component of the SAC, with its southern and western boundary located immediately adjacent to land that has been identified for the purpose of habitat creation or enhancement, as part of the Proposed Scheme, west of Irlam. The remaining components of the SAC are Risley Moss SSSI, located east of Warrington, 790m west of the land required for the Proposed Scheme in the Risley to Bamfurlong area and 1km from the land required for the Proposed Scheme in the Broomedge to Glazebrook area, and Astley and Bedford Mosses SSSI located south of Leigh, 3.4km east of the land required for the Proposed Scheme in the Risley to Bamfurlong area and 3.8km north-east of land required for the Proposed Scheme in the Broomedge to Glazebrook area.

7.3.5 There are six nationally important Sites of Special Scientific Interest (SSSIs) of potential relevance to the assessment in the Risley to Bamfurlong area. For each of these sites, the Proposed Scheme in this area is within the Impact Risk Zone[51] relevant to railway infrastructure as identified by Natural England. They are:

- Risley Moss SSSI covers an area of 83.2ha. It is designated as one of the last remaining fragments of the raised bog system that once covered large areas of South Lancashire and North Cheshire. 60ha of the SSSI is a constituent of the Manchester Mosses SAC. The SSSI is located east of Warrington 790m west of the land required for the Proposed Scheme in the Risley to Bamfurlong area and 1km from land required for the Proposed Scheme in the Broomedge to Glazebrook area;
- Holcroft Moss SSSI is a constituent part of the Manchester Mosses SAC and covers an area of 19.4ha. It is designated as the only known uncut area of raised bog remaining in Cheshire. The surface vegetation of the moss is dominated by purple moor-grass with abundant heather, cross-leaved heath

[50] Annex 1 of the EU's Habitats Directive (1992) lists key habitat types whose conservation requires the designation of Special Areas of Conservation
[51] 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

and cranberry. Wetter hollows support common cottongrass and deergrass. Five species of bog moss have been recorded in these hollows. The site supports dragonfly populations including the locally scarce black darter and notable breeding and wintering bird assemblages. The SSSI is immediately adjacent to land required for the Proposed Scheme, west of Irlam;

- Highfield Moss SSSI covering an area of 20.1ha is designated for its peatland vegetation, including acidic marshy grassland and unimproved acidic grassland. It is the best remaining example of the raised mires which once covered large areas of lowland in Greater Manchester and Merseyside. The SSSI is located south of Golborne 1.3km west of the land required for the Proposed Scheme;

- Astley and Bedford Mosses SSSI is a constituent part of Manchester Mosses SAC and covers an area of 92.2ha. It is designated as one of the largest remaining fragments of Chat Moss, a lowland raised mire, most of which has been drained and reclaimed for agriculture or cut over for peat. The site is important for birds, in particular, wintering birds of prey such as hen harrier, short-eared owl and merlin. It supports breeding species such as curlew and long-eared owl. The SSSI is located south of Leigh, 3.4km east of the land required for the Proposed Scheme;

- Abram Flashes SSSI covers an area of 39.6ha and is designated for its assemblage of breeding birds on lowland open waters and wet grassland. The waterfowl assemblage includes tufted duck, pochard, garganey, shoveler, gadwall and ruddy duck. Birds breeding in the wet grassland include yellow wagtail and waders such as lapwing, snipe and redshank. The swamp and fen habitats support breeding birds such as reed bunting, reed warbler and sedge warbler. The SSSI is located to the south of Wigan and its northern extent is located immediately adjacent to the land required for the Proposed Scheme; and

- Bryn Marsh and Ince Moss SSSI covers an area of 70.6ha and is designated as the best example of swamp and tall fen vegetation in Greater Manchester and Merseyside, as well as for its important populations of dragonflies and breeding birds. Little and great crested grebe, mute swan, tufted duck, snipe, redshank and reed and sedge warblers breed at the SSSI. It forms an important ornithological link with the other wetlands of the Wigan Flashes. The SSSI is located south of Wigan, immediately adjacent to the land required for the Proposed Scheme.

7.3.6 There are four Local Nature Reserves (LNR) of county/metropolitan value with potential relevance to the assessment in the Risley to Bamfurlong area. They are:

- Risley Moss LNR covers an area of 82ha and is designated as one of the last remaining fragments of the raised peat bog system that once covered large areas of South Lancashire and North Cheshire. It is only one of two examples in Cheshire where the water level has been raised and steps taken to encourage the re-establishment of an active mire system. The boundaries of Risley Moss

SSSI and LNR are largely the same and 60ha of the LNR is within the Manchester Mosses SAC. It is located east of Warrington 790m west of the land required for the Proposed Scheme;

- Pennington Flash LNR covers an area of 91ha and is designated for its ornithological importance. Over 230 bird species have been recorded including wildfowl and notable species such as bittern, little ringed plover, great crested grebe and kingfisher. The LNR is located south of Leigh, 650m from the land required for the Proposed Scheme;
- Three Sisters LNR covers an area of 34ha and is designated for its grassland habitats and its assemblage of wetland and woodland birds that includes willow tit, lapwing and teal. The site is part of a larger complex of wetlands in the Wigan area and is important for education and recreation. The LNR is located west of Abram and 1.3km from the land required for the Proposed Scheme; and
- The Wigan Flashes LNR covers an area of 175ha and is designated for its botanical and ornithological importance. The site has open water, reedbed, fen, grassland and wet woodland habitats and it is a wintering site for bittern and other species of wetland birds with over 200 species recorded. The LNR is south of Wigan and overlaps with the Bryn Marsh and Ince Moss SSSI. Seventy hectares of the LNR is designated as SSSI for the same reasons as the LNR. It is located immediately adjacent to the land required for the Proposed Scheme.

7.3.7 There are four Local Wildlife Sites (LWS) and 16 Sites of Biological Importance (SBI) of potential relevance to the assessment in the Risley to Bamfurlong area. Citations provided by the 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 and SBI are:

- Pestfurlong Moss LWS, covering an area of 4.2ha. It is designated for its wet woodland, grassland and fens, swamps, bogs and reedbeds and is of county/metropolitan value. The LWS is located south of Glazebrook and 75m from the land required for the Proposed Scheme;
- Gorse Covert Mounds LWS, covering an area of 19ha. It is designated for wet woodland, grassland and scattered ponds and its vascular plants. The habitats support many different invertebrates, most notably dragonfly and damselfly species, for which the site is also designated. It is of county/metropolitan value and is located south of Glazebrook. It is located immediately adjacent to the land required for the Proposed Scheme. A construction access route is proposed along its northern boundary and a construction site haul route ends at its eastern boundary;

- Silver Lane Ponds LWS, covering an area of 19ha. It is designated for its restorable Biodiversity Action Plan (BAP52) grassland and the four lakes on site that contain reedbed. The site is particularly important for owl species including barn owl and wintering short-eared owl and is of county/metropolitan value. The site is west of Culcheth and 13ha of the LWS is located within the land required for the Proposed Scheme;
- Eleven Acre Common LWS, covering an area of 5ha. It is designated for its herb-rich neutral grassland. The habitat supports butterfly species including gatekeeper and small skipper and is of county/metropolitan value. The site is west of Culcheth and immediately adjacent to the land required for the Proposed Scheme;
- Astley and Bedford Mosses SBI, covering an area of 91ha in size and is designated for its lowland raised bog. The SBI covers the same area as the Astley and Bedford Mosses SSSI and is located 3.3km east of the land required for the Proposed Scheme at its closest point;
- Highfield Moss SBI, covering an area of 19ha and comprising valley mire and grassland. It is of county/metropolitan value and is located south of Golborne 1.3km west of the land required for the Proposed Scheme;
- Pennington Flashes SBI, covering an area of 151ha and comprising a large lake with grassland, reedbed, swamp and fen. It includes the area designated as LNR and is of county/metropolitan value. The SBI is located west of Leigh and 330m east of the land required for the Proposed Scheme;
- Lightshaw Lime Beds SBI, covering an area of 9ha and comprising meadow, fen and swamp. The SBI is of county/metropolitan value and is located north of Golborne and 85m from land required for the Proposed Scheme;
- Ponds Near Lightshaw Lane SBI, covering an area of 12ha of lowland fen. The SBI is of county/metropolitan value and is located north of Golborne, 85m north of the Lightshaw Lime Beds SBI and 6ha of the SBI is within the land required for the Proposed Scheme;
- Abram Flashes SBI, covering an area of 43ha and comprising wet grassland, reedbed, fen and open water. It is also designated as Abram Flashes SSSI and therefore is of national value. It is located west of Abram and the northern extent of the SBI is located immediately adjacent to the land required for the Proposed Scheme;
- Park Lane Colliery SBI, covering an area of 9ha and comprising grassland. The SBI is of county/metropolitan value and is located south of Abram and 420m from land required for the Proposed Scheme;

[52] Greater Manchester Biodiversity Action Plan – Habitat Action Plan, Grasslands (2009)

- Edge Green SBI, covering an area of 1ha and comprising reedbed, swamp and fen. The SBI is of county/metropolitan value and is located north of Edge Green and 160m from land required for the Proposed Scheme;
- Three Sisters SBI covering an area of 28ha and comprising ponds, grassland and woodland. The SBI is also designated as the Three Sisters LNR and is of county/metropolitan value. It is located west of Bryn Gates and 1.2km from the land required for the Proposed Scheme;
- Horrock's Flash SBI, covering an area of 58ha and comprising wet woodland and open water. It is located within the larger Bryn Marsh and Ince Moss SSSI and Wigan Flashes LNR and therefore the SBI site is also of national value. It is located south of Ince-in-Makerfield and adjacent to the land required for the Proposed Scheme;
- Bryn Marsh SBI, covering an area of 16ha and comprising reedbed, swamp and open water. It is within the larger Bryn Marsh and Ince Moss SSSI and Wigan Flashes LNR and therefore the SBI site is also of national value. It is located south of Ince-in-Makerfield and 1km from the land required for the Proposed Scheme;
- Turner's Flash SBI, covering an area of 16ha and comprising reedbed, swamp and open water. The SBI is of county/metropolitan value and is located within the larger Wigan Flashes LNR, south of Ince-in-Makerfield and 850m from the land required for the Proposed Scheme;
- Ochre Flash SBI, covering an area of 14ha and comprising reedbed, swamp and open water. The SBI is of county/metropolitan value and is located within the larger Wigan Flashes LNR, south of Ince-in-Makerfield and 1.4km from the land required for the Proposed Scheme;
- Scotsman's Flash SBI, covering an area of 44ha and comprising reedbed, swamp and open water. The SBI is of county/metropolitan value and is located within the larger Wigan Flashes LNR, south of Ince-in-Makerfield and 1.4km from the land required for the Proposed Scheme;
- Pearson's Flash SBI, covering an area of 19ha and comprising reedbed, swamp and open water. The SBI is of county/metropolitan value and is located within the larger Abram Flashes LNR, south of Ince-in-Makerfield and 1.5km from the land required for the Proposed Scheme; and
- Westwood Flash SBI covering an area of 16ha and comprising reedbed, swamp, scrub and open water. The SBI is of county/metropolitan value and is located adjacent to the Wigan Flashes LNR, south of Ince-in-Makerfield and 2.1km from the land required for the Proposed Scheme.

7.3.8 There are no Ancient Woodland Inventory Sites (AWIS) of potential relevance to the assessment in this area. 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 There are 28 areas of lowland deciduous woodland (likely to qualify as habitats of principal importance[53] and local BAP habitats[54]), outside of designated sites which would be within or partly within the land required for the Proposed Scheme. These woodlands are located in two main areas; near Golborne and Ashton-in-Makerfield and near Culcheth. 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 are likely to be present within land required for the Proposed Scheme. On a precautionary basis, pending the findings of field surveys (which may identify these as unimproved grasslands), these grasslands are considered to be of up to district/borough value.

Hedgerows

7.3.12 Many of the hedgerows in the study area are likely to qualify as a habitat of principal importance and a local BAP[55] habitat. Some may also meet the wildlife and landscape criteria to be 'important' hedgerows as defined in the Hedgerows Regulations 1997[56]. In addition, they could also provide commuting corridors and nesting or feeding habitat for wildlife. 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 Leeds and Liverpool Canal, Hey Brook, Glaze Brook, Small Brook, Nan Holes Brook, Windy Bank Brook and Coffin Lane Brook are within the land required for the Proposed Scheme. These watercourses may qualify as habitats of principal importance and local BAP habitats. On a precautionary basis, pending the findings of field surveys, these watercourses are assumed to be of up to county/metropolitan value. Several smaller watercourses are also within the land required for the Proposed Scheme and these are considered to be of up to district/borough value.

Water bodies

7.3.14 There are 52 ponds that are located within or partly within, the land required for the Proposed Scheme, of which 11 are within land identified for habitat creation or enhancement. Some may qualify as habitats of principal importance, or local BAP habitats (e.g. if they support faunal species of high conservation importance such as great crested newt, which existing records have shown are present in at least two ponds within the land required for the Proposed Scheme). Ponds containing great created newt are of county/metropolitan value. On a precautionary basis, pending the

[53] Section 41 of the National Environment and Rural Communities Act 2007
[54] Cheshire BAP and Greater Manchester BAP
[55] Cheshire BAP and Greater Manchester BAP
[56] *Statutory Instrument 1997 No. 1160* Hedgerows Regulations 1997

findings of field surveys, these water bodies have been assumed to be of up to county/metropolitan value.

Ancient and veteran trees

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

Protected and notable species

7.3.16 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 Risley to Bamfurlong area

Resource/feature	Value	Rationale
Bats	Up to regional	The mosaic of hedgerows, connecting woodlands, watercourses. grassland and scattered trees provide suitable foraging and commuting habitat. Many of the buildings and trees within land required for the Proposed Scheme are likely to provide roosting habitat for bats. Eleven species of bats have been recorded within Cheshire[57] and soprano pipistrelle, common pipistrelle, noctule and brown long eared bat have been recorded in the vicinity of the Proposed Scheme. There are also records of pipistrelle roosts close to the land required for the Proposed Scheme.
Otter	Up to county/metropolitan	Existing data sources provided no records of otter presence, however Abram Flashes and the adjacent Hey Brook and Leeds and Liverpool Canal have suitable habitats for this species. It is likely that other watercourses and wetland habitats within the area also have suitable habitat. Otters are re-colonising Greater Manchester and Cheshire but the population in Cheshire is lower than would be expected compared with the availability of suitable habitat[58].
Water vole	County/metropolitan	Habitat suitable for water vole is present along the watercourses and wetland habitats in the Risley to Bamfurlong area, such as drainage ditches near to Culcheth and wetland habitats at Abram Flashes and ponds adjacent to Lightshaw Lane. Existing data sources provided records of their presence at Silver Lane Ponds LWS, within the land required for the Proposed Scheme and at Partridge Lakes Fish Farm adjacent to land required for the Proposed Scheme. Water vole are widespread and locally common in Cheshire[59] and Greater Manchester and in 2009 robust populations were recorded between Wigan and Pennington Flashes.[60] It is considered possible that this species is present throughout the area.

[57]Bats Local Biodiversity Action Plan – Cheshire Wildlife Trust https://www.cheshirewildlifetrust.org.uk/sites/default/files/2018-06/Bats.pdf
[58] Otter Local Biodiversity Action Plan – Cheshire Wildlife Trust https://www.cheshirewildlifetrust.org.uk/sites/default/files/2018-06/Otter.pdf
[59] Water vole Local Biodiversity Action Plan – Cheshire Wildlife Trust https://www.cheshirewildlifetrust.org.uk/sites/default/files/2018-06/Water%20vole.pdf
[60] Water vole Species Action Plan, Greater Manchester Biodiversity Project, 2009 http://www.gmbp.org.uk/site/images/stories/water%20voles%20bap_09.pdf

Resource/feature	Value	Rationale
Polecat	Up to county/metropolitan	Habitat suitable for this species is present including hedgerows, farmland and woodland. Existing data sources provided no records of their presence within the Risley to Bamfurlong area. The polecat is considered rare but is recolonising Cheshire[61] and its status is unknown in Greater Manchester.
Great crested newt	County/metropolitan	There are 52 ponds within land required for the Proposed Scheme and at least 224 ponds within 250m. In Cheshire the species is considered widespread. In Greater Manchester the species is considered common but declining.[62] Existing data sources provided six records of great crested newt within 250m of the land required for the Proposed Scheme. Environmental DNA surveys carried out in 2017 up to 250m from the land required for the Proposed Scheme provided 35 positive results for this species from 58 surveyed ponds.
Birds	Up to county/metropolitan	The farmland and woodland within the Risley to Bamfurlong area is suitable for breeding and wintering birds. Species associated with these habitats include lapwing, barn owl, skylark, tree sparrow, yellow wagtail, linnet and yellowhammer which breed in low numbers in farmland habitats and a range of typical common woodland breeding and wintering birds. Existing data sources provided numerous records of the species above. The wetland areas in the north and centre of the Risley to Bamfurlong area support wintering wildfowl such as gadwall, tufted duck, teal and pink-footed goose.
White-clawed crayfish	Up to county/metropolitan	Existing data sources provided no records of white-clawed crayfish within the Risley to Bamfurlong area. The nearest known populations of this species are in catchments in southern Cheshire. Suitable habitats for white-clawed crayfish have been identified throughout the Risley to Bamfurlong area.
Brown hare	Up to district/borough	Brown hare populations in Cheshire were in decline between the 1950s and the 1980s, after which populations stabilised and in some localised areas have since increased. In Greater Manchester from 1995 to 2006, brown hare sightings rose gradually, and the Manchester Mosses area is the main stronghold for brown hare in the county.[63] Existing data sources provided records of this species concentrated around Lowton and the Abram Flashes. Habitat suitable for this species is abundant within the land required for the Proposed Scheme.
Aquatic invertebrates	Up to district/borough	Suitable habitat for aquatic invertebrates has been identified during surveys and is likely to be present in the wetland habitats at Abram Flashes SSSI, Silver Lane Ponds LWS, along Glaze Brook, Coffin Lane Brook and drainage ditches south of Byrom Wood. Existing data sources provided records for 14 species of dragonfly and damselfly within the land required for the Proposed Scheme.
Terrestrial invertebrates	Up to district/borough	Suitable habitat for terrestrial invertebrates has been identified during surveys and is likely to be present at Silver Lane Ponds LWS, Holcroft Moss, Pennington Flash LWS and Gorse Covert Mounds LWS. Existing data sources provided records for *Keroplatus testaceus* a nationally scarce true fly within the land required for the Proposed Scheme.

[61] Polecat Local Biodiversity Action Plan – Cheshire Wildlife Trust https://www.cheshirewildlifetrust.org.uk/sites/default/files/2018-06/Polecat.pdf
[62] Great Crested Newt Species Action Plan Greater Manchester Biodiversity Project, 2009 http://www.gmbp.org.uk/site/images/stories/great%20crested%20newt%20bap_09.pdf
[63] North West Brown Hare Project Final Report – January 2013

Resource/feature	Value	Rationale
Fish	Up to district/borough	Existing data sources provided records of European eel, which is in decline across the UK, within in the river catchments affected by the Proposed Scheme. Whilst there are no records of brown trout, European bullhead or brook lamprey (all listed on Annex II of the EC Habitats Directive), there is suitable habitat within the land required for the Proposed Scheme to support these species.
Reptiles	Up to district/borough	Existing data sources provided records for common lizard adjacent to Holcroft Moss SSSI and suitable habitat has been identified for widespread species of reptiles throughout the land required for the Proposed Scheme.

7.4 Effects arising during construction

Avoidance and mitigation measures

7.4.1 The following measures have been included as part of the design of the Proposed Scheme (in addition to the landscape planting shown on the Map Series CT-06 in the Volume 2: MA05 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:

- new woodland planting (17ha) would help towards compensation for the losses of woodland outside of designated sites (e.g. south of Abram, at Lowton Common and east of Culcheth) and to enhance connectivity between remaining woodlands;
- provision of new ponds to support great crested newt for those lost, including two new ponds created for each one lost due to construction of the Proposed Scheme. These would form part of the measures required to reduce the effects on this species to not significant (e.g. within Ponds Near Lightshaw Lane SBI where there are records of great crested newt);
- reduction of the land required for the Proposed Scheme on the A573 at Dover Bridge avoiding loss from Abram Flashes SSSI;
- realignment of the route to avoid the loss of 4ha of priority habitat woodland at Culcheth Linear Park;
- provision of new species-rich hedgerows, using appropriate native species, would help towards compensation for the loss of hedgerows and re-connecting the ecological network in the surrounding areas. This includes along the margins of the route and in specific areas such as south of Culcheth, along Wigshaw Lane and Wilton Lane and between Warrington Road and Hey Brook;
- provision of wetland habitat (5.5ha) adjacent to Holcroft Moss SAC and SSSI to provide additional appropriate habitat adjacent to the SSSI; and
- provision of new grassland habitats (16.5ha), including some species rich grasslands would help towards compensation for the losses from the Proposed Scheme and provide habitat for brown hares, reptiles and terrestrial

invertebrates, for example within Silver Lane Ponds LWS and Ponds Near Lightshaw Lane SBI.

7.4.2 The assessment assumes implementation of the measures set out within the draft Code of Construction Practice (CoCP)[64], which includes translocation of protected species where appropriate.

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

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

Assessment of impacts and effects

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

Designated sites

7.4.5 A study to inform the Habitats Regulations Screening Assessment was undertaken for Manchester Mosses SAC[65] for the Appraisal of Sustainability stage of project development. This was undertaken in consultation with Natural England and the Environment Agency. The findings concluded that there would be no potential for significant effects on the Risley Moss and Astley and Bedford Mosses components of the SAC. The Habitats Regulations Assessment (HRA) assumed the route would be on

[64] Supporting document: Draft Code of Construction Practice
[65] HS2 (2012). *HRA Screening Report for Manchester Mosses SAC*

a viaduct as it passed Holcroft Moss and mitigation measures to avoid significant effects on the SAC were proposed for this option.

7.4.6 An addendum to the HRA was written in 2016[66] to consider additional information available regarding the Manchester Mosses SAC and the proposal for an embankment rather than a viaduct. It was concluded that impedance of water outflows (whether surface water or groundwater), caused by an embankment, could have a beneficial effect in reducing the drying-out of the Moss. However, as discussed in Section 15, Water resources and flood risk, there is uncertainty regarding the direction of groundwater flows in the area. Further assessment will be undertaken to confirm the potential impact of the embankment on water levels and the resultant effect on Holcroft Moss. If required, the results of this assessment will be used in developing an appropriate design.

7.4.7 HS2 Ltd will continue to consult Natural England and the Environment Agency (and other relevant key stakeholders) as the design develops to ensure that the submitted design in the hybrid Bill complies with the Habitats Regulations 2017. Where required, further assessment will be undertaken and an appropriate design will be developed through an iterative process. Any studies to inform the required assessments will be completed and the outcomes agreed with Natural England prior to submission of the hybrid Bill. Impacts to this site are also addressed in Volume 2: MA04, Broomedge to Glazebrook.

7.4.8 Construction of the Proposed Scheme will not result in a significant adverse effect on the integrity of Risley Moss SSSI given that it is located 790m from the land required for the Proposed Scheme and the route does not cross the surface or groundwater catchment area associated with this site. Impacts to this site are also addressed in Volume 2: MA04, Broomedge to Glazebrook.

7.4.9 The basis for the designation of Holcroft Moss SSSI is that it is the only known uncut area of raised bog remaining in Cheshire. This is consistent with the reason for the Manchester Mosses SAC designation, due to its degraded raised bog habitat. The vulnerabilities of changes in ground and surface water are therefore shared by the SSSI and SAC. Therefore, in addressing the potential significant effects on the SAC, potential significant effects on Holcroft Moss SSSI will also be avoided and the Proposed Scheme will not result in a significant effect on the integrity of Holcroft Moss SSSI.

7.4.10 Construction of the Proposed Scheme within the Risley to Bamfurlong area will not result in a significant adverse effect on the integrity of Highfield Moss SSSI given it is located 1.3km west of the land required for the Proposed Scheme and the route does not cross the surface or groundwater catchment area associated with this site.

7.4.11 Construction of the Proposed Scheme will not result in a significant adverse effect on the integrity of Astley and Bedford Mosses SSSI given that it is located 3.4km from the

[66] HS2 (2016) *Manchester Mosses Habitat Regulation Assessment (HRA) Screening Report*- Addendum 2016

land required for the Proposed Scheme and the route does not cross the surface or groundwater catchment area associated with this site.

7.4.12 The northern extent of Abram Flashes SSSI is adjacent to the land required for the Proposed Scheme. Disturbance from construction activities and traffic movements adjacent to the SSSI have the potential to disturb the breeding and wintering bird assemblages for which it is designated. It is anticipated that the 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, in the absence of further information at this stage, the assessment assumes there would be a temporary adverse effect which would be significant at national level.

7.4.13 Bryn Marsh and Ince Moss SSSI and Wigan Flashes LNR are adjacent to the land required for the Proposed Scheme. Disturbance from construction activities and traffic movements adjacent to the site have the potential to disturb the breeding and wintering bird assemblages for which the SSSI and LNR are designated. It is anticipated that the 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, in the absence of further information at this stage the assessment assumes there would be a temporary adverse effect which would be significant at national level.

7.4.14 A construction access route is proposed along Silver Lane, which forms the northern boundary of Gorse Covert Mounds LWS and would also encroach on the eastern edge of Gorse Covert Mounds, resulting in the temporary loss of 0.3ha (7%) of the LWS. Disturbance from construction activities and traffic movements adjacent to the site have the potential to impact on the habitats for which it is designated. It is anticipated that the 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, in the absence of further information at this stage, the assessment assumes there would be a permanent adverse effect which would be significant at the county/metropolitan level.

7.4.15 Construction of the Culcheth south embankment would result in the loss of 13ha (67%) of Silver Lane Ponds LWS. On a precautionary basis, in the absence of further information at this stage, the assessment assumes there would be a permanent adverse effect which would be significant at the county/metropolitan level.

7.4.16 Construction of the Pennington embankment would result in the loss of 6ha (50%) of Ponds Near Lightshaw Lane SBI which would affect species for which the SBI is designated (great crested newt, birds, dragonflies and damselflies). The land required for the Proposed Scheme runs through the centre of the SBI, severing grassland habitats and reducing viable ground nesting and foraging habitat for wintering birds. Habitat loss and severance would result in a permanent adverse effect on site integrity that would be significant at the county/metropolitan level.

Habitats

Woodland

7.4.17 In addition to woodland within designated sites, construction would result in the loss of 12ha of broadleaved deciduous woodland in the Risley to Bamfurlong area including losses north of Windy Bank Farm, at Lowton Common and adjacent to Leigh Golf Course. This would result in a permanent adverse effect that is significant at up to the district/borough level. It is considered that the aforementioned woodland habitat creation areas, which would connect remaining areas of woodland, would reduce the effect on broadleaved woodland to a level that is not significant. Unless the ongoing review identifies any of the woodlands as ancient in which case there would be a permanent adverse effect at up to the county/metropolitan level

Grassland

7.4.18 Construction of the Proposed Scheme could result in the loss of grassland outside of designated sites. In the absence of field survey information, it has been assumed that none of the grassland lost would be unimproved and the loss would be significant at district/borough level. However, the creation of 16.5ha of grassland, including species rich grassland at Lightshaw Hall and marshy grassland adjacent to Abram Flashes, which qualify as habitats of principal importance, would ensure there was no adverse effect on the conservation status of grassland.

Hedgerows

7.4.19 The Proposed Scheme would cross hedgerows that are located throughout the area, some of which may be 'important' hedgerows. The land required for the 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 effects of these losses will be fully assessed in the formal ES. They include those at Windy Bank Farm, at farms south of Lowton and at Blakeley Farm. 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

7.4.20 Twenty-seven small watercourses are within the land required for the Proposed Scheme such as Nan Holes Brook, Coffin Lane Brook, Small Brook and Windy Bank Brook, as well as several unnamed watercourses. The provision of wetland habitat creation will contribute to compensation for habitat loss as a result of construction of culverts at the unnamed river east of Silver Lane Ponds SBI and at Nan Holes Brook. However, the loss and severance of sections of other watercourses due to culverts would result in a permanent effect that would be significant at up to the district/borough level. Indirect impacts on other watercourses due to construction would not be significant, as they will be controlled through the implementation of measures in the draft CoCP.

Water bodies

7.4.21 Forty-one ponds would be lost as a result of the Proposed Scheme, at least two of which are known to support great crested newt populations. The loss of these ponds could result in a significant impact at county/metropolitan level.

Ancient and veteran trees

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

Species

Bats

7.4.23 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 11 bat species potentially present within the area. Bats may also be affected by the lighting associated with construction works, although it is anticipated that this will 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 would result in a permanent adverse effect on the conservation status of the bat populations that would be significant at up to regional level.

Otter

7.4.24 Abram Flashes and the adjacent watercourses have suitable habitats for this species and it is likely that other watercourses and wetland habitats within the area also have suitable habitat. Indirect effects from construction activities may result in disturbance to these species during the construction period and prevent them from commuting and foraging along watercourses. However, it is anticipated that these indirect effects will be controlled through measures in the draft CoCP. The culverting of several smaller watercourses within the land required for the Proposed Scheme would result in habitat loss for this species, as well as potential loss of connectivity of commuting and foraging routes. On a precautionary basis, in the absence of further survey information, impacts to otters would result in an adverse effect on the conservation status of this species that would be significant up to the county/metropolitan level.

Water vole

7.4.25 It is considered possible that this species is present throughout the area within the smaller watercourses and drainage ditches and there are known populations at Partridge Lakes Fish Farm and Silver Lane Ponds LWS. Indirect effects from construction activities may result in disturbance to these species during the construction period. However, it is anticipated that these indirect effects will be controlled through measures in the draft CoCP. The culverting of several smaller watercourses would result in loss and habitat fragmentation of habitat for this species. On a precautionary basis and in the absence of current survey information, impacts to

water vole would result in an adverse effect on the conservation status of this species that would be significant at county/metropolitan level.

Polecat

7.4.26 The loss of woodland and hedgerows along with grassland and arable land could affect polecat, a species which is recolonising Cheshire and Greater Manchester. On a precautionary basis and in the absence of survey information, the effects of permanent habitat loss on this species would be significant at up to the county/metropolitan level.

Great crested newt

7.4.27 It has been assumed that all 41 ponds (and surrounding terrestrial habitat) within the land required for the Proposed Scheme may support great crested newts and would be lost during construction. The loss of ponds supporting great crested newts could result in the isolation and severance of breeding populations of this species across this area. On a precautionary basis and in the absence of further survey information, it has been assumed that all ponds which would be lost support great crested newts. Where great crested newts are present, two new ponds would be created for each one lost to the permanent works and this would be expected to contribute towards reducing the effects to not significant. Additional ponds on a two to one basis would also be required where other great crested newt ponds would be lost outside the area required for the Proposed Scheme. Suitable terrestrial habitat would be required around all new ponds created along with links to encourage dispersal (e.g. by incorporating existing habitat or creating new habitat), and this would require further development. 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 county/metropolitan level.

Birds

7.4.28 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[67] species for which suitable foraging habitat is present within 500m of the land required for the Proposed Scheme within the Risley to Bamfurlong area. Habitat used by wintering birds that would be lost includes wetlands associated with the Hey Brook and the flashes near to Abram, wet grasslands south of Lowton and habitats adjacent to Holcroft Moss SSSI. On a precautionary basis, in the absence of further survey information, it has been assumed that the Proposed Scheme would result in a permanent adverse effect that would be significant at up to the county/metropolitan level.

White-clawed crayfish

7.4.1 Suitable habitat for this species is expected to be present in watercourses in the Risley to Bamfurlong area. Loss and severance of this habitat would occur where watercourses are placed into culverts or tunnels. Indirect impacts to the watercourses

[67] 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

will be controlled through measures set out in the draft CoCP. On a precautionary basis and in the absence of survey information, it has been assumed that the Proposed Scheme would result in a permanent adverse effect on white-clawed crayfish that would be significant at up to the county/metropolitan level.

Brown hare

7.4.2 The land required for the Proposed Scheme would result in the loss of agricultural land suitable for brown hare, which would result in permanent adverse effect at district/borough level. However, it is considered that the grassland habitat creation areas at Lightshaw Hall and near Abram Flashes SSSI would mitigate for the loss of brown hare habitat and reduce the effect on the conservation status of this species to a level that is not significant.

Aquatic invertebrates

7.4.3 The land required for the Proposed Scheme would result in loss of habitat suitable for aquatic invertebrates including species of principal importance as identified in Section 41 of the Natural Environment and Rural Communities (NERC) Act (2006)[68] (Section 41 species). On a precautionary basis and in the absence of survey information, it has been assumed that Proposed Scheme would result in a permanent adverse effect that would be significant at up to the district/borough level.

Terrestrial invertebrates

7.4.4 The land required for the Proposed Scheme would result in loss of habitat suitable for terrestrial invertebrates including Section 41 species. On a precautionary basis and in the absence of survey information, it has been assumed that Proposed Scheme would result in permanent adverse effect that would be significant at up to the district/borough level.

Fish

7.4.5 Indirect impacts to the watercourses would be controlled through measures set out in the draft CoCP. However, where watercourses are directly affected and could support European eel and other Section 41 species and Annex II species, they may require assessment under the Water Framework Directive (WFD)[69]. On a precautionary basis and in the absence of survey information, it has been assumed that the Proposed Scheme would result in a permanent adverse effect that would be significant at up to the district/borough level.

Reptiles

7.4.6 Suitable habitat for common reptiles is likely to be present, including common lizard recorded adjacent to Holcroft Moss SSSI in grassland and scrub habitats. The loss of suitable habitat for common reptiles would result in a permanent adverse effect that would be significant at up to district/borough level. However, it is considered that the grassland habitat creation areas at Lightshaw Hall, near Abram Flashes SSSI and at Holcroft Moss SSSI, which would comprise a matrix of grassland, ponds and scattered

[68] Section 41 of the Natural Environment and Rural Communities (NERC) Act 2006.
[69] EU Water Framework Directive http://ec.europa.eu/environment/water/water-framework/index_en.html

scrub, and incorporate and enhance existing features such as drains and hedgerows, would mitigate for the loss of suitable reptile habitats and reduce the effect on reptiles to a level that is not significant.

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

7.4.8 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

7.4.9 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:

- ancient woodland is an irreplaceable resource and this loss would be 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;
- options to reduce land required for the Proposed Scheme during construction within Silver Lane Ponds LWS, by designing out potential impacts on the ponds within the LWS;
- options to compensate for the loss of habitat within Ponds Near Lightshaw Lane SBI, including grassland habitat creation adjacent to the SBI and habitat creation and enhancement within the SBI;
- river restoration and wetland habitat creation would help towards compensation for the loss of aquatic habitat (e.g. adjacent to Silver Lane Ponds SBI and Nan Holes Brook);
- provision of additional measures to facilitate connectivity where significant foraging or commuting routes of fauna species would be affected;
- considering the need for inclusion of structures to reduce severance effects on bats;
- use of temporary fencing or retention of existing habitat links to reduce the risk of disturbance to otters during construction;
- design of watercourse culverts and underpasses to allow the free passage of wildlife;

- provision of alternative roosting habitat for bats; and
- provision of additional ponds (on a two to one basis where existing ponds supporting great crested 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.

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

Summary of likely residual significant effects

7.4.11 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
Abram Flashes SSSI	Potential temporary adverse effect due to disturbance to breeding bird assemblages during construction.	National
Bryn Marsh and Ince Moss SSSI and Wigan Flashes LNR	Potential temporary adverse effect due to disturbance to breeding bird assemblages during construction.	National
Gorse Covert Mounds LWS	Permanent adverse effect on site integrity due to loss of 0.3ha (7%) of habitat.	County/metropolitan
Silver Lane Ponds LWS	Permanent adverse effect on site integrity due to loss of 13ha (67%) of habitat.	County/metropolitan
Ponds Near Lightshaw Lane SBI	Permanent adverse effect on site integrity due to loss of 6ha (50%) of habitat	County/metropolitan
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
Water bodies	Permanent adverse effect from loss of 41 ponds	County/metropolitan
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	Up to regional

Resource/feature	Residual effect	Level at which the effect would be significant
	roosts, foraging habitat and fragmentation.	
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	County/metropolitan
Polecat	Potential permanent adverse effect on conservation status due to loss of habitat	Up to county/metropolitan
Great crested newts	Loss of at least two ponds that are known to support this species and 41 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	Up to county/metropolitan
White-clawed crayfish	Potential permanent adverse effect on conservation status due to loss of habitat and severance	Up to county/metropolitan
Aquatic invertebrates	Potential permanent adverse effect on conservation status due to loss of habitat	Up to district/borough
Terrestrial invertebrates	Potential permanent adverse effect on conservation status due to loss of habitat	Up to district/borough
Fish	Potential permanent adverse effect on conservation status due to loss of habitat along minor watercourses	Up to district/borough

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 regional level.

7.5.4 Barn owls are at risk of colliding with trains, particularly in the north of the area, near to Abram, 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 foraging in proximity to or attempting to cross the railway and to facilitate their safe passage when the Proposed Scheme is operational; and
- updating the HS2 barn owl mitigation plan which is being developed to provide measures that will be implemented to reduce the effects of the Proposed Scheme to a level that is not significant. This is likely to include seeking opportunities to provide barn owl nest boxes and where feasible habitat enhancement opportunities at least 3km from the Proposed Scheme in consultation with local landowners.

Summary of likely residual significant effects

7.5.7 Taking into account mitigation included as part of the Proposed Scheme design, the anticipated significant residual ecological effects during operation are detailed in Table 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 collision with trains	Regional
Barn owl	Potential permanent adverse effect on conservation status due to collision with trains	Up to county/metropolitan

Monitoring

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

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

8 Health

8.1 Introduction

8.1.1 This section identifies the communities within the Risley to Bamfurlong 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 Risley to Bamfurlong 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: MA05 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)[70].

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.

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

8.2.4 The health determinants of relevance within the Risley to Bamfurlong area are:

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

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

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

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

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

8.3 Environmental baseline

Existing baseline

Description of communities in the Risley to Bamfurlong area

8.3.1 The route of the Proposed Scheme passes through or near to the settlements of Birchwood (a suburb of Warrington), Culcheth, Wigshaw, Lowton, Golborne and Bamfurlong. Areas between larger settlements are characterised by smaller

settlements with few community resources, small clusters of dwellings, and individual farms.

8.3.2 A description of community facilities is provided in Section 6, Community.

Birchwood, Culcheth and surrounds

8.3.3 This area covers the settlements of Birchwood, Culcheth and surrounds, from the southern boundary of the Risley to Bamfurlong area to the A580 East Lancashire Road. Culcheth and surrounds, from the southern boundary of the Risley to Bamfurlong area to the A580 East Lancashire Road.

8.3.4 Birchwood, which has approximately 5,000 residential properties, is located to the south-west of the route of the Proposed Scheme. Culcheth, which has approximately 3,000 residential properties, is located to the east of the route of the Proposed Scheme. There are many community resources within Culcheth, including schools, places of worship, medical facilities, and recreational facilities including Shaw Street Recreational Grounds, Culcheth Linear Park and The Oaks (football pitches on the outskirts of Culcheth). The village of Wigshaw, with approximately 20 residential properties would be on the route of the Proposed Scheme.

Lowton, Golborne and surrounds

8.3.5 This area covers the settlements of Lowton, Golborne and surrounds, from the A580 East Lancashire Road north to the A573 Wigan Road.

8.3.6 Lowton has approximately 3,200 residential properties and a range of community facilities. The nearest residential properties would be on the route of the Proposed Scheme. On the route of the Proposed Scheme would be Hesketh Meadow Playing Fields (a recreational open space with seven football pitches) and GymEtc (a gym).Golborne is a town to the west of the Proposed Scheme with approximately 7,300 residential properties. The nearest residential properties would be on the route of the Proposed Scheme.

8.3.7 Pennington Flash is a 200ha country park with lake and marshland located between Lowton and Pennington. Community facilities such as Pennington Golf Course, Leigh and Lowton Sailing Club, horse riding and fishing facilities, walking routes, play areas and picnic areas are all located at the site. Directly east of Pennington Flash is Byrom Hall Woods, an area of approximately 27ha of publicly accessible woodland and walking routes.

8.3.8 Promoted PRoW in the area include the Glazebrook Timberland Trail, a long-distance walking route which links Pennington Flash Country Park to the Manchester Ship Canal in Cadishead, and the Leeds to Liverpool Canal.

Bamfurlong and surrounds

8.3.9 The village of Bamfurlong, with 400 residential properties, is situated to the west of the Proposed Scheme, where the A58 Lily Lane intersects with the West Coast Main Line. The nearest residential properties would be approximately 500m from the route of the Proposed Scheme. Promoted PRoW in the area include National Route 55 of

the National Cycle Network – a predominantly traffic-free route which links Ironbridge to Preston.

Demographic and health profile of the Risley to Bamfurlong area

8.3.10 The local communities potentially affected by the Proposed Scheme in the Risley to Bamfurlong area have a relatively low population density, commensurate with the rural nature of the area.

8.3.11 Data provided by the Office for National Statistics show that this population has slightly poorer health status compared with the national (England) averages.

8.3.12 The population is slightly less deprived than the national average with regard to the combined indices of multiple deprivation[71], and the health domain (a sub-set of the indices of multiple deprivation).

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

8.3.14 The available data provides detail down to ward level and enable a profile to be made of the population within the Risley to Bamfurlong 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. As far as reasonably practicable, mitigation measures have been incorporated into the design of the Proposed Scheme with the aim of avoiding or reducing adverse health 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 diversion of a number of public rights of way (PRoW) and roads to maintain access (see Section 14 Traffic and transport for further detail).

[71] 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)[72], 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 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). 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

[72] Supporting document: Draft Code of Construction Practice

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

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

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

8.4.11 Dust emissions from construction activities are considered in Section 5, Air quality, which identifies no significant adverse effects with respect to the effects of construction activities on dust soiling and human health within the Risley to Bamfurlong area, taking account of mitigation measures contained in the draft CoCP. Therefore, it is not expected that dust emissions around construction sites would contribute to adverse impacts on neighbourhood quality.

8.4.12 The construction of the Proposed Scheme would have temporary and permanent[73] impacts on neighbourhood quality in areas close to construction sites, including those at Wigshaw, Lowton and Bamfurlong. 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 Risley to Bamfurlong area would include:

[73] 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 listed in Section 14, Traffic and transport.

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

Access to services, health and social care

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

8.4.18 The more urban areas, such as Lowton, Golborne and Culcheth, have a large range of shops and services, with a broad selection, availability and capacity offering greater than average community resilience to changes in access and accessibility to such amenities and facilities during construction. The potential for health effects associated with reduced access to shops and services will be assessed in the formal ES.

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

Access to green space, recreation and physical activity

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

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

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

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

8.4.23 Construction traffic would mainly use site haul routes along the route of the Proposed Scheme. 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.

8.4.24 Construction of the Culcheth North embankment and associated culvert construction, drainage outfalls and PRoW diversions would temporarily restrict access to the northern half of Culcheth Linear Park, a 2.5km linear walking route. The Linear Park stretches from the A574 Warrington Road to the Liverpool to Manchester (via Chat Moss) railway line and can be accessed at various points along the route, with car parking available on Wigshaw Lane. Approximately 50% of the park would be inaccessible for approximately one year and nine months. It is expected that all of the land would be returned to its previous use following completion of the construction activity. It is understood from previous information events that the area is frequently used by local people and provides a location for daily walking exercise. Therefore, the temporary requirement for land affecting Culcheth Linear Park is considered to have potential to result in an adverse health effect.

8.4.25 The A574 Warrington Road overbridge realignment would result in the permanent loss of approximately 1ha of The Oaks playing fields on the outskirts of Culcheth, including its sole access point and car park, three outbuildings, and four football pitches. The Oaks is a privately owned six-pitch football playing field, covering approximately 4.5ha, which was established for the Culcheth Athletic Junior Football Club. The Club provides children with the opportunity to play football and develop teamwork skills. The Club currently has 23 teams (ranging from under seven to under 17), over 350 members and over 40 managers/coaches. There is adjacent land, within the same ownership, which has the potential to be used for football pitches. More widely, within 2km of The Oaks, there are several venues with football pitches, including several schools, Shaw Street Recreation Ground and Culcheth Sports Club. However, in the absence of mitigation, the loss of land at The Oaks would impact the viability of Culcheth Athletic Junior Football Club and would result in the loss of outdoor playing

fields for children in the local area. The permanent loss of some of these football pitches and potential for affecting the viability of Junior Football Club is considered to have the potential to result in an adverse health effect.

8.4.26 In Lowton, works to construct the Proposed Scheme adjacent to the A572 Newton Road overbridge would require 4.9ha of the Hesketh Meadows playing fields located on Hesketh Meadow Lane. The playing fields, which cover a total area approximately 5ha and seven football pitches, are located behind the former Lowton Civic Hall and are easily accessible to the adjacent residential area. Hesketh Meadows is used regularly by East Leigh Junior Football Club, a football club for children up to the age of 18. The Club presently has 17 teams (ranging from under seven to under 18) and an academy for children under six, providing opportunities for physical activity. There are limited publicly accessible alternative resources on this scale that provide a similar service within Lowton. Therefore, the permanent loss of Hesketh Meadows playing fields is considered to have potential to result in an adverse health effect.

8.4.27 Land required for the Proposed Scheme and construction of Golborne Footpath 33 accommodation underbridge and Golborne Footpath 31 accommodation underbridge would lead to Byrom Hall Wood being bisected. Byrom Hall Wood is located to the north-east of Golborne and is approximately 27ha of woodland with footpaths offering a 1.5km circular route. The area is accessible via the road to the east (Slag Lane) and footpaths provide pedestrian access at each of the four corners of the woodland. The Proposed Scheme would require approximately 4ha of land, south to north through the middle of the woods. Following construction, an overbridge would provide pedestrian access between the two halves of the remaining woodland. The nearest alternative is Pennington Flash, which is approximately 1km away. Byrom Hall Woods provides a destination and a waypoint for local walks in the area and opportunities for physical activity. Surveys of the area have not yet been undertaken and the extent of public use is not yet known. Therefore, the permanent requirement for land at Byrom Hall Woods is considered to have potential to result in an adverse health effect.

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.'[74]

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

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 of the Proposed Scheme support small, well-established communities. The size of the temporary construction workforce may be substantial relative to the size of these local communities. During the day, the workforce would be present on construction sites and compounds throughout the area, including main compounds and satellite compounds in the vicinity of the settlements of Wigshaw, Lowton, Golborne and Bamfurlong. The duration of the works at each site would range from approximately two years 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 of and interactions within their communities, modifying behaviour and the value they place on social capital. Such a reduction in social capital has the potential to adversely affect wellbeing, and may influence behaviours that are beneficial to wellbeing such as the use of community facilities.

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

8.4.33 Residential properties would be demolished at Warrington Road (Risley), Glaziers Lane (Wigshaw), Wilton Lane (south east of Lowton), Newton Road (Lowton), Lightshaw Lane (Golborne) and Slag Lane (Golborne). 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.

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

Other mitigation measures

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

8.4.36 HS2 Ltd will engage with local authorities and community representatives to identify measures aimed at fostering positive relationships between local communities and

the temporary construction workforce. Any measures identified will be included within the Community Engagement Framework.

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

8.5 Effects arising from operation

Avoidance and mitigation measures

8.5.1 Adverse impacts on health determinants would be reduced insofar as reasonably practicable through mitigation measures incorporated into the design of the Proposed Scheme to reduce adverse effects on people. The mitigation measures incorporated into the design of the Proposed Scheme in the Risley to Bamfurlong area.

Assessment of impacts and effects

Neighbourhood quality

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

Other mitigation measures

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

Monitoring

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

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

9 Historic environment

9.1 Introduction

9.1.1 This section of the report provides a description of the current baseline for heritage assets and the likely impacts and significant effects identified to date resulting from the construction and operation of the Proposed Scheme within the Risley to Bamfurlong 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, Wigan Metropolitan Borough Council (WMBC) and Warrington Borough Council (WBC) planning authorities and Greater Manchester Archaeological Advisory Service. The purpose of this engagement has been to discuss the assessment approach, to obtain relevant baseline information and to inform the design development and assessment of the Proposed Scheme. Engagement will continue as part of the development of the Proposed Scheme and to inform the formal assessment.

9.1.3 Maps showing the location of the key environmental features (Map Series CT-10) and the key construction (Map Series CT-05) and key operational (Map Series CT-06) features of the Proposed Scheme are provided in the Volume 2: MA05 Map Book. Only designated heritage assets within the Risley to Bamfurlong area are shown on maps CT-10-314b to CT-10-318. Non-designated heritage assets have also been assessed as part of this work, although they are not illustrated on these maps. CT-10-106b to CT-10-111a. 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) or Historic Environment Record (HER) name and number (numbers prefixed MGM). 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)[75] including the method for determining the value of a heritage asset and magnitude of impact (tables 19 and 20 in the SMR, respectively).

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

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.

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

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

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

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

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

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

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

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

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

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

9.3 Environmental baseline

Existing baseline

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

- The NHLE (Historic England register of designated heritage assets);
- Greater Manchester Historic Environment Record;
- Cheshire Historic Environment Record;
- conservation area appraisals;
- historic maps and aerial photography;
- Manchester Central Library; and
- Lancashire Records Office.

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

Designated assets

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

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

- one scheduled monument, the promontory fort 300m west of Great Woolden Hall Farm (NHLE 1015127), of high value;
- two Grade II* listed buildings, Holcroft Hall (NHLE 11569651) and Lightshaw Hall (NHLE 1261780) of high value;
- thirty-five Grade II listed buildings including 14 farmhouses and associated structures across the landscape; eight churches and associated assets; three milestones; three private houses; Kenyon Hall (NHLE 1159636) and two associated structures; Byrom Hall (NHLE 1356257) and three assets related to Ince Cemetery, all of moderate value; and
- four conservation areas; Newchurch Hospital conservation area in Culcheth, Park Road conservation area in Golborne, Golborne Town Centre conservation area and Pennington conservation area in Leigh, all of moderate value.

Non-designated assets

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

- two dismantled railways – a branch line and a colliery siding; and
- the site of Lowton Hall.

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

- the earthworks of four moated sites all of moderate value including Bamfurlong Hall;
- three settlements with medieval origins of low value including Bamfurlong, and associated assets;
- Bamfurlong, and associated assets;
- the sites of two low value former collieries;
- ten farmhouses, farm buildings and associated assets and buried archaeology of low value;
- existing and former transport links of low value such as the Leeds-Liverpool Canal and railway branch lines; and
- the moderate value site of a civil war battlefield at Lowton Common.

Historic environment overview

9.3.7 There is no recorded archaeological evidence from the Palaeolithic or Mesolithic periods within the study area, other than a single flint flake attributed broadly to the Prehistoric period. The first evidence of occupation within the study area is that of an Iron Age promontory fort located adjacent to Great Woolden Hall. The fort comprises a double-ditched enclosure encompassing a farmstead and several roundhouses of timber construction which was typical for this lowland zone. Pottery associated with the process of salt production was identified at the site and is indicative of trade with Cheshire, a centre for salt production.

9.3.8 Forts were established at Wigan and Manchester in the late 1st century AD, but there is little known evidence for Romano-British remains within the study area. At Winwick, on the edge of the study area, the remains of settlement have been identified. However, evidence on the fringes of the study area, such as at Winwick, are largely indicative of dispersed rural settlement. The continuation of occupation into the Romano-British period at Iron Age sites such as Great Woolden Hall, suggests that the Roman arrival had little effect on these settlements.

9.3.9 Archaeological evidence of the early medieval period is rare in the study area, what is known of the period is largely from documentary sources and place name evidence. There is no early medieval archaeology recorded within the study area however, evidence of occupation is present on the fringes.

9.3.10 In the medieval period the settlement pattern in the study area was a mix of village settlements, such as Bamfurlong and Lowton, isolated farms and small hamlets. During this time ecclesiastical establishments and manorial centres were the major landholders. A distinctive feature of this period are moated sites and there are several within the study area, including Bamfurlong Hall (MGM5900); Lightshaw Hall (NHLE 1261780) and Byrom Hall (MGM861). The sites emerged in the 12th century and are generally single platforms in a rectangular or square layout. A number of the sites, such as Bamfurlong Hall and Lightshaw Hall are focused on the Hey Brook and may be moated for drainage purposes as much as for defence. Peat mosses across the south of the study area including Holcroft Moss, Risley Moss, Glazebrook Moss and Pestfurlong Moss, played an important role for seasonal pasture, hunting and peat cutting for fuel in this period.

9.3.11 The post-medieval period witnessed the transformation of the North West from relatively impoverished to a key region in the early stages of the industrialisation of Britain. Until later in the 18th century, involvement in agriculture formed at least part of the employment for the majority of working people. Farming activity extended and increased, and waste, common land and other marginal areas were increasingly enclosed. The peat mosses, previously mentioned, underwent great change as part of this process and nightsoil from Manchester was often added as fertiliser. During the Civil War, Wigan served as the headquarters for the Royalist Earl of Derby and the area witnessed numerous battles and smaller skirmishes, including that at Lowton Common in 1642.

9.3.12 At the start of the post-medieval period there were numerous small coal mines around Wigan. Accessible seams had been mined from the 14th and 15th century but technological advances later in this period, including the invention of the beam engine, allowed for the working of deeper and wetter seams. This increased the production of the coalfields of Wigan and Manchester. The presence of the coal fields, textile production and the general growth of industry in Manchester led to the creation of a number of transport links. The Bridgewater Canal, the first canal to be constructed without the presence of a pre-existing water course, was opened in 1759. In 1820, further construction linked it to the Leeds and Liverpool Canal system at Leigh. The Liverpool to Manchester (Chat Moss) railway line opened in 1830, having overcome the difficulties of passing through Chat Moss to the east.

9.3.13 The coal industry continued to grow in the modern period with approximately 50 mines operating in Wigan. Although the infrastructure has often been removed, their former presence can be noted through the presence of spoil heaps and former colliery railway sidings such as those at Edge Green and Golborne Colliery in the study area. In the early 20th century and the inter-war period, industry entered a phase of decline due to a general economic depression and shrinking world markets. Despite this decline it was an important era in housebuilding. Improved roads and rail links allowed people to live away from the city cores and workplaces. The construction of the M62 and the Birchwood motorway links enabled large-scale out of town developments. Birchwood Park, partially within the study area, was the filling site of the Royal Ordnance Factory (ROF) whilst Risley, one of a number of munitions factories founded

in the Second World War, became the site of the UK's fledgling nuclear weapons and power programme.

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 as far as is reasonably practicable.

9.4.2 Section 8 of the draft Code of Construction Practice (CoCP)[76] sets out the measures that will be adopted, insofar as reasonably practicable, to control effects on heritage assets. These include: sets out the measures that will be adopted, insofar as reasonably practicable, to control effects on heritage assets. These include:

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

Assessment of impacts and effects

Temporary effects

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

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

Permanent effects

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

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

9.4.7 The buried remains of Lowton Hall (MGM856) and any associated former landscaping elements is a non-designated asset of low value. It is located within the land required

[76] Supporting document: Draft Code of Construction Practice

to construct the Proposed Scheme. It would be removed during the construction of the Proposed Scheme. This would constitute a high adverse impact and a moderate adverse significant effect.

9.4.8 The surviving earthworks and buried archaeological remains of the Edge Green Colliery railway and sidings is a non-designated asset of low value identified from historic mapping. The asset is within the land required for the Proposed Scheme and would partially be removed during the realignment of the A573 Wigan Road. The Proposed Scheme would require the removal of a substantial portion of the remains affecting its legibility as a siding that connected the colliery with a basin at the Leeds and Liverpool Canal. This would constitute a high adverse impact and moderate adverse significant effect.

9.4.9 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:

9.4.10 Lightshaw Hall (NHLE 1261780) is a Grade II* listed building of high value located approximately 60m to the north of the land required for the Proposed Scheme. The asset is a 16th century timber-framed farmhouse, largely rebuilt in the 18th and 19th centuries, set within a moated site. It is within a working farm, located to the immediate north of the quiet and private Lightshaw Lane. The immediate and wider setting is of open agricultural land which slopes down toward the Hey Brook to the north. Although the Hall is listed for its architectural interest, the setting of the asset contributes to its value. The surrounding farm buildings and the wider agricultural land form a fundamental aspect of the function of the asset. The setting would be adversely impacted by the construction of the Proposed Scheme. The long-range views out over agricultural land to the south will be foreshortened by both the construction of the Pennington embankment and an overbridge to realign the A573 Wigan Road. The land required for the Proposed Scheme includes much of the agricultural land to the south of Lightshaw Lane. The loss of this adjacent farmland would impact on the immediate agricultural setting of the asset. This would be a permanent effect and constitutes a medium adverse impact and a major adverse significant effect.

9.4.11 Barrow Farmhouse (NHLE 1068477) is a Grade II listed building of moderate value located approximately 850m to the west of the land required for the Proposed Scheme. The asset is an 18th century farmhouse located within a working farmyard with expansive views over open agricultural land to the east. It is located on Kenyon Lane, a quiet road, with the farmhouse experiencing little in the way of passing traffic. The farmhouse is one of a number of dispersed farmsteads in a quiet rural location. The local topography allows for long-range views out across the open-agricultural land to the east which currently and historically creates the setting of the farmhouse. Some of the significance of the asset is derived from its architectural and historical value. However, the setting of the asset makes a significant contribution to the significance of the asset as a farmhouse within a largely agricultural landscape, characteristic of the wider area. A distinct tree line, within the views to the east of the farmhouse, denotes the line of the dismantled Great Central Railway (GCR). The construction of the Proposed Scheme would cause the removal of the trees, altering

the skyline. The presence of the Culcheth North embankment would introduce a modern infrastructure element to the currently rural setting and be present in the long-range views. The construction would have a medium adverse impact that would result in a moderate adverse significant effect.

9.4.12 Wigshaw House (NHLE 1139387) a Grade II listed building of moderate value is located approximately 25m to the north of the land required for the Proposed Scheme. The House is a 19th century house prominently located at the junction of Wigshaw Lane and Glaziers Lane. Due to the current road layout and topography, the House forms a local landmark building at the junction and now denotes the point along Wigshaw Lane at which the open rural land starts to become the urban enclosed experience of Culcheth. The tithe map of Culcheth shows that previously the house was located next to a wide stretch of road which emphasised the prominence of the building. In contrast to surrounding properties, the asset is set well back in its plot with low boundary treatments that allow for long-range views out from the asset to the west over the surrounding open agricultural land that has historically formed the setting of the asset. Alterations to the road network would mean that the asset would no longer be afforded the same degree of prominence it currently experiences, altering the appreciation of the asset. Passing traffic would no longer be able to experience the asset in its prominent setting. The construction would have a medium adverse impact on the heritage asset resulting in a moderate adverse significant effect.

9.4.13 Byrom Hall (NHL 1356257) is a Grade II listed building of moderate value located approximately 70m from the nearest section of land required for the Proposed Scheme. The asset is an early 18th century hall set within an earlier moated site. The hall is located to the west of Slag Lane. The residential spread of Lowton to the south has been halted at the boundary formed by the remains of the St. Helens Branch of the GCR, thus maintaining the open agricultural setting of the Hall. A small group of farms and residential properties are located to the immediate south of the Hall. Elsewhere, the landscape is a mix of agricultural and pastoral land. The scale of the house means that its stature dominates the surrounding buildings, whilst allowing for long-range views out over the open agricultural landscape. These views have been curtailed to the west by the presence of coal spoil heaps, now in use as Forestry Commission woodland. Slag Lane forms a main route between Lowton and Leigh and therefore experiences a relatively high volume of traffic. Although the asset derives some its significance from its architectural value, the setting also contributes to its significance. The setting of the Hall would be adversely affected by the construction of Pennington South embankment and the new highway alignment associated with Slag Lane underbridge. The removal of sections of the moat earthworks associated with the asset would impact on the immediate setting changing the ability to recognise the asset as a hall within a moated site. The land required for the embankment, construction compound and mitigation planting would remove the agricultural land within the immediate setting of the asset. The presence of the embankment would adversely change the easterly views out from the asset. The effects would be permanent and constitute a medium adverse impact resulting in moderate adverse significant effect.

Other mitigation measures

9.4.14 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

9.4.15 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.

9.4.16 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: MA05 Map Book; landscape planting could increasingly reduce impacts on the setting of the designated assets within the study area as it matures.

Assessment of impacts and effects

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

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

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

- Wigshaw House (NHLE 1139387);
- Barrow Farmhouse (NHLE 1068477); and,
- Byrom House (NHLE 1356257).

9.5.7 In relation to the following asset, the operation of the Proposed Scheme would result in additional affects that are significant and greater than the permanent effects of construction alone.

9.5.8 The setting of Lightshaw Hall (NHL 1261780), a Grade II* listed building of high value located approximately 60m to the north of the land required for the Proposed Scheme, (discussed above) will be additionally adversely impacted by the sound and movement of trains on the Pennington embankment and traffic on the A573 Warrington Road overbridge. The effects of the operation of the Proposed Scheme, in combination with effect of the presence of the Proposed Scheme, would constitute a medium adverse impact and a major adverse significant effect.

Other mitigation measures

9.5.9 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

9.5.10 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

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

9.5.12 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 Risley to Bamfurlong 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 mineral extraction and areas of designated mineral resources. Consideration is also given to petroleum (gas) prospects and licensing.

10.1.2 Engagement has been undertaken with the British Geological Survey (BGS), Warrington Borough Council (WBC), Wigan Metropolitan Borough Council (WMBC), the Environment Agency, Fera Science Ltd (FSL)[77] 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: MA05 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)[78].

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 the construction of the Proposed Scheme. 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

[77] Formerly known as the Food and Environment Research Agency
[78] 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[79] identified on publicly-available 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 has been collected from a range of sources including Ordnance Survey mapping, BGS, Coal Authority, Cheshire West and Chester Council (CWCC), WBC, WMBC, CRG, Public Health England, the Environment Agency, Natural England, Fera Services Limited (FSL) and APHA records, as well as publicly available geological trusts and mineral plans.

Geology

10.3.2 This section describes the underlying ground conditions within the Risley to Bamfurlong area. Recent changes in lithostratigraphic classifications by the BGS have been incorporated where appropriate[80].

[79] Defined in the SMR as "mineral body including aggregates, salt, coal and other hydrocarbons, Petroleum Extraction Development Licences (PEDLs), Shale Prospective Areas (SPAs)"
[80] British Geological Survey, (2014), *Lithostratigraphy of the Sherwood Sandstone. Research Report RR/14/01.* Available online at: http://www.bgs.ac.uk/downloads/start.cfm?id=2904

10.3.3 Table 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	160m north of Glazebrook Moss to 240m north of the M62 Aye Bridge Farm to Coffin Lane Brook	Artificial ground comprising variable deposits of reworked natural and man-made materials	Not classified
Superficial			
Peat	Southern end of study area to 500m north of the M62	Organic, partially de-composed vegetation	Unproductive strata
Glaciofluvial sheet deposits	Intermittent bands along the Proposed Scheme between the M62 and just south of Culcheth	Sand and gravel	Secondary A
Glacial till	South of Culcheth to the northern end of study area	Sandy silty clay with gravel	Secondary (Undifferentiated)
Glaciolacustrine deposits	West of the A574 Warrington Road (around Yew Tree Farm and Glaziers Lane Farm) A band just south of Lowton Junior and Infant School	Clay and silt	Unproductive strata
Bedrock			
Helsby Sandstone Formation – Sherwood Sandstone Group	Southern end of study area to south of Franks Farm	Pebbly sandstone	Principal
Wilmslow Sandstone Formation – Sherwood Sandstone Group	South of Franks Farm to Lowton St Mary's	Sandstone	Principal
Chester Formation – Sherwood Sandstone Group	Lowton St Marys to the A573 Wigan Road	Sandstone	Principal
Kinnerton Sandstone Formation	Thin band just west of the A573 Wigan Road	Sandstone	Principal
Manchester Marls Formation - Cumbrian Coast Group	Just west of the A573 Wigan Road to Aye Bridge Farm	Mudstone, siltstone and sandstone, interbedded	Secondary B
Collyhurst Sandstone Formation - Appleby Group	Aye Bridge Farm to Bryn Gates	Sandstone	Principal
Pennine Middle Coal Measures Formation	Bryn Gates to the northern end of study area	Mudstone, coal seams, siltstone and sandstone	Secondary A

Made ground

10.3.4 Made ground is a term used to denote man-made deposits such as landfill, spoil heaps or earthworks associated with construction or ground improvement. Such deposits may be poorly mapped and are often very variable in composition. Minor deposits of

made ground may be encountered within this area, for example where ponds, sand or marl pits have been backfilled.

10.3.5 There is evidence of historical and existing authorised landfilling within the area, which may comprise more substantial deposits of made ground. Furthermore, colliery spoil heaps are also present.

10.3.6 Artificial and worked ground is shown on BGSmapping, and is detailed within Table 15. This indicates deposits of made ground are likely to be present across the previously developed land within the study area.

10.3.7 No known farm burial and pyre sites associated with the 1967 and 2001 outbreak of foot and mouth disease (FMD) are known to be present within the Risley to Bamfurlong study area. In all cases, publicly available records (including APHA Foot and Mouth Disease County Status Maps) 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

10.3.8 An area of peat is located at the southern end of the study area (Glazebrook Moss) to approximately 500m north of the M62.

10.3.9 Bands of glaciofluvial sheet deposits, comprising sand and gravel, are present intermittently along the land required for the Proposed Scheme between the M62 and south of Culcheth.

10.3.10 Glacial till[81] (Devensian) deposits comprising sandy silt clay with gravel are located from Culcheth to the northern end of the study area.

10.3.11 Glaciolacustrine deposits, comprising clay and silt, are present to the west of the A574 Warrington Road (around Yew Tree Farm and Glaziers Lane Farm) and just south of Lowton Junior and Infant School.

Bedrock geology

10.3.12 The bedrock geology in the area typically comprises sandstone and conglomerate interbedded siltstones and mudstones which are part of the Sherwood Sandstone Group. The Cumbrian Coast Group and Appleby Group are present in the north of the study area. The Cumbrian Coast Group typically comprises mudstones and the Appleby Group typically comprises sandstones. The Pennine Middle Coal Measures Formation is located in the northern extent of the study area and comprises coal seams, mudstone, siltstone and sandstone.

[81] 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.

10.3.13 The Mercia Mudstone Group underlies the majority of the land required for the Proposed Scheme and comprises mudstone and siltstone; it is present in the area from Glazebrook Moss to the A573 Wigan Road.

10.3.14 The Cumbrian Coast Group is present from just west of the A573 Wigan Road to Aye Bridge Farm, and the Appleby Group underlies the Proposed Scheme from Aye Bridge Farm to Bryn Gates.

10.3.15 The Pennine Middle Coal Measures Formation underlies the Proposed Scheme from Bryn Gates to the northern end of the study area.

10.3.16 The Helsby Sandstone Formation (part of the Sherwood Sandstone Group) comprises sandstone and is present from the southern end of the Proposed Scheme in the area around Glazebrook Moss to just south of Franks Farm.

10.3.17 The Wilmslow Sandstone Formation (part of the Sherwood Sandstone Group) comprises sandstone and is present from just south of Franks Farm to Lowton St Mary's.

10.3.18 The Chester Formation (part of the Sherwood Sandstone Group) comprises sandstone and is present from Lowton St Mary's to the A573 Wigan Road.

10.3.19 The Kinnerton Sandstone Formation (formerly named the Lower Mottled Sandstone) comprises sandstone and a thin band is present just west of the A573 Wigan Road.

10.3.20 The Manchester Marls Formation (Cumbrian Coast Group) comprises interbedded mudstone, siltstone and sandstone and is present just west of the A573 Wigan Road to Aye Bridge Farm.

10.3.21 The Collyhurst Sandstone Formation (Appleby Group) comprises sandstone and is present from Aye Bridge Farm to Bryn Gates.

10.3.22 The Pennine Middle Coal Measures (no parent group) comprises coal seams, mudstone, siltstone and sandstone and is present from Bryn Gates to the end of the Proposed Scheme in this area (around Bamfurlong).

10.3.23 There are faults which will be intersected by the Proposed Scheme in this area in the following locations:

- just east of Warrens Croft Farm, running in a north to south orientation; and
- just east of Glaziers Lane Farm, running in a north-west to south-east orientation.

Radon

10.3.24 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 Database[82].

[82] Available at: http://www.bgs.ac.uk/radon/hpa-bgs.html. 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.

10.3.25 The formal ES will include an assessment of areas where there are 5% of homes estimated to have radon levels at or above 200 becquerels per cubic metre of air (Bq/m^3). 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 200Bq/m^3, as defined by Public Health England's UK Radon online map.

Groundwater

10.3.26 Five categories of aquifer have been identified within the study area, as defined by the Environment Agency. They are:

- the Sherwood Sandstone Group (which underlies the majority of the route and comprise the Helsby Sandstone Formation, the Wilmslow Sandstone Formation and the Chester Formation), the Appleby Group comprising the Collyhurst Sandstone Formation, are designated as Principal Aquifers;
- the Pennine Middle Coal Measures Formation and the glaciofluvial deposits are designated as Secondary A aquifers;
- the Cumbrian Coast Group comprising the Manchester Marls Formation is designated as a Secondary B aquifer;
- the glacial till is designated as a Secondary undifferentiated aquifer; and
- the peat and glaciolacustrine deposits are designated as unproductive strata.

10.3.27 The Environment Agency reports six groundwater abstractions for public water supply located within 1km of land required for the construction of the Proposed Scheme. There is also one private groundwater abstraction that does not require a permit.

10.3.28 The majority of the Proposed Scheme in the Risley to Bamfurlong area is located in a Source Protection Zone[83] (SPZ)3, between Glazebrook Moss and Aye Bridge Farm. The Proposed Scheme would also pass through, and will be located adjacent and west of, a SPZ2 east of Lowton St Mary's at Wash End and north east of Byrom Hall, respectively.

10.3.29 According to Environment Agency records, there are drinking water safeguard zones[84] for groundwater, within 1km of the study area, from Culcheth to east of the Golborne area.

10.3.30 Details of licenced 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 provided with SPZ. In such cases the abstraction point qualifies for a default 10m radius SPZ1 and a default 250m radius for SPZ2. There is no default SPZ3 for total catchment with respect to this type of abstraction.

10.3.31 Further information on the groundwater in the Risley to Bamfurlong area is provided in Section 15, Water resources and flood risk.

[83] 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.
[84] Environment Agency: Drinking Water Safeguard Zone Mapping. Available at: https://environment-agency.cloud.esriuk.com/farmers/.

Surface water

10.3.32 The following watercourses will be intersected by the Proposed Scheme or are on land required for construction of the Proposed Scheme:

- main rivers: Glaze Brook, Small Brook, Holcroft Lane Brook, Tributary of Holcroft Lane Brook, Jibcroft Brook, Carr Brook, Nan Holes Brook, Tributary of Nan Holes Brook 1, Tributary of Hey Brook 3 and Coffin Lane Brook; and
- ordinary watercourses: Windy Bank Brook.

10.3.33 Glaze Brook is within land to be used for the construction of the Proposed Scheme to the north-east of Holcroft Moss. The Proposed Scheme would intersect Small Brook just north-west of Lowton Common, Windy Bank Brook just south of Balmer's Farm, Nan Holes Brook just south of Aye Bridge Farm and Coffin Lane Brook just north of Viridor Wood.

10.3.34 There are also several surface watercourses located within the study area which do not intersect with the Proposed Scheme. These comprise the Leeds and Liverpool Canal which is located 110m to the east, Willow Brook which is located 230m to the east, Jibcroft Brook which is located 120m to the east and Carr Brook which is located 75m to the east.

10.3.35 A number of unnamed streams, tributaries, drains and ponds are also located within the study area, some of which the Proposed Scheme would intersect.

10.3.36 According to Environment Agency records, there are no drinking water safeguard zones for surface water within 1km of the study area.

10.3.37 Surface water bodies in the Risley to Bamfurlong area are described in more detail in Section 15, Water resources and flood risk.

10.3.38 There are is one licensed surface water abstraction located within the study area.

Current and historical land use

10.3.39 Current potentially contaminative land uses within the study area include five industrial sites amongst a number of other commercial land uses. The key potentially contaminative sites are two active railway lines, Taylor Business Park (including tanks and electricity sub-stations), a factory with a mineral railway and a sludge lagoon (associated with a water works which is located outside the study area).

10.3.40 Historical land uses identified within the study area with the potential to have caused contamination include: five landfill sites, three mining sites and 13 industrial sites. Infilled pits and ponds may have been filled with a variety of waste materials, but have not been licensed. The key historical potentially contaminative sites are: a former brick works, the former Bamfurlong Colliery (with associated mineral railways, shafts, pits and excavations), the former Mains Colliery (with associated sidings, mineral railways, chimneys, pits, reservoirs and ponds), a former soap and glue works (now a depot) and historical landfills.

10.3.41 Further details of these 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
Glaze Brook, Culcheth, Warrington (MA05-EAHLD17890)	The historical landfill is located adjacent east of the Proposed Scheme, north east of Holcroft Moss.	The Environment Agency does not hold information pertaining to the licensing of the landfill, the waste types accepted or operational dates.
Wimpey Waste Management, Warrington Road, Risley (MA05-EAHLD16680)	The historical landfill is located 250m west of the Proposed Scheme, just north of Risley.	Environment Agency records indicate that inert, industrial, commercial, household, special and liquid sludge waste was accepted at the landfill between 31 March 1982 and 31 December 1992. Gas control measures are noted at the historical landfill. There is no information available pertaining to the licence number and no surrender date is listed.
J Whiteside Acres, Lowton Sidings, Greater Manchester (MA05-EAHLD16524)	The historical landfill is located on the route of the Proposed Scheme around Lowton Common.	The Environment Agency does not hold information pertaining to the licensing of the landfill, the waste types accepted or operational dates.
Safeway Land Reclamation Limited, Lily Lane, Bamfurlong, Wigan (MA05-EAHLD15526)	The historical landfill is located within the eastern land required for the construction of the Proposed Scheme to the north east of Bryn Gates.	The Environment Agency does not hold information pertaining to the licensing of the landfill or the waste types accepted, although operational dates are listed as between 31 December 1979 and 7 July 1983.
Wimpey Silver Lane, Risley Landfill, Silvery Lane, Risley, Warrington (MA05-EAHLD15518)	The historical landfill is located 250m west of the Proposed Scheme, north of Risley.	Environment Agency records indicate that inert, industrial, special and liquid sludge waste was accepted at the landfill between 30 April 1975 and 31 January 1984. There is no information available pertaining to the licence number, however the licence was issued on 14 June 1977 and surrendered on 10 September 1984.
Biffa Waste Services Ltd, Silver Lane, Risley (MA05-EAHLD16702)	The authorised current landfill is located on route to the north of Gorse Covert.	The Environment Agency does not hold the licence number, although licence type is listed as 5.2 a(1) b) and the waste type description is noted as waste landfilling; any other landfill to which the 2002 landfill regulations apply.

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

Name and Area Reference	Location	Description
Mains Colliery[85] (MA05-104)	South of Bryn Gates, adjacent west of the Proposed Scheme	The former colliery consisted of several shafts across the mines, had underground haulage which included underground compressed air engines, electric lighting, boilers and chimneys. Closure date is noted as 9 September 1960.
Bamfurlong Colliery[86] (MA05-108)	Approximately 160m north of the Proposed Scheme, north of Bryn Gates and Bamfurlong.	The former colliery consisted of several shafts across the mines, had underground haulage which included underground compressed air engines, electric lighting, boilers and chimneys. Closure date is noted in 1936.

[85] https://www.nmrs.org.uk/mines-map/coal-mining-in-the-british-isles/lancashire-coalfield/wigan-coalfield/mains-colliery/
[86] https://www.nmrs.org.uk/mines-map/coal-mining-in-the-british-isles/lancashire-coalfield/wigan-coalfield/bamfurlong-colliery/

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

Name and Area Reference	Location	Description
Taylor's Business Park (and former works) (MA05-022)	Approximately 145m south of the A574 and 50m west of New Hall.	Taylor's Industrial Estate (and former works) is located immediately adjacent to the route approximately 50m west of New Hall and has been present on maps since 1961.
Liverpool to Manchester (Chat Moss) Railway Line (MA05-039)	Approximately 15m south of Burchall's Farm.	Liverpool to Manchester (Chat Moss) Railway Line, present since 1849, intersects the route approximately 15m south of Burchall's Farm.
Lowton Sidings (MA05-073)	Adjacent to Lowton Common	Lowton Sidings, present from 1907 – 1984, intersects the route adjacent to Lowton Common.
Dismantled Railway (MA05-097)	Approximately 175m north east of Windy Bank Farm and 110m south of Balmer's Farm.	The dismantled railway intersects the route 175m north east of Windy Bank Farm and was present on maps between 1893 and 1960.
London and North-western Railway/North Union Line (MA05-103)	Approximately 230m south east of Bryn Gates.	The London and North-western Railway/North Union Line is located immediately adjacent to the route of the Proposed Scheme at its closest proximity, approximately 230m south east of Bryn Gates, and has been present on mapping from approximately 1849 to the present day.
Depot (former soap and glue works) (MA05-46)	Approximately 90m west of Carr Farm.	The former soap and glue works is located immediately adjacent to the route of the Proposed Scheme, approximately 90m west of Carr Farm, and has been present on mapping from approximately 1893 to the present day.

10.3.42 Contaminants commonly associated with sites in Table 16, Table 17 and Table 18 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.

10.3.43 Contaminants commonly associated with current and historical mining, mineral sites and colliery spoil sites can include mine gas.

10.3.44 There are three areas of filled ground (pit, quarry, etc.) noted in the Risley to Bamfurlong area. The types of material deposited in these areas is unknown. The footprints of these are that of the former brick works around Culcheth Carrs, the former Mains Colliery south of Bryn Gates and the former Bamfurlong Colliery between Bryn Gate Lane and the Leeds and Liverpool Canal.

Other regulatory data

10.3.45 The regulatory data reviewed included pollution incidents (major, significant and minor categories), radioactive and hazardous substances consents and environmental permits (previously landfill, integrated pollution control and integrated pollution prevention and control licences).

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

10.3.47 There are no recorded major, significant and minor incidents in the Risley to Bamfurlong area.

10.3.48 The Environment Agency reports two consented discharges to groundwater within the study area. Further details on the groundwater and surface water in the area can be found in Section 15, Water resources and flood risk.

10.3.49 The Environment Agency reports that there are 27 consented discharges to surface water within the study area, one of which are within the land required for the Proposed Scheme.

10.3.50 Records of private unlicensed surface water abstractions, which comprise those for quantities less than 20m³ per day, have been requested from the local authorities. There is no obligation to register private water supplies so unregistered private surface water supplies may be present. Further information can be found in Section 15, Water resources and flood risk.

10.3.51 Holcroft Moss SSSI is a constituent part of the wider Manchester Mosses Special Area of Conservation (SAC) and is located in this area adjacent east of the Proposed Scheme, south of the M62. Abram Flashes SSSI is located approximately 250m east of the land required for the construction for the Proposed Scheme, to the east of Aye Bridge Farm and Aye Bridge Road. Further information can be found in Section 7 Ecology and biodiversity.

Mining/mineral resources

10.3.52 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 and Development Licences (PEDL).

10.3.53 For mining, a potential for significant adverse effects has been identified associated with mine gas and mine water in historical workings. Any mitigation measures will be identified in consultation with authoritative consultees, including measures to be set out in the draft Code of Construction Practice (CoCP)[87] to mitigate any significant adverse effects.

Minerals plans

10.3.54 WBC is responsible for the regulation of minerals and waste in the southern half of the Proposed Scheme in this area (from the M62 to Culcheth). The WBC Local Plan Core Strategy[88] was adopted in July 2014, and Policy MP9 sets out the policies aimed at encouraging the efficient and sustainable use of mineral resources in order to enable the Council to plan for a steady and adequate supply of aggregates. A 'Minerals Resource Study and Policy Review'[89] was undertaken by Urban Vision on behalf of WBC in March 2017, the aim of which was to review the existing Local Plan to ensure a

[87] Supporting document: Draft Code of Construction Practice
[88] Warrington Borough Council. Local Plan Core Strategy. July 2014
[89] Urban Vision. Warrington Borough Council Minerals Resource Study and Policy Review. March 2017

steady and adequate supply of minerals to meet future demand for minerals in the Plan area.

10.3.55 WMBC is responsible for the mineral and waste local plans for the northern half of the Proposed Scheme in this area (from Culcheth up to Bamfurlong). The Wigan Local Plan Core Strategy[90] was adopted in September 2013 and Policy CP15 sets out the policies aimed at meeting the future need for minerals whilst minimising the adverse impacts to the environment, economy and quality of life. The Greater Manchester Joint Minerals Plan' [91] also forms part of the Local Plan for Wigan Borough (as far as it applies). The Greater Manchester Joint Minerals Plan was implemented in April 2013 and outlines how the 10 boroughs within Greater Manchester can plan for minerals in a sustainable manner. No further revisions of either plan have been published.

10.3.56 The study area is not located in a brine compensation area. Salt is not currently exploited in the Warrington area.

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

Sand, gravel, peat and clay deposits

10.3.58 There are three recorded areas of infilled ground (fill type unknown) within the study area.

10.3.59 Mining of peat is noted at the southern end of the study area.

10.3.60 The Proposed Scheme would pass through a brick clay Mineral Safeguarding Area (MSA) in the northern extent of the area around Bryn Gates and Bamfurlong, which is noted as being associated with the Pennine Middle Coal Measures (coincident with shallow coal).

10.3.61 The Proposed Scheme would pass through a MSA for sand and gravel around Culcheth.

Coal mining

10.3.62 Coal is indicated to underlie the Proposed Scheme from the approximate location of the West Coast Main Line (WCML) railway line to Bamfurlong. Worked coal seams are generally in excess of 90m deep up to 1000m.

10.3.63 A MSA for coal is present to the north of the study area, around Bryn Gates and Bamfurlong.

10.3.64 Mining of iron pyrite is noted at the north of the Proposed Scheme associated with the Pennine Middle Coal Measures Formation.

Open cast coal mining

10.3.65 There are no known open cast coal mining sites within the study area.

[90] Wigan District Council. Wigan Local Plan Core Strategy. September 2013. https://www.wigan.gov.uk/Docs/PDF/Council/Strategies-Plans-and-Policies/Planning/Adopted-Core-Strategy.pdf
[91] https://www.trafford.gov.uk/planning/strategic-planning/local-plan/greater-manchester-joint-minerals-development-plan-document.aspx

Underground coal mining

10.3.66 Available records from the Coal Authority show that the route of the Proposed Scheme would pass through areas of recorded underground working from the approximate route of the Liverpool to Manchester (Chat Moss) railway line to Bamfurlong. Coal Authority records indicate probable historical underground coal mining activities in the Bamfurlong area, between 90m and 1000m.

Petroleum Exploration and Development Licences (PEDLs)/Hydrocarbons

10.3.67 The OGA indicates that the Proposed Scheme passes through five PEDL areas in the Warrington Borough. These PEDLs contain wells for mine gas (as recorded on the OGA interactive map viewer). However, none of the wells are located in the study area. Therefore, the wells have been discounted from requiring further assessment.

Geo-conservation resources

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

Receptors

10.3.69 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 and visitors to nearby surrounding properties	High
		Retail and business park users	Moderate
		Commercial or industrial site users	Low
	Groundwater	Principal aquifers (Collyhurst Sandstone)	High
		Secondary A bedrock and superficial aquifers	Moderate
		Secondary (Undifferentiated) superficial aquifers (Till) Secondary B bedrock aquifer	Low
	Surface waters	Glaze Brook, Small Brook, Windy Bank Brook, Nan Holes Brook and Coffin Lane Brook, Leeds and Liverpool Canal, Willow Brook, Jibcroft Brook, Carr Brook and Hey Brook. Various unnamed streams, tributaries and ponds.	Moderate
	Ecological designations	Holcroft Moss SSSI, Abram Flashes SSSI and Manchester Mosses SAC	High
	Built environment	Underground structures and buried services	Low
Impacts on mining/mineral and petroleum (gas) sites (severance and sterilisation)	Mining/mineral sites	Sand and gravel, coal and brick clay MSAs Peat resources PEDLs	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 CoCP. The draft CoCP sets out the measures and standards of work that will be applied to the construction of the Proposed Scheme and includes requirements to ensure the effective management and control of work in contaminated areas.

10.4.2 The requirements in the draft CoCP relating to work in contaminated areas will ensure the effective management and control of the work. These requirements include:

- methods to control noise, waste, dust, odour, gases and vapours (Sections 5, 7, 11, 13, 14 and 15);
- methods to control spillage and prevent contamination of adjacent areas (Section 5, 11 and 16);
- the management of human exposure for both construction workers and people living and working nearby (Section 5, 7, 11, 13 and 14);

- methods for the storage and handling of excavated materials (both contaminated and uncontaminated) (Sections 6, 7, 11 and 15);
- management of any unexpected contamination found during construction (Section 11 and 15);
- a post-remediation permit to work system (Section 11);
- storage requirements for hazardous substances such as oil (Section 5, 11 and 16);
- traffic management to ensure that there is a network of designated site haul routes to reduce compaction/degradation of soils (Section 5, 6 and 14);
- methods to monitor and manage flood risk and other extreme weather events which may affect land quality during construction (Section 5 and 16); and
- methods to manage discovery of unknown animal burial pits (Section 6).

10.4.3 The draft CoCP would require that prior to and during construction, a programme of further detailed investigations, which may include both desk based and site based work, takes place in order to confirm the full extent of areas of contamination. It also requires a risk assessment to be undertaken to determine what, if any, site specific remediation measures are required to allow the Proposed Scheme to be constructed safely and to prevent harmful future migration of contaminants. The investigation and assessment of potentially contaminated sites would be undertaken in accordance with Environment Agency CLR11[92] and British Standards BS10175[93] and BS8576[94] and Construction Industry Research and Information Association (CIRIA) SP32[95].

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

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

[92] Environment Agency, (2004), *CLR11 Model Procedures for the Management of Land Contamination*
[93] British Standard, (2011), *BS10175+A2:2017 Investigation of Potentially Contaminated Sites*
[94] British Standard, (2013) *BS8576 Guidance on investigations for ground gas – Permanent gases and Volatile Organic Compounds (VOCs)*
[95] CIRIA (1983) SP32 Construction over abandoned mine workings
[96] Sustainable Remediation Forum UK, (2010), *A Framework for Assessing the Sustainability of Soil and Groundwater Remediation*

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: MA05 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 key baseline CSM for sites which may pose a contaminative risk for the study area

Reference[97]	Area name	Human health risk	Ground water risk	Surface water risk	Ecosystem risk	Buildings risk
On site[98]						
MA05-03, MA05-05, MA05-12, MA05-23, MA05-26, MA05-62, MA05-73, MA05-106	Landfills: Warrington Road historical landfill, Risley IV landfill, Lily Lane landfill, Lowton Sidings and infilled ponds and pits and mining spoil heaps	Low to moderate	Low	Low	Moderate	Very low to Low
MA05-09, MA05-14, MA05-16, MA05-24, MA05-25, MA05-38, MA05-41, MA05-43, MA05-44, MA05-47, MA05-60, MA05107	Farms: Bates farm, Rowe farm, Glaziers Lane Farm, Phillips Farm, Clayton's Farm /Tunnel Farm, Birchall's Farm, Layland's Farm, Carr Farm, Baily Hall Farm, Bamfurlong Hall Farm	Very low to moderate	Very low	Low	N/A[99]	Low
MA05-13, MA05-37, MA05-57, MA05- 59, MA05-91, MA05-103	Railway land: London and Northwestern Railway Railway/North Union Line, LNER Wigan Junction Branch southern spur, LNER Wigan Junction Branch, Liverpool to Manchester (Chat Moss) Line, Goods shed and goods yard, Lowton Sidings,	Low to moderate/low	Very low	Moderate/low	N/A	Very low to Low

[97] Each potentially contaminated site is allocated a unique reference number
[98] 'On site' is within the area of land required for construction of the Proposed Scheme
[99] N/A refers to the receptor being absent

	Liverpool - St. Helens Line.					
MA05-22, MA05-46, MA05-54, MA05-58, MA05-64, MA05-88	Works: Taylor's Industrial Estate (and former works), Former Soap and Glue Works, unspecified 'depot' and unspecified 'works'	Low to Moderate/low	Very low	Very low	N/A	Low
MA05-46	Animal processing and abattoir/former soap works	Low to moderate to low	N/A	Low	N/A	Low
MA05-70	Former MOD barracks	Low to Moderate	Very low	Very low	N/A	Low
MA05-48	Sludge Lagoon	Very low to moderate	Low	Very low	N/A	Low
MA05-17	Tanks likely for fuel storage	Low to moderate	Very low	Very low	N/A	Low
MA05-65	Sub-station	Low to moderate to low	Very low	Very low	N/A	Very low
MA05-50	Retail and business park	Low	Very low	Very low	N/A	Low to very low
Off site[100]						
MA05-30, MA05-42, MA05-89, MA05-93, MA05-102	Railway land	Very low to moderate/low	Very low	Moderate/low	N/A	Low
MA05-104, MA05-105, MA05-08	Mains Colliery, Bamfurlong Colliery	Low to moderate	Low	Low	N/A	Low
MA05-49	Sewage filter beds	Low to moderate	Moderate/Low	Very low	N/A	Very low
MA05-23, MA05-32, MA05-33, MA05-34, MA05-53,	Depots and works	Low to moderate	Very low	Very low	N/A	Low

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

MA05-66, MA05-92, MA05-93						
MA05-01, MA05-21, MA05-68, MA05-69	Sub-stations	Very low to low	Very low	Very low	N/A	Very low
MA05-31	MOD land	Low to moderate/low	Very low	Very low	N/A	Low
MA05-63	Scrap yard	Very low to moderate	Very low	Very low	N/A	Very low
MA05-66	Garage	Low to moderate	Very low	Very low	N/A	Very low
MA05-27, MA05-40, MA05-43	Farms	Very low to moderate	Very low	Very low	N/A	Low
MA05-18, MA05-20, MA05-56, MA05-75	Tanks – presumed for fuel storage	Very low to low	Very low	Very low	N/A	low
MA05-33	Textile and dye works	Very low to low	Very low	Very low	N/A	Low
TBC	Peat	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. All of the sites set out in Table 20 were found to have non-significant (neutral or minor beneficial) effects.

10.4.14 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.

10.4.15 Construction compounds located in this study area would 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

10.4.16 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.

10.4.17 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.

10.4.18 All of the sites set out in Table 21 were found to have non-significant (neutral or minor beneficial) effects.

Table 21: Summary of permanent (post-construction) effects

Name and area ref	Receptor	Main baseline risk range	Main post-construction risk range	Post-construction effect
On site[101] Lily Lane landfill MA05-106	Abram Flashes SSSI	Moderate	Low	Moderate beneficial effect (significant)
On-site farms (Ref ID: On- site MA05-14, MA05-16, MA05-24, MA05-25, MA05-38, MA05-41, MA05-60)	Human health (site users, uptake through direct contact, ingestion and inhalation of soil/dust and fibres)	Moderate	Very low	Moderate beneficial effect (significant)
On site MOD barracks MA05-70	Human health (site users)	Moderate	Low	Moderate beneficial effect (significant)

[101] 'On site' is within the area of land required for construction of the Proposed Scheme; 'Off site' is beyond the land required for construction of the Proposed Scheme but within 250m of it

Name and area ref	Receptor	Main baseline risk range	Main post-construction risk range	Post-construction effect
On site sewage filter beds (MA05-48)	Human health (site users, uptake through direct contact, ingestion and inhalation of soil/dust and fibres)	Moderate	Low	Moderate beneficial effect (significant)
	Human health (off site users, exposure to gases/vapours and dusts/fibres)	Moderate/low	Very low	Moderate beneficial (significant)

10.4.19 Table 21 indicates that there could be a significant, moderate beneficial effect from the construction of the Proposed Scheme on the status of Abram Flashes SSSI as a result of the remediation of the on-site landfill during construction. The risks to site users from on-site farms could be significantly reduced with a moderate beneficial effect post construction. The risk to human health from an on-site MOD barracks could be significantly reduced as result of the construction phase of the Proposed Scheme. Risks to human health from an on-site sewage filter beds could also be significantly reduced as a result of the construction phase 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[102] or isolation that may occur during the construction phase of the Proposed Scheme, possibly continuing through to its operation.

10.4.21 The northern extent of the route WCML railway line of the Proposed Scheme (from Bryn Gates to Bamfurlong) intersects a brick clay MSA. There is a further MSA for sand and gravel, around Culcheth.

10.4.22 Coal is indicated to underlie the Proposed Scheme from the approximate location of the Manchester to Liverpool (West Coast Mainline) railway line to Bamfurlong. Worked coal seams are generally recorded from 90m deep up to 1000m below ground level.

10.4.23 One coal MSA underlies the north of the study area, around Bryn Gates and Bamfurlong. Coal is recorded to lie between 90m and 1000m below ground level.

Temporary effects

There are no coal, clay or salt resources in the study area and so no temporary effects from the construction of the Proposed Scheme on these resources would occur.

[102] 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

Sand, gravel and clay deposits

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

10.4.25 The following compounds fall within the MSA:

- Pennington satellite compound; and
- M62 west viaduct north satellite compound.

Petroleum Extraction and Development Licences (PEDLs)

10.4.26 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

10.4.27 The majority of effects on current and future workings of underground mining and mineral sites would be permanent

10.4.28 There are no identified opencast coal mines and deep coal mines in the study area, therefore no permanent effects from the Proposed Scheme on these resources would occur.

Sand, gravel and clay deposits

10.4.29 The effects of construction of the Proposed Scheme on the sand and gravel MSAs would be permanent where underlain by the footprint of the permanent works, with a strip of mineral becoming sterilised. However, the effect on the MSA is considered to be minor and therefore not significant, due to this being a small proportion of the total MSA. Mitigation measures (if any) would be discussed in advance of the works with the Mineral Planning Authority, CEC and the mineral owner.

10.4.30 The effect of construction of the Proposed Scheme on the brick clay MSAs is considered to be minor and therefore not significant, due to the fact that the footprint of the MSA does not underlie the Proposed Scheme.

Petroleum Extraction and Development Licences (PEDLs)

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

10.4.32 Table 22 reports the assessment of permanent effects from construction on the mining and mineral resources identified.

Table 22: Summary of effects for mining and mineral resources

Site name	Status	Description	Sensitivity/ value	Magnitude of impact	Effect and significance (Y/N)
Brick Clay MSA	MSA	MSA for brick clay associate with Pennine Middle Coal Measure	Medium	Moderate	Minor adverse effect (N)
Sand and Gravel MSA	MSA	MSA for sand and gravel extraction	Medium	Moderate	Minor adverse effect (N)
Coal MSA	MSA	MSA for coal extraction	Medium	Moderate	Minor adverse effect (N)

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

Geo-conservation sites

10.4.34 There are no geo-conservation sites within the study area.

Other mitigation measures

10.4.35 At this stage, no additional measures are considered necessary to mitigate risks from land contamination during the construction stage beyond those that are set out in the draft CoCP and/or instigated as part of the site specific remediation strategies that will be developed at the detailed design stage if required. These measures 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

10.4.36 Mitigation of the effects on mineral resources within the proposed MSA could include extraction of the resource and 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 mineral planning department at CEC, the landowner and any other relevant parties to assist in achieving an effective management of minerals within the affected location of the MSA.

Summary of likely residual significant effects

10.4.37 No likely significant residual effects are anticipated with respect to land quality.

10.5 Effects arising from operation

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

Avoidance and mitigation measures

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

Assessment of impacts and effects

10.5.3 The Proposed Scheme within this area would include two auto-transformer stations, one located to the south of Culcheth and one to the north east of Golborne. An auto-transformer station, feeder stations and sub-stations can, in principle, be a source of contamination through accidental discharge or leaks of coolant. However, in common with other modern sub-stations, secondary containment appropriate to the level of risk would be included in the installed design.

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

Other mitigation measures

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

Summary of likely residual significant effects

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

Monitoring

10.5.7 Volume 1, Section 9 sets out the general approach to environmental monitoring during operation of the Proposed Scheme. Requirements for monitoring would be determined as part of the investigation, treatment and validation of contamination on a site specific basis as part of the detailed design process. Monitoring requirements may include water quality, air quality and/or (landfill bulk and trace gases), depending on the site being considered.

11 Landscape and visual

11.1 Introduction

11.1.1 This section of the report presents the assessment of the likely significant landscape and visual effects identified to date within the Risley to Bamfurlong area. It summarises the baseline conditions found within and around the route of the Proposed Scheme and describes the likely impacts and significant effects during construction and operation on landscape and visual receptors.

11.1.2 The operational assessment section refers not just to the running of the trains, vehicles on roads and any associated lighting but also the presence of the new permanent infrastructure associated with the Proposed Scheme.

11.1.3 Engagement with Wigan Metropolitan Borough Council (WMBC) 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. The viewpoints identified in this report are provisional and will be further discussed with WBC.

11.1.4 The Volume 2: MA05 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)[103].

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 to March 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

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

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

11.2.3 The extent of the study area has been informed by construction and operational phase zones of theoretical visibility (ZTV). The ZTV have been produced in line with the 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 up to 1.5km of the Proposed Scheme have been assessed as part of the study area, including long distance views at settlement edges, such as at Ashton-in-Makerfield, Leigh and Irlam.

11.2.6 This assessment is based on preliminary design information and makes reasonable worst-case assumptions on the nature of potentially significant effects where these can be substantiated. It is based on information known at present. The assessment of visual effects during construction covers the situation in winter at peak activity. The assessment of operational visual effects covers the situation in winter and summer of year 1 and summer of year 15. The assessment of landscape effects is undertaken for the construction phase and for the operational phase at both year 1 and year 15. The landscape assessment does not consider seasonal variations e.g. winter/summer, since these do not affect character. Likely significant landscape and visual effects for year 30 will be reported in the formal ES.

11.2.7 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 Risley, Glazebrook and Warrington in the south to Bamfurlong in the north. The low-lying, undulating farmland and peatland of the

Mersey Valley to the south includes Chat Moss and Holcroft Moss. The latter is designated as a Site of Special Scientific Interest (SSSI) and part of the Manchester Mosses Special Area of Conservation (SAC), as is the adjacent Risley Moss which is also a Local Nature Reserve (LNR). The area is characterised by the presence of flashes - predominantly low-lying wetland areas formed by subsidence resulting from historic mining and extraction operations. Examples include Abram Flashes SSSI and areas used as landfill sites including Risley.

11.3.2 The land rises gently either side of the Hey Brook corridor, with localised steeper landform associated with watercourses and historic mining activity. It is a fragmented landscape formed of a mosaic of farmland, scattered urban settlements, industry and derelict or reclaimed workings. The identity of the area is strongly associated with past industrial activity. Although historically a degraded landscape, adversely affected by mining, restoration by WMBC and its partners has created attractive and important landscape and habitats which form part of the Greenheart Regional Park[104]. Improved routes for walkers, cyclists and horse riders now link a series of Greenheart sites. These include Bickershaw South and North, Pennington Flash Country Park, Three Sisters, Leeds and Liverpool Canal, Lightshaw Meadows, Viridor Wood and Byrom Hall Wood.

11.3.3 The urban areas of Warrington, Golborne, Leigh and Wigan enclose tracts of agricultural land used for arable farming and grazing. Areas of reclaimed land include community woodland and other areas of open public access land including Bickershaw, Aspull Common and Byrom Hall Wood. The country parks and LNR, such as Pennington Flash, Three Sisters, Abram Flashes (also designated as a SSSI), provide opportunities for people to enjoy the natural environment.

11.3.4 The settlement pattern has been shaped by past mining and industry, resulting in piecemeal development and close intermingling of housing and industrial uses. Conservation Areas are found within the settlements of Culcheth and Golborne.

11.3.5 The M62, A580 East Lancashire Road and the Liverpool to Manchester (Chat Moss) railway line are intrusive elements in the landscape, cutting across the existing landform, causing severance and contributing to low tranquillity. Permissive footpaths along dismantled railway lines around Golborne and Culcheth and the Leeds and Liverpool Canal towpath provide Public Rights of Way (PRoW). Part of a dismantled railway line around Culcheth forms the Culcheth Linear Park.

11.3.6 The LCAs have been determined as part of an integrated process of environmental characterisation, informed by a review of historic landscape mapping and the outcome from other topics including ecological assessments. These LCAs will be refined, as appropriate, upon review of available historic landscape characterisation data and will be included in the formal ES. Use has been made of published landscape character assessments and a wide range of supporting GIS data, aerial photography and Ordnance Survey mapping, plus desk study and fieldwork. Landscape character assessments reviewed include the relevant National Landscape Character Areas and

[104] Greenheart Regional park, Wigan Council, Available online at: https://www.wigan.gov.uk/Resident/Leisure/Greenheart/Greenheart.aspx

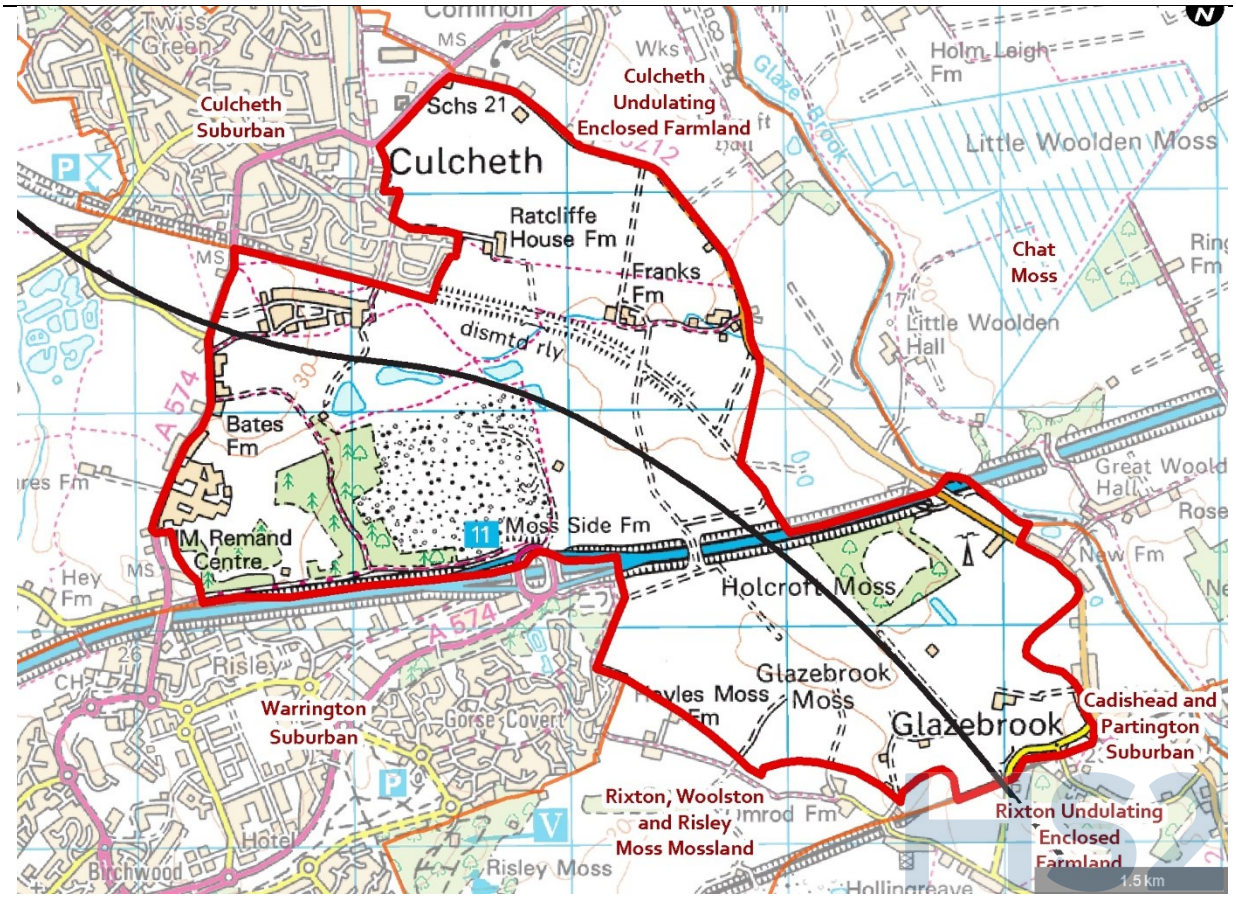
the landscape character assessments for Salford City[105], Trafford Metropolitan Borough[106], Wigan Metropolitan Borough[107] and Warrington Borough[108]. These published LCAs have been adapted for this assessment to provide LCAs of an appropriate and consistent scale, including minor amendments to some published LCA boundaries.

11.3.7 For the purposes of this assessment, Risley to Bamfurlong study area has been subdivided into 15 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. Eleven of the 15 LCAs would not be significantly affected by the Proposed Scheme on account of the distance of these LCAs away from the Proposed Scheme, intervening landform and vegetation. A summary of the remaining three LCAs that would be significantly affected within the Risley to Bamfurlong study area is provided in Table 23.

[105] Salford City Council, Landscape Character Assessment. Available online at: https://www.salford.gov.uk/planning-building-and-regeneration/salfords-natural-environment/landscape/landscape-character-assessment
[106] Trafford Metropolitan Borough Landscape Strategy (2004). Available online at: http://www.trafford.gov.uk/planning/strategic-planning/docs/spg-2004-landscape-strategy.pdf
[107] Wigan A Landscape Character Assessment (2009). Available online at: https://www.wigan.gov.uk/Docs/PDF/Resident/Planning-and-Building-Control/LandscapeCharacterAssessment.pdf
[108] Warrington Landscape Character Assessment (2007). Available online at: https://www.warrington.gov.uk/downloads/file/8633/landscape_character_assessment_2007

Table 23: Summary of Significantly Affected LCAs

Holcroft and Glazebrook Moss Mossland



Flat, open arable landscape of the mossland basin

Linear woodland of the dismatled railway line and end of Risley landfill site

Holcroft and Glazebrook Moss Mossland extends from the Liverpool to Manchester (via Warrington Central) railway line in the south, to the A574 Warrington Road and Culcheth in the north. It forms part of a network of mossland landscapes that includes, Risley Moss, Chat Moss and Highfield Moss level basin of the mossland area, once characterised by dense marsh and woodland habitat has been subject to extensive alteration and erosion. Drainage of land to optimise conditions for arable farming, has resulted in large scale arable fields with notable absence of boundary hedges and trees. The landscape is open, allowing expansive views towards the hills of the Peak District in the east. Towards Culcheth, arable fields are medium scale with some remnant hedgerows creating a more intimate landscape.

The characteristic flat, mossland topography is sensitive to the imposition of raised structures and landform. Risley Landfill site at Silver Lane is an alien landform highly visible within, and beyond the boundaries of the LCA. The Risley

Remand Centre, Taylor Business Park and associated lighting and security fencing, are imposing structures in the agricultural landscape to the south of Culcheth.

The M62 runs in cutting across the LCA in an east west direction, severing field patterns and former mosslands and contributing to low levels of tranquillity. It is well lit at night, with gantries and junctions visible above the line of roadside vegetation. Holcroft Moss Site of Special Scientific Interest (SSSI), an area of woodland, scrub and rough grassland managed by the Cheshire Wildlife Trust, is bounded by the M62 to the north and the B212 Glazebrook Lane overbridge to the east. These infrastructure elements contribute to its sense of physical and visual isolation from the surrounding landscape.

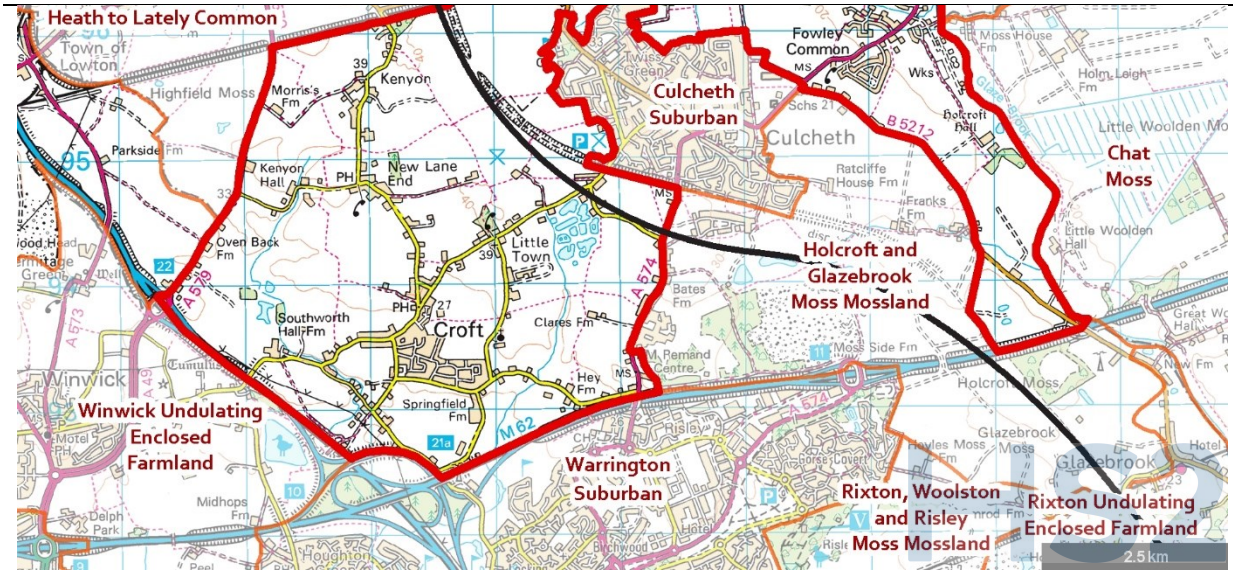
Settlement is sparse, limited to scattered farmhouses on the mossland fringes where groundwater conditions allow for built development. Larger settlements at Culcheth and Gorse Covert lie beyond the boundaries of the LCA and are well integrated into the landscape by woodland planting.

A woodland clad, dismantled railway line runs along the southern edge of Culcheth. It is a key linear feature within the landscape, and part of a network of green-blue spaces that also includes Silver Lane ponds, woodland planting to the restored Risley Landfill site, Holcroft Moss and the Gorse Covert mounds (beyond the boundary of the LCA).

There is a limited PRoW network across the LCA with one combined pedestrian/road link over the M62.

The overall value of this LCA is medium-low based on the woodland, pockets of mossland and low levels of tranquillity.

Culcheth Undulating Enclosed Farmland



Mature oak trees along remnant field boundaries near Wigshaw

Culcheth Linear Park viewed across the arable landscape

This rural landscape extends from the M62 in south to the A580 East Lancashire Road and Liverpool Manchester railway line to the north. The M6 lies to the west and the River Glaze and Warrington Road form the boundary to the east.

The landscape is intensively farmed resulting in medium to large scale fields with no or remnant boundary hedgerows. Improved pasture and stock grazing occurs on poorly drained land close to Wigshaw, where small scale field patterns are

largely intact, delineated by lines of mature oak trees along field boundaries. Fenced horse paddocks are common near settlement edges. The gentle topography and scarcity of intervening field boundary and woodland vegetation allows long, wide, open views across the landscape. Large scale elements such as the Risley landfill site, are highly visible beyond the boundaries of the LCA.

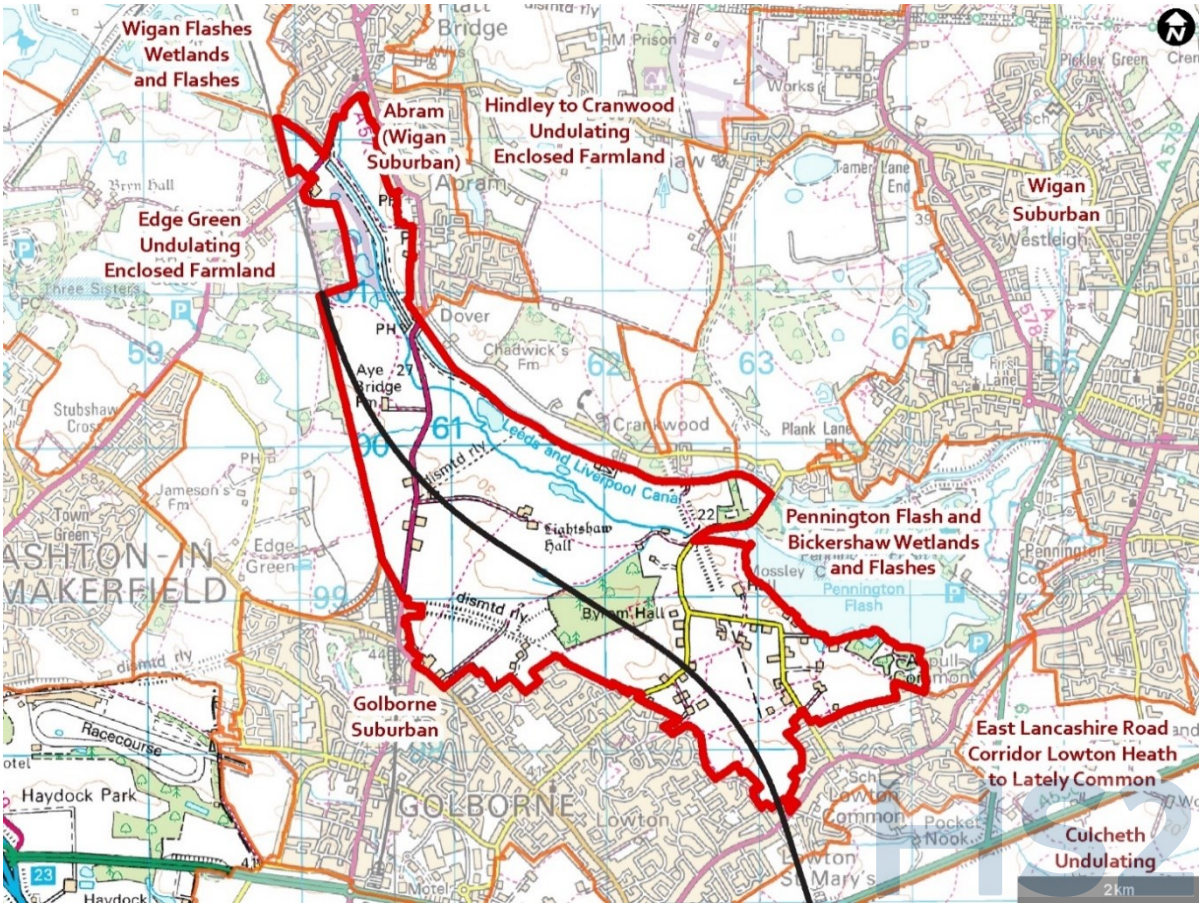
Types of settlement include scattered farmhouses, groups of houses along rural roads and hamlets at Fowley Common, Kenyon, New Lane End and Little Town, and the small village of Croft. The main settlement of Culcheth lies outside the boundaries of the LCA. Culcheth feels isolated from the surrounding landscape due to the physical and visual barrier created by the dismantled railway line to the south and west, and Liverpool to Manchester (Chat Moss) railway Line to the north, both of which have few crossing points.

Cultural and heritage landscape elements include Holcroft Hall (Grade II* listed), Kenyon Hall (Grade II listed) and parkland landscape (now Leigh Golf Club), George Stephenson's Liverpool to Manchester (Chat Moss) Railway Line which runs in shallow, tree-lined cutting to the north of the LCA, listed farmhouses, churches and Newchurch Old Refectory. The strong linear woodland belt along the dismantled railway line to the south and west boundaries of Culcheth contributes to landscape character in an area where woodland cover is sparse. There is a good footpath network. An extensive PRoW network provides excellent pedestrian links within and beyond the boundaries of the LCA and includes the Culcheth Linear Park formed from a section of the dismantled railway line to the south and west of Culcheth. Partridge Lakes Fishery and the Leigh Golf Club contribute to the recreational value of the area.

Detracting elements within the LCA include the A579 Winwick Lane and A574 Warrington Road, main through routes, M6, A580 East Lancashire Road and Liverpool to Manchester (Chat Moss) railway line all of which result in severance and low levels of tranquillity across the LCA. Lines of electricity pylons and wood pole telegraph lines are common features in views.

The overall value of this LCA is medium based on the linear belt of woodland, detracting infrastructure elements and recreational value.

Hey Brook and Aspull Common Undulating Enclosed Farmland and Flashes



Pasture along Hey Brook with the West Coast Mainline (WCML) in the middle distance	Mature oak trees on field boundaries near Red House Farm, Golborne.
	

Hey Brook and Aspull Common Undulating Enclosed Farmland and Flashes is a low-lying landscape within the Makerfield Basin stretching from the urban area of Golborne in the south to Abram in the north. Hydrological features including the Hey Brook, Leeds and Liverpool Canal and Nan Holes Brook along with numerous areas standing water, ponds, field drains, and most notably the Abram Flashes (SSSI), make a strong contribution to landscape character, dictating land use, field patterns and the type and distribution of vegetation within the LCA. Small to medium scale, irregularly shaped fields with remnant hedgerows along field boundaries, support arable farming; rough grassland and permanent pasture cover the Hey Brook floodplain. As land rises towards Golborne in the south west, arable fields are larger in scale with well-maintained field boundary hedgerows. There are several riding schools on the edge of Golborne.
Historically a degraded landscape associated with regional mining operations, this area has been extensively restored and re colonised, and forms an important part of the green infrastructure framework for Greater Manchester and the blue-green network of the Wigan Greenheart Regional Park. There is a notable sense of historic continuity within the LCA represented by historic transport links including the Leeds and Liverpool Canal and three dismantled railway lines, many historic halls and listed buildings including Mossley Hall, Lightshaw Hall (Grade II* listed) and Byrom Hall (Grade II listed), old farms and sunken routes.

The area supports a rich variety of vegetation and habitat types including meadows associated with Hey Brook, linear woodland belts that delineate the course of Nan Holes Brook and dismantled railway lines, and clusters of willow and alder that demarcate ponds and standing water. There is open access woodland at Aspull Common, to the south Pennington Flash, and in association with former halls and parkland estates for example Byrom Hall Wood. The Forestry Commission Viridor Wood Community Woodland and recently planted woodland to the east of the WCML form a strong boundary to the north and west boundaries of the LCA. Mature hedgerow oaks to the west of Red House Farm, are impressive features that convey a sense of maturity within this regenerating landscape.
The LCA is sparsely populated with scattered farmhouses, but set within the context of the surrounding urban areas of Abram and Golborne. An extensive PRoW network provides excellent pedestrian links within and beyond the LCA and includes the Leeds and Liverpool Canal long distance footpath, historic routes and sunken ways. The opportunity for access to green space and semi-natural environments in proximity to the urban areas contributes to the value of this landscape. Long distance views to Rivington Pike in the north contribute to a strong sense of place.
Detracting elements include the busy A573 Wigan Road which is partially lit at night, and West Coast Mainline (WCML) railway on embankment along the western edge of the LCA. These together with the presence of enclosing settlements and often abrupt interfaces between rural and urban areas, reduce the overall sense of tranquillity within the LCA.

The overall value of this LCA is medium based on the extensive PRoW network, historical associations and contribution to blue-green networks.

Visual baseline

11.3.8 A summary description of the distribution and types of receptors most likely to be affected is provided below. The viewpoints are numbered to identify their locations and are shown on the viewpoint location maps (see Volume 2: MA05 Map Book, Map Series Map Series LV-03 and LV-04). In each case, the middle number (xxx.**xx.**xxx) identifies the type of receptor that is present in this area – 1: Protected views (none

within this area), 2: Residential, 3: Recreational[109], 4: Transport, 5: Hotels/healthcare/education and 6: Employment (none within this area).

11.3.9 The majority of residential receptors are concentrated in the larger settlements with lower numbers of receptors in smaller settlements and scattered farmhouses. Views from the settlement edges are typically filtered by intervening hedgerows. Views are more open from the south of the area associated with the low-lying landform of the peatland and mosses. In the north of the area, the presence of vegetation cover, the gently undulating landform and built form limit long distance views.

11.3.10 A number of locations along the Leeds and Liverpool Canal provide elevated, open views over the Hey Brook corridor for recreational users of the towpath and canal. The Glazebrook Trail (long-distance footpath) crosses to the east of the area and views for users of this are largely contained by the localised valley landform and vegetation. The dismantled railway lines close to Golborne and Culcheth tend to be wooded thus limiting views for users of these permissive routes. Long distance views are possible from the higher ground to the north of Pennington Flash Country Park and from other high ground at Gorse Covert, Risley and Three Sisters.

11.3.11 There are also numerous PRoW crossing the area. These are lined by hedgerows of varying condition creating some visual screening for users. People travelling along minor roads and lanes generally experience restricted views due to the visual screening provided by mature hedgerows and trees lining the routes. Hedgerows vary in condition, and in places, particularly associated with arable farming. The hedgerows vary in condition and are gappy in places allowing more expansive views out. In the northern part of the area, hedgerow condition is generally better and, together with a more varied landform and more woodland, views from here tend to be contained.

11.3.12 The views for users of the main roads such as the M62 are generally restricted by mature roadside vegetation. The A580 East Lancashire Road has less roadside vegetation and views are open in places over agricultural land and towards settlements.

11.3.13 There are no protected views within the study area.

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.

[109] 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

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 2024 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)[110] 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[111];
- use of well-maintained hoardings and fencing;
- prevention of damage to the landscape features adjacent to the construction sites due to movement of construction vehicles;
- designing lighting to avoid unnecessary intrusion onto adjacent buildings and other land uses; and
- replacement of any trees intended to be retained which may die as a consequence of nearby construction works.

11.4.5 Implementation of these measures has been considered in the assessment of the construction effects.

Assessment of temporary impacts and effects

11.4.6 The most apparent changes to the landscape and to the views experienced by visual receptors during construction would relate to the presence of construction plant, compounds and soils and material storage and stockpiling. Key construction activities that would give rise to the most apparent changes to landscape and visual receptors are the excavation of cuttings; erection of viaducts; construction of embankments; the removal of existing landscape elements including trees and hedgerows; and the closure and diversion of existing public highways and PRoW. Other key changes include: the construction of overbridges and underbridges, auto-transformer stations and overhead power lines; and demolitions of buildings and structures.

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

Landscape assessment

11.4.7 Based on the current design it is anticipated that the LCAs set out in Table 24 would be significantly affected during construction of the Proposed Scheme.

Table 24: Summary description and assessment of effects on LCAs

Holcroft and Glazebrook Moss Mossland	**Low- medium susceptibility and sensitivity**
Susceptibility to change: The characteristic level basin and open, rural character of the mossland landscape, would have a low-medium susceptibility to change arising from the Proposed Scheme. Construction activity and the introduction of construction plant in particular at the A574 Warrington Road and M62WestViaduct North and South satellite construction compounds and Dam Head Lane and Glazebrook railway south satellite compounds (within MA04) would be at variance with the existing character of this arable landscape. Construction operations would include loss of woodland trees and hedgerows along the disused railway embankment and embankments of the M62, loss of arable farmland and severance of blue-green networks. There would be localised changes to landform due to large scale earthworks and the introduction of temporary material stockpiles, although these would be set within the context of the Risley landfill site. The limited PRoW network would be compromised by temporary closure and diversion of footpaths. The landscape to the south of the M62 would be affected by uncharacteristic construction vehicle movements using temporary site haul routes. Construction activity, additional lighting in a partially lit landscape, and increased noise levels generated by construction activity, would further reduce tranquillity of the LCA. Construction operations would affect a proportion of the LCA. There would therefore be an overall medium magnitude of change and moderate adverse effect.	**Level of effect:** Moderate adverse (significant)
Culcheth Undulating Enclosed Farmland	**Medium susceptibility and sensitivity**
Susceptibility to change: The open, rural character, recreational assets, extensive PRoW network and key linear landscape elements would have a medium susceptibility to change arising from the Proposed Scheme. Construction activity and the introduction of construction plant in particular at the A574 Warrington Road satellite construction compound would be at variance with the existing rural landscape character. There would be localised changes to landform as a result of large scale earthworks and the introduction of temporary material stockpiles. Construction operations would include clearance of a wide corridor of rural landscape, with associated loss of arable farmland, boundary hedgerows and established woodland. Temporary closure and diversion of PRoW and local roads would reduce connectivity with the wider countryside. Tranquillity would be affected by construction activity and associated noise, lighting in a largely unlit environment and movement generated by construction vehicles using A574 Warrington Road and temporary site haul routes. Construction operations would affect a proportion of the LCA. There would therefore be an overall medium magnitude of change and moderate adverse effect.	**Level of effect:** Moderate adverse (significant)
Hey Brook and Aspull Common Undulating Enclosed Farmland and Flashes	**Medium susceptibility and sensitivity**
Susceptibility to change: The historic landscape pattern and recreational value of the landscape have a medium susceptibility to change arising from the Proposed Scheme. The Proposed Scheme would pass through the wider Hey Brook Corridor, separating the settlement of Golborne from Pennington Flash Country Park, the Leeds and Liverpool Canal and Hey Brook corridor	**Level of effect:** Moderate adverse (significant)

to the north and north-east. Removal of existing vegetation to facilitate construction of the Proposed Scheme would directly affect some of the existing field pattern and mature field oaks to the west of Red House Farm and the Grade II listed Byrom Hall and divide Byrom Wood. The sunken lane to Lightshaw Hall (Grade II*) would be unaffected. The satellite compounds would be prominent and uncharacteristic features in the landscape despite the presence of existing infrastructure and residential development to the edge of the LCA. The Pennington satellite compound immediately adjacent to Abram Flashes SSSI and Bamfurlong Hall would be a prominent feature in the LCA. The construction traffic route along Byrom Lane and the presence of construction activity would detract from the tranquillity of this LCA. Construction activity would substantially alter the character and setting of a large part of the LCA, degrading valued landscape features and their setting. There would therefore be an overall medium magnitude of change and moderate adverse effect.	

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 Table 25 describes the construction phase potentially significant visual effects based on the current design of the Proposed Scheme. Viewpoint location are shown in Map Series LV-03 in the Volume 2: MA05 Map Book.

Table 25: Construction phase potentially significant visual effects

Views from PRoW Birchwood 25, representative of residential properties in Gorse Covert, Hoyles Moss Farm, New Hall Farm (VP 322-02-003) **Map Number LV-03-322b**	**High and Medium High Sensitivity Receptors**
Residents and users of recreational footpaths would experience noticeable changes to middle and long-distance views. Construction of the Glazebrook embankment and M62 west viaduct would result in interruption of existing near and middle distance open views across the arable landscape, and long-distance views towards industrial elements in Cadishead, for occupants of residential properties and users of PRoW Birchwood 25. The M62 west viaduct north and south satellite compounds, transfer nodes, earthworks, temporary stockpiling of materials, movement of construction vehicles and machinery, would introduce uncharacteristic elements into near and middle-distance views. Loss of existing woodland from the M62 embankment would open up views to traffic using the M62. There would therefore be an overall high magnitude of change and major adverse effect.	**Level of effect:** Major adverse (significant)

Views from residential properties on the A574 Warrington Road, PRoW Culcheth and Glazebury Footpath 148 and PRoW Croft Footpath 14a, from PRoW Croft Footpath 27 and north from PRoW Croft 20 (VPs 323-03-001, 323-03-002, 323-03-003 and 324-03-001) **Map Number LV-03-323 and 324**	**High and Medium High Sensitivity Receptors**
Residents and users of recreational footpaths would experience substantial changes to near and middle-distance views some partially filtered through intervening vegetation, as a result of construction of the Culcheth south embankment, Risley east underbridge, Croft Footpath 27 accommodation underbridge, Culcheth cutting and A574 Warrington Road overbridge. Construction elements and operations visible in near and middle-distance views would include filtered views to the A574 Warrington Road satellite compound from PRoW Croft 20. Construction traffic would use the A574 Warrington Road and a temporary site haul route to the north of the Proposed Scheme. The large-scale features associated with construction including machinery, earthworks, temporary stockpiles, construction compounds and access roads, fencing and lighting would be viewed in the context of the large scale arable fields, gappy field boundary vegetation, partially restored Risley landfill site and HM Remand Centre. The removal of existing vegetation to facilitate construction, would increase the visibility of the Proposed Scheme from the surrounding area. Material stockpiles used as a temporary form of visual mitigation, would have little effect, due to the scale of elements under construction. There would therefore be an overall high magnitude of change and major adverse effect.	**Level of effect:** Major adverse (significant)
View from Wigshaw, from Blakely Farm Cottage and PRoW Croft Footpath 8 (VP 324-02-003) **Map Number LV-03-324**	**High and Medium High Sensitivity Receptors**
Occupants of residential properties and users of recreational footpaths would experience substantial changes to near distance views for as a result of construction of the Culcheth cutting, Wigshaw Lane realignment, A574 Warrington Road overbridge and Glaziers Lane realignment. There would be direct views to construction elements and operations to the west, south and north, including the A574 Warrington Road satellite compound. Construction traffic would use the A574 Warrington Road to the east, and a temporary site haul route directly to the south west of Wigshaw. The large-scale features associated with construction including machinery, earthworks, temporary stockpiles, construction compounds and access roads, fencing and lighting would be viewed in the context of the immediate, intimate arable landscape, linear woodland belts, scattered residential and farm buildings and Wigshaw Lane road corridor. The removal of existing mature trees from Culcheth Linear Park and boundary vegetation from arable fields to facilitate construction, would increase the visibility of the Proposed Scheme. Material stockpiles used as a temporary form of visual mitigation, would have little effect, due to the scale of elements under construction. There would therefore be an overall high magnitude of change and major adverse effect.	**Level of effect:** Major adverse (significant)
Views for users of PRoW Culcheth and Glazebury Footpath 108, and from PRoW Croft Footpath 105 (VPs 325-03-001 and 325-02-002) **Map Number LV-03-325**	**High and Medium High Sensitivity Receptors**
Residents and users of recreational footpaths would experience substantial changes to near and middle-distance views for, as a result of construction of the Culcheth North embankment. Construction traffic would use a section of Kenyon Lane and a temporary site haul route to the east side of the Proposed Scheme. The large-scale features associated with construction including machinery, earthworks, temporary stockpiles, construction compounds and access roads, fencing and lighting would be viewed in the context of the existing arable landscape, medium scale fields and the woodland backdrop of the Culcheth Linear Park. The features would extend across the majority of the view for PRoW users looking towards the Proposed Scheme from the west, but most views from residential properties would be partially filtered by intervening field boundary vegetation. Removal of mature trees from Culcheth Linear Park and southern boundary of the Liverpool to Manchester (Chat Moss) railway line, would open up views to construction operations and passing trains, respectively, for users of the Leigh Golf Course. Material stockpiles used as a temporary form of visual mitigation, would have little effect, due to the scale of elements under construction. There would therefore be an overall high magnitude of change and major adverse effect.	**Level of effect:** Major adverse (significant)

Views from residential properties on Beech Avenue, Dickinsons Farm and PRoW Golborne Footpath 79, and from PRoW Golborne Footpath 72 (VPs 325-02-004, 325-02-003 and 326-02-001) **Map Number LV-03-325 and 326**	**High and Medium High Sensitivity Receptors**
Occupants of residential properties, staff and pupils of Lowton Junior and Infant School and users of recreational footpaths would experience substantial changes to near and middle-distance views, as a result of construction of the B5027 Wilton Lane overbridge, Lowton cutting and the presence of the A580 East Lancashire Road satellite compound and theA580 East Lancashire Road main compound. Construction traffic would use the A580 East Lancashire Road and Kenyon Lane, and a temporary site haul route to the west of the Proposed Scheme. Views across the existing mixed use agricultural landscape, well maintained field boundaries, linear belt of woodland along the dismantled railway line and A580 East Lancashire Road would be replaced by large-scale features associated with construction including machinery, earthworks, temporary stockpiles, construction compounds and access roads, fencing and lighting. Material stockpiles used as a temporary form of visual mitigation would partially screen construction of the Lowton cutting from the Lowton Junior and Infant School grounds. The removal of existing roadside vegetation from the A580 East Lancashire Road to facilitate construction would open up middle distance views to road traffic and construction activity. There would therefore be an overall high magnitude of change and major adverse effect.	**Level of effect:** Major adverse (significant)
Views from residences off Hesketh Meadow Lane and from properties off Newton Gardens and Cheetham Fold, Brancaster Drive and Stradbroke Close, Lowton Common (VP 326-02-003) **Map Number LV-03-326**	**High and Medium High Sensitivity Receptors**
Occupants of residential properties would have direct near and middle-distance views to construction of the A572 Newton Road overbridge and A572 Newton Road satellite compound, Lowton cutting and Pennington embankment. Construction traffic would use the A572 Newton Road and a temporary site haul route to the east of the Proposed Scheme along Lowton Common. The removal of existing trees and vegetation, along the dismantled railway line and close to property boundaries, would open up views to construction activity and the Lowton cutting in particular. Existing views of Lowton Common, woodland vegetation along the dismantled railway line and residential properties on the edges of Golborne, would be replaced with views of large-scale features associated with construction including machinery, earthworks, temporary stockpiles, construction compounds and access roads, fencing and lighting. The use of temporary material stockpiles would help screen near distance views to construction operations for recreational users of Lowton Common. There would therefore be an overall high magnitude of change and major adverse effect.	**Level of effect:** Major adverse (significant)
Views from Stone Pitch, Golborne, from PRoW Golborne Footpath 63 and from Little Byrom Hall Farm, Slag Lane (VPs 326-02-005, 326-03-004 and 326-02-006) **Map Number LV-03-326**	**High and Medium High Sensitivity Receptors**
Residents and users of recreational footpaths would experience near and middle-distance views, some filtered through intervening vegetation, of the construction of Pennington embankment, Golborne Footpath 63 accommodation overbridge, Slag Lane underbridge and Golborne Footpath 33 accommodation underbridge, and the Slag Lane auto-transformer station satellite compound and Slag Lane satellite compound. Construction traffic would use Slag Lane, Sandy Lane and a temporary site haul route to the east of the Proposed Scheme. For residents on Slag Lane a large proportion of near distance views to the east and west would be of construction operations and elements. Existing views across small scale fields of improved pasture towards lines of mature oak trees, Byrom Hall Wood and dense vegetation along the dismantled railway line, would be replaced with views of large-scale features associated with construction including machinery, earthworks, temporary stockpiles, construction compounds and access roads, fencing and lighting. The removal of existing trees and vegetation to field boundaries and woodland from Byrom Hall Wood, would further open up views to newly introduced construction elements and operations, and substantially alter the character of existing views. Material stockpiles, as a temporary form of visual mitigation, would have little effect, due to the scale of elements under construction. There would therefore be an overall high magnitude of change and major adverse effect.	**Level of effect:** Major adverse (significant)

Views from PRoW Golborne Footpath 33, and from PRoW Golborne Footpath 28 (VPs 327-02-001 and 327-03-002) **Map Number LV-03-327**	**High and Medium High Sensitivity Receptors**
Occupants of residential properties and users of recreational footpaths would have substantial changes to near and middle-distance views, some filtered through intervening vegetation, as a result of construction of the Pennington embankment. The Lowton crossovers satellite compound would be visible from within Byrom Hall Wood. Construction traffic would use a temporary site haul route to the north east of the Proposed Scheme. Large-scale features associated with construction including machinery, earthworks, temporary stockpiles, construction compounds and access roads, fencing and lighting would be viewed within the context of the existing agricultural landscape, Byrom Hall Wood and the setting of Lightshaw and Byrom Hall. The removal of existing trees and vegetation to field boundaries, groups of native trees and woodland from Byrom Hall Wood would further open up views to newly introduced construction elements and operations. Construction elements would feature across the majority of the view for PRoW users, but most views from residential properties would be partially filtered. Material stockpiles at 3m high, as a temporary form of visual mitigation, would have little effect, due to the scale of elements under construction. There would therefore be an overall high magnitude of change and major adverse effect.	**Level of effect:** Major adverse (significant)
Views from PRoW Golborne 30, from PRoW Ashton in Makerfield 28 and from the Leeds and Liverpool Canal (VPs 327-03-003, 327-02-006 and 327-03-005) **Map Number LV-03-327**	**High and Medium High Sensitivity Receptors**
Occupants of residential properties and users of recreational footpaths would have near and middle-distance views, some filtered through intervening field boundary vegetation, of the construction of the A573 Wigan Road overbridge, Lightshaw Lane realignment, and Pennington embankment. A large proportion of near distance views for residents of Wigan Road Farm, Windy Bank Farm, Balmer's Farm and Aye Bridge Farm would be of the A573 Wigan Road satellite compound. Construction traffic would use the A573 Wigan Road, and a temporary site haul route to the east of the Proposed Scheme. Existing views of the Hey Brook corridor and arable landscape would be replaced with views to large-scale construction elements including machinery, earthworks, temporary stockpiles construction compounds and access roads, fencing and lighting. Loss of existing vegetation from Nan Holes Brook and intervening field boundaries, would result in direct views to construction operations for PRoW users. There would be oblique, partially filtered, middle distance views to construction operations for users of the Leeds and Liverpool Canal towpath and partially screened views from Lightshaw Hall. The use of temporary material stockpiles at 3m high to mitigate construction operations, would provide some screening for near distance views, but large-scale construction elements would still be prominent. There would therefore be an overall high magnitude of change and major adverse effect.	**Level of effect:** Major adverse (significant)
Views from PRoW Ashton in Makerfield Footpath 22 and St John's Church, Abram, and the A573 Aye Bridge Road (VPs 328-03-003, 328-02-001 and 328-02-004) **Map Number LV-03-328**	**High and Medium High Sensitivity Receptors**
Occupants of residential properties and users of recreational footpaths would experience near and middle-distance views, some filtered through intervening vegetation, of the construction of the Pennington embankment. Construction traffic would use the A58 Lily Lane, A573 Wigan Road and a temporary site haul route to the east of the Proposed Scheme. The large-scale features associated with construction, including machinery, earthworks, temporary stockpiles, Pennington satellite compound, fencing and lighting would contrast with existing views over the rural landscape of the Hey Brook corridor. These features extend across the majority of the view from the elevated viewpoint at Abram, filtered through intervening vegetation. For walkers along the PRoW, construction operations and elements are visible across the majority of the view and direct. Removal of existing screening vegetation from Viridor Wood and intervening field boundaries from within the Hey Brook corridor would exacerbate this situation and open up views to newly introduced construction elements and operations including the main construction compound. The use of temporary material stockpiles at 3m high to screen construction operations would do little to mitigate views to such large-scale construction elements.	**Level of effect:** Major adverse (significant)

There would therefore be an overall high magnitude of change and major adverse effect.	
Views from Epsom Drive, Bamfurlong (VP 328-02-005) **Map Number LV-03-328**	**High and Medium High Sensitivity Receptors**
Occupants of residential properties and users of recreational footpaths would experience noticeable changes to near distance views in association with the construction of the Pennington embankment. Construction traffic would use the A58 Lily Lane. The large-scale features associated with construction, including machinery, earthworks, temporary stockpiles, the Pennington satellite compound, fencing and lighting would be uncharacteristic of existing views over the intimate rural landscape. Removal of existing vegetation within Viridor Wood to the east of the WCML would open up direct views to construction operations and elements, and in particular the Pennington satellite compound. There would therefore be an overall high magnitude of change and major adverse effect.	**Level of effect:** Major adverse (significant)

Other mitigation measures

11.4.12 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 occupants of residential properties and users of recreational footpaths.

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

- moderate adverse effects in relation to three LCAs;
- major adverse visual effects for 14 residential viewpoint locations; and
- major adverse visual effects for 10 recreational viewpoint locations.

11.5 Permanent effects arising from operation

11.5.1 The permanent features of the Proposed Scheme that have been considered 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:

- 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 Viridor Wood and Byrom Hall Wood, and to provide habitat connectivity, enhanced landscape/green infrastructure connectivity, as well connectivity of historic landscape features, in appropriate locations, and to soften embankments and viaduct abutments;
- hedgerow replacement and restoration in areas of loss to restore connectivity and landscape pattern 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 wetland enhancement at Nan Holes Brook; and
- landscape mitigation planting to help integrate the Proposed Scheme into the landscape, for example along the embankments and cuttings such as the Glazebrook embankment and Culcheth south embankment; the slopes of road bridges such as the A573 Wigan Road overbridge and Slag Lane underbridge, and hedgerow habitat creation along the A574 Warrington Road overbridge and along the top of the Culcheth cutting.

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 M62 West viaduct, Glazebrook embankment, A574 Warrington Road overbridge, Culcheth cutting, Culcheth North and South embankments, Wigshaw Lane realignment, B5027 Wilton Lane overbridge, A580 East Lancashire Road overbridge, A572 Newton Road overbridge, Lowton cutting, Slag Lane underbridge, Pennington embankment and A573 Wigan Road overbridge. Other aspects include the presence of overhead line equipment, fencing, noise fence barriers, overbridges and underbridges for PRoW and farm access.

Landscape assessment

11.5.4 Based on the current design, it is currently anticipated that the LCAs described in Table 26 would be significantly affected during operation of the Proposed Scheme.

Table 26: Operational phase significant landscape effects

Holcroft and Glazebrook Moss Mossland	
Year 1: The LCA would be directly affected by operation of the Proposed Scheme. Loss of existing vegetation during the construction would reduce capacity of the LCA to accommodate and absorb these changes. The introduction of large scale elements including the Glazebrook embankment, M62 west viaduct, Culcheth south embankment, A574 Warrington Road overbridge (partially within this LCA) and Culcheth cutting would be at variance with the landscape character of the level basin of the mosslands. Although set within a highly altered landscape, the Proposed Scheme would be at a much greater scale than existing	**Level of effect:** Moderate adverse (significant)

infrastructure elements. This high level linear element would sever the LCA almost along its centreline, resulting in fragmentation of fields, the diversion of PRoW, realignment of access roads, and interrupting contextual and open views to the hills of the Peak District in the east. The noise of trains moving through the landscape would further reduce levels of tranquillity. There would be a noticeable and irreversible change to characteristics across a proportion of the LCA. There would therefore be an overall medium magnitude of change and moderate adverse effect.	
Year 15: Landscape mitigation planting, landscape earthworks, hedgerow, wetland and grassland habitat creation would be sufficiently established to assist with some integration of the Proposed Scheme into the existing landscape. However, new features would remain prominent in the landscape due to their scale and variance with the existing landform. Severance of the landscape, loss of long distance views, fragmentation of field patterns and reduction in levels of tranquillity would remain. There would continue to be a medium magnitude of change and moderate adverse effect.	**Level of effect:** Moderate adverse (significant)
Culcheth Undulating Enclosed Farmland	
Year 1: The LCA would be directly affected by operation of the Proposed Scheme. Loss of existing vegetation during the construction would reduce capacity of the LCA to accommodate and absorb these changes. The introduction of large scale elements including the Culcheth cutting, Culcheth North embankment and Glazebrook railway underbridge, and the overbridges across the A574 Warrington Lane, B5027 Wilton Lane and A580 East Lancashire Road, would be at variance with the gently undulating rural character of the existing landscape to the west of Culcheth. The Proposed Scheme would be at a much greater scale than the existing disused railway line and Liverpool to Manchester (Chat Moss) railway line. This high level linear element would intersect a proportion of the LCA, resulting in fragmentation of the landscape, severance of existing field patterns and isolation of settlements such as Wigshaw. The perceptual and experiential qualities of recreational assets including PRoW, the Culcheth Linear Park, Leigh Golf Club and Partridge Lakes Fishery would be directly affected by increased noise levels from passing trains. There would be a noticeable and irreversible change to characteristics across a proportion 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: Landscape mitigation planting, landscape earthworks, hedgerow, wetland and grassland habitat creation would be sufficiently established to assist with some integration of the Proposed Scheme into the existing landscape. However, new features would remain prominent in the landscape due to their scale and variance with the existing landform. Severance of the landscape, isolation of the settlement at Wigshaw, fragmentation of field patterns and reduction in levels of tranquillity would remain. There would continue to be a medium magnitude of change and moderate adverse effect.	**Level of effect:** Moderate adverse (significant)
Hey Brook and Aspull Common Undulating Enclosed Farmland and Flashes	**Medium susceptibility and sensitivity**
Susceptibility to change: The cultural and historic landscape pattern and recreational value of the landscape have a medium susceptibility to change arising from the Proposed Scheme. **Year 1**: The LCA would be directly affected by the severance caused by the Proposed Scheme passing through the river valley, separating the settlement of Golborne from Pennington Flash and Hey Brook Corridor to the north and north-east. The Proposed Scheme would introduce further railway infrastructure into a landscape which already contains the existing West Coast Main Line and several disused railway embankments. It would further fragment the landscape and alter the connectivity of the extensive network of PRoW that exists in the LCA, reducing opportunities for access to open space and valued ecological sites in proximity to the adjoining urban areas. The A573 Wigan Road overbridge would be a large scale and uncharacteristic element in the landscape. Some of the existing field pattern and mature field oaks to the west of Red House farm and the Grade II listed Byrom Hall would be directly affected. Important green corridor links would be severed by the Proposed Scheme. Byrom wood would be severed in two by the Proposed Scheme on embankment. Mitigation planting would not provide any landscape integration in year 1. The introduction of large scale infrastructure and earthworks, bridges and the	**Level of effect:** Moderate adverse (significant)

change to the historic landscape pattern and network of PRoW would permanently change key characteristics of the LCA. There would therefore be an overall medium magnitude of change and a moderate adverse effect.	
Year 15: Whilst mitigation planting would provide some integration for the elements of the Proposed Scheme into the landscape, and overbridges and underbridges would re connect some PRoW networks, the low lying character of the LCA and existing connectivity would be compromised. There would continue to be a medium magnitude of change and moderate adverse effect.	**Level of effect:** Moderate adverse (significant)

Visual assessment

Introduction

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

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

11.5.7 Table 27 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: MA05 Map Book.

Table 27: Operation phase significant visual effects

Views from PRoW Birchwood 25, representative of residential properties in Gorse Covert, Hoyle's Moss Farm, New Hall Farm (VP 322-02-003) **Map Number LV-04-322b**	**High and Medium High Sensitivity Receptors**
Year 1 – winter and summer Occupants of residential properties and users of recreational footpaths would experience noticeable changes to near and middle-distance views as a result of operation of the Proposed Scheme. The Glazebrook embankment, associated overhead line equipment, movement of trains, and the M62 west viaduct, would be prominent in views across the flat, arable landscape, viewed against the skyline. These large-scale features would be uncharacteristic of existing views despite the presence of existing infrastructure elements. Newly planted mitigation woodland and hedgerows would not be sufficiently mature to contribute to any visual integration or enclosure. 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 Glazebrook embankment and boundary fencing would be partially screened by mitigation hedgerow planting to the west of the embankment. However, the height of the Proposed Scheme means that the upper parts of the structures, overhead line equipment and the movement of trains would continue to be visible in views across this flat landscape, resulting in changes to rural characteristics of the view. The magnitude of change would reduce to medium and there would be a moderate adverse effect.	**Level of effect:** Moderate adverse (significant)
Views from residential properties on the A574 Warrington Road, PRoW Culcheth and Glazebury 148 and PRoW Croft 14a, from PRoW Croft 27 and from PRoW Croft 20 (VPs 323-03-001, 323-03-002, 323-03-003 and 324-03-001) **Map Number LV-04-323 and 324**	**High and Medium High Sensitivity Receptors**

Year 1 – winter and summer Users of recreational footpaths and occupants of residential properties would experience new, large scale, uncharacteristic structures, into near and middle-distance views. The Culcheth south embankment would be a high wide linear element within this predominantly flat landscape, and along with its associated noise fence barriers, overhead line equipment and movement of trains, would be highly visible in near and middle-distance views from the north, viewed against the backdrop of the restored Risley Landfill site. The A574 Warrington Road overbridge would be a new high, out of character structure viewed against the skyline. The Culcheth cutting, would alter the appearance of the existing landform and field patterns and alter current landuse. Landscape mitigation earthworks would partially mitigate views of the cutting. However, the Warrington Road auto-transformer station, safety fencing, noise fence barriers, overhead line equipment and moving trains would be visible above the line of the cutting. Newly planted mitigation woodland and hedgerows would not be sufficiently mature to contribute to any visual integration or enclosure. 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 Culcheth cutting, Culcheth south embankment, A574 Warrington Road overbridge would be partially screened by a combination of mitigation planting and landscape earthworks. However, the movement of trains, overhead line equipment, embankment and overbridges would be uncharacteristic elements across near and middle distance views in this rural landscape. The magnitude of change would reduce to medium and there would be a moderate adverse effect.	**Level of effect:** Moderate adverse (significant)
View from Wigshaw, from Blakely Farm Cottage and PRoW Croft 8 **(VP 324-02-003)** **Map Number LV-04- 324**	**High and Medium High Sensitivity Receptors**
Year 1 – winter and summer Occupants of residential properties users of recreational footpaths would experience new, large-scale, uncharacteristic structures, into near and middle-distance views. Removal of mature vegetation from the Linear Park and field boundary hedgerows during construction would result in the loss of elements that contribute to the rural character of existing views. The A574 Warrington Road overbridge and Croft footpath 8a accommodation overbridge would be new high structures within this predominantly flat landscape. Culcheth cutting, Wigshaw Lane and Glaziers Lane realignments, and the Culcheth north embankment, would alter the appearance of the existing landform, land use and field patterns. Landscape mitigation earthworks would partially mitigate views of the Culcheth cutting. However, safety fencing, noise fence barriers, overhead line equipment and moving trains would be visible above the line of the cutting. Newly planted mitigation woodland and hedgerows would not be sufficiently mature to contribute to any visual integration or enclosure. 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 Culcheth cutting, A574 Warrington Road overbridge and Croft Footpath 8a accommodation overbridge would be partially screened by a combination of mitigation planting and landscape earthworks. However, Wigshaw Lane and Glaziers Lane realignments, overbridges, the movement of trains and overhead line equipment would be uncharacteristic elements across near and middle distance views. The magnitude of change would reduce to medium and there would be a moderate adverse effect.	**Level of effect:** Moderate adverse (significant)
Views from users of PRoW Culcheth and Glazebury 108, and from PRoW Croft 105 (VPs 325-03-001 and 325-02-002) **Map Number LV-04-325**	**High and Medium High Sensitivity Receptors**
Year 1 – winter and summer Occupants of residential properties and users of recreational footpaths would experience new large scale, uncharacteristic structures into existing near and middle-distance views. The Culcheth north (railway) underbridge, Culcheth north embankment, associated noise fence barriers up, overhead line equipment and the movement of trains, would be highly visible against the skyline in middle distance views from residential	**Level of effect:** Major adverse (significant)

properties and PRoW to the west of Culcheth. Views to these new large-scale elements would extend across the majority of near distance views to the west and north for users of the Leigh Golf Club and PRoW Culcheth and Glazebury Footpath 108 due to the loss of mature trees from the Linear Park and Liverpool to Manchester (Chat Moss) railway line, during construction. Newly planted mitigation woodland and hedgerows would not be sufficiently mature to contribute to any visual integration or enclosure. There would therefore be an overall high magnitude of change and major adverse effect.	
Year 15 – summer Views of the Culcheth north embankment and Culcheth north (railway) underbridge would be partially screened by mitigation planting. However, the scale of these structures means that they will remain highly visible in middle distance views across the landscape from the west and in near distance views from the east, viewed against the skyline. The magnitude of change would reduce to medium and there would be a moderate adverse effect.	**Level of effect:** Moderate adverse (significant)
Views from residential properties on Beech Avenue, Dickinsons Farm and PRoW Golborne 79, and from PRoW Golborne Footpath 72 (VPs 325-02-004, 325-02-003 and 326-02-001) **Map Number LV-04-325 and 326**	**High and Medium High Sensitivity Receptors**
Year 1 – winter and summer Occupants of residential properties, staff and pupils of Lowton Junior School and users of recreational footpaths would experience new large-scale, uncharacteristic structures, into existing near and middle-distance views. The Lowton cutting, would radically alter the appearance of the existing landform, land use and field patterns. Landscape mitigation earthworks would partially mitigate views of the cutting. However, safety fencing, noise fence barriers, overhead line equipment and moving trains would be visible above the line of the cutting, as the Proposed Scheme transitions from the Culcheth north embankment to the Lowton cutting. The B5027 Wilton Lane overbridge would be highly visible in near and middle-distance views across this predominantly flat landscape. Newly planted mitigation woodland and hedgerows would not be sufficiently mature to contribute to any visual integration or enclosure. 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 Lowton cutting would be partially screened by a combination of landscape earthworks, landscape mitigation woodland planting and hedgerows. However, the extent of the cutting, would mean sustained alteration of characteristic land use, field patterns and landform in near and middle-distance views to the south and east. Views of the B5027 Wilton Lane overbridge would be partially screened and filtered by landscape mitigation planting, but would remain highly visible in near and middle-distance views. The magnitude of change would reduce to medium and there would be a moderate adverse effect.	**Level of effect:** Moderate Adverse (significant)
Views from residences off Hesketh Meadow Lane and from properties off Newton Gardens and Cheetham Fold, Brancaster Drive and Stradbroke Close, Lowton Common (VP 326-02-003) **Map Number LV-04-326**	**High and Medium High Sensitivity Receptors**
Year 1 – winter and summer In year 1 of operation, the Proposed Scheme would introduce new, large-scale, uncharacteristic structures, into existing near and middle-distance views for recreational users of Lowton Common and occupants of residential properties. Removal of mature vegetation from Lowton Common and the dismantled railway line during construction would result in the loss of elements that contribute to the rural character of existing views. The large scale Lowton cutting would radically alter existing landform and land use. Landscape mitigation earthworks would partially mitigate views of the cutting. However, safety fencing, noise fence barriers, overhead line equipment and moving trains would be visible above the line of the cutting, as the train transitions from Lowton cutting to Pennington embankment. Newly planted mitigation woodland and hedgerows would not be sufficiently mature to contribute to any visual integration or enclosure. 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 Lowton cutting would be partially screened by a combination of mitigation planting and landscape earthworks, though movement of trains, fencing and overhead line equipment would remain uncharacteristic elements in near distance views as the train transitions from Lowton cutting to Pennington embankment.	**Level of effect:** Moderate Adverse (significant)

The magnitude of change would reduce to medium and there would be a moderate adverse effect.	
Views from Stone Pitch, Golborne, t from PRoW Golborne 63 and south west from Little Byrom Hall Farm, Slag Lane (VPs 326-02-005, 326-03-004 and 326-02-006) **Map Number LV-04-326**	**High and Medium High Sensitivity Receptors**
Year 1 – winter and summer In year 1 of operation, the Proposed Scheme would introduce new, large-scale, uncharacteristic structures, into existing near and middle-distance views for occupants of residential properties and users of recreational footpaths. Removal of mature vegetation from field boundaries and Byrom Hall Wood during construction, would result in the loss of elements that contribute to the rural character of existing views. The Pennington embankment, associated noise fence barriers, overhead line equipment and movement of trains would be highly visible against the skyline across the majority of near and middle-distance views. The Pennington embankment, Golborne Footpath 63 accommodation overbridge, and Slag Lane auto-transformer station would be new structures that would be conspicuous in views across the flat landscape. Movement of traffic along Slag Lane underbridge would be visible from residential properties on Slag Lane, in near distance views to the east. Newly planted mitigation woodland and hedgerows would not be sufficiently mature to contribute to any visual integration or enclosure. 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 embankment, boundary fencing and overbridges would be partially screened by mitigation planting. However, the height of the Proposed Scheme means that the upper parts of the structures, the overhead line equipment and movement of trains would be uncharacteristic elements in near and middle distance views, compared to existing views across the landscape. Views to the Slag Lane underbridge would be predominantly enclosed by woodland planting. However, views to the south and east for occupants of residential properties on Slag Lane would be limited to near distance views only as a result of the woodland mitigation planting. The magnitude of change would remain high and there would be major adverse effect.	**Level of effect:** Major Adverse (significant)
Views from Prow Golborne 33, and from PRoW Golborne 28 (VPs 327-02-001 and 327-03-002) **Map Number LV-04-327**	**High and Medium High Sensitivity Receptors**
Year 1 – winter and summer In year 1 of operation, the Proposed Scheme would introduce new, large-scale, uncharacteristic structures into existing near and middle-distance views for occupants of residential properties and users of recreational footpaths. Removal of mature vegetation from field boundaries and Byrom Hall Wood during construction would result in the loss of elements that contribute to the character of existing views. The Pennington embankment, associated noise fence barriers, overhead line equipment and movement of trains would be highly visible against the skyline across the majority of near and middle-distance views. Newly planted mitigation woodland and hedgerows would not be sufficiently mature to contribute to any visual integration or enclosure. 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 Pennington embankment and noise fence barriers would be partially screened and filtered by mitigation planting. However, the height of the Proposed Scheme means that the upper parts of the structures, the overhead line equipment and the movement of trains would continue to be uncharacteristic elements in views across the landscape, compared with existing views. The magnitude of change would reduce to medium and there would be a moderate adverse effect.	**Level of effect:** Moderate Adverse (significant)
Views from PRoW Golborne 30, from PRoW Ashton in Makerfield 28 and rom the Leeds and Liverpool Canal (VPs 327-03-003, 327-02-006 and 327-03-005) **Map Number LV-04-327**	**High and Medium High Sensitivity Receptors**
Year 1 – winter and summer During year 1 of operation, the Proposed Scheme would introduce new, large scale, uncharacteristic structures, into near and middle-distance views, for occupants of residential properties and users of recreational footpaths. Removal of mature vegetation during construction would result in the loss of elements that contribute to the rural character of existing views. The Pennington embankment, associated noise fence barriers, overhead line equipment and movement of trains, would be a new large scale linear	**Level of effect:** Major Adverse (significant)

feature altering the appearance of the existing landform, highly visible against the skyline. The A573 Wigan Road overbridge would be a conspicuous element in near and middle-distance views for residents of Wigan Road Farm, Windy Bank Farm, Balmer's Farm and Aye Bridge Farm. Walkers along the Leeds and Liverpool Canal towpath would view the Proposed Scheme in oblique middle-distance views, filtered through existing canal side planting. Newly planted mitigation woodland and hedgerows would not be sufficiently mature to contribute to any visual integration or enclosure. There would therefore be an overall high magnitude of change and major adverse effect.	
Year 15 – summer By summer year 15, views of the embankment and overbridge would be partially screened by mitigation planting. The large scale of the Pennington embankment and A573 Wigan Road overbridge would represent uncharacteristic visual elements compared to existing views across the landscape. The magnitude of change would reduce to medium and there would be a moderate adverse effect.	**Level of effect:** Moderate Adverse (significant)
Views from PRoW Ashton in Makerfield Footpath 22 and St John's Church, Abram, and the A573 Aye Bridge Road (VPs 328-03-003, 328-02-001 and 328-02-004) **Map Number LV-04-328**	**High and Medium High Sensitivity Receptors**
Year 1 – winter and summer In year 1 of operation, the Proposed Scheme would introduce new large scale uncharacteristic structures, into near and middle-distance views, for occupants of residential properties and users of recreational footpaths. Removal of mature vegetation from Viridor Wood and from within the Hey Brook corridor during construction, would result in the loss of elements that contribute to the character of existing views. The Pennington embankment, associated noise fence barriers, overhead line equipment and movement of trains, would be a new large scale linear feature altering the appearance of the existing landform and highly visible against the skyline. Views to the Proposed Scheme from Abram would be partially filtered through intervening vegetation. From PRoW within the Hey Brook corridor, the Proposed Scheme would extend across the majority of near distance views to the west and south. Newly planted mitigation woodland and hedgerows would not be sufficiently mature to contribute to any visual integration or enclosure. 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 embankment would be partially screened by mitigation planting. However, the height of the Proposed Scheme means that the upper parts of the structures, the overhead line equipment and the movement of trains would continue to be uncharacteristic elements in near and middle distance views across the landscape. The magnitude of change would reduce to medium and there would be a moderate adverse effect.	**Level of effect:** Moderate Adverse (significant)
Views from Epsom Drive, Bamfurlong (VP 328-02-005) **Map Number LV-04- 328**	**High and Medium High Sensitivity Receptors**
Year 1 – winter and summer In year 1 of operation, the Proposed Scheme would introduce new railway structures, into near distance views, for occupants of residential properties and users of recreational footpaths. Removal of mature vegetation from Viridor Wood during construction would result in the loss of elements that contribute to the character of existing views. The Proposed Scheme would be more visible in views to the east than the existing WCML, partially due to the loss of these existing trees. Newly planted mitigation woodland and hedgerows would not be sufficiently mature to contribute to any visual integration or enclosure. There would therefore be an overall medium magnitude of change and moderate adverse effect.	**Level of effect:** Moderate Adverse (significant)
Year 15 – summer By year 15 mitigation woodland planting would have partially restored the section of Viridor Wood lost during construction. The magnitude of change would reduce to low, there would be a minor adverse effect and no longer significant.	**Level of effect:** Minor Adverse

Other mitigation measures

11.5.8 The permanent effects of the Proposed Scheme on landscape and visual receptors would be reduced through integration of the measures described in this section. Effects in Year 1 may also be further reduced through establishing planting early or in advance of the main construction programme. Other features such as additional earthworks, planting or greenspace including the use of materials, would be considered as part of the ongoing contextual design. These measures would potentially provide additional screening and/or greater integration of the Proposed Scheme into the landscape.

Summary of likely residual significant effects

11.5.9 In many cases, significant effects would reduce over time as the proposed mitigation planting matures and reaches its designed intention. However, the following likely residual significant effects would remain following year 15 of operation:

- moderate adverse effects in relation to three LCAs;
- major adverse visual effects at two residential viewpoint locations;
- moderate adverse visual effects at 11 residential viewpoint locations;
- major adverse visual effects at nine recreational viewpoint locations; and
- moderate adverse visual effects at one recreational viewpoint locations.

Monitoring

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

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 Risley to Bamfurlong area. The assessment considers existing businesses, community organisations, local employment and local economies, including planned growth and development.

12.1.2 Engagement with Warrington Borough Council (WBC) and Wigan Metropolitan Borough Council (WMBC) 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: MA05 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

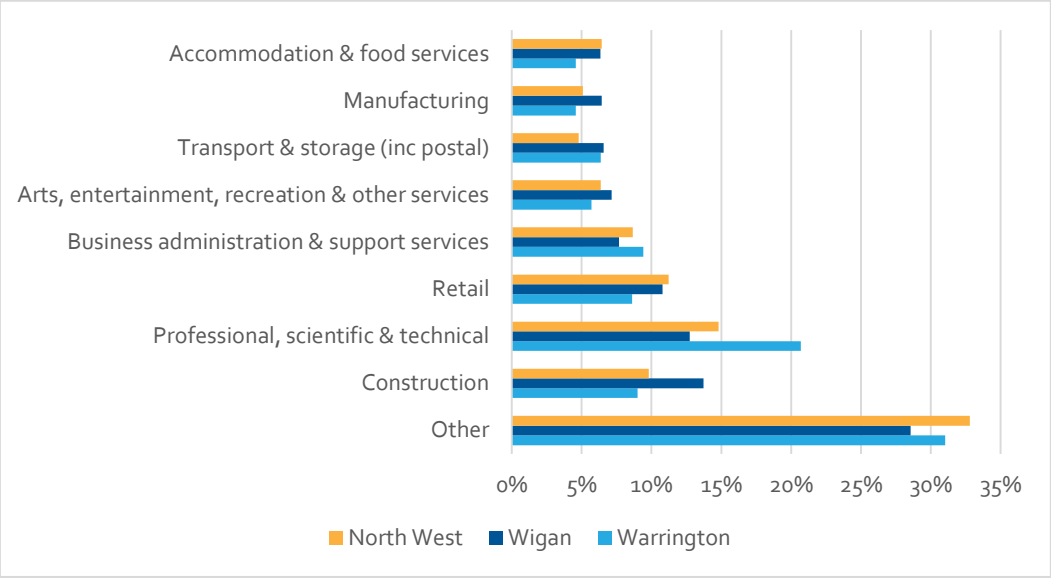
12.3.1 The following provides a brief overview of employment, economic structure, labour market and business premises availability within the Risley to Bamfurlong area. It lies within the administrative areas of WBC and WMBC and the Greater Manchester Combined Authority (GMCA) area. The southern section of the area falls within the

Cheshire and Warrington Local Enterprise Partnership (LEP)[112] and the northern section of the area falls within the Greater Manchester LEP area[113] (approximately 50% within each). It also falls within the North West region.

Business and labour market

12.3.2 In 2017, within the WBC area, the professional, scientific and technical sector accounted for the largest proportion of organisations (21%), with the construction, retail and business administration and support services sectors as joint second largest (9%)[114]. Within the WMBC area, the construction sector accounted for the largest proportion of organisations (14%). The professional, scientific and technical sector was the second largest (13%), followed by retail (11%). This is shown in Figure 8. For comparison, in the North West region, the largest sectors were professional, scientific and technical (15%), followed by retail (11%) and construction (10%).

Figure 8: Business sector composition in WBC and WMBC areas and the North West[115, 116]

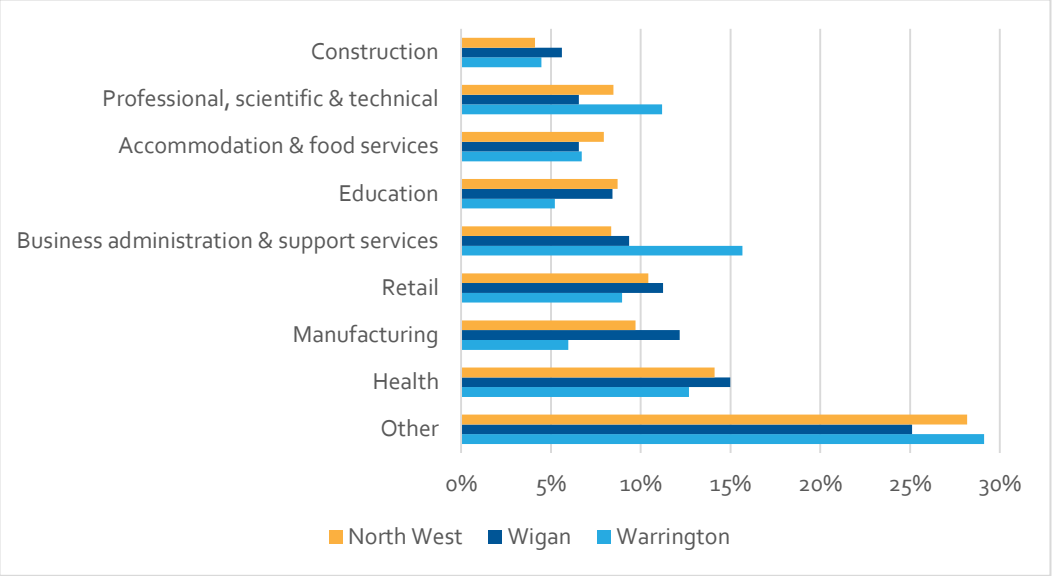


12.3.3 In 2016, approximately 133,000 people worked in the WBC area[117]. According to the Office for National Statistics Business Register and Employment Survey 2016, the largest sectors in terms of share of employment in WBC were: business administration and support services (16%), health (13%) and professional, scientific and technical (11%)[118]. In 2016, approximately 107,000 people worked in the WMBC area. The largest sectors in terms of share of employment in WMBC were health (15%), manufacturing (12%) and retail (11%).

[112] Cheshire and Warrington Local Enterprise Partnership | Cheshire and Warrington Local Enterprise Partnership. [online] Available at: http://www.871candwep.co.uk/
[113] Greater Manchester Local Enterprise Partnership (2013). Stronger Together - Greater Manchester Strategy. GMCA
[114] Office for National Statistics; (2017); UK Business Count – Local Units; http://www.nomisweb.co.uk
[115] Office for National Statistics; (2017); UK Business Count – Local Units; http://www.nomisweb.co.uk
[116] 'Other' includes: Health; Information and communication; Wholesale; Motor trades; Property; Education; Financial and insurance; Agriculture, forestry and fishing; Public administration and defence; Mining, quarrying and utilities
[117] Office for National Statistics; (2016); Business Register and Employment Survey; http://www.nomisweb.co.uk; this number includes both residents and non-residents of WBC who work within its boundaries
[118] Office for National Statistics; (2016); Business Register and Employment Survey; http://www.nomisweb.co.uk; this number includes both residents and non-residents of WBC who work within its boundaries

12.3.4 These compare with the largest sectors for the North West region, which were health (14%), retail and manufacturing (both 10%). This is shown in Figure 9.

Figure 9: Employment by industrial sector in WBC and WMBC areas and the North West[119, 120]



12.3.5 According to the Annual Population Survey (2016)[121], the employment rate[122] within the WBC area was 76% (100,900 people) and 75% (152,100 people) in the WMBC area. This is higher than that recorded for the North West (72%) and England (74%). Unemployment in the WBC area was 3.2% and 4.9% in the WMBC area, both of which are lower than that recorded for the North West (5.3%) and England (5%).

12.3.6 The Annual Population Survey (2016) also shows that 38% of WBC residents and 27% of WMBC residents aged 16-64 were qualified to National Vocational Qualification Level 4 (NVQ4) and above, compared to 34% in the North West and 38% in England. Seven percent of WBC residents and 11% of WMBC residents had no qualifications, which are lower and higher respectively, compared to both the North West (10%) and England (8%).

Property

12.3.7 A review of employment land in 2016[123] within the WBC area identified a further land need, in addition to the land currently identified as available, of 276.4ha to 2037. This equates on average to 13.2ha per year[124]. Therefore, there is potential for a shortfall of available employment land in the WBC area, including both strategic sites for logistics or distribution and local sites, along with a sizable office requirement.

[119] Office for National Statistics; (2016); Business Register and Employment Survey; http://www.nomisweb.co.uk; this number includes both residents and non-residents of WMBC who work within its boundaries.
[120] Percentage of employees within broad industrial groups. 'Other' includes: Transport and storage (inc postal); Public administration and defence; Arts, entertainment, recreation and other services; Wholesale; Property; Motor trades; Information and communication; Mining, quarrying and utilities; Financial and insurance; Agriculture, forestry and fishing.
[121] Annual Population Survey (2016), NOMIS. Available online at https://www.nomisweb.co.uk
[122] The proportion of residents aged 16-64 that are in employment.
[123] BE Group and Mickledore (2016). *Economic Development Needs Study*. Warrington Borough Council.
[124] This is further land need additional to the current realistic supply of 104.5ha to 2037.

12.3.8 WMBC identified a requirement for approximately 196ha of employment land up to 2026[125]. Approximately, 160ha is currently identified as available, which means there is a potential shortfall of around 35ha, across a range of uses including office, industrial and warehousing. Lowton is seen as a popular employment area primarily meeting the needs of sub-regional and local employers. It is one of very few employment locations within the district that has very good access to the strategic road network and as such has been considered for a major site for mixed-use development around Pocket Nook Lane[126].

12.3.9 The draft Greater Manchester Spatial Framework (2016) identifies Pocket Nook as a highly attractive employment site[127]. The importance of developing adequate employment sites is necessary for the GMCA's strategy to support economic growth. The importance of providing a portfolio of market responsive, readily available employment sites to attract new investment has been highlighted in the Cheshire and Warrington LEP Strategic and Economic Plan[128].

12.3.10 The average vacancy rate for industrial and warehousing and office property in the Risley to Bamfurlong area in March 2018 has been assessed as 49% and 37% for WBC and 11% and 18% for WMBC respectively, based on marketed space against known stock[129].

12.4 Effects arising during construction

Avoidance and mitigation measures

12.4.1 The draft Code of Construction Practice (CoCP)[130] 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);

[125] Wigan Council (2015). *Wigan Borough Draft Employment Land Review.* [online]. Available at: https://www.wigan.gov.uk/Docs/PDF/Council/Strategies-Plans-and-Policies/Planning/Employment/Employment-Land-Review.pdf
[126] Identified within the draft Wigan Allocations and Development Management Local Plan (Initial Draft Plan; 2015), which is on-hold pending substantial progress on the Greater Manchester Spatial Framework
[127] Greater Manchester Combined Authority (2016). *Draft Greater Manchester Spatial Framework*. [online] Manchester. Available at: https://www.greatermanchester-ca.gov.uk/downloads/file/371/draft_greater_manchester_spatial_framework_october_2016_-_full_version
[128] Cheshire and Warrington Enterprise Partnership (2014). *Cheshire and Warrington Matters: A Strategic and Economic Plan for Cheshire and Warrington*. [online] p.45. Available at: http://www.871candwep.co.uk/content/uploads/2015/05/Strategic-and-Economic-Plan-and-Growth-Plan-for-Cheshire-and-Warrington.pdf
[129] Vacant space is based on marketed space identified from Estates Gazette data (EGi); stock data is taken from information supplied by the Valuation Office (VOA). The marketed space data are based on a snapshot in time for the property market. The elevated percentages for WBC are likely to be as a result of a new large development becoming available or a large occupier vacating a property and therefore might not reflect the long-term availability within the area.
[130] Supporting document: Draft Code of Construction Practice

- monitor and manage flood risk and other extreme weather events that may affect socio-economic resources during construction (Section 13);
- site specific traffic management measures including requirements relating to the movement of traffic from business and commercial operators of road vehicles, including goods vehicles (Section 14); and
- maintaining access to businesses for the duration of construction works where reasonably practicable (Section 14).

Assessment of impacts and effects

12.4.2 The proposed construction works are assessed for socio-economic effects in relation to:

- premises demolished with their occupants and employees needing to relocate to allow for construction of the Proposed Scheme;
- in-combination effects (e.g. air quality, noise, vibration, construction traffic and visual impacts) and isolation of an area, which could affect business operations, will be reported in the formal ES. Any resulting effects on employment will be reported at a route-wide level (see Volume 3, Route-wide effects); and
- potential employment opportunities arising from construction in the local area (including in adjacent community areas).

Temporary effects

Construction employment

12.4.3 It is currently expected that there would be one main construction compound, the A580 East Lancashire Road main compound, 11 satellite compounds and three rail system compounds in the Risley to Bamfurlong area. The works undertaken at and managed from these sites would result in the creation of up to 1,800 person years of construction employment[131], which is broadly equivalent to 180 full-time jobs[132]. 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 business 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).

[131] 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
[132] Based on the convention that 10 employment years is equivalent to one full time equivalent job

12.4.5 The resulting effects on employment are reported in aggregate at a route-wide level (see Volume 3, Route-wide effects).

Permanent effects

Businesses

12.4.6 Businesses directly affected, comprising those that lie within land required for the Proposed Scheme, are reported in groups, where possible, to form defined resources based on their location and operational characteristics. A group could contain either one or a number of businesses reflecting the fact that a building may have more than one occupier or that similar businesses and resources are clustered together.

12.4.7 Over 35 business accommodation units or sites in the study area would experience direct impacts as a result of the Proposed Scheme. These 35 plus units or sites, together, form five defined resources including:

- Warrington Road (two units engaged in provision of a junior football club and a caravan club);
- The Warehouse Studios (over ten units engaged in supplying clothing (two), pageant supplier; casting agency (two), knitting store and tea room, karate academy and dojo, beauty salon (two), web design; storage for fishery and other business occupiers);
- Lowton Business Park and Pocket Nook Lane (over 20 units engaged in components for lorries, a printing and hot stamping foil specialist, building materials suppliers, logistics companies, a gymnasium and various occupiers of warehouses and office space within the business park);
- Newton Road (one unit engaged in supplying fencing); and
- Slag Lane (two units engaged in provision of specialist pet care and dogs boarding kennels).

12.4.8 Of the five resources identified, two could potentially experience significant direct effects on business activities and employment, as set out in Table 28.

Table 28: Resources which would potentially experience significant direct effects

Resource	Description of business activity
The Warehouse Studios	A group of over ten businesses including clothing suppliers, pageant supplier, casting agencies, a knitting store and tea room, a karate academy and dojo, beauty salons, a web design company, storage for a fishery and other business occupiers.
Businesses at Lowton Business Park and Pocket Nook Lane	A group of over 20 businesses including components for lorries a printing and hot stamping foil specialist, building materials suppliers, logistics companies and various occupiers of warehouses and office space within the business park.

Impact magnitude

12.4.9 The magnitude of impact focuses on the number of jobs that would be affected by the Proposed Scheme, through either displacement or possible job loss. It also considers the implications of this impact in relation to the scale of economic activity and opportunity in the area.

Sensitivity

12.4.10 The sensitivity of resources considers the following:

- availability of alternative, suitable premises;
- size of the local labour market;
- skill levels and qualifications of local people; and
- levels of unemployment.

Significance of effects

12.4.11 Taking account of the sensitivity of the resource and the magnitude of impact, it is currently expected that the significance of the resultant effects would be as set out in Table 29. It should be noted that a precautionary approach has been taken in this assessment as outlined in Section 1.2 and it may change by the time of the formal ES.

Table 29: Significance of effects on resources

Resource	Impact magnitude	Sensitivity	Significance of effect
The Warehouse Studios	Medium	Medium	Moderate adverse
Businesses at Lowton Business Park and Pocket Nook Lane	High	High	Major adverse

12.4.12 The construction of Culcheth cutting would require the demolition of a range of businesses premises based at Warehouse Studios, including retailers. The premises host over 10 small businesses and includes onsite car parking. Although there is reasonable availability of retail and office space in the area, it is concentrated in town centres which are likely to have higher rental values compared to these premises. The effect on the businesses and their employees based at Warehouse Studios is assessed to be a moderate adverse significant effect.

12.4.13 The construction of Lowton cutting would require the demolition of the businesses at Lowton Business Park and Pocket Nook Lane. The premises comprise a number of offices and industrial premises which are very well connected to the strategic road network. It is expected that office occupiers would more easily relocate than industrial premises as these businesses specifically require a large site with good transport connections to the motorway network. Relocation might be a challenge for all types of businesses including office occupiers, given the number of businesses in the area that would be looking to relocate at the same time. Overall, the effect on the businesses is assessed to be a major adverse significant effect.

12.4.14 Among all the affected resources, whether significantly affected or not, it is estimated that 290 jobs[133] would either be displaced or possibly lost within the Risley to Bamfurlong area. There is a reasonable probability that businesses would be able to

[133] Employment within businesses has been estimated through a combination of sources, for example, surveys of businesses, the Experian employment dataset, employment floor space and the Homes and Communities Agency (HCA) Employment Densities Guide 3rd Edition (2015). The estimate is calculated using standard employment density ratios and estimates of floor areas and may vary significantly from actual employment at the sites.

relocate to places that would still be accessible to residents due to the general availability of vacant premises. However, there may be cases where alternative locations are problematic. Businesses might be unable to relocate on a like-for-like basis within the area. The impact on the local economy from the relocation or loss of jobs is considered to be relatively modest in the context of the total number of people employed in the two district authorities (approximately 240,000 jobs) and the scale of economic activity and opportunity in the area.

12.4.15 The resulting effects on employment will be reported in aggregate at a route-wide level (see Volume 3, Route-wide effects).

Other mitigation measures

12.4.16 Businesses displaced by the Proposed Scheme would be compensated in accordance with the Compensation Code. HS2 Ltd recognises the importance of businesses, displaced from their existing premises, being able to relocate to suitable alternative premises and at this stage it assumes that it would, therefore, adopt a policy to offer additional support over and above statutory requirements to facilitate this process as it has done on Phases One and 2a.

12.4.17 The construction of the Proposed Scheme offers considerable opportunities to businesses and residents along the line of route in terms of supplying goods and services and obtaining employment. HS2 Ltd at this stage assumes that it would, therefore, adopt a policy to work with its suppliers to build a skilled workforce that promotes further economic growth across the UK as it has done on Phases One and 2a.

Summary of likely residual significant effects

12.4.18 Any likely residual significant socio-economic effects will be reported in the formal ES.

12.5 Effects arising from operation

Avoidance and mitigation measures

12.5.1 No mitigation measures are proposed in relation to business resources during operation of the Proposed Scheme.

Assessment of impacts and effects

Resources with direct effects

12.5.2 It is currently expected that no socio-economic resources would experience significant direct effects during the operation of the Proposed Scheme.

Operational employment

12.5.3 Direct operational employment created by the Proposed Scheme could lead to indirect employment opportunities for local businesses in terms of potentially supplying the Proposed Scheme or benefiting from expenditure of directly employed workers on goods and services.

12.5.4 The impact of operational employment creation will be assessed and reported at a route-wide level in Volume 3, Route-wide effects.

Other mitigation measures

12.5.5 Any further mitigation measures will be reported in the formal ES.

Summary of likely residual significant effects

12.5.6 Any likely residual significant socio-economic effects will be reported in the formal ES.

Monitoring

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

12.5.8 There are no area-specific requirements for monitoring socio-economic effects during the operation of the Proposed Scheme in the Risley to Bamfurlong 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 Risley to Bamfurlong 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[134]; and
- 'non-residential receptors'[135] such as:
  - community facilities including schools, hospitals, places of worship and 'quiet areas'[136]; 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[137], planning policy, planning practice guidance on noise (PPGN) [138] and EIA Regulations as described in the Scope and Methodology Report[139] (SMR).

13.1.3 Engagement has been undertaken with Warrington Borough Council (WBC) and Wigan Metropolitan Borough Council (WMBC) 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 Risley to Bamfurlong 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

[134] '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.
[135] 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.
[136] '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.
[137] Noise Policy Statement for England, (2015) Department for Environment, Food and Rural Affairs (Defra)
[138] Department for Communities and Local Government (DCLG) (2014), Planning Practice Guidance – Noise. Available online at: https://www.gov.uk/guidance/noise--2
[139] Supporting document: HS2 Phase 2b Environmental Impact Assessment Scope and Methodology Report

be found in the Volume 2: MA05 Map Book. Map series SV-01 also presents key 'non-residential receptors'. These receptors will be reviewed and developed further to incorporate, where appropriate, consultation feedback and ongoing stakeholder engagement.

13.1.5 The assessment of noise and vibration likely significant effects on agricultural, heritage and ecological receptors and the assessment of tranquillity is ongoing and will be reported in the formal ES.

13.2 Scope, assumptions and limitations

13.2.1 The approach to assessing sound, noise and vibration and identifying envisaged mitigation is outlined in Volume 1 (Section 8 and Section 9) and the SMR.

13.2.2 In this assessment 'sound' is used to describe the acoustic conditions that people experience as a part of their everyday lives. Noise is taken as unwanted sound and hence adverse effects are noise effects and mitigation is, for example, by noise barriers.

13.2.3 Effects can either be temporary from construction or permanent from the operation of the Proposed Scheme. These effects may be direct, resulting from the construction or operation of the Proposed Scheme, and/or indirect, resulting from changes in traffic patterns on existing roads or railways that result from the construction or operation of the Proposed Scheme.

13.2.4 The effects of construction noise and vibration are assessed qualitatively, based on construction compound locations, construction routes, initial construction estimates and professional judgement. No quantitative assessment has been undertaken for the construction of the Proposed Scheme at this stage. The quantitative assessment will be reported in the formal ES.

13.2.5 The effects on operational noise and vibration are assessed quantitatively based on forecast noise emission from the Proposed Scheme combined with outline baseline information and professional judgement. As baseline information is limited at this stage the quantitative assessment including a full baseline will be reported in the formal ES.

13.3 Environmental baseline

13.3.1 The SMR describes the three rounds of baseline data collection covering existing sources, modelling and by targeted monitoring. Baseline sound levels will be published in the formal ES.

13.3.2 The area is characterised by a mix of large and small towns, villages, hamlets and isolated residential properties in a predominantly rural setting. The sound environment is generally dominated by local and distant road traffic, overflying aircraft associated with Manchester Airport and local neighbourhood sources, with contributing natural and agricultural sounds.

13.3.3 There are several main roads that contribute to the sound environment within the Risley to Bamfurlong area: the M6 and M62 and the interchange between the two at

junction 21a of the M6 and junction 10 of the M62, the A580 East Lancashire Road on the south side of Golborne, A579 Atherleigh Way through Leigh, A58 Lily Lane and A573 Wigan Road in the Platt Bridge and Abram area, A573 Wigan Road through Golborne and Winwick and the A574 Warrington Road in the north-east area of Warrington. The West Coast Main Line (WCML) railway passes through Golborne, and the northern route of the Liverpool to Manchester (Chat Moss) railway line passes close to the north side of Culcheth.

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[140], Roads[141] or Railways[142]. HS2 Ltd will engage with the Competent Authorities responsible for the relevant Important Areas. Map Series SV-01 (Volume 2: MA05 Map Book) shows any noise Important Areas in the Risley to Bamfurlong 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)[143]. 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.

[140] Noise Action Plan: Agglomerations (large urban areas) (2014) Department for Environment, Food and Rural Affairs
[141] Noise Action Plan: Roads (including major roads) (2014) Department for Environment, Food and Rural Affairs
[142] Noise Action Plan: Railways (including major railways) (2014) Department for Environment, Food and Rural Affairs
[143] 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[144];
- as part of BPM, mitigation measures are applied in the following order:
  - noise and vibration control at source: for example, the selection of quiet and low vibration equipment, review of construction methodology to consider quieter methods, location of equipment on-site, control of working hours, the provision of acoustic enclosures and the use of less intrusive alarms, such as broadband vehicle reversing warnings;
  - screening: for example, local screening of equipment or perimeter hoarding or the use of temporary stockpiles; and
  - where, despite the implementation of BPM, the noise exposure exceeds the criteria defined in the draft CoCP, noise insulation or ultimately temporary re-housing would be offered at qualifying properties.
- lead contractors will seek to obtain prior consent from the relevant local authority under Section 61 of the CoPA for the proposed construction works. The consent application will set out BPM measures to minimise construction noise and vibration, including control of working hours, and provide a further assessment of construction noise and vibration, including confirmation of noise insulation/temporary re-housing provision;
- contractors would undertake and report such monitoring as is necessary to assure and demonstrate compliance with all noise and vibration commitments. Monitoring data would be provided regularly to, and be reviewed by, the nominated undertaker and made available to the local authorities; and
- contractors would be required to comply with the terms of the CoCP and appropriate action would be taken by the nominated undertaker as required to ensure compliance.

13.4.4 Noise insulation or, where appropriate, temporary re-housing would avoid residents of qualifying properties being significantly affected by levels of construction noise inside their dwellings. Work is being undertaken to provide a reasonable worst case estimate of the buildings that are likely to qualify for such measures and the estimate will be reported in the formal ES.

[144] Including local businesses and quiet areas designated by the local authority

13.4.5 Qualification for noise insulation and temporary re-housing would be confirmed as part of seeking prior consent from the local authority under Section 61 of the CoPA. Qualifying properties would be identified, as required in the draft CoCP so that noise insulation could be installed, or any temporary re-housing provided, before the start of the works predicted to exceed noise insulation or temporary re-housing criteria.

Assessment of impacts and effects

13.4.6 Potential construction airborne noise significant effects could occur at the communities, or those parts of the communities, that are nearest to the Proposed Scheme in the following locations, as a result of the construction works illustrated on Map Series CT-05 (Volume 2: MA05 Map Book):

- Culcheth and Wigshaw: arising from overbridge construction and road realignment/diversion;
- Lowton (including Lowton St Mary's, Wash End): arising from overbridge construction, underbridge construction and cutting formation; and
- Abram and Bamfurlong: arising from overbridge construction, embankment formation and road realignment/diversion.

13.4.7 Map Series SV01 (Volume 2: MA05 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):

- Newchurch Community Primary School, Culcheth;
- St Lewis Roman Catholic Primary School, Croft;
- Lowton Junior and Infant School, Lowton;
- Lowton Social Club, Lowton;
- Lowton St Mary's Church of England Primary School;
- St Mary's Church, Lowton Common;
- Independent Methodist Church, Lowton; and
- Abram Bryn Gates Primary School, Bamfurlong.

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:

- the B5207 Church Lane and Kenyon Lane at Lowton St Mary's between Stone Cross Lane and the junction with Wilton Lane; and

- Slag Lane, Byrom Lane and Sandy Lane between the junction of Slag Lane with Church Lane in Lowton to the junction of Sandy Lane with the A572 Newton Road at Wash End.

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 Risley to Bamfurlong 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 four trains per hour in each direction on the main lines with an operating speed of around 250kph at the southern end of the Risley to Bamfurlong area progressively reducing to around 170kph at the northern end. This number of services is assumed to operate every hour from 07:00 to 21:00. The number of services will progressively decrease after 21:00 and the last service will arrive at terminal stations by midnight. Further information is presented in Volume 1 (Section 4).

Avoidance and mitigation measures

13.5.3 The development of the Proposed Scheme alignment has sought to reduce noise impact insofar as reasonably practicable.

13.5.4 Envisaged avoidance and mitigation measures that apply route-wide are described in Volume 1 (Section 9).

Airborne noise

13.5.5 Through the procurement process for the trains and the track, the use of proven international technology will enable the railway to be quieter than implied by current minimum European standards. Details of operational train noise will be provided in the formal ES. 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[145].

13.5.6 The Proposed Scheme would incorporate noise barriers, in the form of either landscape earthworks and/or noise fence barriers to avoid or reduce significant adverse airborne noise effects. The assessment has been based on the assumption that noise fence barriers are acoustically absorbent on the railway side and are located 5m from the outer rail. The envisaged noise barrier locations based upon the currently available information are shown on Map Series SV-01 (Volume 2: MA05 Map Book) and described in Section 2.2.

13.5.7 In practice, barriers may differ from this description while maintaining the required acoustic performance. For example, where noise barriers are in the form of landscape earthworks, they would need to be higher above rail level to achieve similar noise attenuation to the noise fence barrier because the crest of the earthwork would be further than 5m from the outer rail.

13.5.8 Noise effects would also be reduced in other locations along the route by engineering structures and landscape earthworks provided to avoid or reduce significant visual effects.

13.5.9 As required by statute, noise insulation measures would be offered for qualifying buildings as defined in the Noise Insulation (Railways and Other Guided Transport Systems) Regulations 1996 and the Noise Insulation Regulations 1975 ('the NI Regulations'). Additionally, HS2 Ltd will apply more onerous criteria, to provide the same mitigation as defined in 'the NI Regulations' at residential buildings where[146] 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[147] or the maximum noise level criteria[148] defined in the SMR. Noise insulation is designed to avoid residents experiencing any residual significant effect on health and quality of life from resulting noise inside their dwelling.

Ground-borne noise and vibration

13.5.10 Significant ground-borne noise or vibration effects would be avoided or reduced through the design of the track and track-bed.

[145] Technical Specification for Interoperability (TSI) Noise – EU Commission Regulation No 1304/2014
[146] Following Government's National Planning Practice Guidance https://www.gov.uk/government/collections/planning-practice-guidance
[147] World Health Organization (2010), *Night time Noise Guidelines for Europe*
[148] Dependent on the number of train passes

Assessment of impacts and effects

13.5.11 Map Series SV-01 (Volume 2: MA05 Map Book) indicates the likely long-term daytime noise level (defined as the equivalent continuous sound level from 07:00 to 23:00 or LpAeq,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 LpAeq,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.

13.5.12 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.

13.5.13 A summary of the likely significant effects identified on a precautionary basis is presented at the end of this section.

13.5.14 Likely significant noise or vibration effects arising from permanent changes to existing roads, will be reported in the formal ES.

Other mitigation measures

13.5.15 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

13.5.16 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: MA05 Map Book) and Map Series CT-06 (Volume 2: MA05 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.

13.5.17 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:

- Wigshaw and Croft: occupants of residential properties on Wigshaw Lane, Robins Lane and Mustard Lane, located closest to the route of Proposed Scheme, identified by MA05-C01 on Map SV-01-316 (Volume 2 MA05 Map Book);

- Wilton Grange: occupants of residential properties on Kenyon Lane, located closest to the Proposed Scheme, identified by MA05-C02 on Map SV-01-316 (Volume 2 MA05 Map Book);
- Lowton (Lowton St Mary's): occupants of residential properties on Horncastle Close and Hesketh Meadow Lane, located closest to the Proposed Scheme, identified by MA05-C03 on Map SV-01-317 (Volume 2 MA05 Map Book);
- Lowton (near Wash End): occupants of residential properties on Brancaster Drive, Stradbroke Close and Carr Lane, located closest to the Proposed Scheme, identified by MA05-C04 on Map SV-01-317 (Volume 2 MA05 Map Book);
- Lowton (near and including Warren's Croft Farm): occupants of residential properties on Linbeck Grove and residential streets off Lane Head Avenue, located closest to the Proposed Scheme, identified by MA05-C05 on Map SV-01-317 (Volume 2 MA05 Map Book); and
- Lowton (near and including Byrom Hall): occupants of residential properties on Slag Lane and Byrom Lane, located closest to the Proposed Scheme, identified by MA05-C06 on Map SV-01-317 (Volume 2 MA05 Map Book).

13.5.18 The initial assessment indicates that, the forecast noise from long-term railway operation may exceed the daytime threshold set by the Noise Insulation Regulations, the night-time Interim Target identified in the WHO Night Noise Guidelines for Europe 2009 or the maximum noise levels criteria set out in the SMR, at individual residential properties closest to the Proposed Scheme in the vicinity of Wilton Lane (identified on Map SV-01-316 (Volume 2 MA05 Map Book)).

13.5.19 Map Series SV01 (Volume 2 MA05 Map Book) shows key non-residential properties for the assessment of operational airborne noise impacts in the formal ES. Of these Lowton Junior and Infant School is likely to experience significant effects.

13.5.20 Further assessment work is being undertaken to identify operational noise and vibration significant effects. This will be reported in the formal ES.

13.5.21 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

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

13.5.23 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.

13.5.24 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 Risley to Bamfurlong area.

14.1.2 Engagement with Highways England, Warrington Borough Council (WBC) and Wigan Metropolitan Borough Council (WMBC) 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: MA05 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)[149].

14.2.2 The study area for traffic and transport includes the communities of Birchwood, Croft, Culcheth, Kenyon, Golborne, Warrington, Leigh, Ashton-in-Makerfield, Ince-in-Makerfield and Wigan together with St Helens and Eccles.

14.2.3 The study area also includes all roads potentially affected by the Proposed Scheme. The strategic roads in this area are: the M62 via junction 11 and the M6 via junction 23.

14.2.4 The local roads in study area include: the A49 Roman Road, the A49 Warrington Lane/Lodge Road, the A572 Aye Bridge Road/Newton Road, the A573 Warrington Road/Wigan Road, the A574/Birchwood Way/Birchwood Park Avenue/Warrington Way, the A58 Lily Lane/Liverpool Road/Gerard Street/Bolton Road, the A580 East Lancashire Road, B5207 Wilton Lane, Byrom Lane, Church Lane, Glaziers Lane, Sandy Lane, Slag Lane, Warrington Road, and Wigshaw 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.

[149] 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, and liaison with WBC, WMBC and Highways England (including provision of information on public transport, public rights of way (PRoW) 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 WBC, WMBC and Highways England. Assessment of the data indicates that the peak hours in the area are 07:00-08:00 and 16:30-17:30. However, there are only small differences (typically less than 3%) between the observed peak hours and the periods 08:00-09:00 and 17:00-18:00, the periods when HS2 construction traffic movements and workforce arrivals and departures would have the maximum impact. Consequently, the 08:00-09:00 and 17:00-18:00 have been used as the assessment hours representing a reasonable worst case.

14.3.3 PRoW surveys were undertaken in August and November 2017 to establish their nature and usage by non-motorised users (pedestrians, cyclists and equestrians). The surveys included PRoW and roads that would cross the route of the Proposed Scheme, and any additional PRoW and roads that may be affected by the Proposed Scheme. The majority of the PRoW surveys were undertaken during the weekend, at times when recreational use is expected to be highest, but where routes are likely to be used for non-leisure uses such as commuting, surveys were undertaken on a weekday.

Strategic and local highway network

14.3.4 The strategic routes that pass through the area are: the M6, the M62 including junctions 10 and 11 and the A580 East Lancashire Road. The strategic road network in and around M62 junction 11 and the M6 through the area is busy at peak times and delays can be experienced.

14.3.5 The local roads that could be affected by the Proposed Scheme include: the A49 Roman Road/Warrington Lane/Lodge Road, the A572 Aye Bridge Road/Newton Road, the A573 Warrington Road/Wigan Road, the A574/Birchwood Way/Birchwood Park Avenue/Warrington Way, the A58 Lily Lane/Liverpool Road/Gerard Street/Bolton Road, the A580 East Lancashire Road, the B5207 Wilton Lane, Byrom Lane, Church Lane, Glaziers Lane, Sandy Lane, Slag Lane, Warrington Road, and Wigshaw Lane. The local road network in this area generally operates well, although some localised delays can be experienced, particularly at peak times.

14.3.6 Relevant accident data for the road network subject to assessment have been obtained from Department for Transport[150]. Data for the three-year period (2014-2016) have been assessed and any identified clusters (i.e. where there are nine or more accidents in the three-year period) have been examined.

14.3.7 One accident cluster was identified within the Risley to Bamfurlong area: Lancashire Road - Lodge Lane - A580 East Lancashire Road - M6 junction 23 Roundabout (26 accidents, including three with serious causalities).

14.3.8 The route of the Proposed Scheme would cross six roads with footways within the Risley to Bamfurlong area. These are: A573 Wigan Road, Slag Lane, A572 Newton Road, Wilton Lane, Wigshaw Lane and A574 Warrington Road.

Parking and loading

14.3.9 There are parking spaces at business centres located off A572 Newton Road/Pocket Nook Lane; and access to businesses off A574 Warrington Road that could be affected by the Proposed Scheme.

Public transport network

14.3.10 Seventeen bus routes operate on seven roads that are crossed by the route of the Proposed Scheme in the Risley to Bamfurlong area. There are also bus stops primarily located to serve the main built up area. The bus routes that could be affected by the Proposed Scheme include:

- the A572 Newton Road - Route 590 (Leigh - Pennington - Lowton Circular)/34 (Leigh - Lowton - Newton - Earlestown - St Helens)/602 (Ashton-In-Makerfield - Earlestown - Newton Hosp)/600 (Lowton High School - Leigh)/601 (Leigh - Lowton - Ashton-In-Makerfield - Wigan)/603 (Byrchall HS - Highfield Grange - Pemberton)/X34 (Manchester - Leigh - Lowton)/Route 589 (Leigh - Plank Lane - Lowton - Leigh Circular);
- the A573 Wigan Road: Route 360 (Wigan - Newton Le Willows - Warrington)/route 22A (Wigan-Newton-Warrington);
- the A574 Warrington Road: Route 28 (Warrington - Padgate - Birchwood - Culcheth – Leigh)/28E (Warrington - Padgate - Birchwood - Gorse Covert - Culcheth - Leigh)/28A (Warrington - Padgate - Culcheth - Leigh);
- the A58 Lily Lane - Route 320 (Wigan - Platt Bridge - Ashton - St Helens)/559 (Bolton - Westhoughton - Hindley);
- Slag Lane: Route 588 (Leigh - Lowton - Leigh Circular)/Route 589 (Leigh - Plank Lane - Lowton - Leigh Circular); and
- Wigshaw Lane: Route 19 (Leigh-Culcheth-Warrington).

14.3.11 National and local rail services are accessible via Birchwood, Wigan North Western and Warrington stations and local rail services are accessible via Pemberton Station,

[150] STAT19 Road Accident Data 2014-2016, Department for Transport

Wigan Wallgate Station and Ince Station. Birchwood and Wigan North Western Station provide access to national services to Liverpool, Manchester Piccadilly, Glasgow, Crewe and Birmingham. Padgate Station provide access to local services to Northern rail services on the Liverpool to Manchester (Chat Moss) railway line. Newton-le-Willows Station provides access to local services on Arriva and Northern rail services via the Liverpool to Manchester (Chat Moss) railway line.

Non-motorised users

14.3.12 There are pedestrian footways adjacent to many of the roads in the built up areas of Birchwood, Croft, Culcheth, Kenyon, Golborne, Warrington, Leigh, Ashton-in-Makerfield, Ince-in-Makerfield and Wigan. 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 18 PRoW within the Risley to Bamfurlong area that could be affected either temporarily or permanently due to, for example, temporary diversion of PRoW during construction and permanent diversions or upgrades, including for maintenance access to the Proposed Scheme. The routes with the greatest usage during the survey day were: PRoW Croft 108 crossing the Culcheth Linear Park north of Blakely Farm, which was used by 148 pedestrians and six cyclists; Croft 8a off Blakeley Farm, which was used by 67 pedestrians, and Golborne 30 off A572 Newton Road, which was used by 204 pedestrians and 18 cyclists.

14.3.14 In the Risley to Bamfurlong area, National Route 55 (part of the National Cycle Network) passes through the area from west of Wigan to Worsley.

Waterways and canals

14.3.15 There is one navigable waterway in the Risley to Bamfurlong area, the Leeds and Liverpool Canal located close to the A58 Lily Lane and south of Pennington Flash Country Park. It is not currently expected that the Proposed Scheme would have a significant effect upon navigable waterways or canals in the Risley to Bamfurlong area. Consequently, this topic is not considered further in this assessment.

Air transport

14.3.16 There is no relevant air transport in the Risley to Bamfurlong 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)[151] 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.

[151] Supporting document: Draft Code of Construction Practice

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[152] 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 Works potentially affect Network Rail assets, disruption to travelling passengers and freight movements would be reduced insofar as reasonably practicable. This includes measures such as:

- programming the construction works to coincide with the possessions that are required and planned by Network Rail for the general maintenance of their railway;
- planning the required construction works so that they can be undertaken in short overnight stages so that passenger services are not disrupted; and
- programming longer closures at the weekend and on bank holidays to reduce insofar as reasonably practicable the number of passengers affected.

Assessment of impacts and effects

Temporary effects

14.4.8 The traffic and transport impacts during the construction period within the Risley to Bamfurlong 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.

[152] 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.

14.4.9 The construction assessment has also considered any impacts in the Risley to Bamfurlong 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: MA05 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. In this area, it is expected that the main construction routes would use:

- the M62 junction 11;
- the M6 junction 23;
- the A49 Warrington Lane/Lodge Road/Roman Road;
- the A572 Newton Road;
- the A573 Warrington Road/Wigan Road/Church Street/High Street/Bridge Street;
- the A574 Birchwood Way/Birchwood Park Avenue/Warrington Road;
- the A58 Lily Lane/Liverpool Road/Gerard Street/Bolton Road;
- the A580 East Lancashire Road;
- the B5207 Wilton Lane/Church Lane;
- Byrom Lane;
- Glaziers Lane;
- Sandy Lane; and
- Slag 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. In the Risley to Bamfurlong area, all temporary diversions are required as part of a permanent diversion.

14.4.14 Permanent changes to highways are reported under operation.

14.4.15 Changes in traffic have the potential, at some locations, to result in increased travel distance, congestion and delays and increased traffic severance for non-motorised users. The assessment of these changes will be reported in the formal ES.

14.4.16 Assessment of the traffic and transport impacts from utilities works, either separately or in combination with other works, will be reported in the formal ES.

Accidents and safety

14.4.17 Changes in traffic as a result of the Proposed Scheme could result in changes in accident risk. The impacts on accident risk during construction of the Proposed Scheme will be reported in the formal ES.

Parking and loading

14.4.18 It is currently expected that the Proposed Scheme could have impacts on parking. Some parking would be temporarily suspended due to construction works at business centres located off A572 Newton Road/Pocket Hook Lane. There will also be permanent impacts on parking, which are reported under operation. 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 590; 34; 602; 600; 601; 603; X34; 360; 588; 589; 28; 28E; 28A; 19; and 22A. This could result in increased journey times and the need to relocate bus stops. Any consequent effects will be reported in the formal ES.

14.4.20 There are interfaces with the existing rail network in this area, in particular on the operation of the West Coast Main Line (WCML) where the high-speed line would connect to the conventional line. The majority of rail possessions would have little or no impact on rail services as they would be relatively minor and localised. Limited rail possessions would be required to connect the Proposed Scheme to the WCML connection. These work 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, including, where necessary, around construction compounds. It is currently expected that the following PRoW would be temporarily diverted:

- Croft Footpath 8, south of Blakely Farm Cottage, to be diverted during construction of overbridge;

- Golborne Footpath 31, south of Lightshaw Hall, to be diverted during construction of overbridge; and
- Ashton-in-Makerfield Footpath 22, south-east of Abram Bryn Gates Primary School, to be diverted during construction of underbridge.

14.4.23 Permanently diverted PRoW are reported under operation although these PRoW could also be subject to temporary closure or diversion/realignment.

14.4.24 The changes to PRoW are likely to result in some increases in travel distance with the potential for adverse significant effects. The assessment of these will be reported in the formal ES.

Permanent effects

14.4.25 Any permanent effects of construction will be considered in the assessment of operation for traffic and transport. This is because the impacts and effects of ongoing increases in travel demand and the wider impacts and effects of the operations phase need to be considered together.

Other mitigation measures

14.4.26 The implementation of the draft CoCP, in combination with the construction workforce travel plan would help mitigate transport-related effects during construction of the Proposed Scheme.

14.4.27 Any further traffic and transport mitigation measures required during the construction of the Proposed Scheme will be considered based on the outcomes of the assessment. These will be reported in the formal ES.

Summary of likely residual significant effects

14.4.28 Construction of the Proposed Scheme has the potential to lead to additional congestion and delays for road users on a number of routes including the: A49 Roman Road, A49 Warrington Lane/Lodge Road, A572 Aye Bridge Road, A572 Newton Road, A573 Warrington Road/Wigan Road/Church Street/High Street/Bridge Street, A574/Birchwood Way/A574 Birchwood Park Avenue/Warrington Way, A58 Lily Lane, A58 Liverpool Road/Gerard Street/Bolton Road, A580 East Lancashire Road, B5207 Wilton Lane, Byrom Lane, Church Lane, Glaziers Lane, Sandy Lane, Slag Lane, Warrington Road, and Wigshaw Lane. Increases in traffic could also result in increased traffic severance for non-motorised users of the routes and changes to traffic could result in changes to accident risk.

14.4.29 Construction of the Proposed Scheme is expected to require suspension of parking spaces at business centres in A572 Newton Road/Pocket Nook Lane.

14.4.30 Construction of the Proposed Scheme is expected to lead to diversion of the following bus routes: 590; 34; 602; 600; 601; 603; X34; 360; 588; 589; 28; 28E.

14.4.31 Construction of the Proposed Scheme is expected to temporarily close/divert PRoW Croft Footpath 08, Golborne Footpath 30 and Ashton-in-Makerfield Footpath 22.

14.4.32 The assessment of significant effects in relation to traffic and transport during construction of the Proposed Scheme will be reported in the formal ES.

14.5 Effects arising from operation

Avoidance and mitigation measures

14.5.1 The following measures have been included as part of the design of the Proposed Scheme and would avoid or reduce impacts on transport users:

- reinstatement of roads on or close to their existing alignments, where reasonably practicable; and
- replacement, diversion or realignment of PRoW.

Assessment of impacts and effects

14.5.2 The following section considers the impacts on traffic and transport and the likely consequential effects resulting from the operational phase of the Proposed Scheme. Operational effects arising from the Proposed Scheme in year 2033 and year 2046 will be reported in the formal ES.

Key operation transport issues

14.5.3 The operation of the Proposed Scheme would be unlikely to have any substantial impacts within this area due to increased traffic, as there are no stations or depots proposed within the Risley to Bamfurlong area. The maintenance of the Proposed Scheme would generate limited vehicular trips and the effect would not be significant.

14.5.4 The operational impacts are therefore primarily related to permanent diversion, realignment and closure of roads and the diversion of PRoW.

Highway network

Strategic and local highway network

14.5.5 The Proposed Scheme would result in several permanent highway changes. These include:

- the A572 Newton Road realignment between the Elms and Newton Gardens;
- the A573 Wigan Road realignment between B5207 Ashton Road and east of Ae Bridge Farm;
- the A574 Warrington Road closure and realignment between Batters Farm and Culcheth Linear Park;
- the B5207 Wilton Lane realignment between Newton Lane and north-east of Clough Farm;
- Glaziers Lane realignment;
- New Hall Lane (northern access to Taylors Business Park) realignment;

- Slag Lane realignment between Woodvale Drive and Byrom Lane; and
- Wigshaw Lane closure and diversion.

14.5.6 The effects of these changes will be reported in the formal ES.

Accidents and safety

14.5.7 Changes in traffic could result in changes in accident risk. Operational effects arising from the Proposed Scheme will be reported in the formal ES

Parking and loading

14.5.8 It is currently expected that there would be a permanent loss of car parking at locations along the route of the Proposed Scheme in this area. This would include permanent loss of some parking lost during construction at business centres off A572 Newton Road/Pocket Nook Lane. Where car parking is lost that would have served facilities that are displaced by the Proposed Scheme this is not considered a material effect.

14.5.9 HS2 Ltd will work with the businesses affected to identify opportunities, where reasonably practicable, to mitigate effects on parking.

Public transport network

14.5.10 The permanent realignment of roads could increase travel distances for bus passengers. However, as most of the realignments are likely to be less than 1km in length, it is currently expected that there would be no significant effects on public transport users within the Risley to Bamfurlong area.

14.5.11 The Proposed Scheme is not expected to have a significant effect on public transport operations in the Risley to Bamfurlong area.

Non-motorised users

14.5.12 Several PRoW that cross the route of the Proposed Scheme would be either permanently realigned or diverted including:

- Croft Footpath 13, south of Taylors Business Park, to be realigned;
- Croft Footpath 27, south of Taylors Business Park, to be realigned through underbridge;
- Croft Footpath 15, west of Taylors Business Park, to be realigned through New Hall Lane;
- Croft Footpath 19 existing route to be realigned over the A574Warrington Road overbridge connecting to Culcheth Linear Park;
- Croft Footpath 8, north-east of Blakely Farm Cottage, to be realigned;
- Croft Footpath 108, north of Blakely Farm Cottage, to be diverted over the Proposed Scheme via the Croft Footpath 8a overbridge;
- Croft Footpath 28, south of Taylors Business Park, to be diverted;

- Golborne Footpath 63, west of Warrens Croft Farm, to be diverted over the over the Golborne Footpath 63 accommodation overbridge;
- Golborne Footpath 37, west of Warrens Croft Farm, to be diverted over the Golborne Footpath 63 accommodation overbridge;
- Golborne Footpath 39, west of Warrens Croft Farm, to be diverted over the Golborne Footpath 63 accommodation overbridge;
- Golborne Footpath 33, east of Little Byron Hall Farm, to be realigned crossing the Proposed Scheme under the Golborne Footpath 33 accommodation underbridge;
- Golborne Footpath 30 to be diverted along the A573 Wigan Road, over the A573 Wigan Road and along Lightshaw Lane;
- Golborne Footpath 35, north of Little Byron Hall Farm, to be closed permanently;
- Croft 27, south of Taylors Business Park, to be realigned; and
- Abram Footpath 02/10, south-east of Abram Bryn Gates Primary School, to be closed and diverted from alongside the WCML to run parallel to the eastern side of the Proposed Scheme, crossing the Proposed Scheme via the Ashton-in-Makerfield Footpath 22 accommodation underbridge.

14.5.13 The realignment of some of the PRoW would increase journey distance and time for non-motorised users and may result in significant effects. It is expected that the greatest increases in journey distance (likely to be in excess of an additional 500 m) would affect the users of PRoW Croft Footpath 15, Croft Footpath 8, Croft Footpath 108, Golborne Footpath 39 and Golborne Footpath 30. The assessment of PRoW changes will be reported in the formal ES.

Other mitigation measures

14.5.14 HS2 Ltd is continuing to engage with local highway and transport authorities regarding the need for highway and public transport measures to mitigate the impacts of the Proposed Scheme in the area.

14.5.15 Any further traffic and transport mitigation measures required during the operation of the Proposed Scheme will be considered based on the outcomes of the assessment. These will be reported in the formal ES.

Summary of likely residual significant effects

14.5.16 Operation of the Proposed Scheme would require the permanent diversion of: the A572 Newton Road; the A573 Wigan Road; the A574 Warrington Road; the B5207 Wilton Lane; Glaziers Lane; New Hall Lane (northern access to Taylors Business Park); Slag Lane and Wigshaw Lane. Increases in traffic could also result in increased traffic severance for non-motorised users of the routes.

14.5.17 Operation of the Proposed Scheme is expected to permanently remove parking spaces at business centres off A572 Newton Road/Pocket Nook Lane. Suspension of

designated parking spaces could result in increased traffic severance for non-motorised users of the routes.

14.5.18 Operation of the Proposed Scheme is expected to permanently divert and close PRoW: Croft Footpath 13; Croft Footpath 27; Croft Footpath 15; Croft Footpath 19; Croft Footpath 8; Croft Footpath 108; Croft Footpath 28; Golborne Footpaths 63; Golborne Footpath 37; Golborne Footpath 39; Golborne Footpath 33; Golborne Footpath 30; Golborne Footpath 27; Abram Footpath 02/10; and Golborne Footpath 35.

14.5.19 The assessment of significant effects in relation to traffic and transport during operation of the Proposed Scheme will be reported in the formal ES.

Monitoring

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

14.5.21 There are no other area-specific monitoring requirements currently proposed for traffic and transport.

15 Water resources and flood risk

15.1 Introduction

15.1.1 This section provides a description of the current baseline for water resources and flood risk in the Risley to Bamfurlong 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, Warrington Borough Council (WBC) and Wigan Metropolitan Borough Council (WMBC), which are both 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: MA05 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)[153].

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)[154].

15.2.2 Unless indicated otherwise, the spatial scope of the assessment (the study area) is based upon the identification of surface water and groundwater features within 1km of the centre line of the route of the Proposed Scheme, as described in Section 2.2 of

[153] DCLG (2015), *National Planning Policy Framework*
[154] Supporting document: HS2 Phase 2b Environmental Impact Assessment Scope and Methodology Report

this report. The study area has been extended to include Pennington Flash, a WFD lake water body.

15.2.3 This assessment is based on desk study information, including information provided to date by consultees and stakeholders, as well as surveys of accessible water features.

15.2.4 Where surveys have not been undertaken due to land access constraints, a precautionary approach has been adopted in the assessments of receptor value and impact magnitude.

15.2.5 Hydraulic analysis is currently being undertaken of watercourses and key structures within flood risk areas. This includes modelling of Holcroft Lane Brook.

15.2.6 Groundwater levels have been inferred from the available Environment Agency groundwater level monitoring boreholes, historic borehole logs and topographic data, as well as from spring and watercourse locations.

15.2.7 Impacts on biological receptors such as aquatic fauna and flora are assessed in Section 7, Ecology and biodiversity.

15.2.8 The assessments in this working draft ES are based on professional judgement using the information that 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 Mersey Lower management catchment of the North West river basin district (RBD).

15.3.2 The river basin management plan[155] identifies the chemical[156] and ecological[157] status of surface water bodies, and the quantitative[158] and chemical[159] 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

[155] Environment Agency (2015), *Water for life and livelihoods Part 1: Humber river basin district: River basin management plan*
[156] The chemical status of surface waters reflects concentrations of priority and hazardous substances present
[157] 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.

[158] 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
[159] 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 30. The receptor value attributed to each individual water body is based on the methodologies set out in the SMR.

Table 30: Surface water body receptors

Water body name and location[160]	**Designation**	**Q95 value (m^3/s)[161]**	**Receptor value**	**Parent WFD water body name and identification number[162]**	**Current WFD status/Objective[163]**
Glaze Brook WR-01-306b D8	Main river	0.8	High	Glaze GB112069061420	Poor/Poor by 2015
Tributary of Holcroft Lane Brook 1 WR-01-306b D8	Ordinary watercourse	<0.002	Low		
Tributary of Holcroft Lane Brook 2 WR-01-306b F6	Main river	<0.002	Low		
Tributary of Holcroft Lane Brook 3 WR-01-306b F6	Ordinary watercourse	<0.002	Low		
Tributary of Holcroft Lane Brook 4 WR-01-306b F6, G5 and G6	Ordinary watercourse	<0.002	Low		
Tributary of Holcroft Lane Brook 5 WR-01-306b F6 and G6	Ordinary watercourse	<0.002	Low		

[160] The feature locations are indicated by the grid coordinates on the relevant Volume 2: MA05 Map Book figure (in this case WR-01)
[161] This is the flow within the watercourse that is exceeded for 95% of the time
[162] The Environment Agency has attributed each surface water and groundwater body a unique water body identification (ID) number
[163] Status and objectives are based on those set out in the 2015 River basin management plan

Water body name and location[160]	**Designation**	**Q95 value (m^3/s)[161]**	**Receptor value**	**Parent WFD water body name and identification number[162]**	**Current WFD status/Objective[163]**
Holcroft Lane Brook WR-01-306b G6	Main river	<0.002	Low		
Culcheth Linear Park Drain 1 WR-01-306b H5	Ordinary watercourse	<0.002	Low		
Tributary of Cross Brook 1 WR-01-306b H5	Ordinary watercourse	<0.002	Low	Spittle Brook GB112069061020	Moderate/Good by 2027
Jibcroft Brook WR-01-306b I5	Main river	<0.002	Low	Glaze GB112069061420	Poor/Poor by 2015
Tributary of Carr Brook 1 WR-01-306b J5	Ordinary watercourse	<0.002	Low		
Carr Brook WR-01-307 D6	Main river	0.003	Moderate		
Small Brook WR-01-307 E6	Main river	<0.002	Low	Hey/Borsdane Brook GB112069064520	Moderate/Good by 2027
Tributary of Hey Brook 1 WR-01-307 E6	Ordinary watercourse	0.003	Moderate		
Tributary of Hey Brook 2 WR-01-307 F6	Ordinary watercourse	<0.002	Low		
Tributary of Hey Brook 3 WR-01-307 F6	Main river	<0.002	Moderate		
Tributary of Hey Brook 4 WR-01-307 F6	Ordinary watercourse	0.002	Low		
Windy Bank Brook WR-01-307 G5	Ordinary watercourse	<0.002	Low		
Tributary of Nan Holes Brook 1	Main river	<0.002	Low		

Water body name and location[160]	Designation	Q95 value (m³/s)[161]	Receptor value	Parent WFD water body name and identification number[162]	Current WFD status/Objective[163]
WR-01-307 H5					
Nan Holes Brook WR-01-307 H5	Main river	<0.002	Moderate[164]		
Tributary of Hey Brook 5 WR-01-307 H5	Ordinary watercourse	<0.002	Low		
Coffin Lane Brook WR-01-307 I5	Main river	0.004	Moderate		
Tributary of Coffin Lane Brook WR-01-307 I6	Ordinary watercourse	<0.002	Low		
Pennington Flash	Lake	n/a	High	Pennington Flash GB31232085	Moderate/Good by 2027

Abstractions and permitted discharges (surface water)

15.3.6 There are no licensed surface water abstractions in the study area.

15.3.7 Records of private unlicensed surface water abstractions, which comprise those for quantities less than 20m3 per day, have been obtained from the local authorities. These data indicate that there are no registered private unlicensed surface water abstractions within the study area. As there is no obligation to register private water supplies, unregistered private surface water supplies may be present. Private water supplies would be assessed as high value receptors unless details obtained from the owner indicate otherwise.

15.3.8 There are 27 consented discharges to surface waters within the study area, one of which is within the land required for the Proposed Scheme. These have been assessed as being receptors of low value.

Groundwater

15.3.9 The geology of the study area is described in Section 10, Land quality, and the superficial and bedrock hydrogeology is summarised in Table 31. Unless stated otherwise, the geological groups listed would all be crossed by the Proposed Scheme. Table 31 also identifies the receptor values attributed to each groundwater receptor based on the methodologies set out in the SMR.

[164] Receptor value based on WFD reconnaissance survey Feb 2018 rather than SMR/Q95 value

Table 31: Summary of geology and hydrogeology in the study area

Geology[165]	Distribution	Formation description	Aquifer classification	WFD body (ID) and current overall status[166]	WFD status objective[167]	Receptor value
Superficial deposits						
Peat	At Holcroft Moss, Peatfurlong Moss and Ince Moss	Peat	Unproductive	Weaver and Dane Quaternary sand and gravel aquifers (GB41202G991700) Poor [168]	Good by 2027	Low
Glacial till	Outcrops across much of the study area	Sandy silty clay	Secondary (undifferentiated)			Moderate
Glaciofluvial sheet deposits	Intermittent bands along the Proposed Scheme between the M62 and just south of Culcheth	Sand and gravel	Secondary A			Moderate
Glaciolacustrine deposits	Outcrops in large but isolated areas around Croft, Culcheth and Pocket Nook	Clay and silt	Unproductive			Low
Lacustrine deposits	Two isolated patches between Golborne and Croft	Clay and silt	Unproductive			Low
Glaciofluvial ice contact deposits	Isolated patches around Kenyon	Sand and gravel	Secondary A			Moderate
Alluvium	Present in the valleys of many brooks	Clay, silt, sand and gravel	Secondary A			Moderate

[165] 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.
[166] As stated in the 2015 River basin management plan
[167] As stated in the 2015 River basin management plan
[168] Although the superficial deposits in the study area are not within the Weaver and Dane Quaternary sand and gravel aquifers WFD groundwater body catchment area, the Environment Agency have advised that all superficial deposits in this study area should be considered as part of this WFD water body

Head	Small area west of Abram	Clay, silt, sand and gravel	Secondary (Undifferentiated)			Moderate
Bedrock						
Mercia Mudstone Group) - Tarporley Siltstone Formation	Band east of Gorse Covert (not crossed by the Proposed Scheme).	Siltstone, mudstone and sandstone	Secondary B	Not assessed by the Environment Agency	Not assessed by the Environment Agency	Moderate
Sherwood Sandstone Group - Helsby Sandstone Formation	Present in a band beneath Glazebrook, Holcroft Moss and the M62	Pebbly sandstone	Principal	Lower Mersey Basin and Merseyside North Permo-Triassic Sandstone Aquifers (GB41201G101700) Poor	Good by 2027	High
Sherwood Sandstone Group - Wilmslow Sandstone Formation	Present across the study area from the south-eastern edge of Golborne to Croft and the southern edge of Culcheth	Sandstone	Principal			High
Sherwood Sandstone Group - Chester Formation	Present along the route of the Proposed Scheme between Lowland Common and Dover	Sandstone	Principal			High
Kinnerton Sandstone Formation[169]	Present in a narrow, 80m wide band between Bickershaw and Golborne	Sandstone	Principal			High
Cumbrian Coast Group - Manchester Marls Formation	Extends through Dover	Mudstone	Secondary B			Moderate
Appleby Group - Collyhurst Sandstone Formation	Present between Dover and Bryn Gates	Sandstone	Principal			High

[169] Recent updates to the nomenclature used to describe these formations have removed the Kinnerton Sandstone Formation from the Sherwood Sandstone Group (Ambrose, K, Hough, E, Smith, N J P, And Warrington, G. 2014. Lithostratigraphy of the Sherwood Sandstone Group of England, Wales and south-west Scotland. British Geological Survey Research Report, RR/14/01.)

Pennine Coal Measures Group - Pennine Middle Coal Measures Formation	Present from Bryn Gates to the northern end of the study area	Mudstone, siltstone and sandstone with coal seams	Secondary A	Sankey and Glaze Carboniferous aquifers (GB1201G101100) Poor	Good by 2027	Moderate

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 31, and consist of glacial fluvial sheet, glaciofluvial ice contact deposits, alluvium, head deposits, glaciolacustrine deposits, lacustrine deposits and glacial till. Although considered to be unproductive strata, the peat, glaciolacustrine deposits and lacustrine deposits form part of the wider Weaver and Dane WFD water body. The remaining deposits form an aquifer system which may be capable of supporting water supplies at a local rather than regional scale and may also form an important source of baseflow to rivers. They have therefore been classified 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 31 is outlined briefly as follows:

- the Sherwood Sandstone Group (locally comprising sandstones of the Helsby Sandstone Formation, Wilmslow Sandstone Formation and Chester Formation), the Kinnerton Sandstone Formation and the Collyhurst Sandstone Formation (Appleby Group) have been classified as Principal aquifers by the Environment Agency and are therefore high value receptors;
- the Manchester Marls Formation (Cumbrian Coast Group) has been classified as a Secondary B aquifer by the Environment Agency and is therefore a moderate value receptor;
- the Pennine Coal Measures Group is classified as a Secondary A aquifer and can support water abstractions on a local scale along with providing a contribution to river baseflow and is therefore classified as a moderate value receptor; and
- the Mercia Mudstone Group has traditionally been regarded as predominantly impermeable, or at best a poor aquifer. Limited quantities of groundwater suitable for domestic or agricultural use are however occasionally obtainable within the Tarporley Siltstone Formation present in the study area, which has therefore been classified as a moderate value receptor.

WFD status of groundwater bodies

15.3.12 A summary of locations, current overall WFD status, and future overall status objectives associated with the designated groundwater bodies in the bedrock and superficial deposits within the study area is provided in Table 31. The value attributed to each of these receptors is also indicated.

15.3.13 The bedrock Mercia Mudstone Group is not formally designated as a WFD groundwater body, although limited quantities of groundwater are occasionally obtainable from some formations within the Mercia Mudstone Group.

Abstraction and permitted discharges (groundwater)

15.3.14 There are six groundwater abstractions licensed for public water supply within the study area. The Proposed Scheme passes through groundwater source protection zone (SPZ)2 east of Lowton at Wash End and north-east of Golborne at Byrom Hall. With the exception of the area north of Nan Holes Brook and west of Dover, the whole of the rest of the Proposed Scheme is within SPZ3 in this study area.

15.3.15 There is one private groundwater abstraction licence registered in the study area, as shown on Map WR-02-201. This is a moderate value commercial water supply.

15.3.16 Records of private unlicensed groundwater abstractions, which comprise those for quantities less than 20m3 per day, have been obtained from the local authorities. These data indicate that there are no registered private unlicensed groundwater abstractions within the study area. 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.

15.3.17 There are two consented discharges to groundwater within the study area. These discharges have been assessed as low value receptors.

Groundwater - surface water interactions

15.3.18 Desk-based assessment using Ordnance Survey maps and detailed river network data provided by the Environment Agency identified 30 features within the study area that had potential to be springs. Access was possible to inspect six of these features, of which:

- four features were verified as being minor land drainage features of low value;
- one feature was verified as a spring of low value, because it provides baseflow to Jibcroft Brook, which is identified as a low value receptor in Section 7, Ecology and biodiversity; and
- one feature was verified as a spring of low value because it provides baseflow to Hey Brook, which is identified as a low value receptor in Section 7, Ecology and biodiversity.

15.3.19 The remaining 24 potential spring features that have yet to be inspected are assumed to be high value receptors on a precautionary basis. Two of the potential spring features yet to be inspected are within the land required for the Proposed Scheme, one at West Coast Mainline (WCML) railway, 320m north-west of Aye Bridge Farm, and one at WCML railway, east of Bamfurlong Recreation Ground.

15.3.20 There are 52 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

15.3.21 The following nature conservation sites within the study area are potentially groundwater dependent:

- Manchester Mosses Special Area of Conservation (SAC) comprises three sites located to the west of Manchester, two of which are located in the study area. One of the sites is the Holcroft Moss Site of Special Scientific Interest (SSSI), which is located adjacent to the Proposed Scheme, and also adjacent to the M62, west of Irlam. The other two components of the SAC are outside the study area. The southern boundary of the Holcroft Moss SSSI is located along the boundary of MA04 (Broomedge to Glazebrook) area. Holcroft Moss SSSI may be supported, at least in part, by groundwater (potentially from the glaciofluvial sheet deposits and Helsby Sandstone). Another of these sites is Risley Moss SSSI which is located to the west of the Proposed Scheme and may also be dependent on surface water or groundwater (potentially from the peat and Mercia Mudstone Group);
- Abram Flashes SSSI is a series of wetland habitats including open water, swamp, wet grassland and tall herb fen. The site is likely to be fed by a combination of surface water and groundwater (from the alluvium and Chester Formation);
- Bryn Marsh and Ince Moss SSSI and The Wigan Flashes Local Nature Reserve (LNR) contain a series of wetland habitats, including open water, swamp, fen reedbeds and wet woodland. The sites are likely to be dependent on groundwater (potentially from the alluvium and Pennine Middle Coal Measures Formation); and
- Pennington Flash LNR and Country Park is dependent on surface water flows largely from Hey Brook and its tributaries, Small Brook and The Flash.

15.3.22 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.

15.3.23 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

15.3.24 The Environment Agency's Flood map for planning (rivers and sea)[170] 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).

[170] https://flood-map-for-planning.service.gov.uk/

15.3.25 The updated Flood map for surface water[171] 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[172]. The British Geological Survey (BGS) national dataset, Areas susceptible to groundwater flooding[173], has been used to assess the future risk of groundwater flooding.

15.3.26 The following reports were used to help determine the baseline flood risk within the study area:

- Warrington Preliminary Flood Risk Assessment (PFRA) (2011)[174] and Wigan PFRA (2011)[175];
- Warrington Strategic Flood Risk Assessment (SFRA) (2014)[176] and Wigan SFRA (2010)[177]; and
- Warrington Local Flood Risk Management Strategy (LFRMS) (2014)[178] and Wigan LFRMS (2014)[179].

River flooding

15.3.27 The study area includes areas of floodplain (Flood Zone 2 or 3) associated with Holcroft Lane Brook and Tributary of Hey Brook 1. Other floodplains that would be crossed by the route of the Proposed Scheme include those associated with Carr Brook, Small Brook, Windy Bank Brook, Nan Holes Brook and Coffin Lane Brook. Table 32 shows all relevant watercourses within the study area with receptors that would potentially be affected by any changes in flood magnitude. The value of these receptors, based on the definitions in Table 57 of the SMR, is also indicated.

Table 32: River flood risk sources and receptors

Source	Location description and figure/coordinate[180]	Receptor potentially affected	Receptor value/sensitivity to flooding
Holcroft Lane Brook	Holcroft Lane Brook WR-01-306b G6	Croft Footpath	Low
		Residential property	High

Surface water flooding

15.3.28 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 33. The value of these receptors, based on Table 57 of the SMR, is also indicated.

[171] Long term flood risk information. Available online at: https://flood-warning-information.service.gov.uk/long-term-flood-risk/
[172] Long term flood risk information. Available online at https://flood-warning-information.service.gov.uk/long-term-flood-risk/
[173] BGS groundwater flooding. Available online at: http://www.bgs.ac.uk/products/hydrogeology/groundwaterFlooding.html
[174] Warrington Borough Council (2011), *Warrington Preliminary Flood Risk Assessment (PFRA)*
[175] JBA Consulting (2011), *Wigan Preliminary Flood Risk Assessment (PFRA)*
[176] JBA Consulting (2011), *Warrington Strategic Flood Risk Assessment (SFRA)*
[177] JBA Consulting (2010), *Wigan Strategic Flood Risk (SFRA)*
[178] JBA Consulting (2014), *Warrington Local Flood Risk Management Strategy (LFRMS)*
[179] Wigan Council (2014), *Wigan Local Flood Risk Management Strategy (LFRMS)*
[180] This is the location at which the source intersects the Proposed Scheme, as indicated by the grid coordinates on the relevant Volume 2: MA05 Map Book figure (in this case WR-01)

Table 33: Surface water flood risk sources and receptors

Source	Location description and figure/coordinate[181]	Receptor potentially affected	Receptor value
Surface water flow path at Glaziers Lane Farm	Wigshaw WR-01-306b H5	Glaziers Lane	Moderate
		Wigshaw Lane	Moderate
		Residential property	High
Surface flow path draining towards Carr Brook	Lowton St Mary WR-01-307 D6	Residential properties downstream along Brancaster Drive	High
		Brancaster Drive	Moderate
		Residential properties upstream along Beech Avenue	High
		Cedar Avenue, Maple Avenue, Beech Avenue, Kings Avenue upstream of the crossing.	Moderate
		Lowton Junior School	Moderate
		A580 East Lancashire Road	Moderate
Surface water flow path in Lowton St Mary	Lowton St Mary WR-01-307 D6	Residential properties	High
		Newton Road, Hesketh Meadow Lane	Moderate
Small Brook	Pennington Flash Country Park WR-01-307 E6	Agricultural land	Moderate
		Footpath and roads	Moderate
		Residential properties (Brookline Avenue)	High
		Residential properties (Elmridge Court)	High
Surface flow path north of Garton Common	Garton Common WR-01-307 E6	Slag Lane	Moderate
		Residential properties	High
Windy Bank Brook	Hillcroft WR-01-307 G5	A573 Wigan Road	Moderate
Nan Holes Brook	Aye Bridge Farm WR-01-307 H5	A573 Wigan Road	Moderate

[181] This is the location at which the source intersects the Proposed Scheme, as indicated by the grid coordinates on the relevant Volume 2: MA05 Map Book figure (in this case WR-01).

Artificial water bodies

15.3.29 Flooding from artificial water bodies may occur due to failure of an impounding structure, such as a dam or canal embankment. There are no artificial water bodies with potential implications for flood risk within the study area.

Groundwater flooding

15.3.30 Information related to historical incidents of groundwater in the Risley and Bamfurlong area is included in the Warrington SFRA[176] and LFRMS[178], as well as in the Wigan SFRA[177] and LFRMS[179]. The Warrington SFRA and LFRMS state that there is no history of groundwater flooding within the WBC whereas the WMBC SFRA and LFRMS does not indicate incidents near the route of the Proposed Scheme.

15.3.31 The BGS Groundwater flooding susceptibility data set indicates that there is some potential for groundwater flooding to occur along Nan Holes Brook floodplain where the route of the Proposed Scheme is underlain by superficial deposits susceptible to groundwater flooding.

Land drainage

15.3.32 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)182 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.

[182] Supporting document: Draft Code of Construction Practice

Water resources and WFD

15.4.2 The avoidance of sensitive receptors has reduced the risks associated with the Proposed Scheme not complying with the requirements of the WFD. Examples of this strategy include:

- avoidance of channels and floodplain areas, where reasonably practicable – the route of the Proposed Scheme will avoid passing along river or stream valleys, and their associated floodplains;
- avoidance, where reasonably practicable, of water dependent habitats, including natural springs that can play a key role in the hydrology and hydrogeology of such ecosystems; and
- avoidance, where reasonably practicable, of major public water supplies and smaller licensed and unlicensed abstractions of surface water and groundwater.

15.4.3 The presence of any unregistered private water supplies, their function and the means of protecting or if necessary replacing them would be discussed with any landowners potentially affected by the Proposed Scheme.

15.4.4 The temporary works shown on Map Series CT-05 in the Volume 2: MA05 Map Book have been informed by a detailed consideration of the water resources constraints and have sought to avoid sensitive features wherever reasonably practicable.

15.4.5 Watercourse realignments are proposed at the following locations: Holcroft Lane Brook and Tributary of Holcroft Lane Brook 5. The aim will be to design these with equivalent hydraulic capacity to the existing channels. The design of 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[183].

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 two diversions proposed within this study area. It is proposed that Tributary of Hey Brook 2 and 3 are diverted into Tributary of Hey Brook 4 and at Tributary of Nan Holes Brook 1, two small farm drains would be combined.

15.4.7 For watercourses that are not in their natural condition, the design aim for realignments and diversions will be to incorporate measures, where reasonably practicable, to improve their hydromorphological condition, provided this is compatible with their flood risk and land drainage functions.

15.4.8 The design of infrastructure required within or in proximity to an existing channel (including bridge abutments, intermediate piers and outfalls) will aim to reduce

[183] '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

impacts on the natural hydromorphology of watercourse channels, as far as is reasonably practicable.

15.4.9 The draft CoCP includes requirements to protect water bodies and their associated water resources from the potential impacts of pollution from construction site runoff, including where appropriate:

- provision of maps showing sensitive areas and buffer zones where no pollutants are to be stored or used; and
- preparation of method statements for silt management, site drainage at compounds and satellite compounds, for the storage and control of oils and chemicals and the prevention of accidental spillages, in consultation with the Environment Agency, and if appropriate, the LLFA and other relevant authorities as part of the approvals process. These method statements will cover, where applicable:
  - the avoidance of discharges of site runoff to ditches, watercourses, drains, sewers or soakaways without the prior approval of the appropriate authority;
  - measures to prevent silt-laden runoff and other pollutants entering the water environment; and
  - restrictions or controls on excavation within watercourses to limit effects on water quality, sedimentation, fisheries and aquatic ecology.

15.4.10 Method statements will be required for all watercourse crossings and channel realignments required for site haul routes. The method statements will describe how potential changes to flood risk, water quality and channel hydromorphology will be managed during the establishment, use and decommissioning of all site haul routes.

15.4.11 Permanent culverts proposed on the smaller watercourse crossings within this study area include those on Tributaries of Holcroft Lane Brook 2 and 3, Windy Bank Brook, Coffin Lane Brook, Tributary of Coffin Lane Brook, Nan Holes Brook and Small Brook. In addition, culverts are proposed on small drains and watercourses at Carr Brook, Tributary of Hey Brook 1 and Tributary of Hey Brook 5. 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 WFD compliance assessment.

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[184] 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 realignment of the A573 Wigan Road, which intersects Windy Bank Brook, Nan Holes Brook and Hey Brook floodplain, and realignment of Slag Lane, which crosses over a surface flow path near Little Byrom Hall Farm. The Proposed Scheme includes replacement floodplain storage areas to replace losses associated with the highway realignment;
- the temporary works shown in the Volume 2: MA05 Map Book have been informed by a detailed consideration of the flood risk constraints and have sought to avoid flood zones wherever reasonably practicable;

[184] Impermeable barrier preventing water flow

- provision has been made to pass surface water runoff and land drainage flows beneath sections of raised embankment that will cross surface water flow paths where reasonably practicable. This will be achieved using perimeter drainage and culverts, with their inverts set below the likely level of any upstream field subsurface drainage systems;
- in locations where the route of the Proposed Scheme will cross watercourses, the design aim is for structures to accommodate flood flows up to and including the 1 in 100 (1%) annual probability flood with an allowance for climate change based on latest guidance issued by the Environment Agency[185];
- 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:

[185] Environment Agency (2016) *Adapting to Climate Change. Advice for Flood and Coastal Erosion Risk Management Authorities*

- preparation of flood risk assessments and method statements for temporary works, including main construction and satellite compound drainage, watercourse crossings and realignments and temporary realignments in consultation with the Environment Agency, and where applicable, the LLFA and other relevant regulators;
- location of storage, machinery, equipment and temporary buildings outside flood risk areas where reasonably practicable;
- construction of outfalls during periods of low flow to reduce the risk of scour and erosion;
- design of temporary watercourse realignments with equivalent hydraulic capacity to the existing channels, ensuring that field subsurface drainage systems can be adapted to discharge into the new channel; and
- having regard to the requirement for construction activities to avoid any increases in flood risk to vulnerable receptors.

15.4.18 In accordance with Section 16 of the draft CoCP, monitoring will also be undertaken in consultation with the Environment Agency and, where applicable, the LLFA, to ensure that temporary structures are installed, maintained and removed in accordance with the relevant environmental approvals and that impact on existing land drainage systems are managed appropriately.

Assessment of impacts and effects

15.4.19 This section describes the significant effects following the implementation of the avoidance and mitigation measures. The majority of the potential temporary impacts on the water environment during construction will be avoided or mitigated by the working methods outlined in the draft CoCP. The mitigation embedded into the design has focused on reducing permanent impacts resulting from the presence of the Proposed Scheme to as low a level as is reasonably practicable.

Temporary effects – Water resources and WFD

Surface water

15.4.20 Potential temporary impacts on surface water quality, due to site runoff and increased pollution risk, are a key concern during construction and have the potential to affect abstractions and the water environment more generally. However, the practices outlined in the draft CoCP are considered adequate to mitigate any impacts, such that there are unlikely to be any significant effects.

Groundwater

Aquifers

15.4.21 The proposed cuttings in the study area would intersect the Sherwood Sandstone Group Principal aquifer, the Mercia Mudstone Group Secondary B aquifer and the glacial till Secondary (undifferentiated) aquifer. Whilst there could be minor localised impacts, the implementation of the measures outlined in the draft CoCP would mean that any effects on the overall status of these aquifers would not be significant.

15.4.22 Where cuttings could affect local receptors, such as groundwater abstractions or springs, this is reported in the sections below.

Abstractions

15.4.23 No significant temporary effects on abstractions are anticipated.

Groundwater - surface water interactions

15.4.24 No significant temporary effects on groundwater – surface water interactions are anticipated.

Water dependent habitats

15.4.25 No temporary impacts on water dependent habitats are anticipated in this study area as a result of construction of the Proposed Scheme.

Temporary Effects - Flood risk and land drainage

15.4.26 It is not currently anticipated that there would be any temporary effects related to flood risk and land drainage in this study area as a result of the construction of the Proposed Scheme.

Permanent effects – Water resources and WFD

15.4.27 Permanent effects are those initially caused by activity to construct the Proposed Scheme but which would also remain after the Proposed Scheme has been constructed and is present in the area.

Surface water

15.4.28 There are no significant permanent effects anticipated on surface water in this area as a result of construction of the Proposed Scheme.

Groundwater

Aquifers

15.4.29 It is currently anticipated that implementation of the avoidance and mitigation measures would ensure that there are no permanent significant effects related to the impact of the proposed cuttings on water levels and quality in the aquifers intercepted by the Proposed Scheme.

Abstractions

15.4.30 The assessment has not identified any permanent significant effects on groundwater abstractions.

Groundwater - surface water interactions

15.4.31 The Proposed Scheme would result in the permanent loss of 2 potential spring features, one at West Coast mainline (WCML) railway, east of Bamfurlong recreation ground and one at the WCML railway. Until the nature of these features have been confirmed by a site survey, they have been assumed to be high value receptors. On a precautionary basis the assessment therefore identifies its loss as potentially resulting in a permanent major adverse effect, which is significant.

Water dependent habitats

15.4.32 The Proposed Scheme passes adjacent to Holcroft Moss on embankment with piled foundations where it passes over the peat. At present it is unclear whether water levels in the peat at Holcroft Moss are supported by surface water, or by groundwater in the superficial deposits or the underlying Helsby Sandstone Formation bedrock.

15.4.33 The groundwater flow direction in the Helsby Sandstone Formation is expected to be to the west or south-west[186] (i.e. from the site towards the Proposed Scheme). However, the flow direction in the superficial deposits is currently uncertain due to the topography and possible interactions with Glaze Brook and various land drainage channels. Further assessment will be undertaken to confirm the possible impact of the Proposed Scheme on water levels at Holcroft Moss. If required, the results of this assessment will be used in developing an appropriate design, as indicated in Section 7: Ecology and biodiversity.

Permanent effects - Flood risk and land drainage

15.4.34 Hydraulic modelling of Holcroft Lane Brook is currently being undertaken to assess potential permanent effects related to flood risk. It is currently anticipated that the Proposed Scheme would result in minor impacts on flood levels. This would potentially affect residential properties, which are high value receptors, resulting in moderate adverse effects, which would be significant.

Other mitigation measures

15.4.35 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

15.4.36 No further mitigation measures are anticipated to be required.

Groundwater

15.4.37 A survey of the potential spring features adjacent to the WCML railway, east of Bamfurlong recreation ground, and the WCML, 320m north-west of Aye Bridge Farm will be undertaken to determine their value and to identify whether further mitigation would be required. If they are confirmed to be springs of high to moderate value, measures will be identified to reduce any adverse effects as far as is reasonably practicable.

Flood risk and land drainage

15.4.38 Hydraulic modelling is currently being undertaken for the Proposed Scheme and its interaction with Holcroft Lane Brook. Any requirement for mitigation identified from the modelling will be developed in consultation with the Environment Agency.

[186] Taken from BGS Sheet 19: Hydrogeological Map of Clwyd and the Cheshire Basin (1:100,000) – 1989. Accessible at http://www.bgs.ac.uk/research/groundwater/datainfo/hydromaps/hydro_maps_scanviewer.html

Summary of likely residual significant effects

15.4.39 In the absence of the other mitigation measures set out above, the Proposed Scheme would potentially result in residual significant effects as follows:

- major adverse effects related to the loss of two potential spring features which is significant; and
- a moderate adverse effect on flood risk to residential receptors from Holcroft Lane Brook, which is significant.

15.4.40 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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