HS2

October 2018

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

Working Draft Environmental Statement

Volume 2: Community Area report

MA08: Manchester Piccadilly Station

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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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Contents

List of figures

List of tables

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 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.

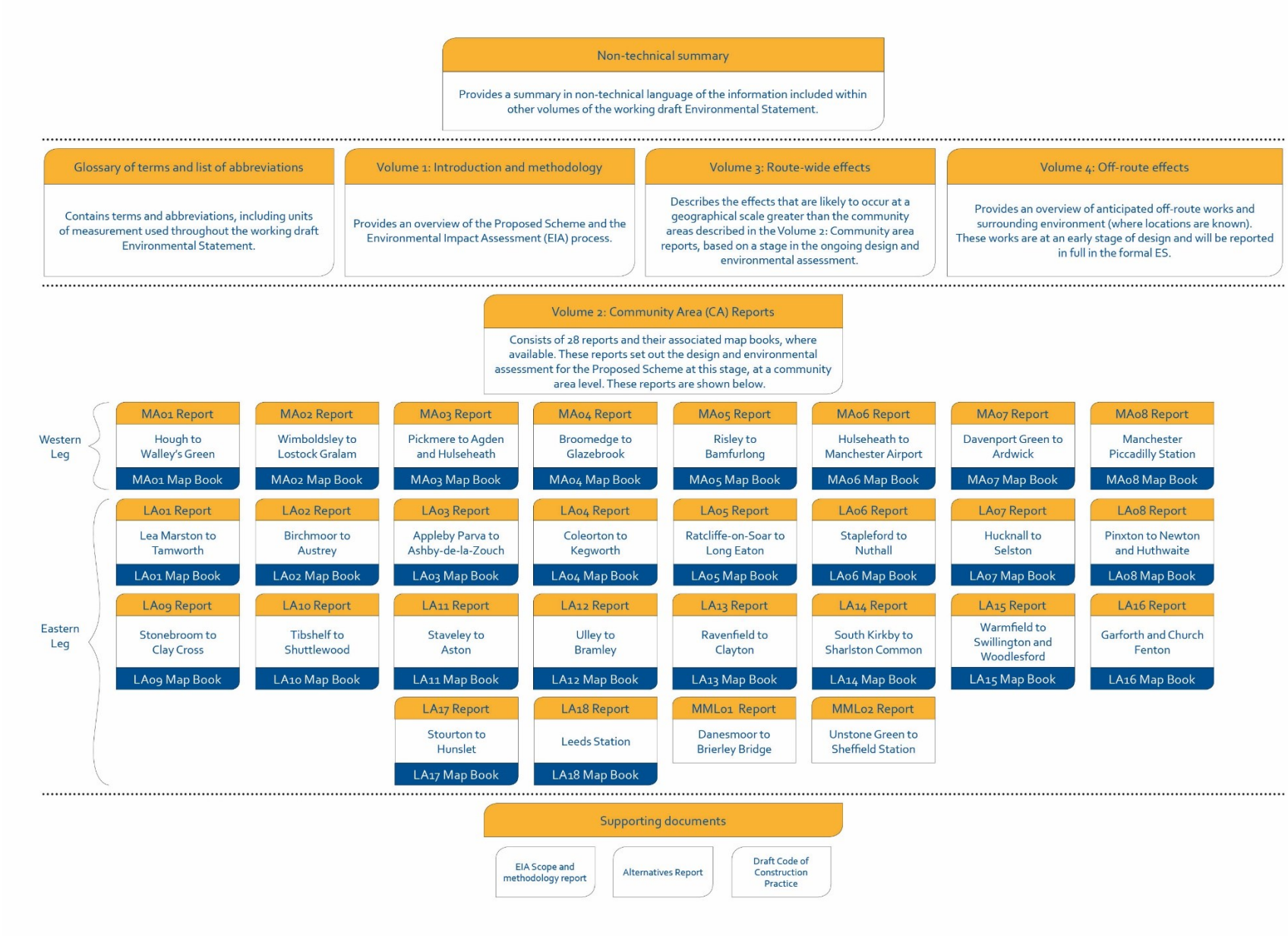
Volume 4: Off-route effects

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.

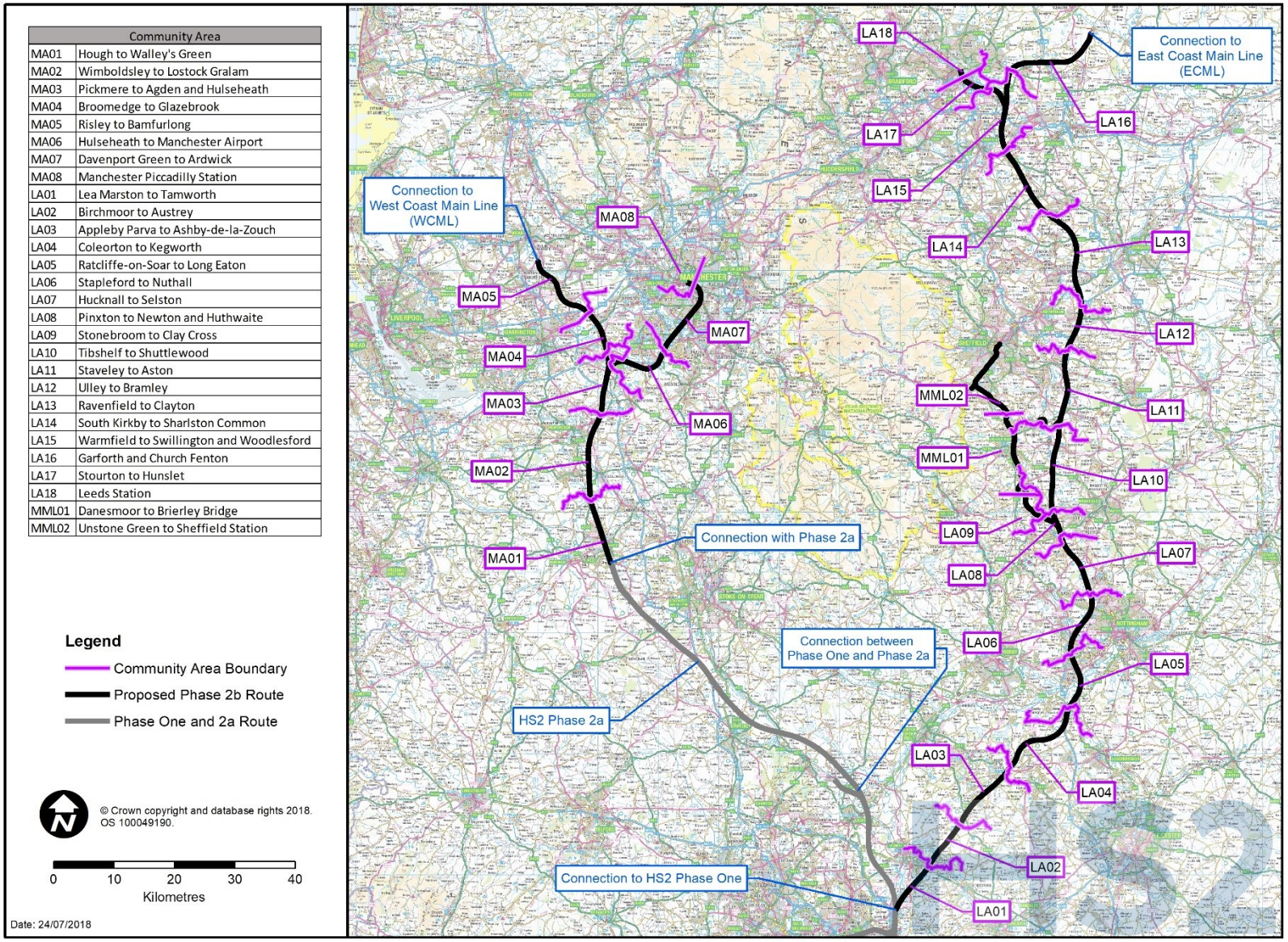
1.1.3 Phase Two of HS2 will extend the route from Phase One in the West Midlands to the north-west to Manchester (approximately 80km (50 miles) with connections to the West Coast Main Line (WCML) at Crewe and Golborne, and to the north-east to Leeds with a connection to the Erewash Valley Line and Midland 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 Manchester Piccadilly Station area (CA number MA08) 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 Manchester Piccadilly Station 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 Manchester Piccadilly Station area are provided in a separate corresponding document entitled Volume 2: MA08 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: MA08 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 Manchester Piccadilly Station area covers an approximately 1.1km section of the Proposed Scheme in Manchester. The boundary of the area is 43m west of the A665 Midland Street and the area extends to the north and west of the existing Manchester Piccadilly Station. The area includes the existing Manchester Piccadilly Station and the Manchester City Council (MCC) wards of City Centre and Ardwick.

2.1.2 As shown in Figure 3, the Davenport Green to Ardwick area (MA07) lies to the south.

Settlement, land use and topography

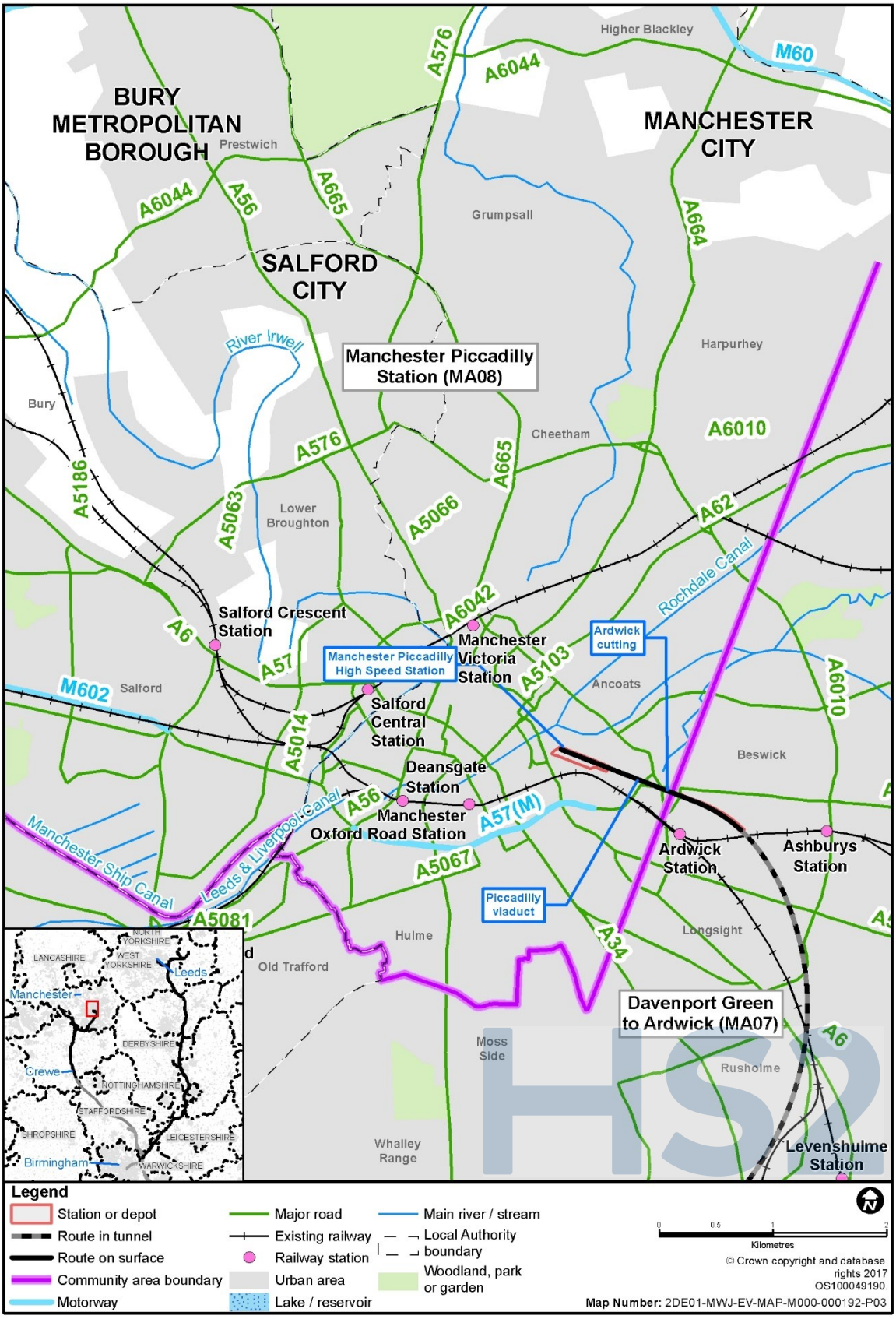
2.1.3 The area extends from commercial properties bounded by the A665 Midland Street, the A665 Chancellor Lane and the A635 Ashton Old Road in the south-east, to Ducie Street in Manchester city centre, north-west of the existing Manchester Piccadilly Station. The area is entirely urban, with land use comprising light industrial and commercial infrastructure throughout. These areas make use of the land to the north and south of the existing Manchester Piccadilly Station and the Crewe-Manchester railway. The River Medlock runs through the southern part of the area. Piccadilly and the city centre are the nearest main residential areas, with the University of Manchester's Sackville Street area campus nearby, to the south-west. Areas of residential development are present in Ancoats and around the existing Manchester Piccadilly Station.

2.1.4 The area has its highest point at the south-eastern end, at approximately 48m above Ordnance Datum (AOD). The ground falls away gently to the north-west towards the River Medlock, before rising and falling slightly towards the existing Manchester Piccadilly Station.

2.1.5 The existing Manchester Piccadilly Station, railway and associated operational and maintenance facilities are key elements of the urban environment in the area; a number of shops and food outlets are provided in the existing station.

2.1.6 The B6469 Fairfield Street bounds the south side of the existing Manchester Piccadilly Station. The A6 London Road bounds the station to the west and has local shops, restaurants and public houses. To the north-west of the existing station is Gateway House, which houses shops, food outlets and a hotel. Manchester city centre is further to the north-west. To the east of the station, there is a mixture of business and residential land use.

Figure 3: Community area context map



Key transport infrastructure

2.1.7 The key transport infrastructure elements in the Manchester Piccadilly Station area are the roads and railways that lead to and from Manchester city centre. The A57(M) Mancunian Way is located within the area, to the south of the existing Manchester Piccadilly Station. Principal highways in this area include the A635 Mancunian Way/Ashton Old Road, the A6 London Road, the A665 Chancellor Lane/Pin Mill Brow and the B6469 Fairfield Street, connecting south-east Manchester with the city centre.

2.1.8 The existing Manchester Piccadilly Station is a major transport interchange and a terminus for both intercity and local train services. There are 12 terminating platforms and two through platforms. A number of railways pass through the Manchester Piccadilly Station area including: the Crewe to Manchester Line, running in a south-east to north-west direction east of the existing station; and the Ashburys line.

2.1.9 The Manchester Metrolink tram network also runs through the area, connecting the existing Manchester Piccadilly Station to the city centre and areas of Greater Manchester.

2.1.10 There is a station approach at the north-west side of the existing Manchester Piccadilly Station, served by three city centre bus routes, and a taxi rank under the station to the south side.

2.1.11 The navigable waterways of the Manchester Ship, Rochdale, Ashton and Bridgewater Canals are present in the area.

Socio-economic profile

2.1.12 Within the MCC area the retail sector accounted for the largest proportion of businesses in 2017 (20%)[4], with the professional, scientific and technical sector as the second largest (17%), followed by business administration and support services (8%).

2.1.13 According to the Annual Population Survey (2016)[5], the employment rate[6] within the MCC area was 63% (237,000 people), and unemployment in the MCC area was 8%.

2.1.14 According to the Annual Population Survey (2016), 39% of MCC 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

2.1.15 Located within Manchester city centre, the Manchester Piccadilly Station area is wholly urban. The smaller residential settlements of Brunswick, Ardwick[7] and Ancoats are located in the area. These settlements, as well as the city centre itself provide the main community facilities in the area, including places of worship, community centres, libraries, medical facilities, care homes and public houses. Nursery, primary and secondary schools, and higher education facilities are located throughout

[4] Office for National Statistics (2017) UK Business Count – Local Units. Available online at https://www.nomisweb.co.uk
[5] Annual Population Survey (2016), NOMIS. Available online at https://www.nomisweb.co.uk
[6] The proportion of residents aged 16-64 that is in employment
[7] Ardwick is also partially situated in the Davenport Green to Ardwick area (MA07); however, the majority of Ardwick's residential areas are found in Manchester Piccadilly Station (MA08)

the area. The University of Manchester and Manchester College have campuses on Sackville Street and the B6469 Whitworth Street, respectively; the University of Salford and Manchester Metropolitan University campuses are also located in this area. There is also a range of associated student accommodation.

2.1.16 Notable community facilities include: Manchester Town Hall; Manchester Cathedral; Manchester Royal Infirmary and Saint Mary's Hospital.

Recreation, leisure and open space

2.1.17 The Manchester Piccadilly Station area features small open spaces, typical of an urban area, including Ardwick Green Park, Vimto Park, Grosvenor Street Park, Sackville Gardens and Piccadilly Gardens. There are a number of waterways in the area, including: the River Medlock; the Ashton, Bridgewater and Rochdale Canals (and moorings); and the River Irwell, all of which provide recreational routes.

2.1.18 There are several promoted public rights of way (PRoW)[8] in the area, including the Medlock Valley Way, the Cheshire Ring Canal Walk and the Irwell Sculpture Trail. There is also a pedestrian footbridge linking the existing Manchester Piccadilly Station with Piccadilly Place to the north-west, in addition to a number of footpaths associated with the highways in the area. National Cycle Route 66 runs to the north of the existing Manchester Piccadilly Station, underneath the station approach, in an east-west direction along Store Street.

2.1.19 Manchester city centre contains many recreational and sports facilities, including museums, galleries, theatres, concert halls, sporting venues and stadia.

Policy and planning context

Planning framework

2.1.20 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.

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

- Adopted Manchester Core Strategy 2012–2027 (2012)[9];
- Adopted Manchester City Council Unitary Development Plan (saved policies) (1995)[10];
- Adopted Greater Manchester Joint Waste Development Plan Document 2012-2027 (2012)[11];

[8] Local, regional or national trails that have been devised by local authorities and walking organisations to help promote the PRoW network.
[9] Manchester Core Strategy 2012-2027 (Adopted 2012). Available online at: http://www.manchester.gov.uk/downloads/download/4964/core_strategy_development_plan
[10] Manchester Unitary Development Plan (saved policies) (Adopted 1995). Available online at: http://www.manchester.gov.uk/downloads/download/4975/extant_udp_policies
[11] 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

- Adopted Greater Manchester Joint Minerals Development Plan Document 2012-2027 (2013)[12]; and
- Adopted Greater Manchester Transport Strategy 2040 (2017)[13].

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

Committed development

2.1.23 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.

2.1.24 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.

2.1.25 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.

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

Ongoing design development

2.1.27 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:

- the layout and design of the proposed Manchester Piccadilly High Speed station and associated public realm;
- review of the accesses for the Manchester Metrolink network at the existing Manchester Piccadilly Station;
- review of the proposed length and height of the Piccadilly viaduct;
- temporary and permanent utility diversions;
- refinement of the realignment of roads, associated pedestrian footways and PRoW that would be crossed by the Proposed Scheme;

[12] Greater Manchester Joint Minerals Development Plan Document 2012-2027 (Adopted 2013). Available online at: http://www.gmmineralsplan.co.uk/docs.html#ADOPTED_MINERALS_PLAN
[13] Greater Manchester Transport Strategy 2040 (Adopted 2017). Available online at: https://www.tfgm.com/2040

- refinement of drainage features required for rail and highways;
- refinement of maintenance access routes;
- additional environmental features required to mitigate likely significant environmental effects;
- accommodation works and crossings of the route of the Proposed Scheme for private means of access;
- refinement of construction compound locations and site haul routes; 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 Manchester Piccadilly Station 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 All dimensions in the sections below are approximate.

Manchester Piccadilly High Speed station approach

2.2.4 The route of the Proposed Scheme within this section would continue from the Davenport Green to Ardwick area (MA07) north-west towards the proposed Manchester Piccadilly High Speed station, where High Speed trains would terminate.

2.2.5 This section of route is illustrated on map CT-06-365b in the Volume 2: MA08 Map Book.

2.2.6 The key features of this 1.1km section would include:

- a section of the Ardwick cutting, which would be a retained cutting 130m in length, 18m in width and 0.5m in depth in this section, continuing from the Davenport Green to Ardwick area (MA07) (see Volume 2: Map CT-06-365b, D6);
- Piccadilly viaduct, 1km in length and up to 11.5m in height, extending from the Ardwick cutting to the Manchester Piccadilly High Speed station (see Volume 2: Map CT-06-365a, D6 to I6 and E5 to I5); and
- the Chancellor Lane auto-transformer station, which would be 46m in length and 24m in width, on the western side of the route of the Proposed Scheme, 750m east of the existing Manchester Piccadilly Station. Access would be provided via the A665 Chancellor Lane to the west or the A635 Ashton Old Road to the east (see Volume 2: Map CT-06-365a, D5).

2.2.7 To accommodate the route of the Proposed Scheme, the A665 Chancellor Lane; the A635 Fairfield Street/Mancunian Way; Helmet Street; St Andrew Street and Travis Street would be crossed by the Piccadilly viaduct, which would require alterations to these existing roads. There would also be alterations to the existing street grid including changes to Sheffield Street; Portugal Street East; Heyrod Street; Boad Street; Baird Street; Chapeltown Street and Sparkle Street.

2.2.8 A new section of St Andrews Street would be constructed to connect the Manchester Piccadilly High Speed station to the existing St Andrews Street alignment.

2.2.9 A new section of road would be created and referred to as New Sheffield Street, which would run between the existing Store Street and the new section of St Andrews Street, to the north of the proposed Manchester Piccadilly High Speed station.

2.2.10 The Piccadilly viaduct would also cross the River Medlock 35m to the east of Helmet Street.

2.2.11 There would also be utilities works within this section, which may include works to overhead or underground lines, gas pipes, potable water supply, sewers and telecommunication cables. There would also be minor works to public roads within this section.

2.2.12 Construction of this section would be managed from the Piccadilly viaduct satellite compounds A, B, C and D and the Manchester Piccadilly High Speed station main compound, which are described in Section 2.3, and shown on map CT-05-365b in the Volume 2: MA08 Map Book.

Manchester Piccadilly High Speed station

2.2.13 The proposed Manchester Piccadilly High Speed station would mark the terminus of the Proposed Scheme within the Manchester Piccadilly Station area. The station would occupy land from St Andrews Street in the east to Ducie Street at its western extent, and from the existing Manchester Piccadilly Station to Chapeltown Street and Portugal Street East. The station would be 455m in length and 50m in width.

2.2.14 Design features of Manchester Piccadilly High Speed station include:

- a roof and canopy structure 20m in height, which would span the length of the platforms allowing light into the station;
- the eastern and western concourses, separated by the Metrolink line, each with three banks of escalators, lifts and ticket gates between the paid and unpaid sides;
- four platforms, each 415m in length and 11m in width, with an additional 40m buffer zone at the western end, arranged into one dual and two single sided. All four of these platforms would be for High Speed train services;
- three multi-storey car parking areas, two located north of the Manchester Piccadilly High Speed station and one immediately to the south;
- drop-off and pick-up areas, bus stops and taxi rank, including a separate vehicular drop-off point and taxi rank on New Sheffield Street, which is to be

created adjacent to the north side of the proposed Manchester Piccadilly High Speed station; and

- two loading bays, accessed from a new section of St Andrews Street. One loading bay would be located at the western end of the station as a re-provision of an existing Network Rail loading area; the second would be located at the eastern end for the station and would service High Speed trains only.

2.2.15 The station would be constructed on two main levels. At platform level, a new combined entrance to the existing Manchester Piccadilly Station and the proposed Manchester Piccadilly High Speed station would be provided. Passengers entering the station would either go forward for national rail services, or take the lift/escalator down to a lower concourse level for High Speed services.

2.2.16 The lower concourse level would provide access to four new platforms and would lie beneath them, taking their access from New Sheffield Street, on the north side of the Manchester Piccadilly High Speed station.

Public realm

2.2.17 Public realm improvements around the existing Manchester Piccadilly Station and the proposed Manchester Piccadilly High Speed station would integrate the two stations with each other and the existing development and public realm within the city centre. Two new outdoor public spaces would be provided.

2.2.18 To the north of the proposed Manchester Piccadilly High Speed station, public realm space would be created along New Sheffield Street. This would include a tree lined boulevard between Travis Street and Store Street, running along the length of the street alongside the proposed Manchester Piccadilly High Speed station. A new transport interchange would be created on New Sheffield Street, serving both the existing Manchester Piccadilly station and the new station with taxi ranks, drop-off/pick-up space, bus stop facilities and nearby car parking. This area of public realm would provide a pedestrian route into and around the station.

2.2.19 The ramp outside Gateway House is currently the main city centre facing entrance to the existing Manchester Piccadilly Station, located on the western side of the station and providing direct access to the station concourse. This would be retained from its northern boundary at Ducie Street, from which it would connect to the proposed shared entrance with the Manchester Piccadilly High Speed station.

2.2.20 There would also be utilities works within this section, which may include works to voltage overhead or underground lines, gas pipes, potable water supply, sewers and telecommunication cables. There would also be minor works to public roads within this section.

2.2.21 Construction of the proposed Manchester Piccadilly High Speed station and associated features would be managed from the Manchester Piccadilly High Speed station main compound, which is described in Section 2.3, and shown on Map CT-05-365b in the Volume 2: MA08 Map Book.

Modifications to the existing Manchester Piccadilly Station

2.2.22 This section describes the proposed modifications to the existing Manchester Piccadilly Station.

2.2.23 Key features of the works would include:

- reconstruction and extension of the existing station concourse, which would be integrated with the Manchester Piccadilly High Speed station as part of a shared concourse;
- creation of new retail units on the shared concourse on the upper level between the existing and proposed stations. The retail units would vary in size and include customer support facilities, cafes, restaurants and shops;
- replacement of a service basement and loading bay under the existing station. Retail and train servicing and access would be provided from an improved service area and a new loading bay between the existing and proposed stations. Vehicles would access this service via Store Street;
- relocation of the existing taxi drop-off and pick-up facilities on the B6469 Fairfield Street to the new interchange on New Sheffield Street;
- minor alterations to the accesses for the Metrolink tram facilities at Manchester Piccadilly Station; and
- removal of existing multi-storey station parking and staff parking spaces underneath the station and re-provision of multi-storey parking facilities as part of the Manchester Piccadilly High Speed station.

2.2.24 Minor works within the existing Manchester Piccadilly Station would include provision of new signage and information systems.

2.2.25 Construction of this section would be managed from the Manchester Piccadilly High Speed station main compound, which are described in Section 2.3, and shown on map CT-05-365b in the Volume 2: MA08 Map Book.

Demolitions

2.2.26 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.

2.2.27 At this stage of the design development, it is anticipated that demolition of 64 commercial/business properties (including outbuildings) and 22 other structures would be required to construct the Proposed Scheme in the Manchester Piccadilly Station 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 Manchester Piccadilly Station area. The construction arrangements described in this section provide the basis for the assessment presented in this working draft ES.

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

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

2.3.4 During the construction phase, public roads, footways 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, footway or PRoW crossing the Proposed Scheme would be constructed prior to any closure of existing roads, footways 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, footways 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[14] which sets out how HS2 Ltd and its contractors, as well as their sub-contractors, would undertake

[14] 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 At Manchester Piccadilly High Speed station, part of the construction could take place on or immediately adjacent to the existing operational railway. Where possible, such construction would be planned to normally take place at night, weekends or during bank holidays, so that there is less disruption to peak services.

2.3.16 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.

2.3.17 The construction programme for the Proposed Scheme at the Manchester Piccadilly High Speed station is complex and will be subject to further detailed refinement. Certain advance works, including utility diversions and enabling works, would commence prior to the civil engineering works.

General overview of construction compounds

2.3.18 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.

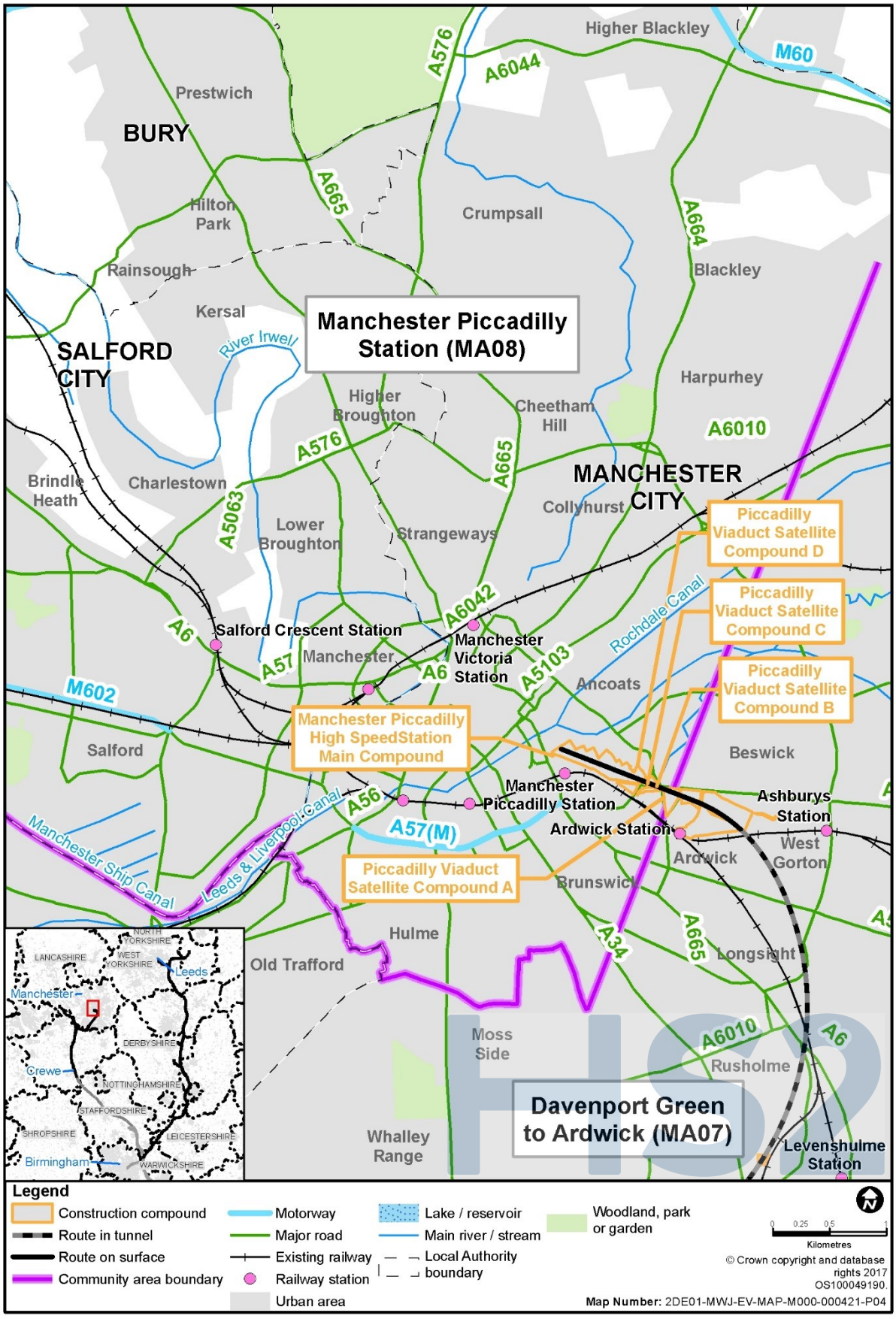
2.3.19 Satellite compounds would be used as the base to manage specific works along a section of the route. Depending on the nature and extent of the works to be managed, these satellite compounds could include office accommodation for staff, local storage for plant and materials, car parking for staff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

2.3.20 One main civil engineering compound, the Manchester Piccadilly High Speed station main compound, would be located in the Manchester Piccadilly Station area. This would manage the civil engineering satellite compounds in the Manchester Piccadilly Station area and would continue to be used as a railway installation compound following the completion of civil engineering work at this compound.

2.3.21 Four civil engineering satellite compounds would be located in the Manchester Piccadilly Station area. Part of the Piccadilly viaduct satellite compound A would continue to be used as the Chancellor Lane auto-transformer station main compound following the completion of civil engineering works at those compounds. This would also manage the railway systems satellite compound in the Manchester Piccadilly Station area.

2.3.22 The location of construction compounds in the Manchester Piccadilly Station area is shown on Figure 4. Map Series CT-05 (in the Volume 2: MA08 Map Book) show in detail the locations of the construction compounds described below.

Figure 4: Location of construction compounds in the Manchester Piccadilly Station area



2.3.23 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.

2.3.24 In the Manchester Piccadilly Station area there would be no worker accommodation provided for the construction workforce.

2.3.25 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 and subsoil storage areas would generally be adjacent to compounds and areas of construction activity. These areas are referred to as material stockpiles.

2.3.26 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

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

2.3.28 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 Manchester Piccadilly Station area are described in the subsequent sections of this report.

2.3.29 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.

2.3.30 Areas of land are also required for the storage, loading and unloading of bulk earthworks materials that are moved to and from the site on public roads. These areas would allow transfer of material between road vehicles and site vehicles during construction to balance traffic movements on the road network. These areas are referred to as transfer nodes.

Construction compounds

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

Figure 5: Construction compounds for civil engineering works

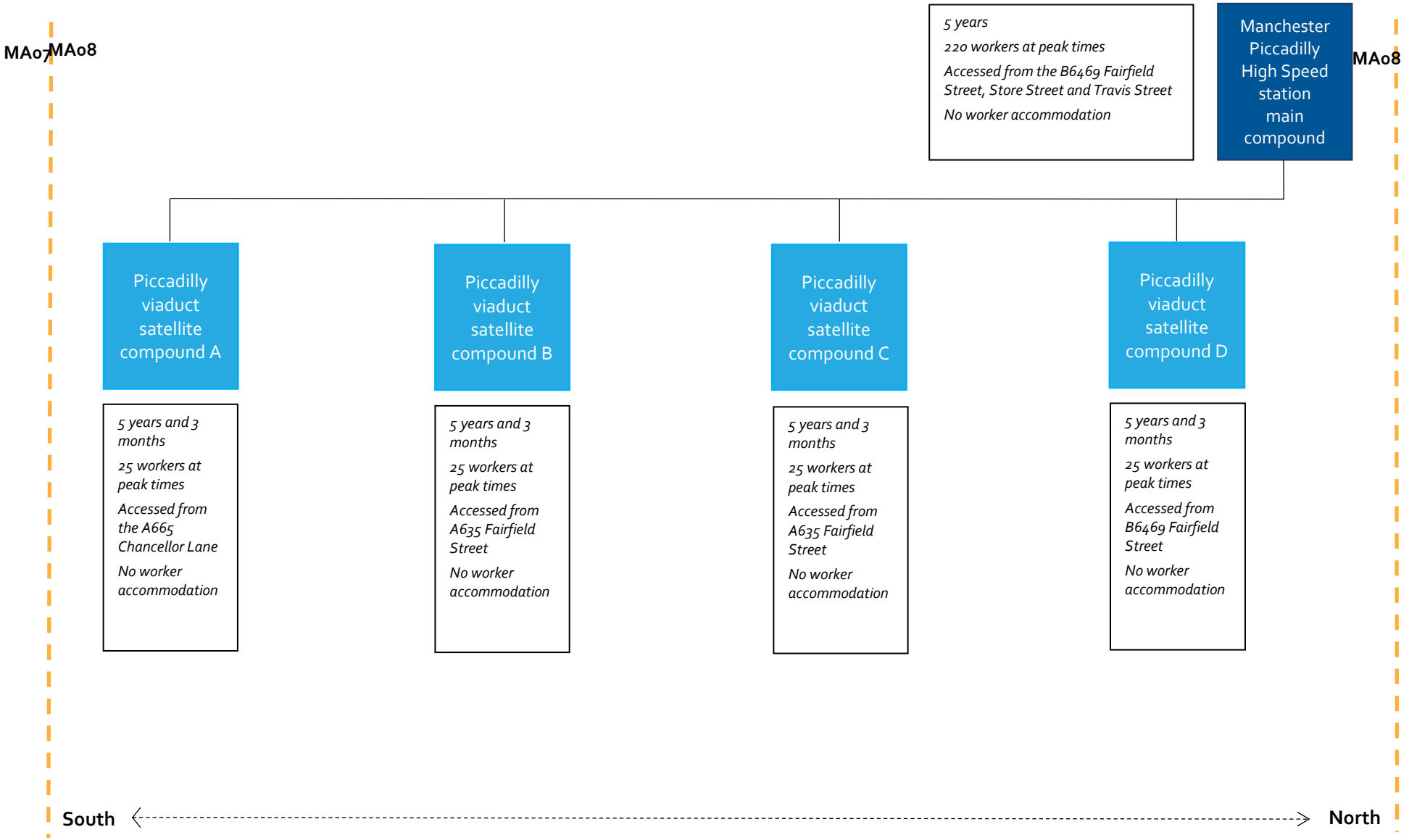
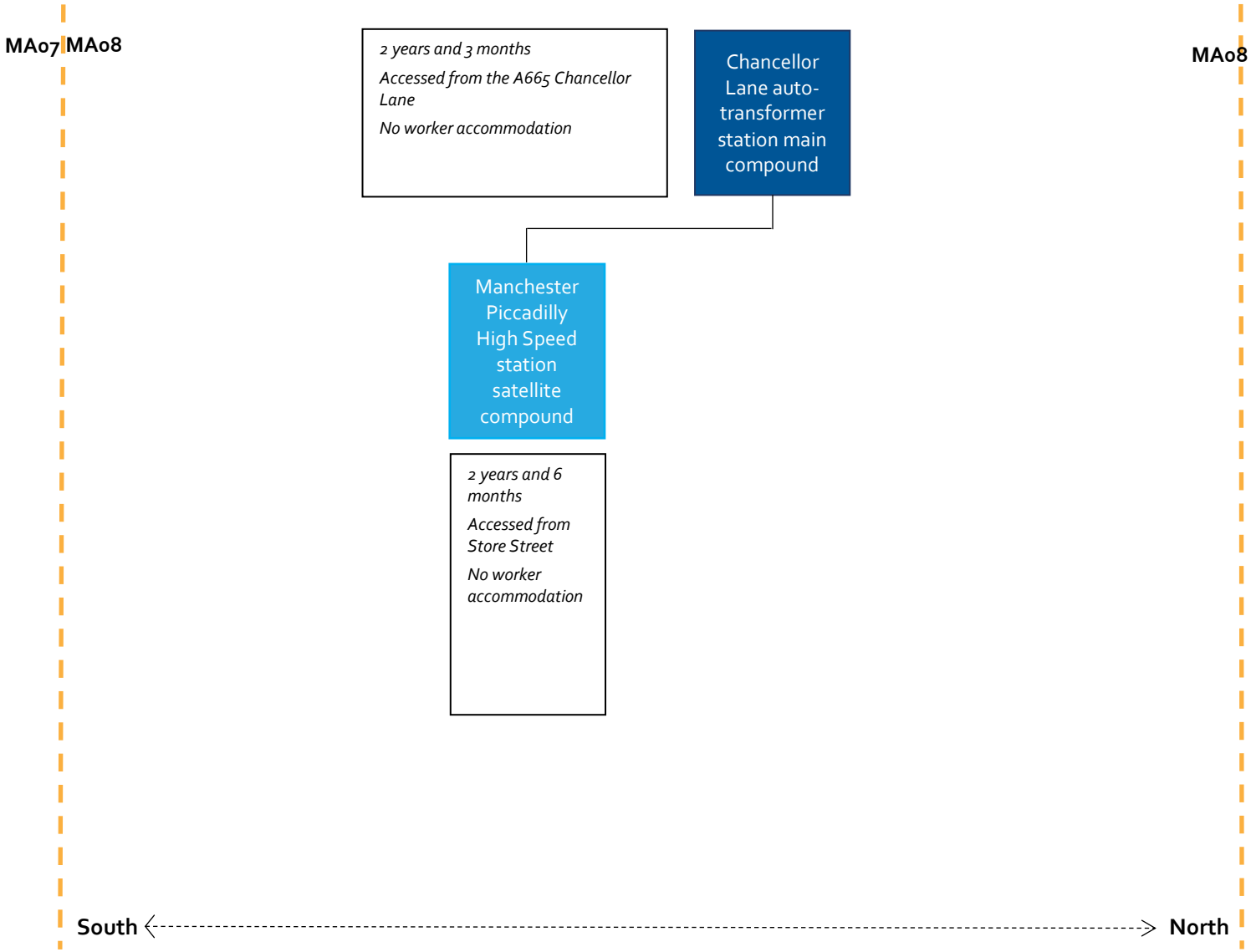


Figure 6: Construction compounds for railway systems works



Piccadilly viaduct satellite compounds A, B, C and D

2.3.32 These four satellite compounds (see Volume 2: Map CT-05-365b, C5, E5, E6 and E5) would be used to manage civil engineering works for the construction of the Ardwick cutting and the Piccadilly viaduct, which would take five years and three months to complete, as illustrated in Figure 5.

2.3.33 On completion of the civil engineering works, the Piccadilly viaduct satellite compound A would remain and manage railway systems installation works for a period of two years and three months, and would be known as the Chancellor Lane auto-transformer station main compound. There would be an overlap of three months between the civil engineering works and the railway systems installation works and the total duration of the works would be seven years and three months.

2.3.34 The works to be managed from the Piccadilly viaduct satellite compound A would require the demolition of the following buildings and structures, as described in Table 1.

Table 1: Demolitions to be managed from the Piccadilly viaduct satellite compound A

Description	Location	Feature resulting in the demolition
Commercial		
Eight commercial properties on the A665 Midland Street	Adjacent to A665 Chancellor Lane and the A665 Midland Street, Manchester	Ardwick cutting
Service station	Ardwick Service Station, Chancellor Lane, Manchester	Piccadilly viaduct satellite compound A
Industrial building	Dark Lane, Manchester	Piccadilly viaduct satellite compound A
Other		
Five advertising hoardings	Ashton Old Road, Manchester, M12 6LB	Ardwick cutting
One advertising hoarding	Chancellor Lane, Manchester	Piccadilly viaduct satellite compound A
Two advertising hoardings	Junction of the A635/B6469 Fairfield Street and the A665 Chancellor Lane, Manchester	Piccadilly viaduct

2.3.35 The works to be managed from the Piccadilly viaduct satellite compound B would require the demolition of the following buildings and structures, as described in Table 2.

Table 2: Demolitions to be managed from the Piccadilly viaduct satellite compound B

Description	Location	Feature resulting in the demolition
Commercial		
Retail and warehouse unit	Pin Mill Brow, Manchester	Piccadilly viaduct
Industrial building and containers	Mill Green Street, Manchester	Piccadilly viaduct satellite compound B
Commercial property	5-7 Blackett Street, Manchester	Piccadilly viaduct

2.3.36 The works to be managed from the Piccadilly viaduct satellite compound C would require the demolition of the following buildings and structures, as described in Table 3.

Table 3: Demolitions to be managed from the Piccadilly viaduct satellite compound C

Description	Location	Feature resulting in the demolition
Commercial		
Four commercial units at Aldow Enterprise Park	Aldow Enterprise Park, Blackett Street, Manchester	Piccadilly viaduct
Other		
Telecommunications mast	Raven Street, Manchester	Piccadilly viaduct

2.3.37 The works to be managed from the Piccadilly viaduct satellite compound D would require the demolition of the following buildings and structures, as described in Table 4.

Table 4: Demolitions to be managed from the Piccadilly viaduct satellite compound D

Description	Location	Feature resulting in the demolition
Commercial		
Commercial property	2 Raven Street, Manchester	Piccadilly viaduct
Five commercial buildings on Helmet Street	Helmet Street, Manchester	Piccadilly viaduct
Commercial building at 115 Fairfield Street (including SOL Christian Academy)	115 Fairfield Street, Manchester	Piccadilly viaduct satellite compound D
Commercial building at 113 Fairfield Street (including The Men's Room)	113 Fairfield Street, Manchester	Piccadilly viaduct satellite compound D
Nine commercial buildings on Fairfield Street	Fairfield Street, Manchester	Piccadilly viaduct satellite compound D
Other		
Five advertising hoardings	Fairfield Street, Manchester	Piccadilly viaduct satellite compound D
Electricity sub-station	Helmet Street, Manchester	Piccadilly viaduct satellite compound D
One advertising hoarding on steel supports	Corner of the B6469 Fairfield Street and St Andrews Street, Manchester	Piccadilly viaduct satellite compound D
Community facility (MO:DEL)	104 Fairfield Street, Manchester	Piccadilly viaduct
Community facility (MASH)	94-96 Fairfield Street, Manchester	Piccadilly viaduct

2.3.38 Works to a number of public roads would be managed from these compounds, 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:

- the A665 Midland Street (located in the Davenport Green to Ardwick area (MA07));
- the A665 Chancellor Lane;

- the A665 Pin Mill Brow;
- the A635/B6469 Fairfield Street;
- William Street;
- Mill Green Street;
- Dark Lane;
- Union Street;
- the A635 Mancunian Way/Ring Road;
- Blackett Street;
- Crane Street;
- Raven Street;
- Coronation Square; and
- Chapelfield Road.

2.3.39 Permanent and temporary highways works in the Manchester Piccadilly Station area, including the proposed closure St Andrews Street, are subject to ongoing design development. The design details and the duration of any associated works are to be reported in the formal ES.

2.3.40 Key railway systems works to be managed from the Chancellor Lane auto-transformer main compound, would include construction and installation of the Chancellor Lane auto-transformer station, located south of the route of the Proposed Scheme off the A665 Chancellor Lane. The construction of the Chancellor Lane auto-transformer station foundations and building would take one year to complete. The installation of the Chancellor Lane auto-transformer station railway systems equipment would take two years and three months to complete. Construction works for the Chancellor Lane auto transformer station would be accessed from the A665 Chancellor Lane. This compound will also support the rail systems works taking place in the Ardwick Depot and the Manchester tunnel north portal main compound and transfer node located in the Davenport Green to Ardwick area (MA07).

Manchester Piccadilly High Speed station main compound

2.3.41 The construction in this area for civil engineering, from Blackett Street to Store Street, would be managed from Manchester Piccadilly High Speed station main compound (map CT-05-365b, E5 to G5 and E6 to I6). During the civil engineering works the main compound would provide support to the four civil engineering satellite compounds (Piccadilly viaduct satellite compounds A, B, C and D) illustrated in Figure 5.

2.3.42 On completion of the civil engineering works, after a period of one year and 3 months, part of the Manchester Piccadilly High Speed station main compound would remain and manage the railway systems installation works for a further period of two years and six months.

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

Table 5: Demolitions to be managed from the Manchester Piccadilly High Speed station main compound

Description	Location	Feature resulting in the demolition
Commercial		
Industrial building	St Andrews Square, Manchester	Manchester Piccadilly High Speed station main compound
Industrial building	Adair Street, Manchester	Manchester Piccadilly High Speed station main compound
Five office buildings on Travis Street	Travis Street, Manchester	Piccadilly viaduct and Manchester Piccadilly High Speed station
Two commercial properties on Heyrod Street	Heyrod Street, Manchester	Piccadilly viaduct and Manchester Piccadilly High Speed station
16 commercial units in railway arches	Sheffield Street, Manchester	Piccadilly viaduct and Manchester Piccadilly High Speed station
Commercial property	Sparkle Street, Manchester	Piccadilly viaduct
Commercial property	Store Street, Manchester	Manchester Piccadilly High Speed station main compound
Office building	Piccadilly Gate, Store Street, Manchester	Piccadilly viaduct and Manchester Piccadilly High Speed station
Two commercial properties	Ducie Street, Manchester	Manchester Piccadilly High Speed station main compound
Other		
Steel container	St Andrews Square, Manchester	Manchester Piccadilly High Speed station main compound
True Jesus Church	St Andrews Street, Manchester, M1 2AH	Piccadilly viaduct and Manchester Piccadilly High Speed station
Electricity sub-station	Store Street/Broad Street, Manchester	Manchester Piccadilly High Speed station
Multi-storey car park and link bridge	Sparkle Street, Manchester	Piccadilly viaduct and Manchester Piccadilly High Speed station

2.3.44 The construction of Manchester Piccadilly High Speed station would take five years to complete, commencing in 2025, with fit-out following this. Areas within the Manchester Piccadilly High Speed station main compound would be used to provide construction offices and facilities, lay down areas, construction access, temporary and permanent car park facilities and short-term storage of materials allowing for just-in-time delivery of materials. Construction of Manchester Piccadilly High Speed station

would require the installation of a number of temporary tower cranes to enable the various components to be lifted into place.

2.3.45 The works to construct Manchester Piccadilly High Speed station would be carried out in stages as described below:

- Phase 1: enabling and site preparation works including mobilisation, site investigation, demolition, utility and road diversions, and protection of existing assets (such as retained utilities and the Metrolink tram line) and advance works including provision of car parking;
- Phase 2 and 3: establishment of main compound, continuing site clearance and demolition;
- Phase 4: sub-structure works, including installation of piled foundations, construction of Piccadilly viaduct and main platform levels;
- Phase 5: superstructure works, including construction of the new station building envelope, superstructure and roof canopy supports, and internal structures and slabs. Station fit-out would also commence in this phase; and
- Phase 6: station roof structure works, including installation of the roof canopy and associated glazing, cladding, drainage, lighting and internal finishes; station building fit-out, railway systems and finishing works, and the connection to the existing Manchester Piccadilly Station building and approach.

2.3.46 Other works managed from the Manchester Piccadilly High Speed station main compound would include:

- modifications to the existing Manchester Piccadilly Station comprising concourse, parking and loading bays;
- highway works to allow permanent closure of roads; and
- alterations to existing street grid to facilitate the construction of the station and construction of the new sections of road associated with the station.

2.3.47 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:

- Elbe Street;
- Sheffield Street;
- St Andrews Street;
- Travis Street;
- Portugal Street East;
- Heyrod Street;

- Sparkle Street;
- Chapteltown Street;
- Baird Street;
- Store Street; and
- Boad Street.

2.3.48 Key railway systems installation works to be managed from this compound would include the fit-out of the railway systems within the Manchester Piccadilly High Speed station, and on the approach to the station. These works would take two years and six months to complete.

Construction waste and material resources

2.3.49 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.

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

2.3.51 Local excess or shortfall of excavated material within the Manchester Piccadilly Station 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

2.3.52 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

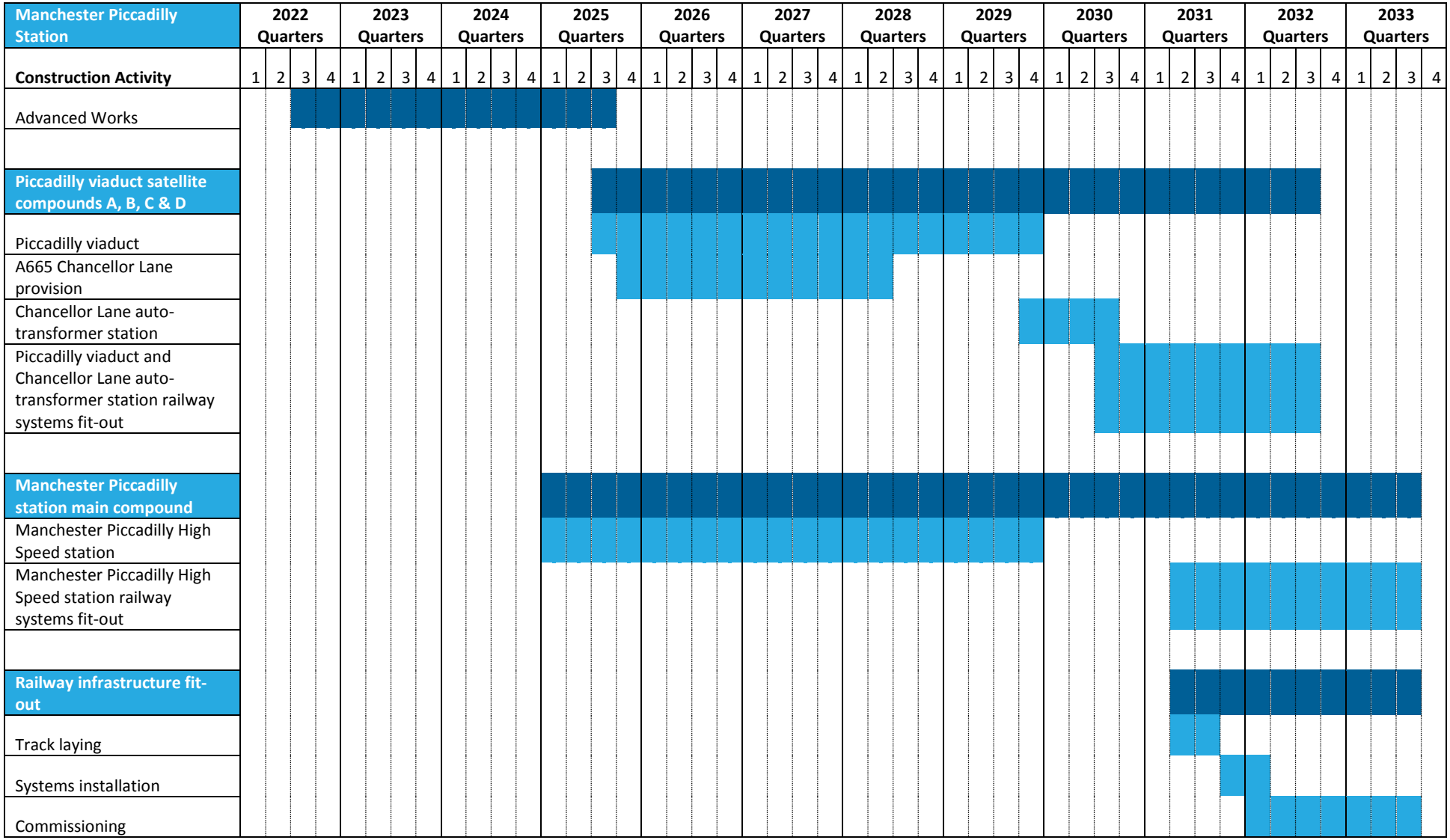
2.3.53 A construction programme illustrating indicative periods for each of the core construction activities described above is provided Figure 7. Construction durations referred to in the following sections of this report are based on this indicative programme.

Monitoring during construction

2.3.54 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.

2.3.55 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



2.4 Operation of the Proposed Scheme

Introduction

2.4.1 This section describes the operational characteristics of the Proposed Scheme in the Manchester Piccadilly Station area. Volume 1, Section 4 describes the envisaged operation characteristics of the Proposed Scheme as a whole, including Phase One, Phase 2a and Phase 2b.

HS2 services

2.4.2 It is anticipated that there would be up to six trains per hour each way passing through the Manchester Piccadilly Station 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 (RSD) in the Wimboldsley to Lostock Gralam area (MA02). Further information on the Crewe North RSD can be found in Volume 2: Community area report MA02, Wimboldsley to Lostock Gralam.

Operational waste and material resources

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

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

Monitoring during operation

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

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

2.5 Route section alternatives

Manchester Piccadilly High Speed station

2.5.1 As part of the design development process since July 2017, consideration has been given to the permanent layout of the proposed Manchester Piccadilly High Speed station.

2.5.2 The Manchester Piccadilly High Speed station would include a shared concourse with Metrolink, situated at north end of the station. The concourse would be located at ground level, below the station platforms.

2.5.3 As part of the development of the design, further work is being undertaken to consider the location of the station platforms and connections with Metrolink, the existing Manchester Piccadilly Station and surrounding area including New Sheffield Street so as to improve pedestrian flow through the station and reduce intermodal journey times.

2.5.4 Further consideration will be given to the construction and engineering options at the proposed Manchester Piccadilly High Speed station 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 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 Scoping and Methodology Report (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 Manchester Piccadilly Station area. A consultation summary report will be published with the formal ES explaining how the responses have been taken into consideration.

3.3 Informing the Proposed Scheme

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

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

- development of the design of the Manchester Piccadilly High Speed station, which allows for integration into the existing Manchester Piccadilly Station;
- potential for construction traffic impacts at multiple locations and the construction haulage routes;
- potential for flood storage mitigation;
- removal of Gateway House;
- relocation of the Metrolink stop at Piccadilly;
- integration of the Proposed Scheme into local authority development plans for the wider Greater Manchester area;
- opportunities for businesses to join the supply chain;

- timescales, construction programme and compensation process; and
- concern about property compensation.

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 Manchester Piccadilly Station 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 Manchester Piccadilly Station area and 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
True Jesus Church	Meeting to discuss timescales, construction programme and compensation process
SOL Christian Academy	Meeting to discuss timescales, construction programme and compensation process

Local authorities and parish councils

3.4.6 Direct engagement has been offered to and undertaken with county, borough, district and parish councils within the Manchester Piccadilly Station area. The purpose of this engagement is to collate local baseline information and knowledge to inform the

design and assessment, identify and understand local issues and concerns, provide access to wider stakeholders and communities and provide a mechanism for ongoing dialogue and discussion on the assessment and design development.

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

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

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

Stakeholder	Area of focus
Manchester City Council	General introductory and project update meetings including engagement over station design; traffic impacts; potential flood storage mitigation; removal of Gateway House; and relocation of the Metrolink stop at the existing Manchester Piccadilly Station. Meetings with technical leads to collate data and discuss key assessment topics including: land quality; landscape and visual; and sound, noise and vibration.
	Meetings with technical leads to collate data and discuss key assessment topics including: air quality; land quality; sound, noise and vibration; traffic and transport, and waste.
Transport for Greater Manchester	General introductory and project update meetings including engagement over station design; traffic impacts and construction haulage routes; baseline pedestrian flows at the existing Manchester Piccadilly Station; access to public transport; and relocation of the Metrolink at the existing Manchester Piccadilly Station.
Greater Manchester Combined Authority	Meeting to discuss economic growth and connectivity.
Transport for the North	Meeting to discuss connectivity to Northern Powerhouse Rail (NPR). and integration of Manchester Piccadilly High Speed station and Manchester Airport High Speed station with the existing transport network.

3.4.9 Councils will continue to be engaged as part of the design development of the Proposed Scheme with ongoing dialogue on key topics such as highways, public rights of way (PRoW) and the draft Code of Construction Practice (CoCP)[15].

Expert, technical and specialist groups

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

- Animal and Plant Health Agency;
- British Geological Survey;
- Campaign to Protect Rural England;
- Canal & River Trust;

[15] Supporting document: Draft Code of Construction Practice

- Coal Authority;
- Department of Environment, Food and Rural Affairs;
- Environment Agency;
- FERA Science Ltd;
- Forestry Commission;
- Greater Manchester Chamber of Commerce;
- Highways England;
- Historic England;
- Inland Waterways Association;
- National Trust;
- Natural England;
- Network Rail;
- Public Health England;
- Royal Agricultural Society;
- Royal Society for the Protection of Birds;
- Royal Society of Wildlife Trusts/The Wildlife Trusts;
- The Ramblers; and
- Woodland Trust.

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

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

Utilities

3.4.13 Engagement is also ongoing with utility companies and statutory stakeholders such as National Grid Transmission (Electricity), Electricity Northwest, United Utilities, BT Openreach, CityFibre, SSE Telecoms, Virgin Media, Sky Telecommunication Services Ltd, Gamma, Verizon, Vodafone Ltd (Below Ground Assets), Vodafone & O2 Mobile Masts, EE & 3 Mobile Masts, Cadent Gas, GeneSYS, Zayo, Instalcom, ESP Utility Group, GTC-UK, Interoute (Vtesse), CSP and Level 3 to establish what infrastructure exists in the Manchester Piccadilly Station area and how it may need to be modified as part of the Proposed Scheme.

Directly affected individuals, major asset owners and businesses

3.4.14 This group includes those with property potentially affected by the Proposed Scheme, including individuals, major asset owners and businesses within the Manchester Piccadilly Station area.

3.4.15 There has been no engagement with farmers and growers within the Manchester Piccadilly Station area due to the mainly urban land use.

3.4.16 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 Manchester Piccadilly Station area, an information event was held at Doubletree by Hilton Hotel on 8 June 2018. Facilities were available at the events for affected individuals, major asset owners and businesses to have private meetings with HS2 staff.

3.4.17 Engagement has been undertaken with Network Rail and the Ballymore Group.

3.4.18 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 environmental topic has been scoped out of the assessment for the Manchester Piccadilly Station area as there are no undisturbed natural soils which would be disturbed or displaced and no agricultural or forestry activities affected by the Proposed Scheme in this urban 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 Manchester Piccadilly Station area. Oxides of nitrogen (NOx) including nitrogen dioxide (NO2), fine particulate matter[16] (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 Manchester City Council (MCC), Salford City Council (SaCC) and Bury Metropolitan Borough Council (BuMBC) 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: MA08 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)[17].

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[18]:

- 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, Euro 4 petrol and Euro 6 diesel cars and light goods vehicles during construction of the Proposed Scheme.

[16] 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.
[17] Supporting document: HS2 Phase 2b Environmental Impact Assessment Scope and Methodology Report
[18] 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 would assume vehicle emission rates and background pollutant concentrations from year 2023. As pollutant emissions from both vehicle exhausts and background pollutant concentrations are anticipated to reduce year by year as a result of vehicle emission controls, the year 2023 represents the worst case for the construction assessment.

5.3 Environmental baseline

Existing baseline

Background air quality

5.3.1 The main sources of air pollution in the Manchester Piccadilly Station area are emissions from road vehicles. The main roads within the area include the A34 the A56, the A57/A57M, the A576 and the A6, which all run through Manchester city centre.

5.3.2 There are three industrial installations (regulated by the Environment Agency) with permits for emissions to air located within the Manchester Piccadilly Station area, namely Heineken UK Ltd, Suez Industrial Water Ltd and Cobden Street Household Waste and Recycling Centre. 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)[19] for the baseline year of 2017. The data is 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 Manchester Piccadilly Station area.

Local monitoring data

5.3.4 There are currently two automatic monitoring stations located within this area. The Manchester Piccadilly monitoring station measuring NO2, PM10 and PM2.5 concentrations is an urban centre site operated by the national Automatic Urban Rural Network. The Manchester Oxford Road monitoring station measuring NO2 and PM10 concentrations is a kerbside site operated by MCC. In recent years, NO2 concentrations have been close to or above the annual mean standard at the urban centre site and consistently above the standard at the kerbside site. Measured concentrations of PM10 and PM2.5 have been within the air quality standards.

5.3.5 There are also 22 local authority diffusion tube sites located within the Manchester Piccadilly Station area, for monitoring NO2 concentrations at various kerbsides, roadside and urban background locations. Measured concentrations have consistently exceeded the annual mean standard at ten locations[20].

[19] 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
[20] At the time of assessment, measurements for 2016 were the latest published annual monitoring baseline data.

Air quality management areas

5.3.6 There is one air quality management area (AQMA) within the Manchester Piccadilly Station area, the Greater Manchester Combined Authority AQMA. This AQMA covers a substantial proportion of main roads and urban centres within the Greater Manchester area and was designated in July 2001 for exceedances of the annual mean NO2 and 24-hour PM10 standards.

Receptors

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

5.3.8 Most of the receptors which may be affected by the Proposed Scheme are residential. Other receptors include commercial properties, immediately adjacent to the route of the Proposed Scheme, and schools and university buildings.

5.3.9 There are no statutory designated ecological sites located within the Manchester Piccadilly Station area. Non-statutory sensitive ecological sites identified close to the route of the Proposed Scheme include Ashton Canal (West) Local Wildlife Site (LWS) and Rochdale Canal, Stott's Lane-Ducie Street Basin LWS. Further details of the ecological receptors are set out in Section 7, Ecology and biodiversity.

5.4 Effects arising during construction

Avoidance and mitigation measures

5.4.1 Emissions to the atmosphere will be controlled and managed during construction through the route-wide implementation of the Code of Construction Practice (CoCP). The draft CoCP[21] includes a range of mitigation measures that are accepted by the Institute of Air Quality Management as being suitable to reduce impacts to as low a level as is reasonably practicable. These measures are generally sufficient to avoid any significant effects from dust during construction.

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

- contractors' being required to manage dust, air pollution, odour and exhaust emissions during construction works;
- inspection and visual monitoring, undertaken in consultation with the local authorities, to assess the effectiveness of the measures taken to control dust and air pollutant emissions;
- cleaning (including watering) of vehicle routes and designated vehicle waiting areas to suppress dust;

[21] Supporting document: Draft Code of Construction Practice

- 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 NO2, PM10 and PM2.5 concentrations.

Construction dust effects

5.4.5 The risks of demolition of existing buildings, earthworks, construction of new structures and trackout[22] have been assessed for their effect on dust soiling, human health[23] and ecological sites. There are residential and ecological receptors located within the Manchester Piccadilly Station area.

5.4.6 It has been identified that there would be a medium to high risk of dust and human health effects from demolition activities. For earthworks, the risk of dust effects would range from low to high within this area, depending on the location of sensitive receptors and the magnitude of the activities. There would also be a low to medium risk of human health effects from earthworks. For construction, 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 construction. For trackout, there would be a high risk of dust effects and a low to medium risk of human health effects. There would also be a low to medium risk of ecological effects from all dust generating 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.

[22] 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
[23] Human health effects relate mainly to short-term exposure to particles of size between 2.5µm to 10µm, measured as PM10

Construction traffic effects

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

5.4.9 The A635 Ashton Old Road, the A665 Chancellor Lane, the A665 Pin Mill Brow, the A635/B6469 Fairfield Street, the A57(M) Mancunian Way, the B6469 Whitworth Street, the A6 London Road, the A56 Bridgewater Viaduct, the A57 Dawson Street/Egerton Street, the A5067 Stretford Road, the B5218 Chorlton Road, the A5103 Princess Road/Albion Street, Higher Cambridge Street, the A665 Great Ancoats Street and the A56 Chester Road 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 these roads. 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, would be considered for all sensitive receptors within 200m of construction routes. These would include human receptors and those ecological habitats considered to be sensitive to changes in air quality. These effects will be reported in the formal ES.

Permanent effects

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

Other mitigation measures

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

Summary of likely residual significant effects

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

5.5 Effects arising from operation

Avoidance and mitigation measures

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

Assessment of impacts and effects

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

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

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

Operational traffic effects

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

Combustion plant emissions

5.5.5 Emissions from any stationary sources, such as combustion plant proposed as part of the Manchester Piccadilly High Speed station, will be included in the air quality assessment. Concentrations of NO2 would be predicted at sensitive receptors and any effects will be reported in the formal ES.

Other mitigation measures

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

Summary of likely residual significant effects

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

Monitoring

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

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

6 Community

6.1 Introduction

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

6.1.2 The assessment draws on information gathered from engagement with the users and operators of community facilities including SOL Christian Academy (115 Fairfield Street) and True Jesus Church (St Andrews Street). 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: MA08 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)[24].

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.

[24] 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, heavy goods vehicles (HGV) traffic and visual intrusion. These in-combination effects will be identified in the formal ES. In addition, the study area has regard to the proposed routes of construction traffic and takes account of catchment areas for community facilities that could be affected where intersected by the Proposed Scheme.

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

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

6.3 Environmental baseline

6.3.1 The Proposed Scheme in the Manchester Piccadilly Station area would be approximately 1.1km in length and would lie within the city of Manchester. The areas of Ancoats, Brunswick and Ardwick are located close to the Proposed Scheme. The route of the Proposed Scheme would run from Ardwick in the south-west and finish at the proposed Manchester Piccadilly High Speed station, alongside the existing Manchester Piccadilly Station in central Manchester.

6.3.2 The area is urban in character and is comprised of a mix of industrial units, retail units, transport infrastructure and residential flats. The Manchester Piccadilly Station area contains many community and recreational facilities including places of worship, community centres, libraries, medical facilities, care homes, public houses, museums, theatres, and sporting venues. The Rochdale Canal, the Ashton Canal, the Bridgewater Canal and the River Medlock wind through in the area with towpaths and canal moorings for recreational use, in addition to promoted PRoW including the Medlock Valley Way, the Cheshire Ring Canal Walk and the Irwell Sculpture Trail.

Manchester Piccadilly Station

6.3.3 Manchester Piccadilly Station is a major transport interchange and is open 24 hours a day. The station is served by a number of train operators, including: Northern, Arriva Trains Wales, CrossCountry, East Midlands Trains, TransPennine Express and Virgin Trains. Four Metrolink tram routes also operate from Manchester Piccadilly Station. The station contains a number of restaurants, cafes and shops.

6.3.4 The area immediately north-east of the existing station is mostly industrial in character, with warehouses, workshops and showrooms. While primarily retaining this industrial character, the B6469 Fairfield Street, which runs directly to the south and west of the station, contains a small number of community resources: the SOL Christian Academy, an independent nursery, primary and secondary school; The Men's Room (113 Fairfield Street), an arts and social care agency that works with young men who are ex-offenders, or who may have experienced homelessness, sexual exploitation, or been involved in sex work; Manchester Action on Street Health (MASH) (94-96 Fairfield Street), an outreach service for women working in the sex industry in Manchester; and a Greater Manchester Mental Health (GMW) and Justice Community Service known as Manchester Offenders: Diversion Liaison Service (MO:DEL) (104 Fairfield Street), a mental health and substance abuse service for mentally ill offenders. True Jesus Church, with a predominantly Chinese congregation, is located on St. Andrews Street, just off the B6469 Fairfield Street. Straight Blast Gym (SBG) Manchester (12 Sheffield Street), a mixed martial arts and Brazilian jiu jitsu gym, is located directly behind the station on Sheffield Street.

North of Manchester Piccadilly Station

6.3.5 To the north of Manchester Piccadilly Station is the industrial area of Ancoats. This area primarily contains retail parks, industrial units and car parking. There are a small number of residential flats adjacent to the Proposed Scheme on Chapeltown Street. To the south-east of Palmerston Street is an area of open space, which is approximately one hectare in size, and the 20km-long Medlock Valley Way, which runs adjacent to the River Medlock, passes through the south-eastern part of Ancoats. The Medlock Valley Way is approximately 190m north-east of the route of the Proposed Scheme.

West of Manchester Piccadilly Station

6.3.6 To the west of Manchester Piccadilly Station is an area primarily made up of offices, shops and other services. The Northern Quarter is situated to the north-west of this area, comprising of bars, restaurants, shops and creative businesses. The Greater Manchester Police Museum is located in this area. Canal Street, the centre of the Manchester Gay Village, is located north-west of Manchester Piccadilly Station. This pedestrianised street includes numerous bars and nightclubs.

6.3.7 Manchester Coach Station, serving national and international coach services, and Piccadilly Gardens Bus Station, serving Greater Manchester bus services, are situated in this area. The University of Manchester has a campus in the Sackville Street area, containing the University's science and engineering departments. The Manchester College has a campus on the B6469 Whitworth Street. University and private halls of residence are located to the north of the A57(M) Mancunian Way.

6.3.8 The area includes a number of small areas of open space, including Piccadilly Gardens, Sackville Gardens and Vimto Park which are all located within 500m of the route of the Proposed Scheme. The Cheshire Ring Canal Walk PRoW passes through the southern portion of the area, and would be located approximately 260m west of the route of the Proposed Scheme. The Irwell Sculpture Trail passes through the western portion of the area, and would be located approximately 1.5km west of the route of the Proposed Scheme.

South of Manchester Piccadilly Station

6.3.9 To the south of the existing Manchester Piccadilly Station is an area characterised by university buildings, housing and industrial space and includes the areas of Brunswick and Ardwick. The nearest residential properties would be approximately 330m from the route of the Proposed Scheme. Between the A34 Upper Brook Street and the A6 Ardwick Green South in the southern part of the area is the Brunswick estate, an area undergoing regeneration. The estate comprises terraced social housing and flats, with areas of development land. The Brunswick area includes a medical centre and the Medlock Primary School. Situated on the A34 Oxford Road to the south-west of the route of the Proposed Scheme is the Manchester Metropolitan University All Saints Campus.

6.3.10 Recreational facilities in this area include: the Manchester Aquatics Centre; the university-owned Sugden Sports Centre; the Apollo Theatre; and Powerleague Manchester, a number of privately owned football pitches. Open spaces in this area include the Gartside Gardens and Ardwick Green Park with a war memorial, both located approximately 900m south-west of the route of the Proposed Scheme.

6.4 Effects arising during construction

Avoidance and mitigation measures

6.4.1 The draft Code of Construction Practice (CoCP[25]) 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 PRoW and footways associated with local roads and highways 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);

[25] Supporting document: Draft Code of Construction Practice

- 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.

Open space and PRoW

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

Permanent effects

Residential properties

6.4.6 No permanent effects on residential properties have been identified as a result of the land required for construction of the Proposed Scheme.

Community facilities

6.4.7 Construction of the proposed Manchester Piccadilly High Speed station would require the demolition of True Jesus Church on St Andrews Street. The church has approximately 40 regular congregants, the majority of whom are Chinese, and range in age with a large proportion aged 20 to 30 years. True Jesus Church is run by volunteers and worship takes place on Saturdays. The church offers religious education classes for children, Bible study courses and gospel choir classes as well as informal social events. Because of its specific links with Manchester's Chinese community, comparable alternative resources are not readily available nearby. The demolition of True Jesus Church would result in a major adverse effect, which would be significant.

6.4.8 Construction of the Piccadilly viaduct would also require the demolition of SOL Christian Academy on the B6469 Fairfield Street. This is an independent, co-educational faith (Pentecostal) school with nursery, primary, secondary, and sixth form provision. The school is registered to take up to 50 pupils, aged between three and 18 years, and currently has 48 pupils on the register, 28 of whom are in nursery. The school is contained in an industrial building and is set out across four floors, with five classrooms, a design and technology room, ICT/language room, media studio, recording studio, playing area and a multipurpose hall. The school premises also host a community church, broadcasting station and community charity. While other school provision for each age bracket provided by the SOL Christian Academy is located nearby, none is comparable in terms of breadth and style of provision, and specific community links. The demolition of SOL Christian Academy would therefore result in a major adverse effect, which would be significant.

6.4.9 Construction of the Piccadilly viaduct would require the demolition of The Men's Room, also on the B6469 Fairfield Street. The Men's Room offers outreach services, one-to-one support sessions and creative drama and arts sessions, including a weekly creative session called The Red Room. Service users are males, typically under the age of 30, who have experienced multiple disadvantages and often feel marginalised by mainstream health services. Many of them identify as male sex workers. There are no equivalent services tailored to the specific needs of this cohort of young men in Manchester. The demolition of The Men's Room would therefore result in a major adverse effect, which would be significant.

6.4.10 Construction of the Piccadilly viaduct would require the demolition of the drop-in centre, MASH, again on the B6469 Fairfield Street. MASH is a charity outreach service for women working in the sex industry in Manchester, offering sexual health services, refreshments, needle exchanges, life skills support, counselling and advice. The centre is open for both afternoon and evening sessions. In 2016/17, MASH engaged with more than 700 women, many of whom do not have English as their first language. While alternative health resources are available nearby, the specific nature of those who use the facilities and services offered means that alternatives are not readily available. The loss of MASH would result in a major adverse effect, which would be significant.

6.4.11 Construction of the Piccadilly viaduct would require the demolition of MO:DEL on the B6469 Fairfield Street. MO:DEL is an NHS mental health and substance abuse service for mentally ill offenders, many of whom have complex health issues. The service offers mental health assessment, risk assessment and case management to up to 150 users for a period of up to six months. While alternative healthcare facilities are available nearby, the specific services provided at MO:DEL are not readily available in the immediate area. The demolition of MO:DEL would result in a major adverse effect, which would be significant.

Recreational facilities

6.4.12 Construction of Manchester Piccadilly High Speed station would require the demolition of SBG Manchester on Sheffield Street. The gym offers drop-in classes in mixed martial arts, Brazilian jiu jitsu, boxing, kickboxing, fitness and self-defence

seven days a week, and is open from 9am until 9pm for training for professional fighters. While there are other gyms in the city centre, few provide the same specialist classes. As such, the demolition of SBG Manchester would result in a moderate adverse effect, which would be significant.

Open space and PRoW

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

Other mitigation measures

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

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

Summary of likely residual significant effects

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

- demolition of True Jesus Church on St. Andrews Street;
- demolition of SOL Christian Academy on the B6469 Fairfield Street;
- demolition of The Men's Room on the B6469 Fairfield Street;
- demolition of MASH on the B6469 Fairfield Street;
- demolition of MO:DEL on the B6469 Fairfield Street; and
- demolition of SBG Manchester on Sheffield Street.

Cumulative effects

6.4.17 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.

6.4.18 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 Manchester Piccadilly Station area as a consequence of the construction and operation of the Proposed Scheme. This includes effects on sites recognised or designated on the basis of their importance for nature conservation.

7.1.2 Engagement with stakeholders including Natural England, Environment Agency, the Woodland Trust, Forestry Commission and 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: MA08 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)[26].

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. Surveys in this area are restricted to the short section of the Proposed Scheme on the station approach and the proposed Manchester Piccadilly High Speed station. The surveys include (but are not limited to) broad habitat and detailed plant surveys, breeding bird surveys and bat 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.

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

7.3.2 The land required for the Proposed Scheme in the Manchester Piccadilly Station area consists of urban habitats, largely comprising buildings and hardstanding with small and fragmented areas of amenity grassland, planted trees and shrubs, and a small area of brownfield land. The River Medlock flows through the land required for the Proposed Scheme and is culverted in places. The Ashton Canal is located immediately to the west of the land required for the Proposed Scheme.

7.3.3 Statutory and non-statutory designated sites are shown on Map Series CT-10, Volume 2: MA08 Map Book.

Designated sites

7.3.4 There is one internationally important site of potential relevance to the assessment in the Manchester Piccadilly Station area. The Rochdale Canal Special Area of Conservation (SAC) covers an area of 24.9ha. The SAC supports extensive colonies of the nationally scarce floating water-plantain. It is located north of Manchester Piccadilly Station 4.6km north-east of the land required for the Proposed Scheme.

7.3.5 There is one nationally important Site of Special Scientific Interest (SSSI) of potential relevance to the assessment in the Manchester Piccadilly Station area. For this site, the land required for the Proposed Scheme in this area is within the Impact Risk Zone[27] relevant to railway infrastructure as identified by Natural England. The Rochdale Canal SSSI covers an area of 25.5ha, which has a boundary largely similar to Rochdale Canal SAC. It is designated for important habitats for submerged aquatic plants and emergent vegetation. The canal supports a rich but generally common assemblage of invertebrates, with in excess of 112 recorded species, of which 13 species are of local importance. The canal supports a number of waterside bird species including grey wagtail and kingfisher.

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

- Ashton Canal (West) LWS, covering an area of 8.5ha, is formed by part of the Ashton Canal. The LWS is located 80m north of the land required for the Proposed Scheme, at Manchester Piccadilly Station. In addition, a construction access road passes over the LWS on an existing road. The Ashton Canal (West) LWS continues to the north of Manchester Piccadilly Station for 10.2km;
- Ashton Canal (East) LWS, covering an area of 9.1ha, is formed by part of the Ashton Canal. The LWS is located 3.2km north-east of the land required for the Proposed Scheme, 800m north-east of a construction access road and adjoins the Ashton Canal (West) LWS;

[27] 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.

- Rochdale Canal, Stott's Lane-Ducie Street Basin LWS, covering an area of 8.9ha, is formed by part of the Rochdale Canal. The LWS is located 45m north east of the land required for the Proposed Scheme, to the west of Manchester Piccadilly Station and is connected to Ashton Canal (West) LWS; and
- Rochdale Canal, lock at Scowcroft Farm to Stott's Lane LWS, covering an area of 13.3ha, is formed by part of the Rochdale Canal. It is located 3.3km north of a construction access road, 3.9km north of the land required for the Proposed Scheme, to the north of Manchester Piccadilly Station. The LWS adjoins the Rochdale Canal, Stott's Lane-Ducie Street Basin LWS.

7.3.7 There are no Ancient Woodland Inventory Sites (AWIS) relevant to the assessment in this area.

7.3.8 A review is being undertaken to identify any additional woodlands that are not currently listed on the AWIS 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.

Watercourses

7.3.10 In addition to the watercourses within designated sites aforementioned, the River Medlock is relevant to the assessment as it would be crossed by the proposed Piccadilly viaduct. Upstream sections of the river qualify as a habitat of principal importance. However, due to the largely canalised nature of the section of the river within the land required for the Proposed Scheme and limited aquatic vegetation in this area; this section of the river is considered unlikely to qualify as a habitat of principal importance. However, on a precautionary basis, pending the findings of field surveys the watercourse is considered to be of up to district/borough value.

Protected and notable species

7.3.11 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 provide in Table 9.

Table 9*:* Species potentially relevant to the assessment within the Manchester Piccadilly Station area

Resource/feature	Value	Rationale
Birds	Up to regional	The built structures and habitats, including the brownfield sites, canals and River Medlock present within the Manchester Piccadilly Station area are suitable for breeding and wintering birds. Species associated with these habitats include black redstart, little ringed-plover, peregrine falcon and kingfisher. There are records for these species within 2km of the land required for the Proposed Scheme. The UK population of black redstart is considered to fluctuate between 80 and 100 pairs[28]. There is a small but important

[28] Black Redstart Species Action Plan 2009 – Greater Manchester Biodiversity Project - http://www.gmbp.org.uk/site/images/stories/black%20redstart%20bap_09.pdf

Resource/feature	Value	Rationale
		breeding population of black redstarts in Manchester city centre, with possibly as few as 2-3 breeding pairs. Due to large-scale redevelopment of city centre sites, the black redstart population within Greater Manchester is considered to be declining or threatened with decline[29].
Bats	Up to county/metropolitan	Nine species of bats have been recorded within Greater Manchester[30]. Desk study results have reported 36 bat roosts within 2km of the land required for the Proposed Scheme. The roosts are located within a number of commercial properties and viaducts associated with Manchester Piccadilly Station. They include two common pipistrelle maternity roosts. There are also records for brown long-eared bat roosts. The majority of the records within the desk study are for common pipistrelle, which are nationally considered to be common and widespread. In addition, the land required for the Proposed Scheme is considered to be highly urbanised and offers little opportunity to support foraging bats, other than sections within the canal network and River Medlock.

7.4 Effects arising during construction

Avoidance and mitigation measures

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

7.4.2 The assessment assumes implementation of the measures set out within the draft Code of Construction Practice (CoCP)[31], 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;

[29] Black Redstart Species Action Plan 2009 – Greater Manchester Biodiversity Project - http://www.gmbp.org.uk/site/images/stories/black%20redstart%20bap_09.pdf
[30] Bats Local Biodiversity Action Plan – Greater Manchester Biodiversity Project- http://www.gmbp.org.uk/site/images/stories/pdf/bats.pdf
[31] Supporting document: Draft Code of Construction Practice

- 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 Rochdale Canal SAC and SSSI is the only internationally/nationally important site within the vicinity of the land required for the Proposed Scheme. It lies 4.6km north-east of the Proposed Scheme. It is on the other side of the large conurbation of Manchester and it is considered that there would be no significant effect as a result of the Proposed Scheme. It has therefore been scoped out for Habitats Regulations Assessment and from further consideration, as agreed with Natural England.

Habitats

Watercourses

7.4.6 Construction of the Proposed Scheme in the Manchester Piccadilly Station area would result in a direct impact to 210m of the River Medlock. An upstream section of the river is a habitat of principal importance. However, due to the largely canalised nature of the river and limited aquatic vegetation in this area, the section of the river within the land required for the Proposed Scheme, is considered unlikely to qualify as a habitat of principal importance. Given this and that 34% of the impact area is already culverted, the direct and indirect effects would not be significant as they would be controlled through the implementation of measures in the draft CoCP.

Species

Birds

7.4.7 The Proposed Scheme would result in the loss of nesting and foraging habitats for a range of breeding and wintering birds. In the absence of survey information, it is considered that these are likely to include black redstart, kingfisher and peregrine falcon. On a precautionary basis, it has been assumed that the Proposed Scheme would result in a permanent adverse effect that would be significant at up to the regional level.

Bats

7.4.8 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. Demolition of buildings may also result in loss of roosts. This could particularly affect breeding populations of two bat species within the area. Bats may also be affected by the lighting associated with construction works, although it is anticipated that this would be controlled through measures in the draft CoCP. On a precautionary basis, in the absence of survey information, it has been assumed that impacts would result in a permanent adverse effect on the conservation status of the bat populations that would be significant at up to the county/metropolitan level.

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

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

Other mitigation measures

7.4.11 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:

- provision of alternative roosting habitat for bats; and
- provision of suitable breeding and nesting habitat for Schedule 1 bird species[32], including black redstart, kingfisher and peregrine falcon.

Summary of likely residual significant effects

7.4.12 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 10.

Table 10: Residual significant effects on ecological resources/features during construction

Resource/feature	Residual effect	Level at which the effect would be significant
Birds	Potential permanent adverse effect on conservation status due to loss of breeding, nesting and foraging habitat	Up to regional
Bats	Potential permanent adverse effect on conservation status due to loss of roosts and foraging habitat	Up to county/metropolitan

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.

[32] 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

Assessment of impacts and effects

7.5.2 It is considered that there would be no 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 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

7.5.4 No additional mitigation measures are currently being considered for the Manchester Piccadilly Station area.

Summary of likely residual significant effects

7.5.5 There would be no significant residual effects as a result of the operation of the Proposed Scheme.

Monitoring

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

7.5.7 There are no area-specific requirements for monitoring ecology and biodiversity effects or mitigation during the operation of the Proposed Scheme in the Manchester Piccadilly Station area.

8 Health

8.1 Introduction

8.1.1 This section identifies the communities within the Manchester Piccadilly Station 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 Manchester Piccadilly Station 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: MA08 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)[33].

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

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

8.2.4 The health determinants of relevance within the Manchester Piccadilly Station area are:

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

- for impacts during construction (temporary and permanent):
  - neighbourhood quality;
  - access to services, health and social care;
  - access to green space, recreation and physical activity;
  - education; 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 Manchester Piccadilly Station area

8.3.1 For the purposes of the health assessment, the study area is divided into the communities described below. A full description of community facilities is provided in

Section 6, Community. The Manchester Piccadilly Station area is used by people who live, work, visit and travel to Manchester city centre.

8.3.2 The area immediately adjacent to Manchester Piccadilly Station is mostly industrial in character, with warehouses, workshops and showrooms. While primarily retaining this industrial character, the B6469 Fairfield Street, which runs directly to the south and west of the station, contains a small number of community resources: the SOL Christian Academy (115 Fairfield Street), an independent nursery, primary and secondary school; the Men's Room (113 Fairfield Street), an arts and social care agency for young men who are ex-offenders, or who may have experienced homelessness, sexual exploitation, or been involved in sex work; a Greater Manchester Mental Health (GMW) and Justice Community Service known as Manchester Offenders: Diversion Liaison Service (MO:DEL) (104 Fairfield Street); and Manchester Action on Street Health (MASH) (94-96 Fairfield Street) an outreach service for women working in the sex industry in Manchester. True Jesus Church, with a predominately Chinese congregation, is located on St Andrews Street, just off the B6469 Fairfield Street. Straight Blast Gym (SBG) Manchester, a mixed martial arts and Brazilian jiu jitsu gym, is located directly behind the station on Sheffield Street.

8.3.3 The area to the south of the existing Manchester Piccadilly Station is characterised by university buildings, housing and industrial space. Recreational facilities include: Manchester Aquatics Centre; the university-owned Sugden Sports Centre; the Apollo Theatre; and Powerleague Manchester, a number of privately owned football pitches.

8.3.4 The area to the west of the existing Manchester Piccadilly Station is primarily made up of offices, shops and services. The area includes a number of small areas of open space, including Piccadilly Gardens, Sackville Gardens and Vimto Park. To the north of Manchester Piccadilly Station is the industrial area of Ancoats. This area primarily contains retail parks, industrial units and car parking.

Demographic and health profile of the Manchester Piccadilly Station area

8.3.5 The communities potentially affected by the Proposed Scheme in the Manchester Piccadilly Station area have a relatively high population density, commensurate with the urban nature of the area.

8.3.6 Data provided by the Office for National Statistics[34] show that this population has a poor health status compared with the national (England) averages.

8.3.7 The population is more deprived than the national average with regard to the combined indices of multiple deprivation[35], and the health domain (a sub-set of the indices of multiple deprivation).

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

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

8.3.9 The available data provides detail down to ward level and enables a profile to be made of the population within the Manchester Piccadilly Station 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. Adverse impacts on health determinants have been reduced insofar as reasonably practicable through mitigation measures incorporated into the design of the Proposed Scheme to reduce adverse effects on people. 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; and
- incorporating landscape design and screening into the design.

8.4.2 In addition, 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)[36], which provides a general basis for route-wide construction environmental management. Contractors would also be required to comply with the measures in Local Environmental Management Plans (LEMP), which apply the environmental management strategies at a local level.

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

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

[36] Supporting document: Draft Code of Construction Practice

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

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

Assessment of impacts and effects

Neighbourhood quality

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

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

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

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

8.4.11 Dust emissions from construction activities are considered in Section 5, Air quality, which identifies no significant adverse effects with respect to the effects of construction activities on dust soiling and human health within the Manchester Piccadilly Station 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[37] impacts on neighbourhood quality in areas close to construction sites. 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 Manchester Piccadilly Station area would include:

- construction vehicle movements to and from the various construction compounds and sites;
- temporary and permanent road closures and associated diversions; and
- temporary and permanent alternative routes for public rights of way (PRoW) and footways associated with local roads and highways.

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 The link between health and the aesthetic value of the public realm is not well understood, but there is moderate evidence to suggest that an attractive environment can improve people's enjoyment and sense of wellbeing. Conversely, poor quality environments have been shown to have negative effects on people's health. There is moderate evidence that people have a preference for views of natural environments over man-made environments, and that exposure to views of natural environments is associated with increased wellbeing.

8.4.17 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

8.4.18 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

[37] 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.

feelings of isolation and enabling participation in society, as well as accessing basic needs such as food shopping.

8.4.19 Construction of the Piccadilly viaduct would require the demolition of The Men's Room on the B6469 Fairfield Street. This is an arts and social care agency that works with young men who are ex-offenders, or who may have experienced homelessness, sexual exploitation, or been involved in sex work. The service offers outreach services, one-to-one support sessions and creative drama and arts sessions, including a weekly creative session called The Red Room. Service users are males, typically under the age of 30 years, who have experienced multiple disadvantages and often feel marginalised by mainstream health services. Many of them identify as male sex workers. There are no equivalent services tailored to the specific needs of this cohort of young men in Manchester. The demolition of The Men's Room has the potential to result in an adverse health effect.

8.4.20 Construction of the Piccadilly viaduct would require the demolition of the drop-in centre, MASH on B6469 Fairfield Street. MASH is a charity outreach service for women working in the sex industry in Manchester, offering sexual health services, refreshments, needle exchanges, life skills support, counselling and advice. The centre is open for both afternoon and evening sessions. In 2016/17, MASH engaged with 713 women, many of whom do not have English as their first language. While alternative health resources are available nearby, the specific nature of those who use the facilities and services offered means that alternatives are not readily available. This demolition of MASH has the potential to result in an adverse health effect.

8.4.21 Construction of the Piccadilly viaduct would require the demolition of MO:DEL on the B6469 Fairfield Street. MO:DEL is an NHS mental health and substance abuse service for mentally ill offenders, many of whom have complex health issues. The service offers mental health assessment, risk assessment and case management to up to 150 users for a period of up to six months. While alternative healthcare facilities are available nearby, the specific services provided at MO:DEL are not readily available in the immediate area. The demolition of MO:DEL has the potential to result in an adverse health effect.

8.4.22 Construction of Manchester Piccadilly High Speed station would require the demolition of True Jesus Church, on St Andrews Street. The church has approximately 40 regular congregants, the majority of whom are Chinese, and range in age, with a large proportion aged 20 to 30 years. True Jesus Church is run by volunteers and worship takes place on Saturdays. The church offers religious education classes for children, Bible study courses and gospel choir classes as well as informal social events. Because of its specific links with Manchester's Chinese community, comparable alternative resources are not readily available nearby. The demolition of True Jesus Church has the potential to result in adverse health effects.

8.4.23 The Manchester Piccadilly Station area is urban in nature, with 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.

Access to green space, recreation and physical activity

8.4.24 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.

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

- impacts of construction traffic, including HGVs, on pedestrians and cyclists; and
- any loss of green space or facility used for physical activity.

8.4.26 The route of the Proposed Scheme is not expected to affect the amenity and recreational value of footpath networks, and therefore levels of physical activity and associated health and wellbeing benefits.

8.4.27 Construction traffic, including HGVs, would be present on local roads. This could obstruct or deter pedestrians and cyclists 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 and reported in the formal ES.

8.4.28 Construction of the proposed Manchester Piccadilly High Speed station would require the demolition of SBG Manchester on Sheffield Street. The gym offers drop-in classes in mixed martial arts, Brazilian jui jitsu, boxing, kickboxing, fitness and self-defence seven days a week, and is open from 9am until 9pm for training for professional fighters. While there are other gyms in the city centre, few provide the same specialist classes. The demolition of SBG Manchester has the potential to result in an adverse health effect.

Education

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

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

8.4.31 The construction of the proposed Manchester Piccadilly High Speed station would require the demolition of SOL Christian Academy on the B6469 Fairfield Street. This is an independent, co-educational faith (Pentecostal) school with nursery, primary, secondary, and sixth form provision. The school is registered to take up to 50 pupils, aged between three and 18 years, and currently has 48 pupils on the register, 28 of whom are in nursery. The school premises also host a community church,

broadcasting station and community charity. While other school provision for each age bracket provided by the SOL Christian Academy is located nearby, none is comparable in terms of breadth and style of provision and specific community links. The demolition of SOL Christian Academy has the potential to result in an adverse health effect.

Social capital

8.4.32 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."[38]

8.4.33 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.

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

8.4.35 The size of the construction workforce would not be substantial relative to the size of these local communities; therefore, no health effects associated with changes to social capital are expected.

8.4.36 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.

8.4.37 The Community section of the formal ES will include an assessment of impacts resulting from the loss of residential properties. The loss of five properties is identified as the threshold for a significant Community effect. In some cases, the Community

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

assessment may identify significant impacts below this threshold; for example, where the demolitions make up a significant proportion of a very small community.

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

8.4.39 No demolition of residential property is anticipated in the Manchester Piccadilly Station area and therefore no health effects are expected.

8.4.40 Road closures and diversions required for the construction of the Proposed Scheme would have the potential to reduce community connectivity by increasing journey times, particularly on heavily used commuter routes.

Other mitigation measures

8.4.41 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.

8.4.42 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.

8.4.43 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 Manchester Piccadilly Station area will be reported in the formal ES.

Assessment of impacts and effects

Neighbourhood quality

8.5.2 Operational noise would have the potential to generate a noticeable change in noise at outdoor areas and at neighbourhoods in proximity to the Proposed Scheme, as listed in Section 13, Sound, noise and vibration. The permanent features of the Proposed Scheme would be visible from nearby residential properties, 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 Manchester Piccadilly Station 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, Manchester City Council (MCC), 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: MA08 Map Book. Only designated heritage assets within Manchester Piccadilly Station are shown on map CT-10-326b. 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)[39] including the method for determining the value of a heritage asset and magnitude of impact (tables 19 and 20 in the SMR, respectively).

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

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

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

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

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

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

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

9.2.8 At this stage of the design development, heritage assets within the land required to construct the Proposed Scheme are assumed to require complete removal and the assessment has been undertaken on that basis. The exception to this is the Grade II listed train shed at Manchester Piccadilly Station (NHL1283014) which although within the land required for the construction of the Proposed Scheme, would not be removed. Also, in relation to the former goods offices (NHLE1197919), although the asset is within the land required for the construction of the Proposed Scheme and may be affected, any effect is unlikely to be significant. 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 date 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 in compiling this assessment, including:

- the NHLE (Historic England designated heritage asset data);
- local planning authority information on conservation areas;
- Greater Manchester historic environmental records (HER);
- conservation area appraisals; and
- historic maps and aerial photography.

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

Designated assets

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

- the train shed at Piccadilly station (NHLE 1283014) a Grade II listed building of moderate value; and
- the former goods offices to Piccadilly station (NHLE 1197919) a Grade II listed building of moderate value.

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

- remains of the eastern wall of the Mamucium Roman fort (NHLE 1001953) and The Hanging Bridge immediately south of Manchester Cathedral (NHLE 1020983), both scheduled monuments of high value;
- Roman Catholic Church of the Holy Name of Jesus (NHLE 1271296); former Liverpool Road Railway Station Masters House (NHLE 1291477); Old Warehouse to the north of former Liverpool Road Railway Station (NHLE 1282991); Railway Bridge over River Irwell to former Liverpool Road Station (NHLE 1270603); Railway Bridge over River Irwell to former Liverpool Road Station, that Part in Salford (NHLE 1391927); City Art Gallery (NHLE 1282980); Town Hall (NHLE 1207469); Albert Memorial (NHLE 1197820); John Rylands Library and attached railings, gates and lamp standards (NHLE 1217800); Bank of England Trustee Savings Bank (NHLE 1291596); Church of St Anne (NHLE 1247612); Cathedral Church of St Mary (NHLE 1218041) and Chetham's Hospital and attached wall (NHLE 1283015), all Grade I listed buildings of high value;

- 18 textile mills, warehouses and associated buildings; 19 public buildings; seven religious buildings; three private houses; three offices and shops; two educational buildings; Manchester war memorial (NHLE 1270697); Store Street aqueduct (NHLE 1270666); Southern Railway Viaduct and Colonnade (NHLE 1386162) and the Midland Hotel (NHLE 1271154); all Grade II* listed buildings of high value;

- 134 warehouses; 70 shops or offices; 63 houses; 59 buildings or structures associated with roads, canals or rail; 32 public service buildings; 28 religious buildings and associated monuments; 25 pubs and clubs; 18 textile mills or industrial buildings; 16 statues and monuments; 13 educational buildings; 10 items of street furniture; nine theatre buildings; seven hospital buildings; seven hotels or hostels; four assets within a prison complex; three war memorials; two power stations, one free masons hall and one military building; all Grade II listed buildings of moderate value; and

- Whitworth Street Conservation Area; George Street Conservation Area; Stevenson Square Conservation Area; Ancoats Conservation Area; Smithfield Conservation Area; Upper King Street Conservation Area; Albert Square Conservation Area; St Peters Square Conservation Area; Deansgate Conservation Area; St Anne's Square Conservation Area; Shudehill Conservation Area; Cathedral Conservation Area; Parsonage Gardens Conservation Area; St John Street Conservation Area; Castlefield Conservation Area; Flat Iron Conservation Area; and Adelphi/Bexley Square Conservation Area; all of moderate value.

Non-designated assets

9.3.5 One non-designated asset of high value is located wholly or partially within the land required for the Proposed Scheme: the site of the Church of St. Andrew's and disused graveyard (MGM108620).

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

- sites of a variety of types of asset comprising housing, industrial and commercial buildings on the following streets - Hyde Street (MGM17346); Chancery Lane (MGM17349, MGM17348, MGM17349, MGM17343) site of Chancery Lane School (MGM17373); William Street (MGM17347, MGM17354, MGM17357); Victoria Terrace (MGM17363); Mellor Street (MGM17366) and Fairfield Street (MGM17365); and

- several public houses and breweries including the sites of Victoria Brewery and Starch Works (MGM17377); Swann Inn (MGM17356); Mitre Inn and adjoining housing (MGM17359); and Bridge Inn and site of Bridge Inn Brewery (MGM17364).

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

- the sites of a variety of types of building on Coleman Street (MGM17374); Spring Gardens (MGM17372); Birch Street (MGM17352); William Street (MGM17347); Chapelfield Road (MGM17361); Water Street (MGM17360); Chancery Lane (MGM17373) and Ogden Street (MGM17392); and Bridge Inn and site of Bridge Inn Brewery (MGM17364); and
- sites of industrial buildings and canals including Pin Mill (MGM2836); Ardwick Mill (MGM17362); Bridge Street Mill Print Works (MGM10864); site of Dark Lane Mill (MGM17353), site of canal Warehouse (MGM19073), Bank Top Coal Wharf (MGM19066); Goods Shed (MGM19078) and Castle Brewery (MGM17342); site of Rochdale Canal Arm (MGM19079) and Ancoats Bridge (MGM1742).

9.3.8 Non-designated heritage assets located partially or wholly within 250m study area include: 64 assets including 15 of moderate value and 49 of low value, the majority of the assets are associated with the textile industry with a large number of cotton mills, dye works or engine houses. Buildings and structures related to the canals including several canal warehouses, numerous terraces and back to back workers housing.

Historic environment overview

9.3.9 There is no recorded evidence for activity from the Palaeolithic or Mesolithic periods in the study area. The earliest evidence for human activity comes from the Neolithic period which is generally considered to be the period when hunting and gathering societies moved towards a more settled farming lifestyle. Ceremonial and funerary monuments (burial mounds) appear in the landscape and new artefacts including pottery and stone tools appear. The Greater Manchester HER records the discovery of flint scatters and stone tools which could be representative of semi-permanent settlement within the study area at this time.

9.3.10 There is no recorded archaeology from the Bronze Age period within the study area.

9.3.11 During the Iron Age the climate became cooler and wetter, and the period saw an expanding population, which necessitated the intensification of agricultural practices and the use of marginal land that resulted in large-scale clearance. There are no confirmed settlements within the 2km study area, although Iron Age pottery was recovered in Castlefield 1.5km west of Piccadilly Station.

9.3.12 The concentration of find spots dating to the Roman period in Manchester city centre is associated with the 1st century fort and vicus of Mamucium. The vicus developed as a linear settlement along the road from the north gate of the fort, extending to what is now Deansgate. There was a cemetery to the south-east of the vicus, first evidenced by the discovery of two cinerary urns near the eastern boundary of Castlefield.

9.3.13 Archaeological evidence for the early medieval period for the North West is scant, with much of the evidence coming from documentary sources. The North West at this period was relatively thinly populated compared to other parts of the country. Archaeological investigation into both rural and urban settlement has been hampered by the destruction of evidence through both 19th and 20th century urbanisation and industrialisation.

9.3.14 A castle at Manchester is mentioned in 1184 and was replaced by a manor house by 1282. This site is now occupied by Chetham's College. The manor had monopolies over fisheries, fulling mills and communal ovens from the late 13th century. Manchester had become a town of regional importance by the medieval period and received its market charter in 1282. This early development focused in the area adjacent to the cathedral, Hanging Bridge, Fennel Street, Deansgate and Market Street. Burgages (a tenure of land in a town or city which was held in return for a yearly rent) were noted from 1316 along Long Millgate, Shudehill and Deansgate to the north-west of the existing Manchester Piccadilly Station.

9.3.15 By the end of the medieval period and into the post medieval period Manchester had become a regional centre for textile processing. Manchester was key to the early stages of the industrialisation and globalisation of Britain. Along with the favourable climate, the textile and coal industries were the driving force behind this growth. The construction of extensive canal networks from 1761 onward further enabled Manchester to develop as an inland port and allowed for greater access to raw materials and increased the number of outlets for its products. The 19th century also saw significant expansion of the rail network in Manchester, with railway companies investing in new sidings, stations, warehouses and goods yards, which are still prominent in the landscape today, Piccadilly Station itself being an example of this, along with London Warehouse just to the north of the station, which was built as a railway warehouse.

9.3.16 Manchester shrank as it moved towards becoming a commercial centre for the surrounding towns and villages rather than a focus on manufacturing. Warehousing, banks and the Royal Exchange to the north of Piccadilly station became the focus of the city centre. These provided not just storage for finished textiles, but offices and a space to display the goods, while the banks provided loans and credit for the production of cotton. The warehousing contained within Stevenson Square Conservation Area are fine examples of this building type. It is around this time that Manchester gained its nickname of Cottonopolis.

9.3.17 During the First World War, cotton could no longer be exported to foreign markets and, as a result, countries nearer to the source of cotton began to produce their own cloth at a much cheaper rate than Britain. This spelt the beginning of the end for the cotton industry in Manchester. Textile mills were frequently converted to other industry, housing or abandoned completely.

9.4 Effects arising during construction

Avoidance and mitigation measures

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

9.4.2 Section 8 of the draft Code of Construction Practice (CoCP)[40] sets out the measures that will be adopted, in so far 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 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 train shed at Piccadilly Station (NHLE 1283014) is a Grade II listed building of moderate value located within the land required for the Proposed Scheme. The train shed dates from 1881 and is the second remodelling of Store Street Station built in 1842. The asset derives its significance from its architectural and historic value as a well-preserved example of 19th century train station architecture. The asset will be physically impacted by the construction of the new station at Piccadilly, which will be immediately adjacent and connected to the existing train shed building, blocking the north elevation from view and constructed over the existing listed brick under croft of the station. This would constitute a medium adverse impact and result in a moderate adverse significant effect.

[40] Supporting document: Draft Code of Construction Practice

9.4.8 The site of the Church of St. Andrew's and disused graveyard (MGM108620) is a non-designated heritage asset dating from the later post-medieval period and is considered to be of high value due to the presence of the graveyard. Any surviving below-ground archaeological remains would be physically impacted by the construction of the Manchester Piccadilly High Speed station main compound. This would constitute a high magnitude of impact, and result in a major adverse significance of effect.

9.4.9 The following non-designated heritage assets date from the later post-medieval period and together illustrate the urban development of Manchester, which occurred as a result of industrial growth. They are all of moderate value. Any surviving below-ground archaeological remains associated with these assets would be physically impacted by the construction of the Piccadilly viaduct satellite compound A. This would constitute a high magnitude of impact, and result in a major adverse significance of effect:

- the site of the Victoria Brewery, Starch Works and terraced housing (MGM17377);
- the site of terraced housing, back-to-back workers housing and industrial premises on Hyde Street (MGM17346);
- the site of buildings at Chancery Lane School (MGM17373); and
- the site of terraced housing, back-to-back housing and workers cottage at Chancery Lane (MGM17348).

9.4.10 The following non-designated heritage assets date from the later post-medieval period and illustrate the development of Manchester. They are all of moderate value. The below-ground archaeological remains associated with these assets would be physically impacted by the construction of the Piccadilly viaduct satellite compound B. This would constitute a high magnitude of impact, and result in a major adverse significance of effect:

- the site of the Swann Inn, terraced housing and back-to-back workers housing (MGM17356);
- the site of back-to-back housing and blind-back housing at Chancery Lane (MGM17343);
- the site of terraced housing, back-to-back housing, a workers' cottage and an industrial building on William Street (MGM17347); and
- the site of blind-back housing; a church school; lighting engineering works; mission hall; cotton waste works; a Presbyterian church; cinema and a cardboard box factory on William Street (MGM17354).

9.4.11 The following non-designated heritage assets date from the later post-medieval period and illustrate the development of Manchester. They are all of moderate value. The archaeological remains associated with these assets would be physically impacted by the construction of the Piccadilly viaduct satellite compound D.

This would constitute a high magnitude of impact, and result in a major adverse significance of effect:

- the site of Mitre Inn and adjoining back-to-back housing (MGM17359);
- the site of two ranges of blind-back housing on Mellor Street (MGM17366);
- the site of blind-back housing and back-to-back housing on Victoria Terrace (MGM17363); and
- the site of blind-back housing and terraced housing on Fairfield Street (MGM17365).

9.4.12 The following non-designated heritage assets date from the later post-medieval period and illustrate the development of Manchester. They are all of low value. The archaeological remains associated with these assets would be physically impacted by the construction of the Piccadilly viaduct satellite compound A. This would constitute a high magnitude of impact, and result in a moderate adverse significance of effect:

- the site of a block of double-depth housing on Coleman Street (MGM17374);
- the site of a terrace of housing, allotments and small industrial buildings on Chancery Lane (MGM17349); and
- the site of a block of terraced housing built between 1824 and 1831 on Spring Gardens (MGM17372).

9.4.13 The following non-designated heritage assets date from the later post-medieval period and illustrate the industrial development of Manchester. They are all of low value. The archaeological remains associated with these assets would be physically impacted by the construction of the Piccadilly viaduct satellite compound B. This would constitute a high magnitude of impact, and result in a moderate adverse significance of effect:

- the site of a cotton mill constructed between 1805 and 1809 on Dark Lane Mill (MGM17353);
- the site of buildings relating to Castle Brewery (MGM17342); and
- the site of a row of single and double-depth properties are present in the 1787 on Birch Street (MGM17352).

9.4.14 The following non-designated heritage asset dates from the later post-medieval period and illustrates the industrial development of Manchester. They are all of low value. The archaeological remains associated with these assets would be physically impacted by the construction of the Piccadilly viaduct satellite compound C. This would constitute a high magnitude of impact, and result in a moderate adverse significance of effect: The site of an engine house, textile mill, weaving mill, finishing works and office built from 1750 on Pin Mill (MGM2836).

9.4.15 The following non-designated heritage assets date from the later post-medieval period and illustrate the industrial development of Manchester. They are all of low value. The archaeological remains associated with these assets would be physically

impacted by the construction of the Piccadilly viaduct satellite compound D. This would constitute a high magnitude of impact, and result in a moderate adverse significance of effect

- the site of housing on Chapelfield Road and Union Work (MGM17361);
- the site of terraced housing on Water Street (MGM17360);
- the site of Ardwick Mill (MGM17362);
- the site of housing on Ogden Street (MGM17392);
- the site of Print Works (Bridge Street Mill) (MGM10864); and
- the site of Bridge Inn and Bridge Inn Brewery (MGM17364).

9.4.16 The following non-designated heritage assets date from the later post-medieval period and illustrate the industrial development of Manchester. They are all of low value. The archaeological remains associated with these assets would be physically impacted by the construction of the Manchester Piccadilly High Speed station main compound. This would constitute a high magnitude of impact, and result in a moderate adverse significance of effect:

- Ancoats Bridge (MGM1742);
- the site of Bank Top Coal Wharf (MGM19066);
- the site of a canal warehouse (MGM19073);
- the site of a goods shed (MGM19078); and
- the Rochdale Canal arm (MGM19079).

9.4.17 No significant effects have been identified at this stage as a result of permanent impacts on the setting of designated or non-designated heritage assets, but work is ongoing and will be reported in the formal ES.

Other mitigation measures

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

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

Summary of likely residual significant effects

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

9.4.20 As no specific mitigation measures have yet been identified in relation to heritage assets described above, the residual effects are the same as those reported under permanent effects.

9.5 Effects arising from operation

Avoidance and mitigation measures

9.5.1 No measures have yet been incorporated into the design of the Proposed Scheme to reduce the impacts and effects on heritage assets within the Manchester Piccadilly Station area.

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 physical 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 there would be no significant effects as a result of the operation of the Proposed Scheme.

Other mitigation measures

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

Summary of likely residual significant effects

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

Monitoring

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

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

10 Land quality

10.1 Introduction

10.1.1 This section of the report presents the baseline conditions that exist along the land required for the Proposed Scheme in the Manchester Piccadilly Station 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), 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), Manchester City Council (MCC), Greater Manchester Geological Unit (GMGU), the Environment Agency, Fera Science Ltd (FSL)[41] 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: MA08 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)[42].

10.2.2 In accordance with the SMR, a risk based approach was undertaken to identify contamination that may have an impact upon the construction of the Proposed Scheme. To support this, a desk based assessment has been undertaken for the study area, defined as the land required for construction of the Proposed Scheme plus a 250m buffer. In the case of groundwater abstractions, this 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 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

[41] Formerly known as the Food and Environment Research Agency
[42] Supporting document: HS2 Phase 2b Environmental Impact Assessment Scope and Methodology Report

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 land required for 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[43] identified on published minerals plans, and existing planning or licensed areas. Any inference of minerals provided by geological maps/reports is excluded (except where these are covered by the Minerals Plan).

10.2.8 The geo-conservation assessment is based upon publicly available local geological trust records.

10.3 Environmental baseline

Existing baseline

10.3.1 Baseline data has been collected from a range of sources including Ordnance Survey (OS) mapping, the BGS, Coal Authority, Oil & Gas Authority (OGA), Public Health England (PHE), MCC, GMGU, Natural England, FERA Science Ltd, Ministry of Defence, Network Rail, Petroleum Officers and APHA as well as web sources such as local geological trusts and publicly available mineral plans.

Geology

10.3.2 This section describes the underlying ground conditions within the Manchester Piccadilly Station area. Recent changes in lithostratigraphic classifications by the BGS have been incorporated where appropriate[44].

10.3.3 Table 11 provides a summary of the geology (made ground, superficial and bedrock units) underlying the land required for the Proposed Scheme in the study area.

[43] Defined in the SMR as "mineral body including aggregates, salt, coal and other hydrocarbons, Petroleum Extraction and Development Licences (PEDLs), Shale Prospective Areas (SPAs)"
[44] 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

Table 11: Summary of the geology underlying the land quality study area

Geology	Distribution	Formation description	Aquifer classification
Made ground			
Made ground	Majority of the area	Artificial ground comprising variable deposits of reworked natural and man-made materials	Not classified
Superficial			
Alluvium	Band 100m wide along the River Medlock	Organic rich clay, silt, sand and gravel	Secondary A
Glacial till	Majority of the area	Sandy silty clay with gravel	Secondary (Undifferentiated)
Areas where superficial deposits are not recorded have been identified as: 90m east of Ancoats Bridge (A665 Pin Mill Brow) to 20m west of Ancoats Bridge (A665 Pin Mill Brow); and 5m west of where the River Medlock meets North Western Street to A6 London Road and A57(M) Mancunian Way.			
Bedrock			
Chester Formation - Sherwood Sandstone Group	Underlying the entirety of the area	Sandstone	Principal

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. There is evidence of historical authorised landfilling within the study area, associated with Palmerston Street Landfill, which may comprise more substantial deposits of made ground.

10.3.5 Artificial and worked ground is shown on BGS 10k and 50k mapping detailed within Table 11. A deposition of made ground is present along the south of the route of the Proposed Scheme between Manchester Piccadilly Station and the A57(M)/A635 Mancunian Way. Made ground is also present from the south-east to the north-east of the area between the A635 Mancunian Way and Ancoats Bridge (A665 Pin Mill Brow). The made ground is associated with previously developed land within the area.

10.3.6 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 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

10.3.7 Alluvium, variably comprising clay, silt, sand and gravel, is typically present along the courses of streams and rivers. A band of alluvium is present in the study area around the River Medlock.

10.3.8 Glacial till[45] (Devensian) deposits, comprising sandy silty clay with gravel, underlie the entirety of the area from the eastern end at the A665 Midland Street to the western end at Manchester Piccadilly Station.

10.3.9 Locations where no superficial deposits are recorded have been identified as: 90m east of Ancoats Bridge (A665 Pin Mill Brow) to 20m west of Ancoats Bridge (A665 Pin Mill Brow); and 5m west of where the River Medlock meets North Western Street to the A6 London Road and the A57(M) Mancunian Way.

Bedrock geology

10.3.10 The Sherwood Sandstone Group, comprising red, yellow and brown partly pebbly sandstone, underlies the entirety of the area from the eastern end at the A665 Midland Street up to and including the existing Manchester Piccadilly Station. The specific formation of the Sherwood Sandstone Group in this area is the Chester Formation.

10.3.11 A fault is located to the north of Ardwick, running in a south-east to north-west orientation, which intersects the route of the Proposed Scheme at Baird Street.

Radon

10.3.12 Radon is a radioactive gas formed by the radioactive decay of naturally occurring uranium in rocks and soils. The occurrence of radon gas is described on PHE's UK Radon online maps[46] and the BGS radon maps[47].

10.3.13 The formal ES will include an assessment of areas where there are 5% of homes estimated to have radon levels at or above 200Bq/m3. The study area is located in a lower probability radon area where less than 1% of homes have radon levels at or above the radon action level of 200 Becquerels per cubic metre of air (Bq/m3) for residential properties.

Groundwater

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

- the Sherwood Sandstone Group, comprising the Chester Formation, is designated as a Principal Aquifer;

[45]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.
[46] UK Maps of Radon, Public Health England, www.ukradon.org/information/ukmaps
[47] British Geological Survey radon potential dataset

- the alluvium deposits are designated as a Secondary A Aquifer; and
- the glacial till deposits are designated as a Secondary (Undifferentiated) Aquifer.

10.3.15 The Environment Agency reports no groundwater abstraction licences within the study area.

10.3.16 The route of the Proposed Scheme does not pass through any Source Protection Zone (SPZ) within the study area.

10.3.17 According to MCC records, there is one private groundwater abstraction that does not require a permit registered within the study area.

10.3.18 Further information on the groundwater in the Manchester Piccadilly Station area is provided in Section 15, Water Resources and flood risk.

Surface water

10.3.19 The River Medlock is the most significant watercourse within the area and would be intersected by the route of the Proposed Scheme 200m south-west of Ancoats Bridge.

10.3.20 Surface water bodies in the Manchester Piccadilly Station area are described in more detail in Section 15, Water resources and flood risk.

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

10.3.22 No private water supplies from surface water sources have been identified within the study area.

Current and historical land use

10.3.23 Current potentially contaminative land uses within the study area include 20 industrial sites. The key potentially contaminative site identified is the existing Manchester Piccadilly Station (and car parks) and associated rail lines.

10.3.24 Historical land uses identified within the study area with the potential to have caused contamination include one landfill site and 23 industrial sites. No former mining sites have been identified within the study area. The key historical potentially contaminative sites are:

- former tanks associated with various former land use activities;
- Pin Mill Iron Forge;
- Limekiln Lane Dye Works;
- Ivy Works (shirt and blouses); and
- Iron and Brass Foundry.

10.3.25 Further details of these current and historical contaminative land uses within the study area are shown in Table 12 and Table 13.

Table 12: Current and historical landfill sites located in the study area

Name and Area Reference	Location	Description
Palmerston Street Landfill (MA08-78)	The historical landfill is located approximately 10m north-east of the route of the Proposed Scheme.	Environment Agency records indicate that the landfill (EAHLD16530) accepted both inert and industrial wastes between 1 September 1986 and 31 December 1987. The issue and surrender dates for the licence is noted as 20 August 1986 and 21 July 1988, respectively.

Table 13: Current and historical industrial sites located within the study area

Name and Area Reference	Location	Description
Depot (MA08-69 and MA08-89)	Approximately 170m west of A635 Mancunian Way (MA08-69) Approximately 50m north of Manchester Piccadilly Station. (MA08-89)	Historical depot intersects the route of the Proposed Scheme and is shown on historical mapping from 1965 to 1996. Historical depot intersects the route or the Proposed Scheme and is shown on OS historical mapping from 1985 to 1994.
Ancoats Goods Station and railway (MA08-75)	Approximately 70m south of the A635 Ashton Old Road	Historical Ancoats Goods Station and railway line intersect the route of the Proposed Scheme and are shown on historical mapping from 1889 to 1977.
Works (MA08-38 and MA08-44)	Approximately 20m south of the A635 Ashton Old Road (MA08-38) Approximately 10m south of the A635 Fairfield Street (MA08-44)	Historical works intersects the route of the Proposed Scheme and is shown on historical mapping from 1965 to 1977. Historical works intersects the route of the Proposed Scheme and is shown on historical mapping from 1988 to 1994.
Pin Mill (Cotton) (MA08-57)	Approximately 10m north of the A635 Fairfield Street	Historical Pin Mill (Cotton) intersects the route of the Proposed Scheme and is shown on historical mapping from 1889 to 1994.
Bridge Street Mill (Cotton) (MA08-66)	Approximately 10m north-west of the A635 Mancunian Way	Historical Bridge Street Mill (Cotton) intersects the route of the Proposed Scheme and is shown on historical mapping from 1889 to 1994.
Ardwick Iron Works (MA08-62)	Approximately 40m west of the A635 Mancunian Way	Historical Ardwick Iron Works intersects the route of the Proposed Scheme and is shown on historical mapping from 1881 to 1889.
London Road Station and Manchester Piccadilly station (MA08-27)	Approximately 100m north of Ardwick	The historical London Road Station and existing Manchester Piccadilly Station and associated infrastructure intersect the route; they are shown on OS historical mapping from 1848 to present

10.3.26 Contaminants commonly associated with landfill sites could include metals, semi-metals, asbestos, organic and inorganic compounds. Infilled pits could also give rise to landfill gases such as methane or carbon dioxide and leachate.

10.3.27 Contaminants commonly associated with the types of industrial sites highlighted in Table 13 could include metals, semi-metals, asbestos, organic and inorganic compounds, including fuels, oils and solvents.

Other regulatory data

10.3.28 The regulatory data reviewed included pollution incidents (major, significant and minor categories), radioactive and hazardous substances consents and environmental

permits (previously landfill, integrated pollution control and integrated pollution prevention and control licences). There are no recorded major, significant and minor incidents in the study area.

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

10.3.30 The Environment Agency reports no consented discharge to groundwater within the study area. The Environment Agency reports 42 consented discharges to surface water within the study area, nine of which are within the land required for the Proposed Scheme. Further details on the groundwater and surface water in the area can be found in Section 15, Water resources and flood risk.

10.3.31 There are no nationally significant ecological designations as defined in the land quality section of the SMR located within the study area.

Mining/mineral resources

10.3.32 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).

Minerals plans

10.3.33 MCC is responsible for the regulation of minerals and waste in the study area. The MCC Core Strategy Development Plan Document[48] was adopted in July 2012. Policy EN20 sets out aims at encouraging the efficient and sustainable use of mineral resources in order to enable MCC to plan for a steady and adequate supply of aggregates.

10.3.34 As the study area falls within the Greater Manchester area, it also adopts the policies set out in the 'Greater Manchester Joint Minerals Plan', which was adopted in April 2013. That document outlines how the boroughs within Greater Manchester can plan for minerals in a sustainable manner.

10.3.35 The MCC Core Strategy Development Plan Document indicates that Manchester does not have any active mineral workings; however, there are mineral resources within some of the other Unitary Districts of the city. No mines are recorded within the study area.

10.3.36 The land required for the Proposed Scheme would not intersect any mineral safeguarding areas (MSA) in the study area.

Sand and gravel deposits

10.3.37 Sands and gravels are recorded within the study area but these are not recorded as mining and mineral resources in the area.

[48] The MCC Core Strategy Development Plan, http://www.manchester.gov.uk/downloads/download/4964/core_strategy_development_plan

Coal mining

10.3.38 Shallow coal (located at less than 50m in depth) is not recorded as a resource in the study area. Deep coal (located between 50m and 1,200m in depth) is recorded as a resource in the study area. Available records from the Coal Authority show that the route of the Proposed Scheme would not pass through areas of recorded historical underground coal mining activities. Unconventional gas resources are recorded in the Mineral Plan as mineral resources in the area, although no extractions are known to be present.

Geo-conservation resources

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

Receptors

10.3.40 The sensitive receptors that have been identified within the study area are summarised in Table 14. A definition of receptor sensitivity is given in the SMR.

Table 14: Summary of sensitive receptors

Issue	Receptor type	Receptor description	Receptor sensitivity
Land contamination	People	Residents of and visitors to nearby surrounding properties	High
		Workers at and visitors to nearby commercial properties	Moderate
	Groundwater	Principal bedrock aquifers	High
		Secondary A superficial aquifers	Moderate
		Secondary (Undifferentiated) superficial aquifers	Low
	Surface waters	River Medlock Various unnamed streams, tributaries, drains and ponds	Moderate
	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	Medium

10.4 Effects arising during construction

Avoidance and mitigation measures

10.4.1 The construction assessment takes into account the mitigation measures described in the draft Code of Construction Practice (CoCP)[49]. The draft CoCP sets out the measures and standards of work that would be applied to the construction of the land

[49] Supporting document: Draft Code of Construction Practice

required for the Proposed Scheme and includes requirements to ensure the effective management and control of work in contaminated areas.

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

- methods to control noise, waste, dust, odour, gases and vapours (Sections 5, 7, 13 and 15);
- methods to control spillage and prevent contamination of adjacent areas (Sections 5, 11 and 16);
- the management of human exposure for both construction workers and people living and working nearby (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 (Sections 5, 11 and 16);
- traffic management to ensure that there is a network of designated site haul routes to reduce compaction/degradation of soils (Sections 5, 6 and 14);
- methods to monitor and manage flood risk and other extreme weather events which may affect land quality during construction (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[50] and British Standards BS10175[51] and BS8576[52] and Construction Industry Research and Information Association (CIRIA) SP32[53].

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

[50] Environment Agency, (2004), *CLR11 Model Procedures for the Management of Land Contamination*
[51] British Standard, (2011), *BS10175+A1:2013 Investigation of Potentially Contaminated Sites*
[52] British Standard, (2013) *BS8576 Guidance on investigations for ground gas – Permanent gases and Volatile Organic Compounds (VOCs)*
[53] CIRIA (1983) SP32 Construction over abandoned mine workings

analysis that considers environmental, resource, social and economic factors in line with the framework set out by the Sustainable Remediation Forum UK[54]. The preferred option would then be developed into a remediation strategy.

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

Assessment of impacts and effects

10.4.6 Construction of the Proposed Scheme in this area would require earthworks, utility diversions, deep foundations, grouting, ground stabilisation and other activities, including the construction of the various viaducts and road infrastructure works. These aspects of the Proposed Scheme, along with other construction features, are shown on the Map Series CT-05 in the Volume 2: MA08 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 15. The potential impacts and baseline risks quoted are those before any mitigation is applied. The assessed

[54] Sustainable Remediation Forum UK, (2010), *A Framework for Assessing the Sustainability of Soil and Groundwater Remediation*

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 15: Summary of baseline CSM for sites which may pose a contaminative risk for the Proposed Scheme

Area reference[55]	**Area name**	**Human health risk**	**Ground water risk**	**Surface water risk**	**Ecosystem risk**	**Buildings risk**
On-site[56]						
MA08-74	Timber Yard	Low to moderate/low	Moderate	Moderate/low	N/A[57]	Moderate/low
MA08-89 MA08-69 MA08-76	Depots	Low to moderate	Moderate	Moderate	N/A	Very low
MA08-48, MA08-103, MA08-110, MA08-21, MA08-90, MA08-33, MA08-98, MA08-42, MA08-49, MA08-45, MA08-38, MA08-44, MA08-30, MA08-29, MA08-58, MA08-55, MA08-56, MA08-46	Smithy Phoenix Works Packing Case Manufacturer Works Unbreakable Pulley Works Ardwick Mill	Low to moderate	Moderate	Moderate	N/A	Low
MA08-54 MA08-59	Garage	Moderate/low	Moderate/low	Moderate/low	N/A	Moderate/low
MA08-61 MA08-62	Pin Mill Iron Forge Ardwick Iron Works	Moderate	Moderate	Moderate	N/A	Moderate
MA08-121	Tin Works	Moderate	Moderate	Moderate	N/A	Moderate
MA08-81	Printing Works	Moderate/low	Moderate	Moderate/low	N/A	Moderate/low
MA08-27 MA08-75	Manchester Piccadilly Station	Moderate	Low	Moderate	N/A	Moderate

[55] Each potentially contaminated site is allocated a unique reference number
[56] 'On site' is within the area of land required for construction of the Proposed Scheme
[57] N/A – no ecosystem receptor identified

Area reference[55]	Area name	Human health risk	Ground water risk	Surface water risk	Ecosystem risk	Buildings risk
MA08-85	Ancoats Goods Station Tramway					
MA08-66 MA08-57 MA08-72 MA08-31 MA08-41	Bridge Street Mill Pin Mill (Cotton) Sandy Nook Mill Marlborough Mills Neptune Works	Moderate/low	Moderate	Moderate/low	N/A	Moderate/low
MA08-40 MA08-108	Timber Yard and Ardwick Saw Mill	Moderate/low	Moderate	Moderate/low	N/A	Moderate/low
MA08-97 MA08-100	Warehouse	Moderate/low	Moderate	Moderate	N/A	Moderate/low
Off-site[58]						
MA08-86 MA08-15 MA08-13 MA08-03	Cotton Mill Ardwick Bridge Chemical Works (disused) Rubber and Plastics Works Paint and Varnish Works	Very low to moderate/low	Moderate	Moderate/low	N/A	Low
MA08-60	Engineering Works	Low	Moderate	N/A	N/A	Low
MA08-102 MA08-18	Tanks	Moderate	Moderate	Moderate	N/A	Moderate
MA08-37	Iron Works	Moderate/low	Moderate/low	Moderate/low	N/A	Moderate/low
MA08-78	Palmerston Street Landfill	Low to moderate/low	Moderate/low	Low	N/A	Low to very low
MA08-115 MA08-119	Phoenix Works Mill Lead and Patent Pipe Manufactory	Moderate/low	Moderate/low	Moderate/low	N/A	Moderate/low
MA08-22	Ardwick Tannery	Low	Moderate	Low	N/A	Low
MA08-77 MA08-43 MA08-126	Ardwick Dye Works Mayfield Works Cotton Mill	Moderate/low	Moderate	Moderate/low	N/A	Moderate/low

[58] 'Off site' is beyond the land required for construction of the proposed scheme but within 250m of it

Area reference[55]	Area name	Human health risk	Ground water risk	Surface water risk	Ecosystem risk	Buildings risk
MA08-32 MA08-34 MA08-25 MA08-17 MA08-123 MA08-19 MA08-92 MA08-101 MA08-39 MA08-122 MA08-67 MA08-80	Hanover Mill Cotton Mills Dye Works/Rubber Works Dye Works Clothing Factory Medlock Works Piccadilly Mill Cloth Finishing Works Clothing Factory					
MA08-47 MA08-71 MA08-64	Timber Yard	Moderate/low	Moderate	Moderate/low	N/A	Moderate/low

Temporary effects

10.4.11 In order to identify potential temporary effects, the baseline and construction CSM have been compared to determine the change in level of risk at receptors during the construction stage, and thus to define the level of effect at the construction stage.

10.4.12 Where there is no change between the main baseline risk and the main construction risk, the temporary effect significance is deemed to be negligible even if the risk is deemed to be high. For example, this would be the case where the construction of the Proposed Scheme does not alter the risks from an existing potentially contaminated site that is outside the area required for construction.

10.4.13 A worsening risk at construction stage compared to baseline would result in a negative effect, and conversely, an improvement would result in a positive effect. The assessment assumes that contamination would be controlled through the general measures in the draft CoCP.

10.4.14 All of the sites set out in Table 15 have been assessed for the change in impact associated with the construction stage of the work and were found to have non-significant effects.

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

10.4.16 Construction compounds located in this study area 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

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

10.4.18 The magnitude of the permanent effects and their significance have been determined by assessing the change in risk between the main baseline risk and the main post-construction risk. Therefore, where there is no change between the main baseline risk and the main post-construction risk, the permanent effect significance is deemed to be negligible even if the risk is assessed to remain as high. This would be the case where the construction of the Proposed Scheme does not alter the risks from an existing potentially contaminated site that is outside the construction boundary. As noted above, a worsening would result in negative effects and an improvement would result in positive effects.

10.4.19 All of the sites set out in Table 15 have been assessed for the change in impact associated with the construction stage of the work and were found to have non-significant (neutral or minor beneficial) effects.

Mining/mineral resources

10.4.20 Construction of the Proposed Scheme has the potential to affect existing mineral resources and proposed areas of mineral exploitation. This could occur by sterilisation of the resource through direct excavation during construction of the Proposed Scheme or through temporary and/or permanent severance[59] or isolation that may occur during the construction phase of the Proposed Scheme, possibly continuing through to its operation.

10.4.21 The land required for the Proposed Scheme would not pass over any mining, mineral resource area or MSA in the Manchester Piccadilly Station area.

Temporary effects

10.4.22 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.

10.4.23 The following compounds fall within the study area:

- Manchester Piccadilly Station main compound;
- Manchester Approach viaduct satellite compound A;
- Manchester Approach viaduct satellite compound B;

[59] 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

- Manchester Approach viaduct satellite compound C; and
- Manchester Approach viaduct satellite compound D.

Permanent effects

10.4.24 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.

10.4.25 There would be negligible effects on mining, which are not significant.

Geo-conservation sites

10.4.26 No geo-conservation areas such as SSSI or LGS are present in the study area.

Other mitigation measures

10.4.27 At this stage, no additional measures are considered necessary to mitigate risks from land contamination during the construction stage beyond those that are set out in the draft CoCP and/or instigated as part of the site specific remediation strategies that would be developed at the detailed design stage if required. These measures would ensure that risks to people and property from contaminants in the ground would be controlled such that they would not be significant. For example, measures might include excavation and treatment of contaminated soils or controls to manage movement of landfill gas and leachate.

10.4.28 Mitigation of the effects on mineral resources within the study area could include extraction of the resource in landscaping areas within the Proposed Scheme adjacent to, rather than beneath the structural footprint, which would require good founding conditions. A plan would be discussed in advance of the construction works with the landowner, the mineral planning department 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

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

10.5 Effects arising from operation

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

Avoidance and mitigation measures

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

Assessment of impacts and effects

10.5.3 The Proposed Scheme within this area would include one auto-transformer station, located east of the A665 Chancellor Lane. 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 Manchester Piccadilly Station 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 Manchester City Council (MCC) 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 MCC.

11.1.4 The Volume 2: MA08 Map Book shows the locations of key environmental features (Map Series CT-10) and the key construction (Map Series CT-05) and operational (Map Series CT-06) features of the Proposed Scheme. It also shows the locations of landscape and visual impact mitigation measures (Map Series CT-06) and viewpoints that would potentially be significantly affected at the construction (Map Series LV-03) and operation (Map Series LV-04) phases and Landscape Character Areas (LCA) that would potentially be significantly affected at the construction and operation phases (Map Series LV-02).

11.1.5 A separate, but related, assessment of effects on the setting of heritage assets is reported in Section 9, Historic environment.

11.2 Scope, assumptions and limitations

11.2.1 The scope, key assumptions and limitations for the landscape and visual assessment are set out in full in Volume 1 (Section 8) and the Scope and Methodology Report (SMR)[60].

11.2.2 Summer surveys for the landscape and visual assessment were undertaken from July 2017 and winter surveys were undertaken in February 2018 to inform the assessment. Further surveys will be undertaken to inform the assessment and will be reported in the formal ES. At this stage it has not been possible to complete surveys of all publicly accessible land in this area; therefore, for the working draft ES an assumption has been made about the level of sensitivity and magnitude of change on a case by case

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

basis. This will be adjusted, as appropriate, on the basis of survey results to inform the formal ES.

11.2.3 The extent of the study area has been informed by construction and operational phase zones of theoretical visibility (ZTV). The ZTV have been produced in line with the methodology described in the SMR and are an indication of the theoretical visibility of the Proposed Scheme.

11.2.4 Tall construction plant (for example cranes and piling rigs) is excluded from the ZTV for the construction phase, as there is a great degree of variability in the extent and timeframes of the visibility of construction activity and plant. Overhead line equipment rarely gives rise to significant effects if it is the only element visible and has, therefore, been excluded from the ZTV to give a better indication of the possible spread of significant effects to aid the assessment.

11.2.5 Landscape and visual receptors within approximately 1.5km of the Proposed Scheme have been assessed as part of the study area. Tall buildings, viaducts, embankments, variations in local topography and the tight urban grain limit long-distance views across the area.

11.2.6 This assessment is based on preliminary design information and makes reasonable worst-case assumptions on the nature of potentially significant effects where these can be substantiated. It is based on information known at present. The assessment of visual effects during construction covers the situation in winter at peak activity. The assessment of operational visual effects covers the situation in winter and summer of year 1 and summer of year 15. The assessment of landscape effects is undertaken for the construction phase and for the operational phase at both year 1 and year 15. The landscape assessment does not consider seasonal variations e.g. winter/summer, since these do not affect character. Likely significant landscape and visual effects for year 30 will be reported in the formal ES.

11.2.7 The assessment has been carried out on the basis that new structures and surrounding public realm associated with the Proposed Scheme will be subject to a high quality architectural and landscape design.

11.2.8 The assessment has been carried out on the basis that design of structures would, insofar as reasonably practicable, integrate with existing skyline features and would make use of a simple, clean and coherent palette of materials to help structures fit in the landscape.

11.2.9 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 covers central Manchester, including the city centre and its fringes to the south and east. The city centre has developed on a spur of higher ground within an area with a varying natural terrain – a result of the influence of the Irwell, Medlock and Irk rivers. These gradual level changes are, however, largely masked by the overlying built form. Two canals cross the study area on a broadly east to west-axis; the Rochdale Canal and the Ashton Canal.

11.3.2 The street pattern in the centre of the city, west of the existing Manchester Piccadilly Station, is Georgian and Victorian in origin, much of it is laid out on a rectilinear grid. This has shaped the existing built form and results in an easy to navigate arrangement of streets. The pattern changes east of Manchester Piccadilly Station and around the former Mayfield Station, where the canals, the River Medlock and railway viaducts cut across the area and the arrangement of streets becomes less regular, with larger blocks of built form. The canals, river and viaducts all contribute to poorer permeability in this part of the city.

11.3.3 The history of Manchester as an economic and industrial powerhouse of the Industrial Revolution is demonstrated by the large number of buildings of high architectural interest and importance, such as Manchester Town Hall (Alfred Waterhouse, 1877) in the city centre, and the London Road Fire Station (Woodhouse, Willoughby and Langham, 1906), south-west of Manchester Piccadilly Station. Much of the study area is in conservation area.

11.3.4 Manchester city centre is a dense mix of retail, hotel, leisure and office uses, together with new residential development and 19th century former industrial buildings converted to residential use. The city centre pavements and public spaces are crowded and busy at all times of day. Neighbourhoods such as New Islington, the Northern Quarter and China Town have a lively, eclectic character deriving from the mixture of uses and the high levels of activity generated by cafes, bars and restaurants. The character of the area immediately around the existing Manchester Piccadilly Station and in the area to the north and east is dominated by the train shed and viaduct, by the disused Mayfield station and the busy A665 Great Ancoats Street and B6469 Fairfield Street. Here, the environment is less hospitable to pedestrians and cyclists, with narrow footways and fast traffic. The B6469 Fairfield Street and Travis Street both pass under the Manchester Piccadilly Station in long, dark tunnels which are uninviting for pedestrians.

11.3.5 There is little public open space in the centre of the city, but Piccadilly Gardens and St Peter's Square are examples of well-used public realm, where open space and transport infrastructure have been successfully integrated. Cotton Fields Park, a new mixed-use development north of the station and the Medlock Valley Park to the east contribute to green infrastructure in the area, though the Medlock Valley Park is not well-used currently.

11.3.6 Buildings in Manchester city centre mainly date from the 19th century onwards and are of varying heights, typically between four and eight storeys, though there are some taller buildings. The area around Piccadilly has been extensively redeveloped since the 1960s and buildings here range in height from single storey buildings to high rise blocks. The density and scale of built form is high in the city centre, becoming generally lower north and east of Manchester Piccadilly Station, where there are areas of single storey buildings and empty plots awaiting development. The station is an amalgam of the original 19th century train shed, including its vaulted roof, and modern buildings (dating from the mid to late 20th century). The station platforms are elevated above the A6 London Road and Store Street, but the train shed is largely screened from the south and west by the surrounding taller, modern buildings. It has a greater presence in the streetscape to the north and east where buildings are lower.

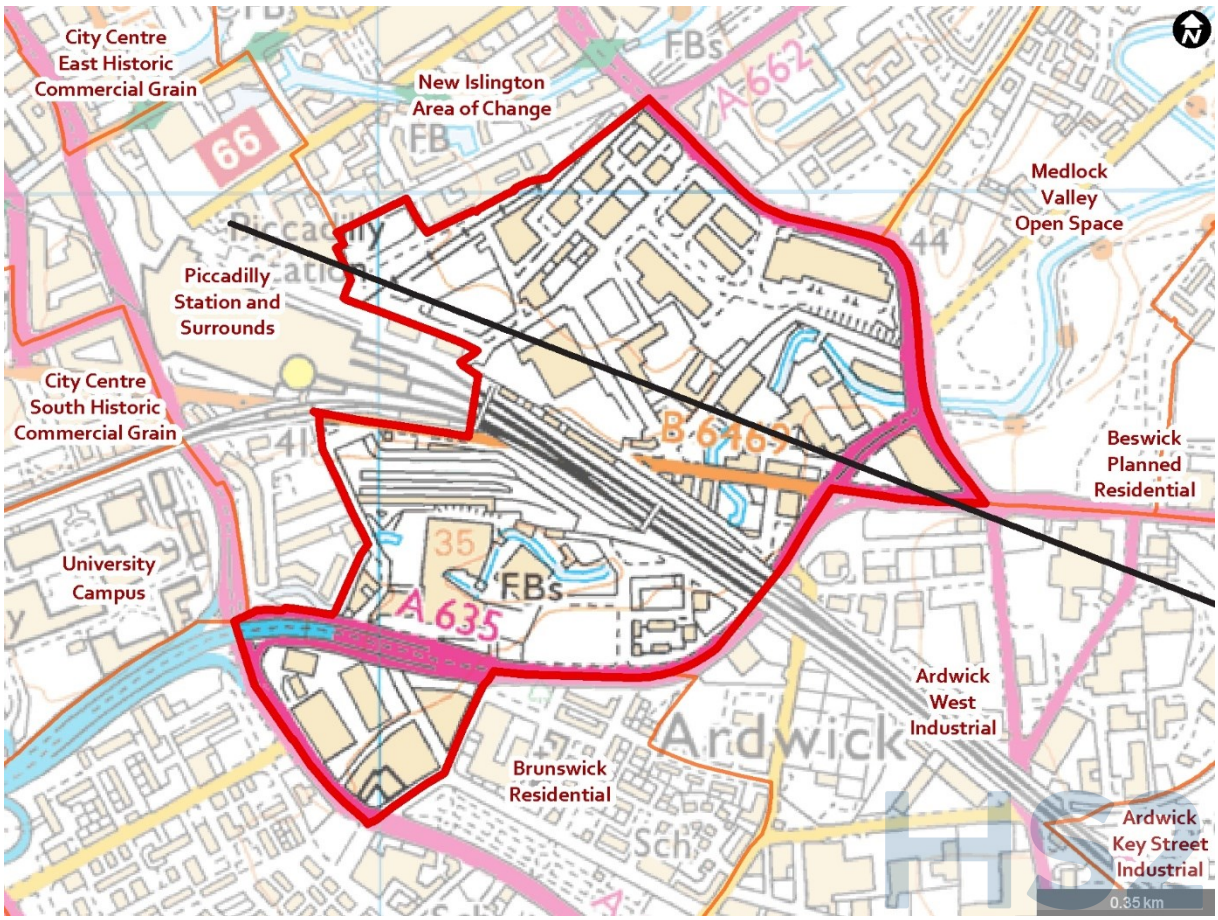
11.3.7 LCAs have been determined as part of an integrated process of environmental characterisation, informed by a review of historic landscape mapping and the outcome from other topics including ecological assessments. These LCAs will be refined, as appropriate, upon review of available historic landscape 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 geographical information system (GIS) data, aerial photography and Ordnance Survey mapping, plus desk study and fieldwork. Landscape character assessments reviewed include the relevant National Landscape Character Areas[61] and the Local Development Framework: Strategic Level City-Wide Urban Characterisation for Core Strategy[62].These published LCAs have been adapted for this assessment to provide LCAs of an appropriate and consistent scale. Minor amendments have also been made to some published LCA boundaries to reflect existing conditions.

11.3.8 For the purposes of this assessment, the study area has been subdivided into 10 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. Eight of the 10 LCAs would not be significantly affected by the Proposed Scheme on account of the dense urban form, tall buildings and variable topography of the study area which would contain landscape effects to a relatively small area around the site of the Proposed Scheme. A summary of the remaining two LCAs that would be significantly affected within the Manchester Piccadilly Station area is provided in Table 16.

[61] Natural England (2013, 2014), *National Character Area profiles*. Available online at: https://www.gov.uk/government/publications/national-character-area-profiles-data-for-local-decision-making/national-character-area-profiles
[62] Manchester City Council (2010), *strategic level city-wide urban characterisation for core strategy* Available online at: http://www.manchester.gov.uk/download/downloads/id/15520/strategic_level_city-wide_urban_characterisation_for_core_strategy.pdf

Table 16: Summary of Significantly Affected LCAs

Piccadilly East Industrial



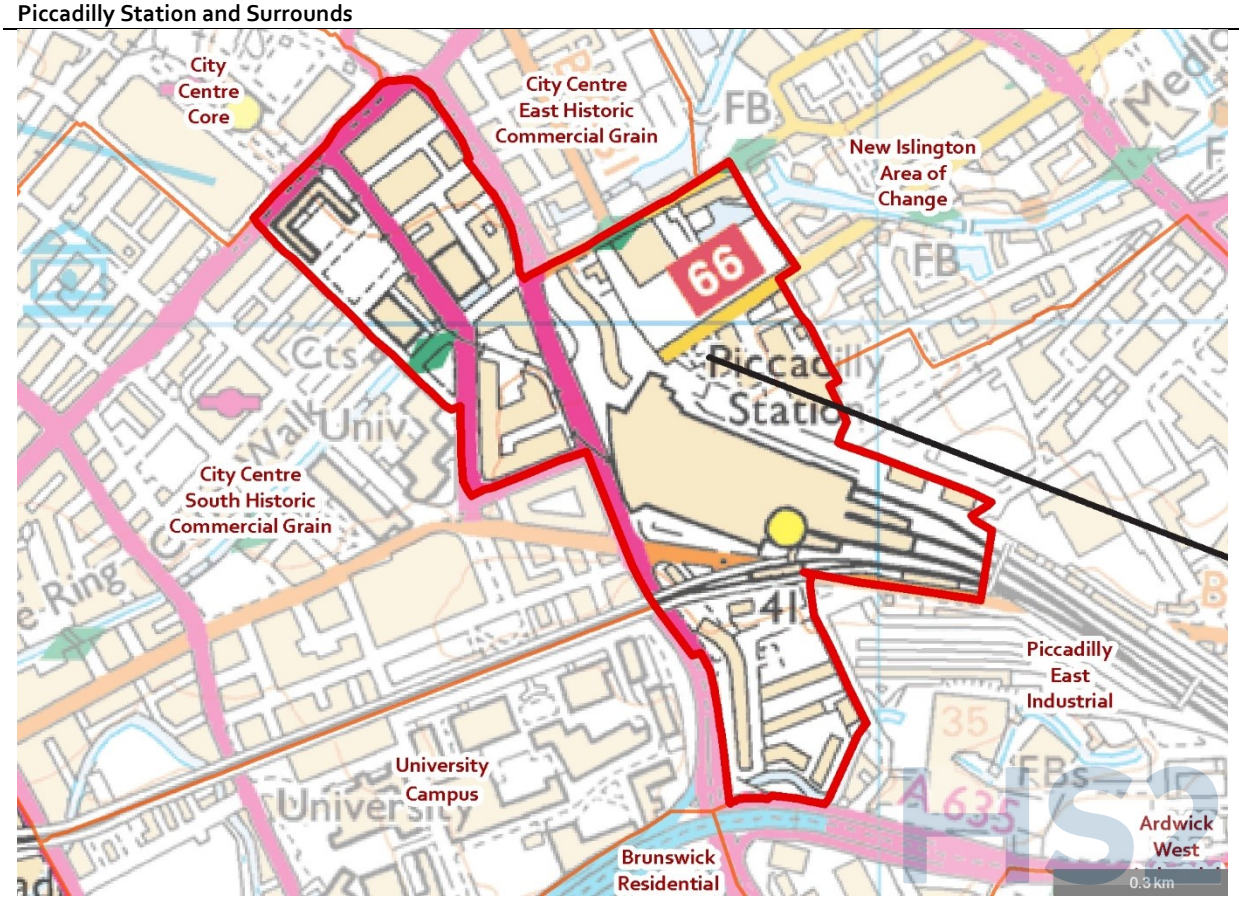
A57(M) Mancunian Way

Adair Street

The Piccadilly East Industrial LCA is located on the fringe of the city centre, to the east of Manchester Piccadilly Station. It is characterised by busy transport infrastructure, including: the existing Manchester Piccadilly Station and former Mayfield Station; railway lines on viaduct and arterial roads such as the A57(M) Mancunian Way; and by industrial and commercial development. The stations, viaducts and roads have shaped the urban form. Street patterns tend to be irregular, permeability is low and away from the main roads, there is little through traffic. The buildings within the LCA are principally mid to late 20th century, low-rise brick and metal sheds occupied by warehousing and distribution centres, with some surviving examples of earlier 19th century mills concentrated along the River Medlock in the south. The river, being surrounded by built development and heavily canalised, is largely unseen from much of the LCA and has little influence on its wider character. The high quality Victorian brickwork of the viaducts and arches add a positive element to the overall historic character of the area, which has experienced a high degree of change since the 19th century, due to demolition and redevelopment. Vacant plots of previously developed land used for car parking are detracting elements within the urban landscape. Away from the stations, the area has a weak sense of place. The A57(M) Mancunian Way to the south and the A665 Great Ancoats Street/Pin Mill Brow to the north and north-east are traffic-dominated routes that create barriers to movement, reduce tranquillity and result in poor quality pedestrian environments. Some areas away from the busier thoroughfares feel isolated and lacking in activity, particularly outside business hours. The only notable designations are two Grade II listed buildings – Drill Hall and the Star and Garter public house. The cycle path running along the A635 Ashton Old Road, is the only outdoor recreational resource of note.

The overall value of this LCA is low based on its weak sense of place, the high proportion of utilitarian buildings and low recreational value.

Piccadilly Station and Surrounds



Sheffield Street

A6 London Road

The Piccadilly Station and Surrounds LCA is on the southern side of the city centre. Manchester Piccadilly Station is one of the principal rail interchanges in the city and its presence has influenced the development of the area and gives the LCA its distinctive appearance and busy, inner city character. The extensive rail infrastructure dates principally from the 19th century and a number of the structures are Grade II listed, including the train shed, the Former Goods Office, the Manchester South Junction and Altrincham Railway Viaduct and the London Warehouse. The high roof of the train shed, the Victorian brickwork of the station and viaducts and the classical detailing of the Fairfield Street entrance to the station, are positive elements in the overall historic character of the area, especially around the B6469 Fairfield Street/A6 London Road junction. Other listed buildings in the LCA include the City Police Courts (Grade II*) whose clock tower is a landmark in views north-west from the station approach. Modern steel and glass-clad blocks in the area, such as Gateway House and Piccadilly Place, lack the distinctiveness of the adjacent 19th century listed buildings and do not relate to them in terms of character or appearance. The station and viaduct and the undulating underlying local landform create marked level changes in the area. This is particularly noticeable on Store Street and the A6 London Road, which are substantially lower than the station and the station approach ramp. The large-scale buildings in the LCA restrict views of the station, reducing its presence within the cityscape, especially from the south and west. The principal land uses are commercial, together with transport infrastructure, including the station, the Metrolink tram, and highways. A large empty plot on Store Street, currently used for parking, is awaiting redevelopment, and construction activity is ongoing in the area.

A short length of the Cheshire Ring Canal Walk passes through the LCA via Auburn Street and the Ashton Canal. The station and traffic dominated arterial roads are a barrier to north-south movement and contribute to a poor-quality pedestrian environment. Street furniture and transport related structures in London Road and Fairfield Street, including the Metrolink overhead line equipment, road signs and bollards are visually detracting and contribute to a cluttered streetscape.

The overall value of this LCA is medium based on the 19th century station, the detracting influence of the roads, the lack of buildings with distinctive character and the vacant land used for parking.

Visual baseline

11.3.9 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: MA08 Map Book, Map Series LV-03 and LV-04). In each case, the middle number (xxx.**xx**.xxx) identifies the type of receptor that is present in this area – 1: Protected views (none within this area), 2: Residential, 3: Recreational[63], 4: Transport, 5: Hotels/healthcare/education and 6: Employment.

11.3.10 Manchester Piccadilly Station is visible from a number of residential areas within the study area including: Wharf Close, Chapeltown Street and Sparkle Street (all north of the station); Piccadilly Village; A665 Great Ancoats Street (to the north-east); and Brunswick and Ardwick (both south-east of the station). Due to the densely built-up nature of most of the study area, views experienced by residents are typically restricted by intervening buildings and the varied street orientation. However, from locations close to Manchester Piccadilly Station, less restricted views are possible over areas of open land and canal corridors.

11.3.11 There are open views of the station from a range of recreational routes north and north-east of the study area, including the Cheshire Ring Canal Walk and Medlock Valley Way (Sustrans Route 86) along the Ashton Canal, footpaths along the Rochdale Canal and Sustrans Route 66, which runs along Store Street and Old Mill Street. Views from the canal corridors are generally restricted by the dense arrangement of canalside buildings. More open views are, however, available from the Store Street Aqueduct, with elevated views of the station roof and eastern façade. Views from within the Medlock Valley to the east are generally restricted by intervening dense vegetation including mature tree planting.

11.3.12 Views from the road network around the station are limited by intervening buildings and the station is mainly visible from local roads around the station.

11.3.13 The station is visible in narrow, partially screened views from hotels in Ducie Street.

11.3.14 There are no designated or 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

[63] 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

be mitigated. Such effects are temporary and would vary over the construction period depending on the intensity and scale of the works at the time. The assessment of landscape and visual effects has been based on the activities occurring during the peak construction phase, which is defined as the period during which the main construction works would take place, including the presence of compounds, main earthworks and structure works.

11.4.2 The effects associated with the peak construction stage in this area are generally considered to be medium-term, based on the indicative construction programme in Section 2.3. It is currently anticipated that the civil engineering in this area would be undertaken between the start of 2025 and mid-2030. Effects during other stages of works are likely to be less intensive due a reduced level 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)[64] 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[65];
- use of well-maintained hoardings and fencing;
- prevention of damage to the landscape features adjacent to the construction sites due to movement of construction vehicles;
- designing lighting to avoid unnecessary intrusion onto adjacent buildings and other land uses; and
- replacement of any trees intended to be retained which may die as a consequence of nearby construction works.

11.4.5 Implementation of these measures has been taken into account in the assessment of the construction effects.

Assessment of temporary impacts and effects

11.4.6 The most apparent changes to the landscape and to the views experienced by visual receptors during construction would relate to the presence of construction plant, compounds and material storage and stockpiling. Key construction activities that would give rise to the most apparent changes to landscape and visual receptors are: the demolition of existing commercial buildings, the presence of construction

[64] Supporting document: Draft Code of Construction Practice
[65] BS 5837:2012 Trees in relation to design, demolition and construction – Recommendations, 2012, British Standard

compounds and the construction of Manchester Piccadilly High Speed Station and approach.

Landscape assessment

11.4.7 Based on the current design it is anticipated that the LCAs set out in Table 17 would be significantly affected during construction of the Proposed Scheme.

Table 17: Summary description and assessment of effect on LCAs

Piccadilly East Industrial	**Medium-low susceptibility and low-medium sensitivity**
Susceptibility to change: The LCA's existing large-scale infrastructure, industrial uses, extensive redevelopment, vacant land, busy roads and high degree of severance impart a low susceptibility to change arising from the Proposed Scheme. The Piccadilly East Industrial LCA would be directly affected by the introduction of large-scale construction activities and elements associated with the Proposed Scheme, including the demolition of buildings and the construction of the Piccadilly viaduct, the eastern end of Manchester Piccadilly High Speed station, New Sheffield Street and three car parks (one between the new and existing viaducts and two north of the proposed station). The presence of the Manchester Piccadilly High Speed Station main compound would reduce north-south connectivity. Construction would be seen in the context of the existing industrial and infrastructure uses of the area, but scale and prominence of the works, including the demolition of buildings and the main and satellite compounds would noticeably alter landscape character. There would therefore be an overall medium magnitude of change and moderate adverse effect.	Level of effect: Moderate adverse (significant)
Piccadilly Station and Surrounds	**Medium susceptibility and low-medium sensitivity**
Susceptibility to change: The LCA's existing busy, inner city character, the large scale and historic value of Manchester Piccadilly Station and viaduct, and the high degree of severance in the area, impart a medium susceptibility to change arising from the Proposed Scheme. The Piccadilly Station and Surrounds LCA would be directly affected by the introduction of large-scale construction activities and elements associated with the Proposed Scheme, including the demolition of buildings and the construction of Manchester Piccadilly High Speed station and New Sheffield Street, the demolition of existing buildings and the main compound and satellite compounds. Construction of the Proposed Scheme would occupy the eastern end of the LCA, but its large scale means that effects would be experienced over the whole area. The presence of the Manchester Piccadilly High Speed Station main compound would reduce north-south connectivity. Construction would be seen in the context of the existing industrial and infrastructure of the area, but the scale and prominence of the works, including the demolition of buildings and the main compound would noticeably alter landscape character. There would therefore be an overall medium magnitude of change and moderate adverse effect.	Level of effect: Moderate, adverse (significant)

Visual assessment

Introduction

11.4.8 The following section describes the likely significant effects on visual receptors during construction. The construction assessment has been undertaken for the winter period, in line with best practice guidance, to ensure a robust assessment. However, in some

cases, visibility of construction activities may be reduced during summer when vegetation, if present in a view, would be in leaf.

11.4.9 Where a viewpoint represents multiple types of receptor, the assessment is based on the most sensitive receptors. Effects on other receptor types with lower sensitivity would be lower than those reported.

11.4.10 Night-time surveys will be undertaken to inform the assessment in the formal ES. Potential visual impacts arising from additional lighting at night during construction within the area may arise from continuous working and/or overnight working. Assessment of these effects will be reported in the formal ES on completion of the night time assessment. Table 18 describes the construction phase potentially significant visual effects based on the current design of the Proposed Scheme. Viewpoint locations are shown in Map Series LV-03 in the Volume 2: MA08 Map Book.

Table 18: Construction phase potentially significant visual effects

Views from the A665 Pin Mill Brow, other local roads and National Cycle Route 86 in the Medlock Valley (VP 341.03.005) **Map reference: LV-03-341b**	**Medium-high and medium sensitivity receptors**
Pedestrians and cyclists would have clear and close or middle-distance sequential views of the construction of the Piccadilly viaduct, the Piccadilly viaduct satellite compounds and the highways works on the A665 Pin Mill Brow. The demolition of buildings to facilitate construction of the Proposed Scheme would open-up views towards the existing Manchester Piccadilly viaduct and construction works would be prominent on the skyline. There would therefore be an overall medium magnitude of change and moderate adverse effect.	Level of effect: Moderate adverse (significant)
Views from the Medlock Valley Way, the Store Street aqueduct, residences on Jutland Street and Ducie Street, hotels on Ducie Street and Store Street - National Cycle Route 66 (VPs 342.03.011, 342.02.013, 342.03.015, 342.03.012) **Map reference: LV-03-342**	**High and medium sensitivity receptors**
Walkers along the canal towpath, residents and hotel guests in Ducie Street, Store Street and Jutland Street and pedestrians and cyclists on Store Street would have clear, elevated views of the Manchester Piccadilly High Speed Station main compound and construction traffic using Store Street. The construction of the Manchester Piccadilly High Speed station and associated infrastructure would be visible beyond the Manchester Piccadilly High Speed Station main compound. The demolition of buildings to facilitate construction of the Proposed Scheme would open-up views towards the existing Manchester Piccadilly Station. The construction works would be prominent in views, changing their historic character and the skyline. There would therefore be an overall high magnitude of change and major adverse effect.	Level of effect: Major adverse (significant)
Views from residences in Chapeltown Street, Sparkle Street, the Thomas Telford Basin within Piccadilly Village, and users of Metrolink (VPs 342.02.009 and 342.04.008) **Map reference: LV-03-342**	**High and medium sensitivity receptors**
Residents would have clear and close views of the construction of the Piccadilly viaduct, Manchester Piccadilly High Speed station and associated infrastructure. The Manchester Piccadilly High Speed Station main construction compound would be prominent in foreground views and the construction of the station and viaduct would change the skyline, screening current views of the existing station. The construction works would result in a substantial change to residents' views. There would therefore be an overall high magnitude of change and major adverse effect.	Level of effect: Major adverse (significant)

Views residences off and along Great Ancoats Street, including Great Street, Every Street, and Adair Street (VPs 342.02.007, 342.02.003, 342.02.001, and 342.02.004) **Map reference: LV-03-342**	**High sensitivity receptors**
Most residents would have partially screened mid-distance views of the construction of the Piccadilly viaduct and the Manchester Piccadilly High Speed station, beyond the Manchester Piccadilly High Speed Station main compound. Residents in upper floors of buildings however, would experience open, mid-distance views of construction activity above intervening buildings. The construction works on the station and viaduct would change the skyline, screening existing views of the existing station. The works would result in a noticeable change to residents' views. There would therefore be an overall medium magnitude of change and moderate adverse effect.	Level of effect: Moderate, adverse (significant)

Other mitigation measures

11.4.11 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

11.4.12 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 residents, pedestrians and road users within the study area.

11.4.13 The significant effects that would remain after implementation of construction phase mitigation are summarised below:

- moderate adverse effects in relation to two landscape character areas;
- major adverse effects in relation to two residential viewpoint locations;
- major adverse effects in relation to three recreational viewpoint locations;
- major adverse effects in relation to one transport viewpoint location;
- moderate adverse effects in relation to four residential viewpoint locations; and
- moderate adverse effects in relation to three recreational viewpoint locations.

11.5 Permanent effects arising from operation

11.5.1 The permanent features of the Proposed Scheme that have been taken into account in determining the effects arising during operation on landscape and visual receptors are presented in Section 2.2 of this report.

Avoidance and mitigation measures

11.5.2 The operational assessment of impacts and effects is based on year 1 (2033) and year 15 (2048) of the Proposed Scheme, with Year 30 (2063) to be reported in the formal ES. A process of iterative design and assessment has been employed, and is ongoing, to avoid or reduce adverse effects during the operation of the Proposed Scheme. Those measures that are adopted will be reported in the formal ES.

11.5.3 Measures currently being considered, but which are not yet part of the design and will be informed by engagement with relevant stakeholders, include:

- design of structures to integrate as far as possible with existing skyline features and making use of a simple, clean and coherent palette of materials to help structures fit in the landscape, plus rationalisation of operation and security fencing and integration of the same with new planting, insofar as reasonably practicable; and
- use of high quality contemporary materials for all areas of new public realm and new buildings and structures associated with the Proposed Scheme, including Manchester Piccadilly Station forecourt and New Sheffield Street Boulevard, taking account of, and make reference to, the local context and vocabulary in terms of colour, texture and pattern.

11.5.4 The permanent effects of the Proposed Scheme on landscape and visual receptors would be reduced through integration of the measures described in this section.

Assessment of impacts and effects

11.5.5 The likely effects on landscape and visual receptors during operation of the Proposed Scheme relate to the presence of new structures and elements in the landscape including the presence of the Piccadilly viaduct, the Manchester Piccadilly High Speed station and associated infrastructure and New Sheffield Street and public realm.

Landscape assessment

11.5.6 Based on the current design, it is currently anticipated that the LCAs described in Table 19 would be significantly affected during operation of the Proposed Scheme.

Table 19: Operational phase significant landscape effects

Piccadilly East Industrial	**Low susceptibility and low sensitivity**
Susceptibility to change: The LCA's existing large-scale infrastructure, industrial uses, extensive redevelopment, vacant land, busy roads and high degree of severance impart a low susceptibility to change arising from the Proposed Scheme. **Year 1 winter and summer:** The LCA would be directly affected by the introduction of new features into the landscape including the Piccadilly viaduct, the eastern end of Manchester Piccadilly High Speed station, three new multi-storey car parks (two north of the new station and one between the new and existing viaducts) and the eastern end of the new public realm along New Sheffield Street. The Proposed Scheme would mainly affect the northern part of the character area as the southern part would be screened by the existing Manchester Piccadilly Station and viaduct. The Piccadilly viaduct and the Manchester Piccadilly High Speed station would be large-scale structures, approximately the same height as the existing Manchester Piccadilly Station and viaduct, and the car parks would replace an existing multi-storey car park on Boad Street. They would therefore not be uncharacteristic additions to the landscape, but would result in substantial alteration to the landscape due to their height and	**Level of effect**: Moderate adverse (significant)

massing. They would be prominent new features in the area, affecting a relatively large part of the LCA. The demolition of low quality commercial and industrial buildings would result in a more open and less dense character north of the station, but much of the area is already occupied by vacant plots and car parking. A corridor of land, accommodating one of the new car parks, would be enclosed by the new and existing viaducts and Mancunian Way, increasing the proportion of the LCA where there are low levels of human activity and where pedestrians do not always feel safe. While, connectivity for cyclists and pedestrians would not be reduced, the extent of dark, uninviting road in tunnel would be increased due to the Piccadilly viaduct. Tree planting along New Sheffield Street would be insufficiently mature in year 1 to have any effect on landscape character. There would therefore be an overall medium magnitude of change and moderate adverse effect.	
Year 15: Tree planting along New Sheffield Street would assist in the integration of the eastern end of Manchester Piccadilly High Speed station by summer of year 15, but the viaduct and car parks would remain prominent features in the landscape. The magnitude of change would therefore remain medium and there would be a moderate adverse effect.	**Level of effect**: Moderate adverse (significant)
Piccadilly Station and Surrounds	**Medium susceptibility and low-medium sensitivity**
Susceptibility to change: The LCA's existing busy, inner city character, the large scale and historic value of the Manchester Piccadilly Station and viaduct and the high degree of severance in the area impart a medium susceptibility to change arising from the Proposed Scheme. **Year 1 winter and summer:** The LCA would be directly affected by the introduction of new features into the landscape including the northern end of Manchester Piccadilly High Speed station and the new public realm along New Sheffield Street. The Manchester Piccadilly High Speed station would be a large-scale new building, covering a substantial area of land. Its design would be informed by the local context to ensure it is integrated into the existing skyline and surrounding landscape. The station would be a prominent addition to the area, affecting a large part of the LCA. However, in the context of the existing railway infrastructure, it would be characteristic of the LCA. Connectivity for cyclists and pedestrians would not be reduced by the Proposed Scheme because Travis Street, which currently passes under Manchester Piccadilly Station, would be kept open for pedestrians and cyclists. However, the extent of road in tunnel would be increased making the road even darker and less hospitable. The replacement of indistinct commercial and industrial buildings by vacant plots would result in a more open character north of the station, but since much of the area is currently occupied by vacant plots and car parking, the change will be slight. The proposed station would bring more people into the area, increasing activity and making it feel safer for pedestrians. Tree planting along New Sheffield Street would be insufficiently mature in year 1 to have any effect on landscape character. There would therefore be an overall medium magnitude of change and moderate beneficial effect.	**Level of effect**: Moderate beneficial (significant)
Year 15: Tree planting along New Sheffield Street would have matured and the new public realm would provide a landscape setting for the Manchester Piccadilly High Speed station. The magnitude of change would therefore remain medium and there would be a moderate beneficial effect.	**Level of effect**: Moderate beneficial (significant)

Visual assessment

Introduction

11.5.7 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. Any general night-time visual effects on visual receptors arising from additional lighting are also identified.

11.5.8 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.

11.5.9 Table 20 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: MA08 Map Book.

Table 20: Operation phase significant visual effects

Views from the A665 Pin Mill Brow, other local roads and National Cycle Route 86 in the Medlock Valley (VP 341.03.005) **Map reference: LV-03-341b**	**Medium-high and medium sensitivity receptors**
Year 1 Winter and summer: Pedestrians and cyclists would have clear and close or middle-distance sequential views of the Piccadilly viaduct, Manchester Piccadilly High Speed Station, associated raised infrastructure and therefore, visually prominent on the skyline. These features would be viewed across vacant plots in the foreground which would replace a large proportion of nearby poor-quality buildings resulting in a more open view of the Proposed Scheme and its surrounding context. The Proposed Scheme would lead to a substantial alteration to the view. However, considering the presence of a busy arterial road, industrial and commercial units and the existing railway viaduct, the change would be in part, characteristic of the existing view with an integrated design. Mitigation planting would not provide any visual integration. There would therefore be an overall medium magnitude of change and moderate adverse effect.	**Level of effect**: Moderate adverse (significant)
Year 15 Summer: Mitigation planting would not provide any visual integration. The magnitude of change would remain medium and there would be a moderate adverse effect.	**Level of effect**: Moderate adverse (significant)
Views from the Medlock Valley Way, the Store Street Aqueduct, residences on Jutland Street and Ducie Street, hotels on Ducie Street and Store Street - National Cycle Route 66 (VPs 342.03.011, 342.02.013, 342.03.015, 342.03.012) Map reference: LV-03-342	High, and medium sensitivity receptors
Year 1 winter and summer: Walkers on the canal towpath, residents in Jutland Street and Ducie Street, pedestrians and cyclists on Store Street would experience noticeable changes to near and middle-distance views as a result of the operation of the Proposed Scheme. Manchester Piccadilly High Speed Station would be a prominent new element in the view, replacing the existing indistinct buildings, car parks and narrow views of the 19th century train shed at the existing Manchester Piccadilly Station. Public realm improvements along New Sheffield Street would introduce a designed, linear green open space into the view. Mitigation planting would not provide any visual integration at this stage. There would therefore be an overall medium magnitude of change and a moderate beneficial effect.	**Level of effect**: Moderate beneficial (significant)
Year 15 Summer: Tree planting in New Sheffield Street would have matured, increasing the verdant quality of the new public realm. The magnitude of change would therefore remain medium and there would be a moderate beneficial effect.	**Level of effect**: Moderate beneficial (significant)

Views from residences in Chapeltown Street, Sparkle Street, the Thomas Telford Basin within Piccadilly Village, and users of Metrolink (VPs 342.02.009 and 342.04.008) Map reference: LV-03-342	High and medium sensitivity receptors
Year 1 winter and summer: Residents on Chapeltown Street, Sparkle Street, in Piccadilly Village, and Metrolink users would experience noticeable changes to near and middle-distance views as a result of the operation of the Proposed Scheme. Manchester Piccadilly High Speed Station would be a prominent new element in the view, replacing the existing indistinct buildings, car parks and narrow views of the 19th century train at Manchester Piccadilly Station. New Sheffield Street would introduce a designed, linear green open space into the view. The planting would provide no visual integration at this stage. There would therefore be an overall medium magnitude of change and a moderate beneficial effect.	**Level of effect**: Moderate beneficial (significant)
Year 15 Summer: Tree planting in New Sheffield Street public realm would have matured, increasing the verdant quality of the new public realm. The magnitude of change would therefore remain as medium and there would be a moderate beneficial effect.	**Level of effect**: Moderate, beneficial (significant)

Other mitigation measures

11.5.10 The permanent effects of the Proposed Scheme on landscape and visual receptors have been reduced through integration of the measures described in this section. Effects in Year 1 may also be further reduced through establishing planting early or in advance of the main construction programme. Other features such as additional earthworks, planting or public realm, including the use of materials, would be considered as part of the ongoing development of contextual design. These measures would potentially provide additional screening and/or greater integration of the Proposed Scheme into the landscape.

Summary of likely residual significant effects

11.5.11 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 one landscape character area;
- moderate beneficial effects in relation to one landscape character area;
- moderate adverse effects in relation to two residential viewpoint locations;
- moderate adverse effects in relation to four recreational viewpoint locations; and
- moderate adverse effects in relation to one transport viewpoint location.

Monitoring

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

11.5.13 There are no area-specific requirements for monitoring landscape and visual mitigation during the operation of the Proposed Scheme in the Manchester Piccadilly area.

12 Socio-economics

12.1 Introduction

12.1.1 This section reports on the environmental baseline, likely economic and employment impacts and significant effects identified to date during construction and operation of the Proposed Scheme within the Manchester Piccadilly Station area. The assessment considers existing businesses, community organisations, local employment and local economies, including planned growth and development.

12.1.2 Engagement with Manchester City Council (MCC) 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: MA08 Map Book.

12.2 Scope, assumptions and limitations

12.2.1 The scope, assumptions and limitations for the socio-economics assessment will be set out in Volume 1 (Section 8) and the Scope and Methodology Report (SMR)[66].

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

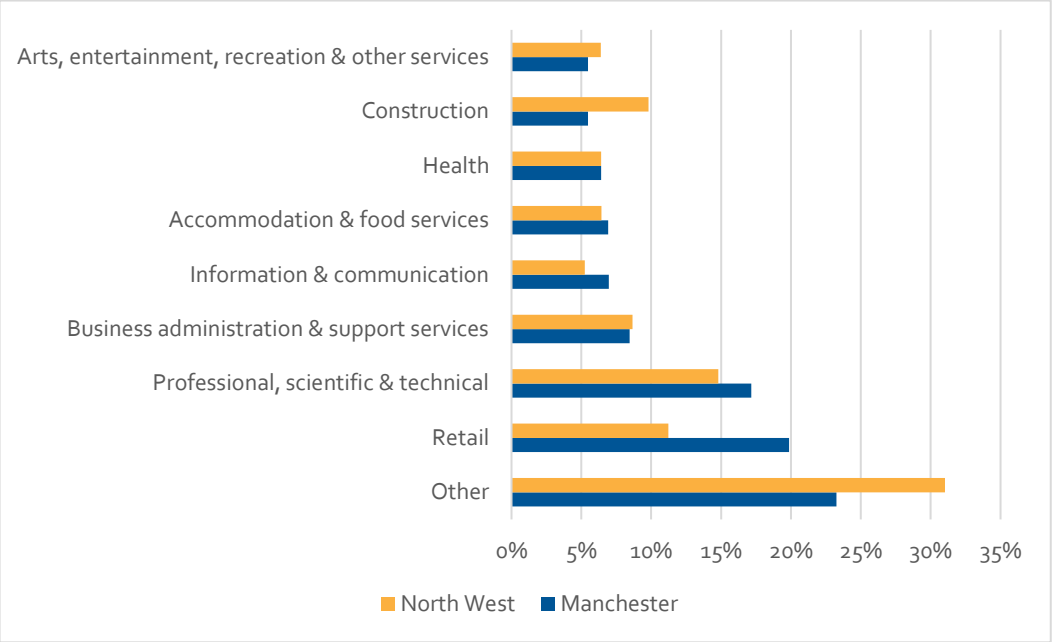
12.3.1 The following provides a brief overview of employment, economic structure, labour market and business premises availability within the Manchester Piccadilly Station area. It lies within the administrative area of MCC, within the Greater Manchester Combined Authority (GMCA) area. It also falls entirely within the Greater Manchester Local Enterprise Partnership area[67] and the North West region.

[66] Supporting document: HS2 Phase 2b Environmental Impact Assessment Scope and Methodology Report
[67] Greater Manchester Local Enterprise Partnership (2013). *Stronger Together - Greater Manchester Strategy. GMCA*.

Business and labour market

12.3.2 Within the MCC area there is a wide spread of organisation types, which reflects a diverse range of commercial activities. In 2017, the retail sector accounted for the largest proportion of organisations (20%). The professional, scientific and technical sector was the second largest (17%), followed by business administration and support services (8%). 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 MCC area and the North West[68, 69]

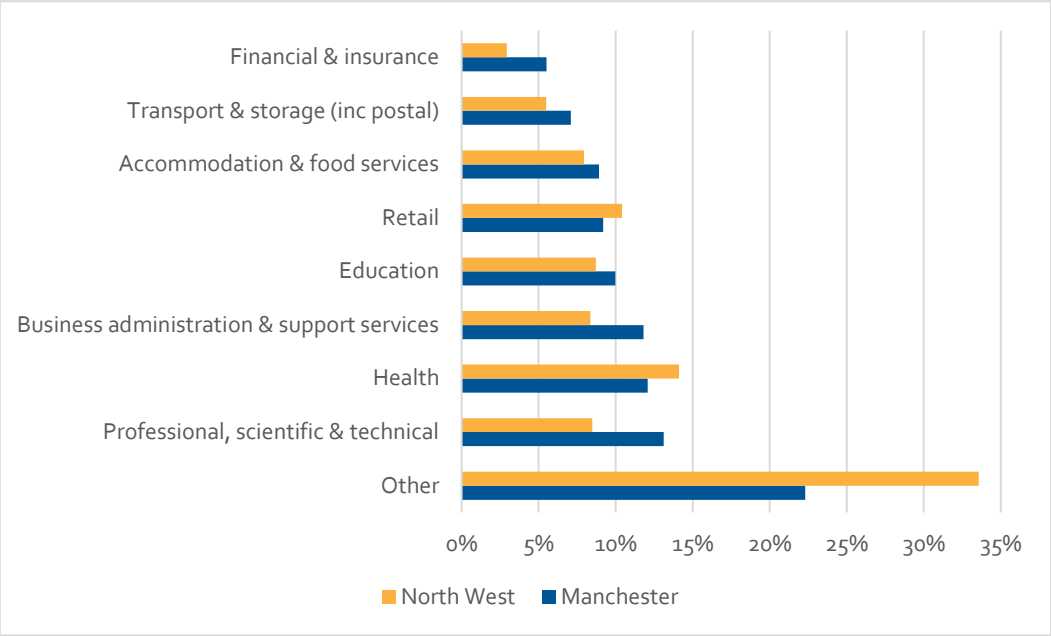


12.3.3 In 2016, approximately 381,000 people worked in the MCC area[70]. According to the Office for National Statistics Business Register and Employment Survey 2016, the largest sectors in terms of share of employment in the MCC area were: professional, scientific and technical (13%), health, and business administration and support services (both 12%) and education (10%).

12.3.4 These compare with the largest sectors for the North West region[71], which were: health (14%), retail, and manufacturing (both 10%) and education (9%). This is shown in Figure 9: Employment by industrial sector in the MCC area and the North West .

[68] Office for National Statistics; (2017); UK Business Count – Local Units; http://www.nomisweb.co.uk
[69] 'Other' includes: Wholesale; Property; Transport and storage (inc postal); Manufacturing; Financial and insurance; Education; Motor trades; Public administration and defence; Mining, quarrying and utilities; Agriculture, forestry and fishing
[70] Office for National Statistics; (2016); Business Register and Employment Survey; http://www.nomisweb.co.uk; this number includes both residents and non-residents of MCC who work within its boundaries
[71] Office for National Statistics; (2016); Business Register and Employment Survey; http://www.nomisweb.co.uk; this number includes both residents and non-residents of the North-west region who work within its boundaries

Figure 9: Employment by industrial sector in the MCC area and the North West[72, 73]



12.3.5 According to the Annual Population Survey (2016)[74], the employment rate[75] within the MCC area was 63% (237,000 people). This is lower than that estimated for the North West (72%) and England (74%). In 2016, unemployment in the MCC area was 8.3%, which is higher than that estimated for the North West (5.3%) and England (5%).

12.3.6 The Annual Population Survey (2016) also shows that 39% of MCC area residents aged 16-64 were qualified to National Vocational Qualification Level 4 (NVQ4) and above. This is compared to 34% in the North West and 38% in England; while 11% of residents had no qualifications, which is higher than the North West (10%) and England (8%).

Property

12.3.7 MCC have estimated a shortfall of employment land to 2027 of up to 50ha, though there was thought to be low market demand in the south of Manchester[76]. The draft Greater Manchester Spatial Framework (2016)[77] identifies Manchester city centre as an area of disproportionate economic growth in Greater Manchester, with the priority being to protect its economic role. The importance of developing adequate employment sites is necessary for the GMCA's strategy to support economic growth.

[72] Office for National Statistics; (2016); Business Register and Employment Survey; http://www.nomisweb.co.uk
[73] Percentage of employees within broad industrial groups. 'Other' includes: Public administration and defence; Information and communication; Manufacturing; Arts, entertainment, recreation and other services; Wholesale; Property; Construction; Motor trades; Mining, quarrying and utilities; Agriculture, forestry and fishing
[74] Annual Population Survey (2016), NOMIS. Available online at https://www.nomisweb.co.uk
[75] The proportion of residents aged 16-64 that are in employment
[76] Nathaniel Lichfield and Partners (2010), *Manchester Economy and Employment Space Study*. Based on upper range (includes 20% flexibility factors)
[77] 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

12.3.8 The average vacancy rate for industrial and warehousing property, office property and retail property in the MCC area in March 2018 has been assessed as 18%, 26% and 5% respectively based on marketed space against known stock[78].

12.4 Effects arising during construction

Avoidance and mitigation measures

12.4.1 The draft Code of Construction Practice (CoCP)[79] includes a range of provisions that would help mitigate socio-economic effects associated with construction within this area, including:

- reducing nuisance through sensitive layout of construction sites (Section 5);
- consulting businesses located close to hoardings on the design, materials used and construction of the hoarding, to reduce impacts on access to and visibility of their premises (Section 12);
- applying best practicable means during construction works to reduce noise (including vibration) at sensitive receptors (including local businesses) (Section 13);
- monitor and manage flood risk and other extreme weather events that may affect socio-economic resources during construction (Section 13);
- site specific traffic management measures including requirements relating to the movement of traffic from business and commercial operators of road vehicles, including goods vehicles (Section 14); and
- maintaining access to businesses for the duration of construction works where reasonably practicable (Section 14).

Assessment of impacts and effects

12.4.2 The proposed construction works are assessed for socio-economic effects in relation to:

- premises demolished with their occupants and employees needing to relocate to allow for construction of the Proposed Scheme;
- 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).

[78] 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)
[79] Supporting document: Draft Code of Construction Practice

Temporary effects

Construction employment

12.4.3 There would be one main construction compound, Manchester Piccadilly High Speed station main compound, four satellite compounds and two railway system compounds in the Manchester Piccadilly Station area. The works undertaken at and managed from these sites would result in the creation of up to 1,400-person years of construction employment[80], which is broadly equivalent to 140 full-time jobs[81]. Depending on skill levels required and the skills of local people, employment is potentially accessible to residents in the locality and to others living further afield. The impact of the direct construction employment creation has been considered as part of the route-wide assessment (see Volume 3, Route-wide effects).

12.4.4 Construction and the related direct employment could also lead to opportunities for local businesses to supply the Proposed Scheme or to benefit from the expenditure of construction workers. The impact of the indirect construction employment creation has been considered as part of the route-wide assessment (see Volume 3, Route-wide effects).

12.4.5 The resulting effects on employment 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 Eighty-two business accommodation units or sites in the study area would experience direct impacts as a result of the Proposed Scheme. These 82 units or sites, together, form 49 defined resources including:

- four business units on Midland Street;
- Ardwick Service Station and a Nissan car dealership Chancellor Lane (two business units);
- two business units on Ashton Old Road;
- four business units on Dark Lane;
- two business units on Mill Green Street;
- three business units on William Street;

[80] 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
[81] Based on the convention that 10 employment years is equivalent to one full time equivalent job

- two business units at 12 Pin Mill Brow;
- one business unit on Crane Street;
- 14 business units on Fairfield Street;
- one business on North Western Street;
- six business units on Blackett Street;
- one business unit on Raven Street;
- one business unit on St Andrew's Street;
- two business units on Helmet Street;
- two business units on St Andrew's Square;
- Richmond House and Thrapston House, Travis Street (two business units);
- one business unit on Adair Street;
- three business units on Heyrod Street (one of which is vacant);
- 14 business units on Sheffield Street;
- one business unit on Sparkle Street;
- surface and multi-level car parks close to Manchester Piccadilly Station, Sheffield Street, Congou Street and Boad Street (two business units);
- six business units on Store Street;
- Network Rail Ltd. and the Royal Mail Vehicle Depot on Travis Street (two business units); and
- a group of car rental companies at Manchester Piccadilly Station (four business units).

12.4.8 Of the 49 resources identified, three businesses could potentially experience significant direct effects on business activities and employment, as set out in Table 21.

Table 21: Resources which would potentially experience significant direct effects

Resource	Description of business activity
Network Rail Ltd.	Office building (Square One) for Manchester's Network Rail Ltd. staff as well as infrastructure management of Manchester Piccadilly Station.
Royal Mail Vehicle Depot	Additional heavy goods vehicle (HGV) parking for Royal Mail depot, which is located nearby on Gidding Road.
Group of car rental companies at Manchester Piccadilly Station	Four rental agencies connected to station car parking and using a proportion of these car parks for their car storage.

12.4.9 Businesses within Manchester Piccadilly Station may also experience disruption, which could include temporary closure during the construction of the Proposed Scheme. Further details will be reported in the formal ES.

Impact magnitude

12.4.10 The magnitude of impact focuses on the number of jobs that would be affected by the Proposed Scheme, either through displacement or possible job loss. It also considers the implications of this impact in relation to the scale of economic activity and opportunity in the area.

Sensitivity

12.4.11 The sensitivity of resources considers the following:

- availability of alternative, suitable premises;
- size of the local labour market;
- skill levels and qualifications of local people; and
- levels of unemployment.

Significance of effects

12.4.12 Taking account of the sensitivity of the resource and the magnitude of impact, it is currently expected that the significance of the resulting effects would be as set out in Table 22. It should be noted that a precautionary approach has been taken in this assessment and the conclusions may change in the formal ES.

Table 22: Significance of effects on resources

Resource	Impact magnitude	Sensitivity	Significance of effect
Network Rail Ltd.	High	Medium	Major adverse
Royal Mail Vehicle Depot	Medium	Medium	Moderate adverse
Group of car rental companies at Manchester Piccadilly Station	Medium	Medium	Moderate adverse

12.4.13 The construction of Piccadilly viaduct would require the demolition of the premises occupied by Network Rail Ltd at Square One. Given the size of the building, the organisation may have difficulty finding suitable alternative premises of this scale. Though some of the staff may need to be close to Manchester Piccadilly Station, this is likely to be a limited number. The effect on this resource and its employees is assessed as major adverse and would, therefore, be significant.

12.4.14 Construction of Piccadilly viaduct would require the demolition of a vehicle depot and parking associated with the Royal Mail facility on Gidding Road. A site for relocation would need to be identified very close to the main Royal Mail facility. The business may have difficulty finding suitable alternative local premises. The effect on this resource and its employees is assessed as moderate adverse and would, therefore, be significant.

12.4.15 The construction of Piccadilly viaduct would require the demolition of four business units (four car rental companies associated with Manchester Piccadilly Station car parking). While these businesses are located in portacabins they may have difficulty finding suitable alternative premises in nearby locations given the land requirements

and the need to be close to Manchester Piccadilly Station. The effect on this group of resources and its employees is assessed to be moderate adverse and would, therefore, be significant.

12.4.16 True Jesus Church, a group of government departments at Piccadilly Gate, and a company supplying Mediterranean and Asian food produce are subject to direct impacts as a result of construction of the Proposed Scheme. Significance of their effects will be assessed and reported in the formal ES.

12.4.17 Among all the affected resources, whether significantly affected or not, it is estimated that 2,390 jobs[82] would either be displaced or possibly lost within the Manchester Piccadilly Station area. There is a reasonable probability that businesses would be able to 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 and businesses may be unable to relocate on a like-for-like basis within the area. The impact on the local economy from the relocation or loss of jobs is considered to be relatively modest in the context of the total number of people employed in the MCC area (approximately 381,000 jobs) and the scale of economic activity and opportunity in the area.

12.4.18 The resulting effects on employment will be reported in aggregate at a route-wide level (see Volume 3, Route-wide effects).

Other mitigation measures

12.4.19 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.

12.4.20 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

12.4.21 Any likely residual significant socio-economic effects will be reported in the formal ES.

[82] Employment within businesses has been estimated through a combination of sources, for example, surveys of businesses, the Experian employment dataset, employment floor space and the Homes and Communities Agency (HCA) Employment Densities Guide 3rd Edition (2015). The estimate is calculated using standard employment density ratios and estimates of floor areas and may vary significantly from actual employment at the sites.

12.5 Effects arising from operation

Avoidance and mitigation measures

12.5.1 No mitigation measures are proposed in relation to business resources during operation of the Proposed Scheme.

Assessment of impacts and effects

Resources with direct effects

12.5.2 It is currently expected that no socio-economic resources would experience significant direct effects during the operation of the Proposed Scheme.

Operational employment

12.5.3 Operational employment connected to the Proposed Scheme would be created at Manchester Piccadilly Station. The operation of Proposed Scheme alongside Manchester Piccadilly Station could result in the creation of approximately 80 full-time jobs and a further 30 full-time jobs associated with retail at the station. It is likely that some of these jobs would be accessed by local residents.

12.5.4 Direct operational employment created by the Proposed Scheme could lead to indirect employment opportunities for local businesses in terms of potentially supplying the Proposed Scheme or benefiting from expenditure of directly employed workers on goods and services.

12.5.5 The impact of operational employment creation will be assessed and reported at a route-wide level in Volume 3, Route-wide effects.

Other mitigation measures

12.5.6 Any further mitigation measures will be reported in the formal ES.

Summary of likely residual significant effects

12.5.7 Any likely residual significant socio-economic effects will be reported in the formal ES.

Monitoring

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

12.5.9 There are no area-specific requirements for monitoring socio-economic effects during the operation of the Proposed Scheme in the Manchester Piccadilly Station 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 Manchester Piccadilly Station 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[83]; and
- 'non-residential receptors'[84] such as:
  - community facilities including schools, hospitals, places of worship and 'quiet areas'[85]; 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[86], planning policy, planning practice guidance on noise (PPGN) [87] and EIA Regulations as described in the Scope and Methodology Report[88] (SMR).

13.1.3 Engagement has been undertaken with Manchester City Council (MCC) 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 Manchester Piccadilly Station area showing the location of the key environmental features (Map Series CT-10), key construction features (Map Series CT-05), key operational features (Map Series CT-06) and operational sound, noise and/or vibration impacts and proposed noise mitigation (Map series SV-01), can be found in the Volume 2: MA08 Map Book. Map series SV-01 also presents key 'non-residential receptors'. These receptors will be reviewed and

[83] '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.
[84] 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.
[85] '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.
[86] Noise Policy Statement for England, (2015) Department for Environment, Food & Rural Affairs (Defra)
[87] Department for Communities and Local Government (DCLG) (2014), Planning Practice Guidance – Noise. Available online at: https://www.gov.uk/guidance/noise--2
[88] Supporting document: HS2 Phase 2b Environmental Impact Assessment Scope and Methodology Report

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 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 as a predominantly urban environment: the centre of Manchester. The sound environment is generally one of a typical city centre. It is influenced by road traffic on main through roads, existing train movements in and out of Manchester Piccadilly Station, fixed building services plant, construction activities and local neighbourhood sources including pedestrian activity, noise from retail premises (such as shops and bars) and deliveries to and servicing of local businesses.

13.3.3 There are several main through roads that contribute to the sound environment within the Manchester Piccadilly Station area: the A57 (M) and the A635, which form the Mancunian Way and city centre ring road to the south and east of Manchester

Piccadilly Station; and the A6 London Road and the A62 Oldham Road to the west and north of Manchester Piccadilly Station. The West Coast Main Line (WCML) and other local railways converge at Ardwick on their approach into the existing Manchester Piccadilly Station.

13.3.4 Sound levels close to these main transportation routes are relatively high during the day and do not reduce substantially at night. Beyond the immediate influence of these transportation routes, sound levels are controlled by the various other sound sources described above, resulting in a relatively high sound level throughout the Manchester Piccadilly Station area.

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 Department for Environment, Food and Rural Affairs' (Defra) Noise Action Plans for Agglomerations[89], Roads[90] or Railways[91]. HS2 Ltd will engage with the Competent Authorities responsible for the relevant Important Areas. Map Series SV-01 (Volume 2: MA08 Map Book) shows any Noise Important Areas in the Manchester Piccadilly Station 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)[92]. 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 following assumptions have also been made in relation to the construction methods specific to the Manchester Piccadilly Station area.

13.4.3 Manchester Piccadilly High Speed station and the Piccadilly viaduct involve construction works adjacent to the existing Manchester Piccadilly Station and railway, including advanced enabling works (demolitions, utilities and road diversions), sub-structure works (piled foundations, Piccadilly viaduct and platform levels), superstructure works (construction of station building envelope) and fit-out works. Where this work is on or immediately adjacent to the existing operational railway, it is

[89] Noise Action Plan: Agglomerations (large urban areas) (2014) Department for Environment, Food & Rural Affairs (Defra)
[90] Noise Action Plan: Roads (including major roads) (2014) Department for Environment, Food & Rural Affairs (Defra)
[91] Noise Action Plan: Railways (including major railways) (2014) Department for Environment, Food & Rural Affairs (Defra)
[92] Supporting document: Draft Code of Construction Practice

assumed to be undertaken during night-time and weekends so that there is less disruption to existing services.

13.4.4 The construction of the Proposed Scheme at the Manchester Piccadilly High Speed station is complex, taking up to nine years to complete, as set out in Section 2.3 of this report. Noise levels in the adjacent communities will vary considerably over this period as the work progresses in scale and location around the area. The programming of the work is subject to further refinement. The construction noise assessment presented in this working draft ES considers the noisiest activities. The formal ES will provide further detail on the location and duration of effects.

13.4.5 The assessment takes account of people's sensitivity to noise during the day, evening and night. More stringent criteria are applied during evening and night-time periods, compared to the busier and more active daytime period.

Avoidance and mitigation measures

13.4.6 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[93];
- 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;

[93] Including local businesses and quiet areas designated by the local authority.

- 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.

13.4.7 Noise insulation or, where appropriate, temporary re-housing would avoid residents of qualifying properties being significantly affected by levels of construction noise inside their dwellings. Work is being undertaken to provide a reasonable worst case estimate of the buildings that are likely to qualify for such measures and the estimate will be reported in the formal ES.

13.4.8 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

13.4.9 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: MA08 Map Book):

- Ancoats, bounded by the A665 Great Ancoats Street to the south and west, the A662 Pollard Street to the north, Palmerston Street to the east and Ancoats Grove and Snell Street to the north-east, arising from demolition works and construction activities associated with Piccadilly viaduct and Manchester Piccadilly High Speed station;
- central Manchester, on and between the A665 Great Ancoats Street, Store Street and Chapeltown Street, arising from demolition works and construction activities associated with Piccadilly viaduct and Manchester Piccadilly High Speed station;
- central Manchester, bounded by Tariff Street, the A62 Newton Street, the A6 Aytoun Street and Ducie Street, arising from demolition works and construction activities associated with Piccadilly viaduct and Manchester Piccadilly High Speed station;
- central Manchester, around the junction of the B6469 Whitworth Street and the A6 Aytoun Street and on the B6469 Fairfield Street and Granby Row, arising from demolition works and construction activities associated with Piccadilly viaduct and Manchester Piccadilly High Speed station;

- central Manchester, on Baring Street, Buxton Street and Berry Street, arising from demolition works and construction activities associated with Piccadilly viaduct and Manchester Piccadilly High Speed station; and
- Ardwick on Cotter Street, Brydon Avenue, Paddock Street and St Gregorys Drive, arising from demolition works and construction activities associated with Piccadilly viaduct.

13.4.10 Map Series SV-01 (Volume 2: MA08 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):

- Monroes Bar Hotel, on the A6 London Road;
- Motel One, on the A6 London Road;
- Staycity Piccadilly, on the A6 Piccadilly;
- DoubleTree by Hilton Hotel, on Auburn Street;
- The Place Aparthotel, on Ducie Street;
- La Reserva Aparthotel, on Ducie Street;
- Premier Inn, on Dale Street; and
- ABode Hotel, on the A6 Piccadilly.

13.4.11 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.

13.4.12 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:

- A665 Great Ancoats Street (and side roads) between A635 Ashton Old Road and the junction with Store Street and Old Mill Street;
- Store Street, between the A665 Great Ancoats Street and Manchester Piccadilly Station;
- Chapeltown Street and Sparke Street between A665 Great Ancoats Street and Store Street; and
- B6469 Fairfield Street between A635 Mancunian Way and A6 Aytoun Street.

13.4.13 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

13.4.14 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 reported in the formal ES and will 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

13.4.15 Further work is being undertaken to confirm significant construction noise and vibration effects, including any temporary indirect effects from construction traffic.

13.4.16 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 Manchester Piccadilly Station 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 six trains per hour in each direction on the main lines with an operating speed of less than 100kph. 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). With regard to stations the route-wide measures include control of noise from static sources (e.g. ventilation equipment and public address systems).

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 compared to the current minimum European standards[94].

13.5.6 Noise effects would be also reduced in locations along the route by engineering structures (including the design of stations).

13.5.7 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[95] 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[96] or the maximum noise level criteria[97] 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

13.5.8 Significant ground-borne noise or vibration effects would be avoided or reduced through the design of the track and track-bed.

Assessment of impacts and effects

13.5.9 Map Series SV-01 (Volume 2: MA08 Map Book) indicates the likely long-term daytime noise level (defined as the equivalent continuous sound level from 07:00 to 23:00 or $Lp_{Aeq,day}$) from HS2 train 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 $Lp_{Aeq,night}$) 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.

13.5.10 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.

13.5.11 A summary of the likely significant effects identified on a precautionary basis is presented at the end of this section.

[94] Technical Specification for Interoperability (TSI) Noise – EU Commission Regulation No 1304-2014
[95] Following Government's National Planning Practice Guidance https://www.gov.uk/government/collections/planning-practice-guidance
[96] World Health Organization (2010), *Night time Noise Guidelines for Europe*
[97] Dependent on the number of train passes

13.5.12 Likely significant airborne noise effects arising from permanent changes to existing roads will be reported in the formal ES.

Other mitigation measures

13.5.13 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

13.5.14 Mitigation, including screening from the station structure and noise barriers as described in Volume 1 (Section 9), section 2.2 and presented in Map Series SV-01 (Volume 2: MA08 Map Book) and Map Series CT-06 (Volume 2: MA08 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.

13.5.15 Taking account of the avoidance and mitigation measures this initial assessment has identified no airborne noise effects with the potential to be considered significant on a community basis due to increased noise levels forecast to arise from the operation of the Proposed Scheme in line with the SMR.

13.5.16 The initial assessment indicates that, the forecast noise from long-term railway operation will not 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 closes to the Proposed Scheme within the Manchester Piccadilly Station area.

13.5.17 Map Series SV-01 (Volume 2: MA08 Map Book) shows key non-residential properties for the assessment of operational airborne noise impacts in the formal ES. The initial assessment indicates that there are no significant effects identified at any non-residential receptors in this community area as a result of operational airborne noise.

13.5.18 Further assessment work is being undertaken to identify operational noise and vibration significant effects. This will be reported in the formal ES.

13.5.19 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

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

13.5.21 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.

13.5.22 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 Manchester Piccadilly Station area.

14.1.2 Engagement with Highways England, Manchester City Council (MCC), Transport for Greater Manchester (TfGM), Greater Manchester Combined Authority (GMCA) and Network Rail 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: MA08 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)[98].

14.2.2 The study area for traffic and transport includes the area around the existing Manchester Piccadilly Station and Ardwick, including much of Manchester city centre, together with Manchester Piccadilly Station, Manchester Victoria Station, Oxford Road Station, Deansgate Station and Salford Central Station, with stops on the Metrolink tram line serving the area.

14.2.3 The study area also includes all roads potentially affected by the Proposed Scheme including: the A5067 Stretford Road; the A5103 Princess Road/Albion Street; the A56 Bridgewater Viaduct/Chester Road; the A57 Dawson Street/Egerton Street; the A57(M)/A635 Mancunian Way; the A6 London Road; the A635 Ashton Road; the A665 Pin Mill Brow/Great Ancoats Street; the A635/B6469 Fairfield Street; the A665 Chancellor Lane/Midland Street; the B6469 Whitworth Street; the B5218 Chorlton Road; Adair Street; Baird Street; Boad Street; Blackett Street; Coronation Square; Chapeltown Street; Crane Street; Dark Lane; Elbe Street; Higher Cambridge Street; Helmet Street; Heyrod Street; Mill Green Street; Portugal Street East; Raven Street; St. Andrew Street; Store Street; Sparkle Street; Travis Street; Union Street; and Willian Street.

14.2.4 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.

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

14.2.5 No quantitative assessment has been undertaken at this stage. A quantitative assessment will be presented in the formal ES.

14.3 Environmental baseline

Existing baseline

14.3.1 Existing conditions in the study area have been determined through site visits, traffic and transport surveys, liaison with Highways England, MCC, TfGM, GMCA and Network Rail (including provision of information on public transport, public rights of way (PRoW) and accident data) and desktop analysis.

Surveys

14.3.2 Traffic surveys, comprising junction turning counts and queue surveys and automatic traffic counts, were undertaken in June, July and November 2017. These data have been supplemented by existing traffic data from other sources, including from Highways England, MCC, GMCA, TfGM, and Network Rail. Assessment of the data indicates that the peak hours in the area are 07:00-08:00 and 17:00-18:00. 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 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 Public Rights of Way (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 There are no strategic routes that pass through the area, but the A57 (M) and the A635 Mancunian Way form part of the Greater Manchester Key Route Network. These roads and the road network in and around the Manchester Piccadilly Station area (MA08) are 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 A5067 Stretford Road, the A5103 Princess Road, the A56 Chester Road, the A56 Bridgewater Viaduct, the A57 Dawson Street/Egerton Street, the A6 London Road (between Ducie Street and A635 Mancunian Way), the A635 Ashton Old Road/Fairfield Street, A665 Pin Mill Brow/Chancellor Lane/Great Ancoats Street, the B5218 Chorlton Road, the B6469 Whitworth Street/Fairfield Street, Adair Street, Baird Street, Boad Street, Chapeltown Street, Helmet Street, Higher Cambridge Street, Portugal Street East, St Andrew Street, Store Street, Sparkle Street, and Travis Street. 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 (DfT)[99]. 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 Manchester Piccadilly Station area: Deansgate Interchange (10 accidents, including one with a fatality and two with serious casualties).

14.3.8 The route of the Proposed Scheme would cross eight roads with footways within the Manchester Piccadilly Station area. These are: the A635 Mancunian Way/Fairfield Street, the A665 Chancellor Lane, B6469 Fairfield Street, Helmet Street, St Andrews Street, Store Street, Sheffield Street and Travis Street. The A665 Midland Street (which lies in MA07) is accessed off the A665 Chancellor Lane.

Parking and loading

14.3.9 There are extensive restrictions on on-street parking across the Manchester Piccadilly Station area, which may be impacted by the Proposed Scheme. The following off-street parking could also be impacted by the Proposed Scheme:

- Manchester Piccadilly Station (long stay Manchester Station Car Park (MSCP) with access off Boad Street) – 857 spaces;
- Manchester Piccadilly Station (short stay), off the B6469 Fairfield St – 56 spaces;
- Network Rail Deck (including 40 blue badge) with contract parking and car rental – 150 spaces;
- Network Rail undercroft arches parking – private 115 spaces;
- Gateway House undercroft arches (run by RCP Parking Ltd) – 140 spaces;
- Gateway House private – approximately 60 spaces;
- Store Street surface car park – 406 spaces;
- surface car parking off Sheffield Street (160 spaces); and
- private car parking spaces at Square One (Travis Street), and off the A665 Chancellor Lane and William Street.

Public transport network

14.3.10 There is an extensive bus network serving the Manchester Piccadilly Station area, with services that provide access to the wider Greater Manchester area. Four bus routes operate on two roads that would be crossed by the route of the Proposed Scheme in the Manchester Piccadilly Station area. There are also bus stops primarily located to serve the main built up area and Manchester Piccadilly Station. In addition, Manchester Piccadilly Station approach is served by many bus routes, including the

[99] STAT19 Road Safety Data 2014-2016, Department for Transport

Metro Shuttle services operating between Manchester Piccadilly Station and the city centre. Bus services that operate in the immediate local area are:

- the A635 Ashton Old Road: Route 219 (Manchester – Openshaw – Ashton – Stalybridge), Route 221 (Dukinfield – Audenshaw – Openshaw – Manchester) and Route 220 (Manchester – Dukinfield); and
- Travis Street: Route 147 (Piccadilly Rail Station – Oxford Road circular).

14.3.11 National and local rail services are accessible via Manchester Piccadilly Station and local rail services are accessible via Manchester Victoria Station, Manchester Oxford Road Station, Deansgate Station, Salford Central Station. Manchester Piccadilly Station provides access to national rail services to London, Edinburgh, Cardiff, Birmingham and other major towns and cities throughout the country, along with a network of local and regional services. Metrolink services operate throughout Manchester city centre, including through Manchester Piccadilly Station, providing access to the wider Greater Manchester area.

Non-motorised users

14.3.12 There are pedestrian footways adjacent to many of the roads in the built up areas of the Manchester Piccadilly Station area. 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 not cross the route of any listed PRoW within the Manchester Piccadilly Station area although footways along a number of roads and other routes could be affected.

14.3.14 In the Manchester Piccadilly Station area, National Cycle Routes 6, 55, 60, 66 and 86 (part of the National Cycle Network) pass through the area. Sustrans cycle routes (NCN86) run along the east bank of the River Medlock to the A665 Pin Mill Brow and along Store Street (NCN 66).

Waterways and canals

14.3.15 There are three navigable waterways in the Manchester Piccadilly Station area, with the Bridgewater Canal and Rochdale Canal running from west to east, north of the Proposed Scheme, and the Ashton Canal (Islington Branch) - located north-west of Manchester Piccadilly Station.

14.3.16 The River Medlock is located in the south of the area running east to west; the River Irwell is located in the north-western section of the area and the River Irk is located on the northern periphery of the area.

Air transport

14.3.17 There is no relevant air transport in the Manchester Piccadilly Station 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 diversions 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)[100] includes measures that aim to reduce the adverse impacts and effects on local communities and maintain

[100] Supporting document: Draft Code of Construction Practice

public access. This includes the impacts of deliveries of construction materials and equipment.

14.4.3 The measures in the draft CoCP include controls on vehicle types, hours of site operation and routes for HGVs to reduce the impact of road-based construction traffic. In order to achieve this, general and site specific traffic management measures would be implemented during the construction of the Proposed Scheme on or adjacent to public roads and PRoW affected by the Proposed Scheme.

14.4.4 The draft CoCP includes the requirement to develop local traffic management plans in consultation with the highway and traffic authorities and the emergency services. These would consider the local traffic management strategy including consideration of sensitive receptors, such that adverse impacts would be reduced insofar as reasonably practicable and any effect on safety and accidents would not be significant.

14.4.5 Specific measures would include core site operating hours of 08:00 to 18:00 on weekdays and 08:00 to 13:00 on Saturdays with site staff and workers generally arriving before the morning peak hour and departing after the evening peak hour.

14.4.6 The number of private car trips to and from the construction compounds (both workforce and visitors) would be reduced by encouraging alternative sustainable modes of transport or vehicle sharing. This would be supported by an overarching framework travel plan that would require construction workforce travel plans[101] to be produced that would include a range of potential measures to mitigate the impacts of traffic and transport movements associated with construction of the Proposed Scheme.

14.4.7 Where works potentially affect Network Rail assets, disruption to travelling passengers and freight movements would be reduced insofar as reasonably practicable. This includes measures such as:

- programming the construction works to coincide with the possessions that are required and planned by Network Rail for the general maintenance of their railway;
- planning the required construction works so that they can be undertaken in short overnight stages so that passenger services are not disrupted; and
- programming longer closures at the weekend and on bank holidays to reduce insofar as reasonably practicable the number of passengers affected.

[101] Construction and operational travel plans would promote the use of sustainable transport modes as appropriate to the location and types of trip. They would include measures such as: provision of information on and promotion of public transport services; provision of good cycle and pedestrian facilities; liaison with public transport operators; promotion of car sharing; and the appointment of a travel plan coordinator to ensure suitable measures are in place and are effective.

Assessment of impacts and effects

Temporary effects

14.4.8 The traffic and transport impacts during the construction period within the Manchester Piccadilly Station area are likely to include:

- construction vehicle movements to and from the various construction compounds;
- road closures and associated realignments and diversions, including changes to A635 Pin Mill Brow junction;
- possessions on conventional rail network; and
- impacts on Manchester Piccadilly Station due to construction work, which could affect users of the station and users of the adjacent highway network.

14.4.9 The construction assessment has also considered any impacts in the Manchester Piccadilly Station 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: MA08 Map Book.

Strategic and local highway network

14.4.12 The primary HGV access routes for construction vehicles would be the strategic and/or primary road network with the use of the local road network limited, where reasonably practicable. The construction routes would also provide access to compounds. Where reasonably practicable, HGVs would use the site haul routes alongside the route of the Proposed Scheme to reduce the impact on the local road network. In this area, it is expected that the main construction routes would use:

- the A5067 Stretford Road;
- the A5103 Princess Road/Albion Street;
- the A56 Bridgewater Viaduct/Chester Road;
- the A57 Dawson Street/Egerton Street;
- the A57(M) Mancunian Way;
- the A635 Mancunian Way;
- the A6 London Road (between Ducie Street and A635 Mancunian Way);
- the A635 Ashton Road/Fairfield Street;

- the A665 Pin Mill Brow/Great Ancoats Street;
- the A665 Chancellor Lane;
- the B6469 Fairfield Street/Whitworth Street;
- the B5218 Chorlton Road;
- Higher Cambridge Street;
- Adair Street;
- Helmet Street; and
- Store Street.

14.4.13 In addition to increases in traffic flows due to construction traffic, construction of the Proposed Scheme is expected to result in temporary highway closures and diversions or realignments as set out in section 2.3. The works to construct both temporary and permanent highway diversions/realignments could also result in disruption to highway users. These are expected to include:

- the A635 Mancunian Way;
- the A665 Chancellor Lane/Midland Street;
- Adair Street;
- Blackett Street;
- Coronation Square;
- Chapeltown Street;
- Crane Street;
- Elbe Street;
- Heyrod Street;
- Mill Green Street;
- Portugal Street East;
- Raven Street; and
- Union Street.

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. This includes: Manchester Piccadilly Station short and long stay public and operational parking, including blue badge spaces; Gateway House parking and surface parking off Sheffield Street. It is expected that replacement parking would be provided as part of the Proposed Scheme to, at least partly, replace this parking in advance of its removal. Some roads that could be used as construction routes have on-street parking that 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 147, 219, 220, and 221. 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 Construction of the Proposed Scheme is expected to include works that requires possession of conventional rail network for short periods that could affect the users of the existing Manchester Piccadilly Station.

14.4.21 There are expected to be impacts on users of Manchester Piccadilly Station during construction including to access routes for all users. Access to servicing for the station may also be affected. The effects on users of Manchester Piccadilly Station will be reported in the formal ES.

14.4.22 No construction impacts are anticipated on the Metrolink services as no planned diversions or substantial closures would be required as part of the Proposed Scheme.

Non-motorised users

14.4.23 The construction works associated with the Proposed Scheme would require the temporary closure or diversion/realignment of routes used by pedestrians and other non-motorised users. These will include pedestrians using the footbridge over London Road on the approach to Manchester Piccadilly Station and footways on Ducie Street, Fairfield Street, Station Approach, Store Street and Travis Street. Pedestrians would also be re-routed, where necessary, around construction compounds. The assessment of these will be reported in the formal ES.

14.4.24 Permanent diversions for non-motorised users are reported under operation.

14.4.25 The changes to routes are likely to result in some increases in travel distance with the potential for adverse significant effects. The assessment of these will be reported in the formal ES.

Waterways and canals

14.4.26 It is not currently expected that the construction of the Proposed Scheme would have a significant effect upon navigable waterways or canals in the Manchester Piccadilly Station area.

Permanent effects

14.4.27 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

14.4.28 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.

14.4.29 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

14.4.30 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 A5067 Stretford Road; the A5103 Princess Road/Albion Street; the A56 Bridgewater Viaduct/Chester Road; the A57 Dawson Street/Egerton Street; the A57(M)/A635 Mancunian Way; the A6 London Road; the A635 Ashton Road; the A665 Pin Mill Brow/Great Ancoats Street; the A635/B6469 Fairfield Street; the A665 Chancellor Lane/Midland Street; the B6469 Whitworth Street; the B5218 Chorlton Road; Adair Street; Helmet Street and Store Street. Increases in traffic could also result in increased traffic severance for non-motorised users of the routes and changes in traffic could result in changes in accident risk.

14.4.31 Construction of the Proposed Scheme is expected to result in temporary closures and diversions of the A635 Mancunian Way; the A665 Chancellor Lane/Midland Street; Adair Street; Blackett Street; Coronation Square; Chapeltown Street; Crane Street; Elbe Street; Heyrod Street; Mill Green Street; Portugal Street East; Raven Street and Union Street.

14.4.32 Construction of the Proposed Scheme is expected to affect parking at: Manchester Piccadilly Station; Gateway House; and parking spaces off Sheffield Street.

14.4.33 Construction of the Proposed Scheme is expected to require temporary diversion of bus route 147, 219, 220 and 221.

14.4.34 Construction of the Proposed Scheme is expected to include works that requires possession of conventional rail network for short periods that could affect the users of the existing Manchester Piccadilly Station. Works to Manchester Piccadilly Station may also affect access routes and facilities for all station users.

14.4.35 Construction of the Proposed Scheme is expected to require some diversion or re-routeing of pedestrians using the footbridge over London Road and footways on local roads including: Ducie Street; Fairfield Street; Station Approach; Store Street; and Travis Street.

14.4.36 The assessment of significant effects in relation to traffic and transport during construction of the Proposed Scheme will be reported in the formal ES.

14.5 Effects arising from operation

Avoidance and mitigation measures

14.5.1 The following measures have been included as part of the design of the Proposed Scheme and would avoid or reduce impacts on transport users:

- provision for access by sustainable modes at Manchester Piccadilly High Speed station, including walking and cycling to promote non-car access and to create permeable access and through routes in and around the station;
- facilities for bus, tram, taxi and car access and links to the existing Manchester Piccadilly Station; and
- changes to the highway network to accommodate users of the Proposed Scheme and maintain local access.

14.5.2 A station travel plan for the Manchester Piccadilly High Speed station would include measures that aim to reduce the impacts and effects of traffic and transport movements.

Assessment of impacts and effects

14.5.3 The following section considers the impacts on traffic and transport and the likely consequential effects resulting from the operational phase of the Proposed Scheme. Operational effects arising from the Proposed Scheme in year 2033 and year 2046 will be reported in the formal ES.

Key operation transport issues

14.5.4 Manchester Piccadilly High Speed station would be a new station for the Proposed Scheme, providing direct and fast access from Manchester to destinations including London, the south of the UK, Birmingham and Crewe. It would link to the existing Manchester Piccadilly Station and Metrolink services. The major impacts in the Manchester Piccadilly Station area are the beneficial impacts of the new and improved rail services and the opportunities to improve conventional rail services.

14.5.5 The operation of the Proposed Scheme could, however, result in impacts on the highway and public transport networks within this area due to increased rail users traffic associated with Manchester Piccadilly High Speed station. However, maintenance of the Proposed Scheme would generate limited vehicular trips and the effect would not be significant.

14.5.6 The operational impacts would, therefore, primarily relate to the major improvements to travel opportunities and the potential impacts of additional users on the local

transport networks. There would also be impacts due to permanent diversion, realignment and closure of roads.

Public transport network

14.5.7 The Proposed Scheme would generate significant major beneficial effects as a result of:

- the increase in rail capacity at Manchester Piccadilly Station and from the introduction of the Proposed Scheme;
- significantly improved journey times between major cities in the North, the Midlands and the South of the UK; and
- released capacity on the existing rail network easing pressure and reducing crowding on other passenger rail services, creating significant major beneficial effects for local commuters and potentially freeing up space for freight.

14.5.8 The permanent realignment of roads could increase travel distances for bus passengers. However, the road realignments are likely to be less than 1km in length. There are no proposed changes or diversions to Metrolink services.

Highway network

Strategic and local highway network

14.5.9 The Proposed Scheme would result in a number of permanent highway changes. These would include changes to the following highways:

- the A635 Mancunian Way;
- the A665 Chancellor Lane;
- the A665 Pin Mill Brow;
- Adair Street;
- Baird Street;
- Boad Street;
- Helmet Street;
- Sheffield Street;
- St Andrew Street;
- Sparkle Street;
- Travis Street; and
- William Street.

14.5.10 Operation of the Proposed Scheme would result in changes in traffic flows due to passengers and staff accessing the Manchester Piccadilly High Speed station. This could result in changes to traffic movements in the Manchester Piccadilly Station area and affect, in particular, St Andrews Street, Adair Street, Travis Street, New Sheffield

Street and Store Street. Changes to taxi facilities, bus drop off and pick up, car parking, servicing and loading could also result in changes to travel patterns and impacts on local transport networks and users.

14.5.11 The effects of these changes will be reported in the formal ES.

Accidents and safety

14.5.12 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

14.5.13 Long-stay and short-stay car parking would be provided for the Manchester Piccadilly High Speed station. In addition, the Proposed Scheme would provide parking spaces in the existing Manchester Piccadilly Station area to help offset those displaced.

14.5.14 Overall, despite re-provision there is the potential for some loss of parking or increase in distance to access parking spaces. It is currently expected that there could be some permanent loss of car parking. This could include loss of car parking at: Manchester Piccadilly Station (long stay MSCP with access off Boad Street); Manchester Piccadilly Station (short stay) – off Fairfield Street; NR Deck; NR Arches, Gateway House arch and ramp (run by RCP Parking Ltd), and parking spaces off Sheffield Street. Where car parking is lost that would have served facilities that are displaced by the Proposed Scheme this is not considered a material effect.

14.5.15 Where reasonably practicable, HS2 Ltd would work with the businesses affected to identify opportunities for mitigating effects on parking.

Non-motorised users

14.5.16 The Manchester Piccadilly High Speed station would generate additional pedestrian and cycle movements, particularly in the morning and evening peak periods. These would then be dispersed to access nearby destinations or onward travel modes, increasing use of footways, cycle routes and crossings in the local area.

14.5.17 The Proposed Scheme includes changes to pedestrian and cycle routes that could potentially have effects on users. It is not, however, currently expected that these changes would result in net adverse effects.

14.5.18 The effect of these changes for non-motorised users will be reported in the formal ES.

Waterways and canals

14.5.19 It is not currently expected that the operation of the Proposed Scheme would have a significant effect upon navigable waterways or canals in the Manchester Piccadilly Station area.

Other mitigation measures

14.5.20 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.

14.5.21 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

14.5.22 Operation of Proposed Scheme is expected to provide major beneficial impacts by providing improved journey times between major cities in the North, the Midlands and the South of the UK and the new Manchester Piccadilly high speed station, which includes new interchange facilities. The use of released capacity on the conventional rail network will result in benefits to users of conventional rail services.

14.5.23 Operation of the Proposed Scheme is expected to result in permanent changes to: the A635 Mancunian Way; the A665 Chancellor Lane; the A665 Pin Mill Brow; Adair Street; Baird Street; Boad Street; Helmet Street; Sheffield Street; St Andrew Street; Sparkle Street; Travis Street; and William Street. Users of the improved rail services would result in some increases in traffic and place additional pressure on the local highway network in the Manchester Piccadilly area. Increases in traffic could also result in increased traffic severance for non-motorised users of the routes and potential changes in accident risks.

14.5.24 Although the Proposed Scheme will include substantial replacement car parking, operation could require the permanent loss or change of access for parking spaces in the Manchester Piccadilly area.

14.5.25 Operation of the Proposed Scheme is expected to result in permanent diversion of bus route 147 off Travis Street.

14.5.26 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

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

14.5.28 A station travel plan would detail monitoring of travel associated with operation of the Manchester Piccadilly high speed station.

14.5.29 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 Manchester Piccadilly Station 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, Manchester City Council (MCC), which is the Lead Local Flood Authority (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: MA08 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)[102].

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)[103].

15.2.2 Unless indicated otherwise, the spatial scope of the assessment (the study area) is based upon the identification of surface water and groundwater features within 1km of the centre line of the route of the Proposed Scheme, as described in Section 2.2 of this report. In the Manchester Piccadilly Station area, the study area has been reduced to 500m for flood risk features, as the study area is urban. For groundwater and

[102] DCLG (2015), *National Planning Policy Framework*
[103] Supporting document: HS2 Phase 2b Environmental Impact Assessment Scope and Methodology Report

surface water features, the study area remains at 1km as there is potential for impacts from construction on groundwater and surface water within 1km of the route of the Proposed Scheme.

15.2.3 This assessment is based on desk study information, including information provided to date by consultees and stakeholders, as well as surveys of accessible water features.

15.2.4 Where surveys have not been undertaken due to land access constraints, a precautionary approach has been adopted in the assessments of receptor value and impact magnitude.

15.2.5 Hydraulic analysis is currently being undertaken of watercourses and key structures within flood risk areas.

15.2.6 Groundwater levels have been inferred from the available Environment Agency groundwater level monitoring boreholes, historic borehole logs and topographic data, as well as from spring and watercourse locations.

15.2.7 Impacts on biological receptors such as aquatic fauna and flora are assessed in Section 7, Ecology and biodiversity.

15.2.8 The assessments in this working draft ES are based on professional judgement using the information that it currently available. A precautionary approach has been adopted with regard to assessing the potential for adverse impacts to occur. The surveys, analysis and modelling work currently in progress, and the results of the consultation process, will be used to refine the assessments reported in the formal ES.

15.3 Environmental baseline

Existing baseline - Water resources and WFD

Surface water

15.3.1 All surface water bodies in the study area fall within the Irwell management catchment of the North West river basin district (RBD).

15.3.2 The river basin management plan[104] identifies the chemical[105] and ecological[106] status of surface water bodies, and the quantitative[107] and chemical[108] 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

[104] Environment Agency (2015), *Water for life and livelihoods Part 1: North West river basin district: River basin management plan*
[105] The chemical status of surface waters reflects concentrations of priority and hazardous substances present
[106] 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 the ecology and biodiversity section;
- 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.

[107] 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
[108] 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 23. The receptor value attributed to each individual water body is based on the methodologies set out in the SMR.

Table 23: Surface water body receptors

Water body name and location[109]	Designation	Q95 value (m^3/s)[110]	Receptor value	Parent WFD water body name and identification number[111]	Current WFD status/Objective[112]
River Medlock WR-01-310b l4	Main river	0.2	High	Medlock (Lumb Brook to Irwell) GB112069061152	Moderate/Moderate by 2015

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 42 consented discharges to surface waters within the study area, nine of which are within the land required for the Proposed Scheme. These have been assessed as being receptors of low value.

Groundwater

15.3.9 The geology of the study area is described in Section 10, Land quality, and the superficial and bedrock hydrogeology is summarised in Table 24. Unless stated otherwise, the geological groups listed would all be crossed by the Proposed Scheme. Table 24 also identifies the receptor values attributed to each groundwater receptor based on the methodologies set out in the SMR.

[109] The feature locations are indicated by the grid coordinates on the relevant Volume 2: MA08 Map Book figure (in this case WR-01)
[110] This is the flow within the watercourse that is exceeded for 95% of the time
[111] The Environment Agency has attributed each surface water and groundwater body a unique water body identification (ID) number
[112] Status and objectives are based on those set out in the 2015 River basin management plan

Table 24: Summary of geology and hydrogeology in the study area

Geology[113]	Distribution	Formation description	Aquifer classification	WFD body (ID) and current overall status[114]	WFD status objective[115]	Receptor value
Superficial deposits						
Alluvium	In the base of the valley of the River Medlock	Clay, silt, sand and gravel	Secondary A	Not assessed by the Environment Agency	Not assessed by the Environment Agency	Moderate
Glacial till	Present over most of the study area	Clay, silt, sand and gravel	Secondary (undifferentiated)	Not assessed by the Environment Agency	Not assessed by the Environment Agency	Moderate
Glaciofluvial sheet deposits	Outcrops in the south-west of the study area.	Sand and gravel	Secondary A	Not assessed by the Environment Agency	Not assessed by the Environment Agency	Moderate
Bedrock						
Sherwood Sandstone Group – Chester Formation	Present across the majority of the study area	Sandstone	Principal	Manchester and East Cheshire Permo-Triassic Sandstone Aquifers (GB41201G101100) Poor	Good by 2027	High
Cumbrian Coast Group– Manchester Marls Formation	Mainly outcrops in a band north-east of Piccadilly Station	Mudstone	Secondary B			Moderate
Appleby Group - Collyhurst Sandstone Formation	Outcrops in a band north-east of Piccadilly Station	Sandstone	Principal			High
Warwickshire Group- Halesowen Formation	Outcrops in the north-eastern corner of the study area	Sandstone	Secondary A			Moderate
Warwickshire Group - Halesowen Formation –	North-west to south-east trending band in the Beswick	Limestone	Secondary A			Moderate

[113] In recent years the BGS 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.

[114] As stated in the 2015 River basin management plan

[115] As stated in the 2015 River basin management plan

Geology[113]	Distribution	Formation description	Aquifer classification	WFD body (ID) and current overall status[114]	WFD status objective[115]	Receptor value
Great Mine Limestone	and Ancoats areas					
Warwickshire Group - Halesowen Formation – Holt Town Sandstone Bed	Present in a north-west to south-east trending band in the Beswick and Ancoats areas	Sandstone	Secondary A			Moderate
Warwickshire Group - Etruria Formation	Outcrops in the north-eastern corner of the study area	Mudstone and sandstone	Secondary A			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 24, is outlined briefly as alluvium, glacial till and glaciofluvial sheet deposits, which may be capable of supporting water supplies at a local rather than regional scale and may also form an important source of baseflow to rivers. They have therefore been classified as moderate value receptors.

Bedrock aquifers

15.3.11 The basis of the receptor values attributed to the bedrock aquifers present within the study area, as shown in Table 24 is outlined briefly as follows:

- the Chester Formation within the Sherwood Sandstone Group, and the Collyhurst Sandstone Formation within the Appleby Group, have been classified as Principal aquifers by the Environment Agency and are therefore high value receptors;
- the Warwickshire Group which comprises the Halesowen Formation (including the Great Mine Limestone and Holt Town Sandstone Bed) and the Etruria Formation, has been classified as a Secondary A aquifer by the Environment Agency and is therefore a moderate value receptor; and
- the Manchester Marls Formation within the Cumbria Coast Group has been classified as a Secondary B aquifer by the Environment Agency and is therefore 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 bedrock groundwater bodies within the study area is provided in Table 24. The value attributed to each of these receptors is also indicated.

15.3.13 The superficial deposits in the study area are not formally designated as WFD groundwater bodies but may be hydraulically connected to the WFD bedrock aquifers.

Abstraction and permitted discharges (groundwater)

15.3.14 There are no groundwater abstractions licensed for public water supply. A source protection zone (SPZ) 3, associated with public water supplies extends into the south-west corner of the study area, 960m from the Proposed Scheme.

15.3.15 There are no private groundwater abstraction licences registered in the study area, as shown on Map WR-02-201 in Volume 2: MA08 Map Book.

15.3.16 Records of private unlicensed groundwater abstractions, which comprise those for quantities less than 20m^3 per day, have been obtained from the local authorities. These data indicate that there are no registered private unlicensed groundwater abstractions within the study area. As there is no obligation to register private water supplies, unregistered private groundwater supplies may also be present. Private water supplies would be assessed as high value receptors unless details obtained from the owner indicate otherwise.

15.3.17 There are no consented discharges to groundwater in the study area.

15.3.18 A summary of locations, current overall WFD status, and future overall status objectives associated with the designated bedrock groundwater bodies within the study area is provided in Table 24. The value attributed to each of these receptors is also indicated.

15.3.19 The superficial deposits in the study area are not formally designated as WFD groundwater bodies but may be hydraulically connected to the WFD bedrock aquifers.

Abstraction and permitted discharges (groundwater)

15.3.20 There are no groundwater abstractions licensed for public water supply. A source protection zone (SPZ) 3, associated with public water supplies extends into the south-west corner of the study area, 960m from the Proposed Scheme.

15.3.21 There are no private groundwater abstraction licences registered in the study area, as shown on Map WR-02-201.

15.3.22 Records of private unlicensed groundwater abstractions, which comprise those for quantities less than 20m^3 per day, have been obtained from the local authorities. These data indicate that there are no registered private unlicensed groundwater abstractions within the study area. As there is no obligation to register private water supplies, unregistered private groundwater supplies may also be present. Private water supplies would be assessed as high value receptors unless details obtained from the owner indicate otherwise.

15.3.23 There are no consented discharges to groundwater in the study area.

Groundwater - surface water interactions

15.3.24 Desk-based assessment using Ordnance Survey maps and detailed river network data provided by the Environment Agency identified no features within the study area that had potential to be springs.

15.3.25 There are no 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

15.3.26 No groundwater dependent designated nature conservation sites have been identified within the study area that have the potential to be affected by the Proposed Scheme.

15.3.27 The following nature conservation sites are potentially dependent on surface water flows, for example periodic flooding from a watercourse:

- Ashton Canal (West) Local Wildlife Site (LWS) is located within the study area and is dependent on periodic inundation from the River Medlock; and
- Rochdale Canal, Stott's Lane – Ducie Street Basin LWS is located within the study area and is dependent on periodic inundation from the River Medlock and River Irwell.

15.3.28 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

15.3.29 The Environment Agency's Flood map for planning (rivers and sea)[116] has been used to scope the baseline flood risk for flooding from main rivers and ordinary watercourses. These plans define Flood Zone 2 (land assessed as having between a 1 in 100 (1%) and 1 in 1,000 (0.1%) annual probability of river flooding) and Flood Zone 3 (land assessed as having a 1 in 100 (1%) or greater annual probability of river flooding).

15.3.30 The updated Flood map for surface water[117] 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[118]. The British Geological Survey's (BGS) Groundwater flooding susceptibility data set[119], has been used to assess the future risk of groundwater flooding.

15.3.31 The following reports were used to help determine the baseline flood risk within the study area:

- MCC Preliminary Flood Risk Assessment (2011)[120];
- Manchester, Salford and Trafford Strategic Flood Risk Assessment (SFRA) (2011)[121]; and
- MCC Local Flood Risk Management Strategy (LFRMS) (2014)[122].

[116] https://flood-map-for-planning.service.gov.uk/
[117] https://flood-warning-information.service.gov.uk/long-term-flood-risk/
[118] https://flood-warning-information.service.gov.uk/long-term-flood-risk/
[119] http://www.bgs.ac.uk/products/hydrogeology/groundwaterFlooding.html
[120] JBA Consulting (2011), *Manchester City Council Preliminary Flood Risk Assessment (PFRA)*
[121] JBA Consulting (2011), *Manchester, Salford and Trafford Strategic Flood Risk Assessment (SFRA)*
[122] Manchester City Council (2014), *Manchester City Council Local Flood Risk Management Strategy (LFRMS)*

River flooding

15.3.32 The study area includes substantial areas of floodplain (Flood Zone 2 or 3) associated with the River Medlock. No other floodplains would be crossed by the route of the Proposed Scheme in this area. Table 25 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 25: River flood risk sources and receptors

Source	Location description and figure/coordinate[123]	Receptor potentially affected	Receptor value/sensitivity to flooding
River Medlock	River Medlock WR-01-310b l3	Electricity sub-station	Very high
		Commercial properties	Moderate
		Several streets and roads including Palmerston St, Gurney St and Pin Mill Brow	Moderate
		Enterprise Park	Low
		Urban area around Limekiln Lane	Low
		Residential properties along Palmerston Street	High
		Residential properties along Linton Close	High
		Residential properties along Ancoats Grove	High
		Industrial properties	Moderate
		Land around the A57(M)/A635 Mancunian Way	Low
		Land adjacent to Baring Street	Low
		Industrial support	Moderate

Surface water flooding

15.3.33 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 26. The value of these receptors, based on Table 57 of the SMR, is also indicated.

[123] This is the location at which the source intersects the Proposed Scheme, as indicated by the grid coordinates on the relevant Volume 2: MA08 Map Book figure (in this case WR-01).

Table 26: Surface water flood risk sources and receptors

Source	Location description and figure/coordinate[124]	Receptor potentially affected	Receptor value
Surface water flow along Travis Street	Travis Street WR-01-310b l3	Travis Street, Morville Street	Moderate
Surface water flow along Heyrod Street	Heyrod Street WR-01-310b l3	Heyrod Street, Portugal Street East	Moderate
		Car Park	Moderate
Surface water flow along Sheffield Street	Sheffield Street WR-01-310b l3	Electricity sub-station	Very high
		Commercial property	Moderate
		Sheffield Street	Moderate

Artificial water bodies

15.3.34 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

15.3.35 Information related to historical incidents of groundwater flooding in the Manchester Piccadilly Station area is included in the MCC, Salford City Council and Trafford Metropolitan Borough Council SFRA[121] and LFMRS[122]. These documents state that there is no history of groundwater flooding within the area.

15.3.36 BGS's Groundwater flooding susceptibility data set indicates that there is no significant groundwater flood risk within this area.

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)[125] 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.

[124] This is the location at which the source intersects the Proposed Scheme, as indicated by the grid coordinates on the relevant Volume 2: MA08 Map Book figure (in this case WR-01)
[125] 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, such as that of the River Medlock, and their associated floodplains. Instead it would pass over larger watercourses on viaducts spanning the floodplain, with piers set back from the channel;
- avoidance, where reasonably practicable, of water dependent habitats, including natural springs that can play a key role in the hydrology and hydrogeology of such ecosystems; and
- avoidance, where reasonably practicable, of major public water supplies and smaller licensed and unlicensed abstractions of surface water and groundwater.

15.4.3 The presence of any unregistered private water supplies, their function and the means of protecting or if necessary replacing them would be discussed with any landowners potentially affected by the Proposed Scheme.

15.4.4 The temporary works shown on Map Series CT-05 in the Volume 2: MA08 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 No watercourse realignments are proposed within the Manchester Piccadilly area.

15.4.6 Watercourse diversions, which would result in changes in flow regime within discrete sections of channel, have been avoided wherever possible. There are no diversions proposed within this study area.

15.4.7 For watercourses that are not in their natural condition, the design aim for realignments and diversions would be to incorporate measures, where reasonably practicable, to improve their hydromorphological condition, provided this is compatible with their flood risk and land drainage functions.

15.4.8 The design of infrastructure required within or in proximity to an existing channel (including bridge abutments, intermediate piers and outfalls) will aim to reduce impacts on the natural hydromorphology of watercourse channels, as far as is reasonably practicable.

15.4.9 The draft CoCP includes requirements to protect water bodies and their associated water resources from the potential impacts of pollution from construction site runoff, including where appropriate:

- provision of maps showing sensitive areas and buffer zones where no pollutants are to be stored or used; and
- preparation of method statements for silt management, site drainage at compounds and satellite compounds, for the storage and control of oils and

chemicals and the prevention of accidental spillages, in consultation with the Environment Agency, and if appropriate, the LLFA and other relevant authorities as part of the approvals process. These method statements will cover, where applicable:

- the avoidance of discharges of site runoff to ditches, watercourses, drains, sewers or soakaways without the prior approval of the appropriate authority;
- measures to prevent silt-laden runoff and other pollutants entering the water environment; and
- restrictions or controls on excavation within watercourses to limit effects on water quality, sedimentation, fisheries and aquatic ecology.

15.4.10 Method statements will be required for all watercourse crossings and channel realignments required for site haul routes. The method statements will describe how potential changes to flood risk, water quality and channel hydromorphology will be managed during the establishment, use and decommissioning of all site haul routes.

15.4.11 Existing groundwater abstraction boreholes or monitoring points will be protected from physical damage, insofar as reasonably practicable, including appropriate decommissioning of abandoned boreholes in order to prevent pollution pathways. If boreholes are to be decommissioned and replaced with alternatives, the contractors will follow the latest good 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.

15.4.12 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[126] 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.

[126] Impermeable barrier preventing water flow

15.4.13 The exact requirements will be refined and method of mitigation will be designed following ground investigation at foundations and cutting locations.

Flood risk and land drainage

15.4.14 The design of the Proposed Scheme will aim to mitigate permanent impacts on flood risk and land drainage as follows:

- the floodplain avoidance strategy will ensure that the impacts on flood flows within rivers and streams, and their floodplains, will be limited to those associated with the intermediate pier structures on the Piccadilly viaduct. The Proposed Scheme includes replacement floodplain storage areas to replace losses associated with the piers;
- the temporary works shown in the Volume 2: MA08 Map Book have been informed by a detailed consideration of the flood risk constraints and have sought to avoid flood zones wherever reasonably practicable;
- 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[127];
- 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.

[127] Environment Agency (2016), *Adapting to Climate Change. Advice for Flood and Coastal Erosion Risk Management Authorities*

15.4.15 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 drainage systems during construction. Some of the specific measures referred to in the draft CoCP, include:

- preparation of flood risk assessments and method statements for temporary works, including main construction and satellite compound drainage, watercourse crossings and realignments and temporary realignments in consultation with the Environment Agency, and where applicable, the LLFA and other relevant regulators;
- location of storage, machinery, equipment and temporary buildings outside flood risk areas where reasonably practicable;
- construction of outfalls during periods of low flow to reduce the risk of scour and erosion;
- design of temporary watercourse realignments with equivalent hydraulic capacity to the existing channels, ensuring that any existing drainage outfalls 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.

15.4.16 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 drainage systems are managed appropriately.

Assessment of impacts and effects

15.4.17 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

15.4.18 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

15.4.19 The proposed Piccadilly viaduct and associated pile foundations would intersect the Chester Formation of the Sherwood Sandstone Principal aquifer and the glacial till Secondary Undifferentiated aquifer. There could be localised impacts on groundwater quality as a result of piling. However, the implementation of the measures outlined in the draft CoCP would mean effects on the overall status of this aquifer would not be significant.

15.4.20 Dewatering of the Ardwick cutting in the Davenport Green to Ardwick area (MA07) has potential to result in localised and controlled impacts on groundwater flows and levels within the Chester Formation of the Sherwood Sandstone Principal aquifer and the glacial till Secondary Undifferentiated aquifer. However, implementation of the CoCP measures will ensure that groundwater levels are controlled with minimal losses of water from the aquifer system. Impacts are likely to be minor, resulting in no significant effects.

15.4.21 Where cuttings or foundations could affect local receptors, such as groundwater abstractions or springs, this is reported in the sections below.

Abstractions

15.4.22 There are no licensed groundwater abstractions within the study area.

Groundwater - surface water interactions

15.4.23 There is potential for baseflows in the River Medlock to be impacted whilst groundwater levels are temporarily lowered during excavation of the Ardwick cutting in the Davenport Green to Ardwick area (MA07). This minor impact on the River Medlock, which is a high value receptor, would result in a temporary moderate adverse effect, which is significant.

Water dependent habitats

15.4.24 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

15.4.25 Construction of the Piccadilly viaduct would require temporary working within flood zones. Construction sequencing and temporary works design would be carefully considered and assessed in terms of potential impacts on flood risk. Method statements detailing how these works would be undertaken will be produced by the nominated undertaker in consultation with the Environment Agency and the LLFA. It is not anticipated that these temporary activities would result in significant effects related to flood risk.

Permanent effects – Water resources and WFD

15.4.26 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

15.4.27 There are no permanent effects on surface water within the study area as a result of construction of the Proposed Scheme.

15.4.28 Potential permanent impacts on baseflow in surface water receptors arising from construction effects are described in 'Groundwater – surface water interactions' below.

Groundwater

Aquifers

15.4.29 The construction of the Piccadilly viaduct would require the installation of pile foundations. This has potential to cause a minor localised impact on water levels and groundwater flow in the Sherwood Sandstone Principal aquifer which is a high value receptor. As a result, water levels could increase up-gradient of the pile foundations (to the north-east), with the potential for groundwater flooding along the River Medlock valley where the groundwater table is close to surface.

15.4.30 It is currently anticipated that implementation of the avoidance and mitigation measures would ensure that there are no permanent significant effects related to the impact of the Piccadilly viaduct pile foundations on the aquifers intercepted by the route of the Proposed Scheme.

15.4.31 Where the impacts of the Piccadilly viaduct pile foundations on the aquifers could affect additional local receptors that rely on the groundwater resource, for example on baseflow to rivers, the impacts on these are assessed below. The impacts of potential groundwater flooding are described in 'Permanent effects - flood risk and land drainage'.

Groundwater - surface water interactions

15.4.32 There remains potential for baseflows in the River Medlock to be impacted due to the potential changes in groundwater levels resulting from permanent pile foundations associated with the Piccadilly viaduct. It is likely that groundwater contributions to baseflow would increase north of the pile foundations and decrease south of the pile foundations. The pile foundations are not expected to impact the overall baseflow contribution to the River Medlock. However, on a precautionary basis, and pending further investigation, impact on baseflow to the River Medlock has been assessed as minor. This minor impact on the high value River Medlock would result in moderate adverse effects related to flow alterations to the river, which would be significant.

Water dependent habitats

15.4.33 No permanent impacts on water dependent habitats are anticipated in this study area as a result of construction of the Proposed Scheme.

Permanent effects - Flood risk and land drainage

15.4.34 The potential for groundwater level rise upstream of the Piccadilly viaduct pile foundations might result in groundwater flooding in the area. Pending further investigation, it is currently anticipated that the Proposed Scheme would result in

minor impacts on flood levels. This would potentially affect very high and high value receptors, resulting in moderate adverse effects, which are 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.

Groundwater - surface water interactions

15.4.36 Additional mitigation measures for the management of groundwater baseflows to the River Medlock, during construction of the Ardwick cutting in the Davenport Green to Ardwick area (MA07) and installation of pile foundations associated with the Piccadilly viaduct, may be required. Mitigation measures will be designed in detail following further investigation.

15.4.37 Any such additional measures will be designed in consultation with the Environment Agency.

Flood risk and land drainage

15.4.38 Further investigation is required to assess the likely effect of the Piccadilly viaduct pile foundations on groundwater levels in the Sherwood Sandstone Principal aquifer. If this assessment confirms that impacts would occur then consideration will be given to the application of appropriate mitigation measures, if deemed necessary.

15.4.39 Any mitigation measures in connection with the Piccadilly viaduct pile foundations and groundwater flooding will be developed in consultation with the Environment Agency. Monitoring would be undertaken to ensure successful establishment of the mitigation proposals developed.

Summary of likely residual significant effects

15.4.40 In the absence of the other mitigation measures set out above, the Proposed Scheme would potentially result in residual significant effects as follows:

- a moderate adverse effect related to the installation of pile foundations for the Piccadilly viaduct on groundwater flow pathways in the Sherwood Sandstone Principal aquifer, which is significant;
- a moderate adverse effect, related to temporary dewatering of the Ardwick cutting in the Davenport Green to Ardwick area (MA07), on baseflow in the River Medlock, which is significant;
- a moderate adverse effect, related to the installation of pile foundations for the Piccadilly viaduct, on baseflow in the River Medlock, which is significant; and
- a moderate adverse effect in relation to groundwater flooding to the north of the route of the Proposed Scheme, as a result of the installation of pile foundations for the Piccadilly viaduct, which is significant.

15.4.41 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

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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