In Parliament – Session 2021 - 2022

HS2

High Speed Rail (Crewe – Manchester) Environmental Statement

Volume 2: Community Area reports

MA07: Davenport Green to Ardwick

M22

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Department for Transport

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The Environmental Statement

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

- the Phase 2b Western Leg, which comprises the section of the proposed High Speed Two (HS2) rail network from Crewe to Manchester, with connections onto the West Coast Main Line;
- a number of works that are required beyond the route, such as to the existing conventional rail network, to enable the operation of the Western Leg; and
- provision for future Northern Powerhouse Rail services to connect with HS2.

Collectively, these are referred to in this ES as 'the Proposed Scheme'. The ES describes the Proposed Scheme and reports its likely significant environmental effects and the measures proposed to mitigate adverse effects.

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

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

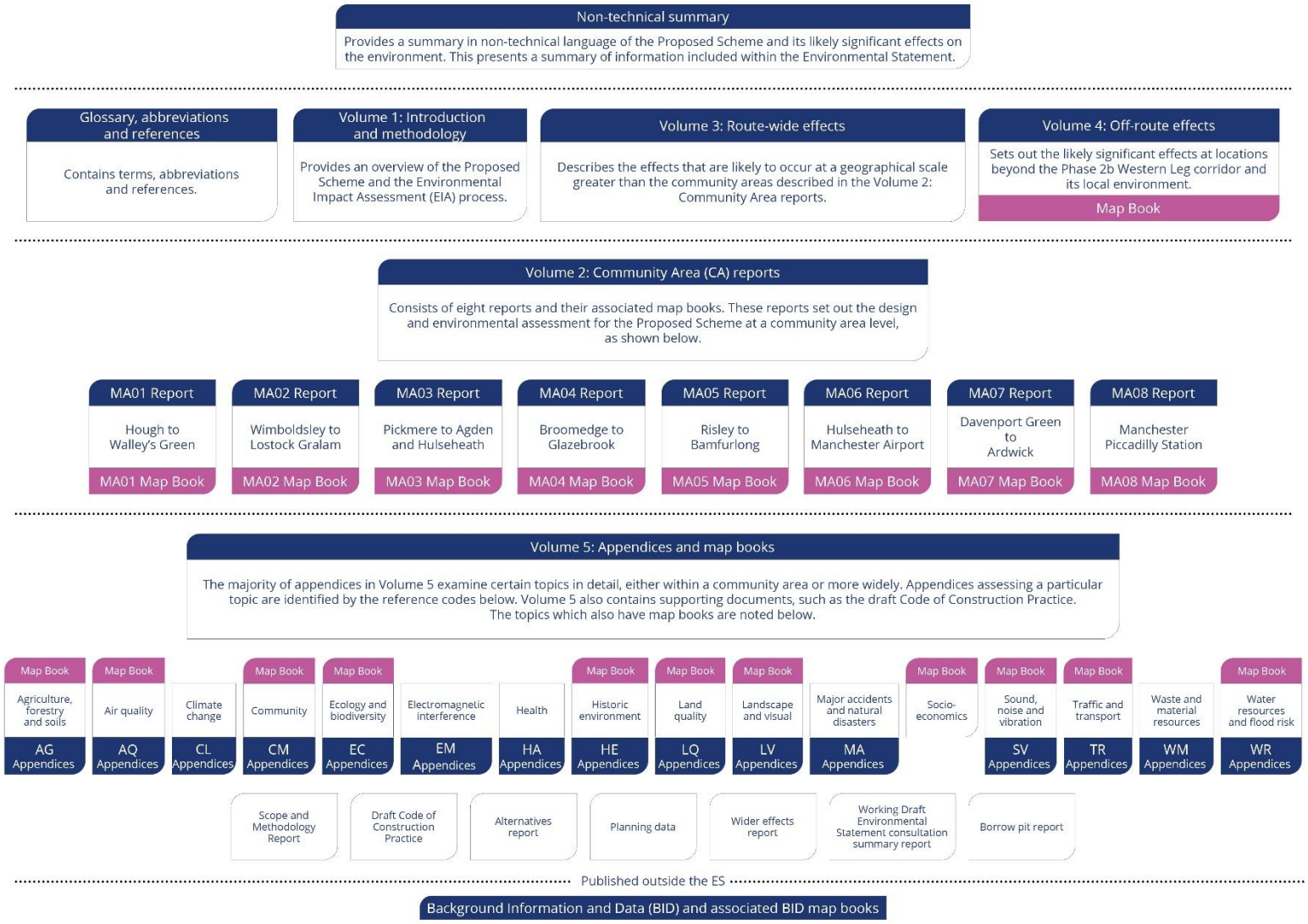
Consultation on the Environmental Statement

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

Structure of the Environmental Statement

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

Figure 1: Structure of the Environmental Statement



1 Introduction

1.1 Introduction to HS2

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

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

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

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

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

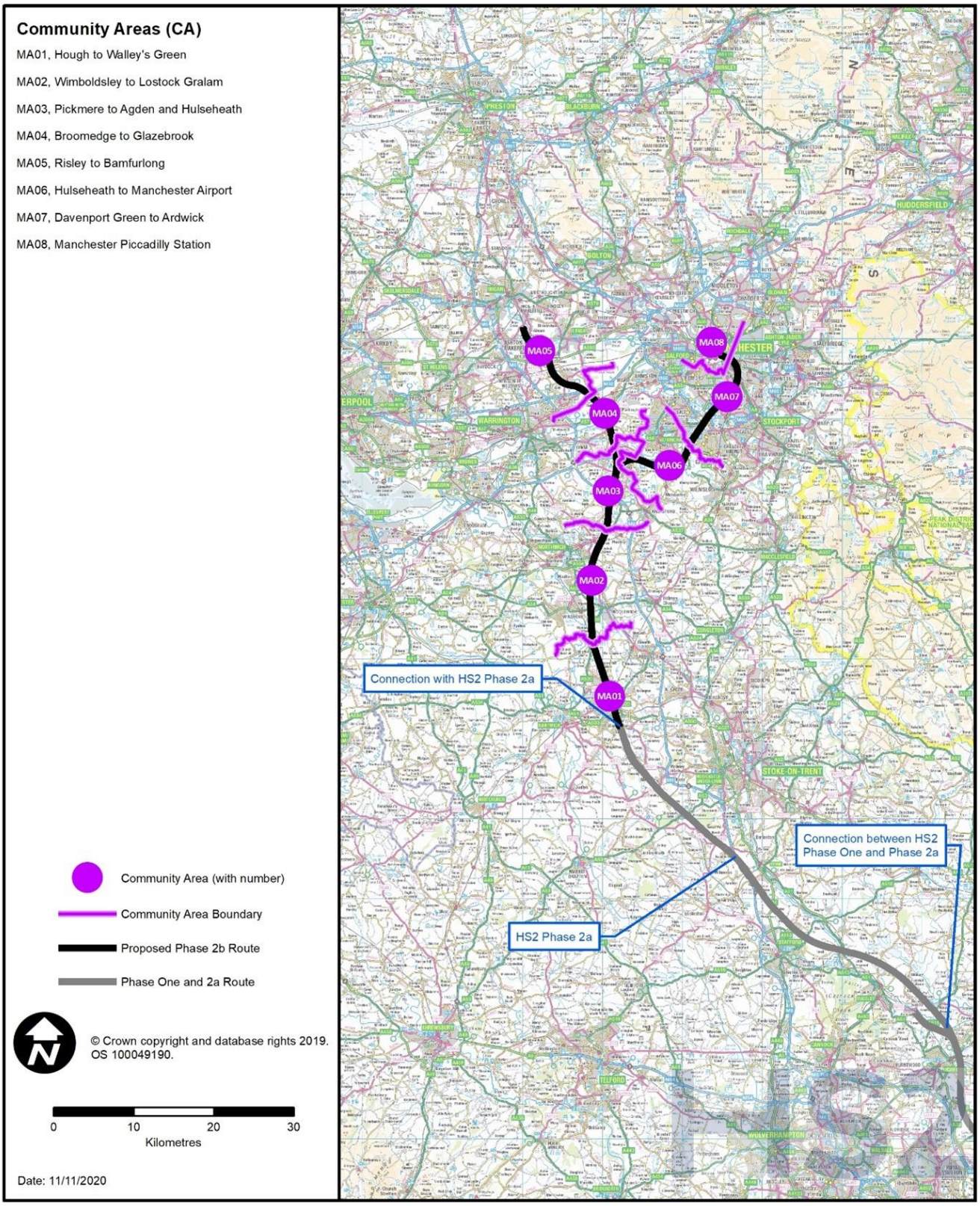
1.1.5 The environmental effects of the Proposed Scheme have been assessed. The findings of the assessment are reported in the ES, of which this Volume 2 report forms a part. The ES has been deposited alongside the Bill, in accordance with the requirements of Parliamentary

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

1.1.6 For environmental assessment and community engagement purposes, the Proposed Scheme has been divided into eight community areas (CA). These are shown in Figure 2. This CA report relates to the Davenport Green to Ardwick area (MA07).

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

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



1.2 Purpose of this report

1.2.1 This report presents the likely significant effects of the construction and operation of the Proposed Scheme on the environment within the Davenport Green to Ardwick area. The report also describes the proposed means to avoid, prevent, reduce or, if possible, offset the likely significant effects of the Proposed Scheme on the environment within the area, along with any proposed monitoring measures.

1.3 Structure of this report

1.3.1 This report is divided into the following sections:

- Section 1: an introduction to HS2 and the purpose and structure of this report;
- Section 2: overview of the community area, description of the Proposed Scheme within the community area and its construction and operation, and a list of the local alternatives considered;
- Section 3: consultation and stakeholder engagement; and
- Sections 4 to 15: an assessment of the following environmental topics:
  - agriculture, forestry and soils (Section 4);
  - air quality (Section 5);
  - community (Section 6);
  - ecology and biodiversity (Section 7);
  - health (Section 8);
  - historic environment (Section 9);
  - land quality (Section 10);
  - landscape and visual (Section 11);
  - socio-economics (Section 12);
  - sound, noise and vibration (Section 13);
  - traffic and transport (Section 14); and
  - water resources and flood risk (Section 15).

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

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

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

1.3.4 The maps relevant to the Davenport Green to Ardwick area are provided in a separate corresponding document entitled Volume 2: MA07 Map Book, which should be read in conjunction with this report. The maps contain grid references that are referred to in this report to enable features to be located.

1.3.5 The Proposed Scheme described in this report is that shown on the Map Series CT-05 (construction) and CT-06 (operation) (Volume 2: MA07 Map Book). There is some flexibility during detailed design to alter the horizontal and vertical alignments and other details within the limits shown on the plans and sections submitted to Parliament and as set out in the Bill, and this flexibility is included within the scope of the environmental assessment. Further explanation is provided in Volume 1, Section 1.

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

1.3.7 Supporting technical information, including technical appendices and map books, relating to the assessment in this Volume 2 report is provided in Volume 5 of the ES.

1.3.8 In addition to the technical appendices and map books in Volume 5, certain reports and maps containing Background Information and Data (BID) have been produced, which do not form part of the ES. These documents are available on the HS2 Ltd website (www.hs2.org.uk). The BID reports and maps present survey information, collated from published and unpublished sources, and other background data, and are referenced at various places within the ES.

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

2 Overview of the area and description of the Proposed Scheme

2.1 Overview of the area

General

2.1.1 The Proposed Scheme in the Davenport Green to Ardwick area will comprise two main components:

- a section of the HS2 Manchester spur (referred to in this report as the route of the Proposed Scheme), which will be 13.4km in length in this area of which 12.8km will be in tunnel; and
- provision for a connection between HS2 and a future Northern Powerhouse Rail (NPR) route between Manchester and Leeds, referred to as the NPR Manchester to Leeds junction.

2.1.2 The Proposed Scheme in the Davenport Green to Ardwick area will be within the local authority areas of Trafford Metropolitan Borough Council (TMBC), Manchester City Council (MCC) and the strategic authority of Greater Manchester Combined Authority (GMCA). The Proposed Scheme will pass in tunnel through the non-civil parish areas of Wythenshawe, Northenden, Withington, Longsight and West Gorton, before emerging from tunnel at Ardwick.

2.1.3 Fairywell Brook and the M56 junction 5 form the southern boundary of the Davenport Green to Ardwick area. The northern boundary of this area is within a commercial area bounded by the A665 Midland Street, the A665 Chancellor Lane and the A635 Ashton Old Road. The Hulseheath to Manchester Airport area (MA06) lies to the south-west and the Manchester Piccadilly Station area (MA08) lies to the north, as shown in Figure 3.

Settlement, land use and topography

2.1.4 The Davenport Green to Ardwick area is predominantly suburban in character becoming more urban towards the north, with land use comprising dense residential development alongside recreational grounds, parkland and woodland. A number of watercourses, notably the River Mersey, are found in the area. Historical land uses in the area include coal mining and landfill.

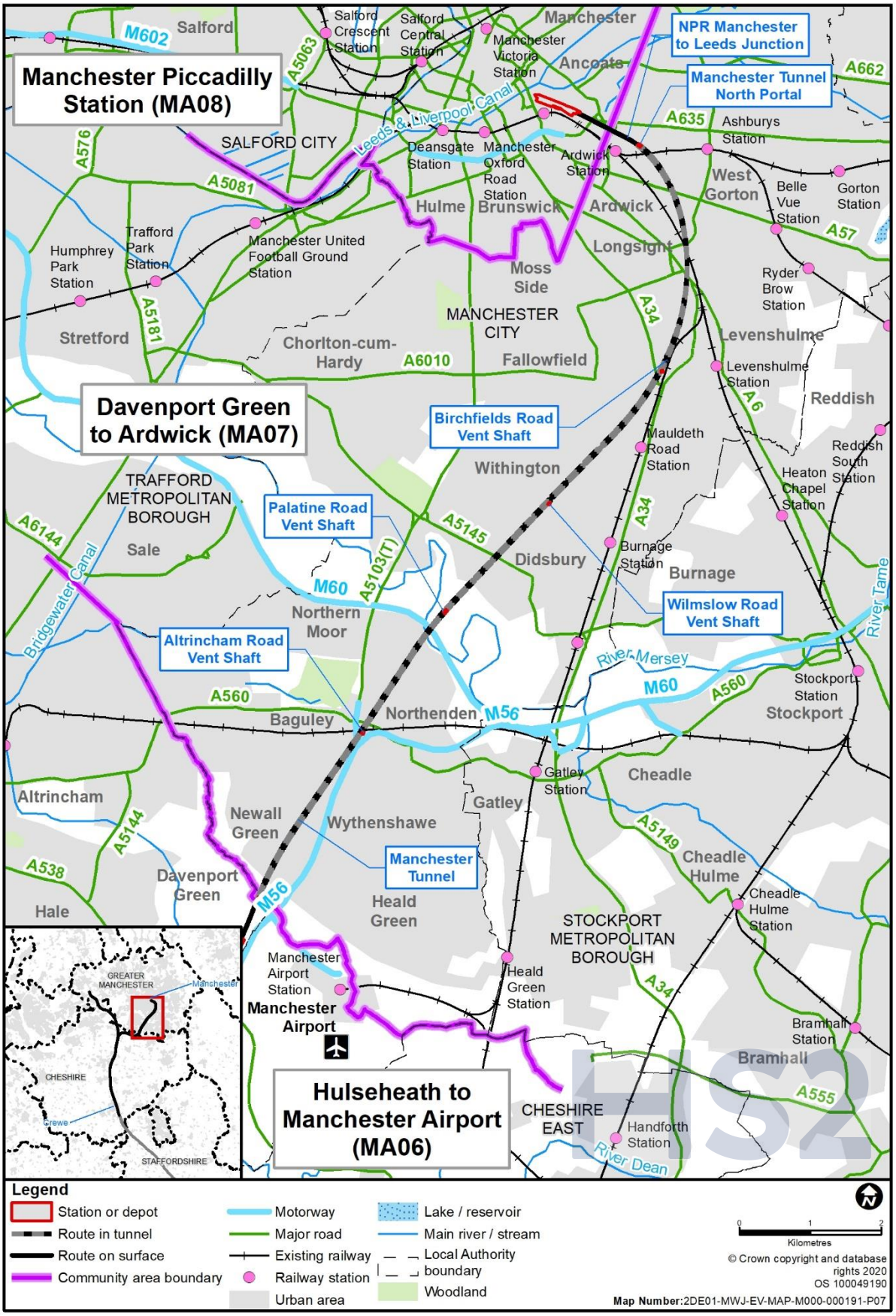
2.1.5 At the southern end of the area, the route of the Proposed Scheme will pass in tunnel under the settlements of Newall Green, Wythenshawe, Northenden, Didsbury and Withington. Golf courses adjacent to the River Mersey lie towards the middle of the area. The northern extent of the area becomes more urban in character as it approaches Manchester city centre. There

are light industrial and commercial uses in Roundthorn, Northenden, Longsight, West Gorton and Ardwick[3].

2.1.6 The area is generally flat, with urban development overlying the topography. The highest point is located near Newall Green (74m above Ordnance Datum (AOD)) in the south; the lowest point is located along the valley of the River Mersey at Northenden (28m AOD) in the north.

[3] Ardwick is only partially situated in the Davenport Green to Ardwick area; many of Ardwick's residential areas are found in the Manchester Piccadilly Station area (MA08).

Figure 3: Community area context map



Key transport infrastructure

2.1.7 The principal highways within this area include the M56, the M60, the A5103 Princess Parkway/Princess Road, the A560 Altrincham Road, the A5145 Wilmslow Road/Barlow Moor Road, the A34 Birchfields Road/Kingsway, the A5079 Slade Lane, the A6 Stockport Road, the A6010 Kirkmanshulme Lane/Dickenson Road, the A57 Hyde Road, the A635 Ashton Old Road and the A665 Midland Street/Devonshire Street North. Other local roads in the area include the B5167 Palatine Road, the B5166 Church Road and the B5093 Wilmslow Road/Moseley Road/Albert Road.

2.1.8 There are a number of railway lines in this area, including the Mid-Cheshire Line, Styal Line, Ashburys Line, Glossop Line and the Crewe to Manchester Line.

2.1.9 The Metrolink is a light rail (tram) system which runs through the Davenport Green to Ardwick area, with seven lines and multiple stops. The closest stops to the route of the Proposed Scheme are Martinscroft and West Didsbury.

2.1.10 The Ashton Canal is present in the north of this area, the Bridgewater Canal is present in the south-west of this area and the Manchester Ship Canal partially passes through the north-west of this area.

2.1.11 The route of the Proposed Scheme will pass under several national, regional and local cycle routes including: the Trans Pennine Trail and National Cycle Network route 62 along the River Mersey; the Fallowfield Loop; National Cycle Network route 6 close to Lindleywood Road; regional cycle route 85 in Wythenshawe and Medlock Valley Way, as well as beneath footways associated with the highways in the area.

Socio-economic profile

2.1.12 The Davenport Green to Ardwick area includes two district council areas. However, data are provided in this overview for the MCC area only as this district is considered to be representative of the socio-economic profile of the area as a whole.

2.1.13 The retail and professional, scientific and technical sectors account for the largest proportion of businesses within the MCC area (18% each), followed by business administration and support services (9%) sector[4].

2.1.14 According to the Annual Population Survey (2020)[5], the employment rate (the proportion of residents aged 16-64 in employment) within the MCC area was 66% (257,800 people). The unemployment rate was 9% in the MCC area in 2020.

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

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

2.1.15 The same survey indicates that 48% of residents aged 16-64 in the MCC area were qualified to National Vocational Qualification Level 4 (NVQ4) and above, while 8% of residents had no qualifications.

Notable community facilities

2.1.16 The Davenport Green to Ardwick area is a densely populated residential area with community facilities and services located throughout, with higher concentrations of amenities located closer to Manchester city centre. Longsight Market on Dickenson Road is an important and popular local resource.

2.1.17 Community facilities in the area include the Tree of Life Community Centre on Greenbrow Road, Baguley Hall on Hall Lane and Benchill Community Centre on Benchill Road. Libraries in the area include Northenden Community Library on the B5167 Palatine Road and Longsight Library and Learning Centre on the A6 Stockport Road.

2.1.18 There are pre-school education facilities, primary schools (the closest to the route of the Proposed Scheme is Birchfields Primary School), secondary schools (the closest to the route of the Proposed Scheme is Manchester Enterprise Academy Central) and colleges throughout the area. In addition, The University of Manchester Fallowfield Campus is located on Moseley Road.

2.1.19 There are medical surgeries, dental practices, care homes and hospitals throughout the area. The closest hospital to the route of the Proposed Scheme is The Christie Hospital on the B5093 Wilmslow Road.

2.1.20 There are places of worship throughout the area. The closest to the route of the Proposed Scheme are The Church of Jesus Christ of Latter-Day Saints on the A560 Altrincham Road and Kingsway International Christian Centre on Kingswood Road, which is located directly above the Manchester tunnel.

2.1.21 There are also a number of industrial estates throughout the area. The closest to the route of the Proposed Scheme are Sharston Industrial Area adjacent to the M56, Vaughan Industrial Estate located on Bennett Street and the industrial area around Rondin Road.

Recreation, leisure and open space

2.1.22 There is a range of recreation, leisure and open space facilities throughout the Davenport Green to Ardwick area. Notable facilities close to the route of the Proposed Scheme include: Wythenshawe Park, which includes woodlands, an orienteering course, tennis courts, a community farm and a horticultural centre; Fletcher Moss Botanical Garden; Marie Louise Gardens; Fog Lane Park and Recreation Grounds; Ladybarn Park; Platt Fields Park; and Crowcroft Park. Golf clubs in the area include Didsbury Golf Club, Withington Golf Club and Northenden Golf Club.

2.1.23 In addition, there are allotment gardens, sports fields, clubs and sports centres including Armitage Sports Centre, stadia and multi-use pitches within the area, which offer recreational and leisure opportunities to residents.

Policy and planning context

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

Planning framework

2.1.25 Relevant development plan documents and other planning policies have been considered in relation to environmental topics, as part of considering the Proposed Scheme in the local context. Development plan documents and other planning policies relevant to the Davenport Green to Ardwick area are listed in Volume 5: Appendix CT-004-00000, Planning data. These have been considered and referred to where appropriate to the assessment described in Sections 4 to 15 of this Volume 2 report.

Committed development

2.1.26 Committed developments are defined as developments with planning permission and sites allocated for development, or safeguarded for minerals in adopted development plans, on or close to the land required for the Proposed Scheme. Section 7 of Volume 1 sets out the approach to identifying and considering committed developments in the assessment. The committed developments relevant to the assessment of the Proposed Scheme in the Davenport Green to Ardwick area are listed in Volume 5: Appendix CT-004-00000, Planning data and are shown in Volume 5, Planning Data/Committed Development Map Book: maps CT-13-322b to CT-13-326a.

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

Changes to the design since the working draft ES

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

- introduction of the NPR Manchester to Leeds junction, making provision for a future NPR route between Manchester and Leeds, comprising:
  - Ardwick box structure (see Volume 2: MA07 Map Book, map CT-06-365a, B5 to C5);
  - Manchester to Leeds embankment (see Volume 2: MA07 Map Book, map CT-06-365a, C5 to D5); and

  - the length of Ardwick cutting in this area has been reduced by 266m and the width has increased by 6m. The feature has been renamed Ardwick North cutting retaining wall (see Volume 2: MA07 Map Book, map CT-06-365a, C5).
- changes to the route of the Proposed Scheme in the Davenport Green to Ardwick area as a result of design development including:
  - the Manchester tunnel south portal, located within the Hulseheath to Manchester Airport area in the working draft ES, has been moved into the Davenport Green to Ardwick area (MA07) (see Volume 2: MA07 Map Book, map CT-06-357b, G6);
  - the proposed location of Manchester tunnel north portal has been moved 230m west (see Volume 2: MA07 Map Book, map CT-06-364, I5 to J5 and map CT-06-365a, A5);
  - amendment to the proposed horizontal alignment of the Manchester tunnel by up to 160m through Newall Green, Northenden, Longsight and West Gorton (see Volume 2: MA07 Map Book, maps CT-06-357b to CT-06-365a);
  - the depth of the Manchester tunnel has been reduced by up to 17m through Newall Green, Northenden, Longsight and West Gorton (see Volume 2: MA07 Map Book, maps CT-06-357b to CT-06-365a);
  - the location of Altrincham Road vent shaft and associated infrastructure has been moved 18m east and the height of the headhouse has been reduced by 2.5m (see Volume 2: MA07 Map Book, map CT-06-359, C6 to C7);
  - the length of Manchester tunnel has been increased by 55m due to proposed horizontal alignment changes and a combination of shifting Birchfields Road vent shaft, Palatine Road vent shaft, Manchester tunnel south portal and Manchester tunnel north portal (see Volume 2: MA07 Map Book, maps CT-06-357b to CT-06-365a);
  - the location of Palatine Road vent shaft satellite compound, Palatine Road vent shaft, Palatine Road vent shaft auto-transformer station and associated infrastructure has been moved 395m south-west (see Volume 2: MA07 Map Book, map CT-05-360, D3 to E3 and map CT-06-360, D3 to E3); and
  - the location of Lytham Road vent shaft satellite compound, Lytham Road vent shaft, Lytham Road vent shaft auto-transformer station and associated infrastructure has been moved 205m south-west of the route of the Proposed Scheme and are renamed Birchfields Road vent shaft satellite compound, Birchfields Road vent shaft and Birchfields Road vent shaft auto-transformer station (see Volume 2: MA07 Map Book, maps CT-05-362, J5 to J6 and map CT-05-363, A5 to A6 and maps CT-06-362, J6 and map CT-06-363, A6).
- introduction of the temporary Manchester tunnel north portal construction sidings[6], which will provide a facility to handle material from the construction of the Proposed Scheme. The Manchester tunnel north portal construction sidings will be accessed via

[6] Sites with connections to the National Rail network to allow excavated materials to either join the rail network from the Proposed Scheme construction areas, or to leave the rail network to enter the construction areas. Facilities at construction sidings will include offices and rail sidings to provide for the loading or unloading of construction material from rail wagons.

reception tracks off the Ashburys Line to the north (see Volume 2: MA07 Map Book, map CT-05-364, H9 to J6 and map CT-05-365a, A6 to B6);

- introduction of the Manchester tunnel north portal satellite compound to manage the construction of the Manchester tunnel north portal construction sidings (see Volume 2: MA07 Map Book, map CT-05-365a, A5 to B6);
- the proposed Chancellor Lane auto-transformer station has been moved 30m east, to the Manchester Piccadilly Station area (MA08), and is renamed Midland Street sectioning auto-transformer station (see Volume 2: MA07 Map Book, map CT-06-365a, C5 to D6);
- introduction of road closures and diversions:
  - permanent closure of Hooper Street, Glenbarry Street and Rondin Close (see Volume 2: MA07 Map Book, map CT-05-365a, B6 to C6);
  - permanent closure of a section of the A665 Midland Street (see Volume 2: MA07 Map Book, map CT-05-365a, C5); and
  - diversion of the A665 Midland Street at the junction with the A665 Chancellor Lane, in this section, continuing into Manchester Piccadilly Station area (MA08) (see Volume 2: MA07 Map Book, map CT-05-365a, C4 and D6).
- introduction of utilities works including the diversion of Electricity North West, United Utilities, Virgin and Vodafone/O2 assets and decommissioning of Openreach, Cadent Gas, Electricity North West, United Utilities, Virgin and Vodafone/O2 assets throughout the Davenport Green to Ardwick area, as described in Section 2.2; and
- introduction of two telecommunications sites in the Davenport Green to Ardwick area, as described in Section 2.2 (see Volume 2: MA07 Map Book: maps CT-06-364, I5 to J5 and CT-06-365a, C5 to D6).

2.1.29 In addition, the location and layout of construction compounds, stockpiles and site haul routes have been considered as part of the development of the design. Mitigation such as landscape planting and replacement floodplain storage areas have also been included throughout the Davenport Green and Ardwick area to reduce adverse effects from the Proposed Scheme.

2.2 Description of the Proposed Scheme

General

2.2.1 The following section describes the main features of the Proposed Scheme in the Davenport Green to Ardwick area, including the proposed environmental mitigation measures that have been identified. Further general information on typical permanent features is provided in Volume 1, Section 5. Similarly, a general description of the approach to mitigation is explained in Volume 1, Section 9. Some of the ecological mitigation described in this section has been provided on a precautionary basis. This is described in Section 7, Ecology and biodiversity.

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

Overview

2.2.3 The Proposed Scheme within the Davenport Green to Ardwick area has two main components (as illustrated in Figure 3):

- the route of the Proposed Scheme: a section of the HS2 Manchester spur 13.4km in length of which 12.8km is in tunnel, continuing from the northern boundary of the Hulseheath to Manchester Airport area (MA06) and travelling north to the Manchester Piccadilly Station area (MA08); and
- NPR Manchester to Leeds junction: provision for a connection between HS2 and a future NPR route between Manchester and Leeds.

2.2.4 Each of these components and their associated key features are set out in the following sections. Where key features are associated with more than one component of the Proposed Scheme, they are described within the section they are first associated with.

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

The route of the Proposed Scheme

2.2.6 The route of the Proposed Scheme through the Davenport Green to Ardwick area will extend from north of Davenport Green in the south and travel north towards Withington and Longsight and on to Ardwick.

2.2.7 This section of the Proposed Scheme is illustrated on maps CT-06-357b to CT-06-365a in the Volume 2: MA07 Map Book.

2.2.8 All dimensions in the sections below are approximate.

2.2.9 The route of the Proposed Scheme will consist of 12.8km of tunnel, 100m of porous portals, 370m of cutting, a 108m long box structure and 81m of embankment in the Davenport Green to Ardwick area.

2.2.10 These components and their associated key features are described in three separate sections below.

2.2.11 In general, the Proposed Scheme is described from south to north.

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

Manchester tunnel south portal to Manchester tunnel north portal

2.2.13 The route of the Proposed Scheme will continue from the Hulseheath to Manchester Airport area (MA06) and enter Manchester tunnel south portal. The tunnel will run in a northwards direction and will include four vent shafts, before emerging from Manchester tunnel north portal to the north-west of the Siemens Ardwick Train Care Facility. This section of route is illustrated in the Volume 2: MA07 Map Book, maps CT-06-357b to CT-06-365a.

2.2.14 Key features of this 12.9km section will include:

- Manchester tunnel south portal, a porous portal 50m in length at the southern end of Manchester tunnel, with a headwall at the northern end of the portal cutting (see Volume 2: MA07 Map Book, map CT-06-357b, G6);
- Manchester tunnel south portal building, 27m in length, 24m in width and 7m in height to the north of Manchester tunnel south portal, containing the control equipment for rail tunnel operations. There will also be a surface water pumping station for railway drainage. An emergency rescue area will also be located adjacent to the portal to accommodate emergency evacuation of passengers and vehicular access for emergency services. Access will be provided via a new access track from the realigned Thorley Lane (see Volume 2: MA07 Map Book, map CT-06-357b, G6);
- a pumping station storage tank for portal area drainage, 63m south-east of Fairywell Brook. Access will be provided from Thorley Lane (see Volume 2: MA07 Map Book, map CT-06-357b, G6);
- Manchester tunnel south portal auto-transformer station, 27m by 12m, to the west of the route of the Proposed Scheme, including signalling equipment and a railway telecommunications mast, up to 15m in height. Access will be provided via a new access track from the realigned Thorley Lane (see Volume 2: MA07 Map Book, map CT-06-357b, G6);
- an underground attenuation tank for railway drainage, 8m by 8m, 240m north-west of the M56 junction 5 (see Volume 2: MA07 Map Book, map CT-06-357b, G6);
- a substation, 10m by 10m in area, 41m north of Thorley Lane (see Volume 2: MA07 Map Book, map CT-06-357b, G6);
- an area of landscape mitigation planting around Manchester tunnel south portal to provide visual screening for the residents of Newall Green (see Volume 2: MA07 Map Book, map CT-06-357b, G6);
- an area of woodland habitat creation to the north and east of Manchester tunnel south portal to provide replacement habitat (see Volume 2: MA07 Map Book, map CT-06-357b, G6 and G7);
- Manchester tunnel, a twin bore tunnel, 12.8km in length and up to 43m in depth, passing under the settlements of Newall Green, Wythenshawe, Northenden, Didsbury, Withington, Rusholme, Longsight and West Gorton. The top of the bored tunnel will be up to 36m below existing ground level and track level will be up to 43m below ground

level. Both excavated bores will be 8.3m in external diameter with a lined internal diameter of 7.6m. There will be cross passages up to every 500m providing access between the two bores (see Volume 2: MA07 Map Book, maps CT-06-357b to CT-06-365a);

- Altrincham Road vent shaft and headhouse, with associated landscape mitigation planting to help integrate the Proposed Scheme into the surrounding landscape. The vent shaft will be 24m in internal diameter and 39m in depth. The headhouse will be 29m in length, 28m in width and 16m in height. Access will be provided from Altrincham Road vent shaft access road off the A560 Altrincham Road (see Volume 2: MA07 Map Book, map CT-06-359, C6 to D8);
- an underground attenuation tank for vent shaft drainage, 8m by 8m, 8m south of the Mid-Cheshire Line (see Volume 2: MA07 Map Book, map CT-06-359, C7);
- Altrincham Road vent shaft access road and retaining wall, 250m in length and up to 2m above ground level, located to the east of the route of the Proposed Scheme, between the Mid-Cheshire Line and the M56 (see Volume 2: MA07 Map Book, map CT-06-359, C7 to D8);
- permanent relocation of the Altrincham Road telecommunications mast, from 23m north of the M56, on the route of the Proposed Scheme, to 60m north of the M56 fronting onto the existing Mid Cheshire Railway Line that borders Altrincham Road vent shaft (see Volume 2: MA07 Map Book, map CT-06-359, C7);
- permanent relocation of a telecommunications mast owned by Network Rail. The mast is located on the northern boundary of the proposed Altrincham Road vent shaft site, fronting onto the existing Mid Cheshire Railway Line that borders the site. The telecommunications mast will be relocated to make way for access roads to Altrincham Road vent shaft (see Volume 2: MA07 Map Book, map CT-06-359, C7);
- a substation, 5m by 6m in area, 15m south of the A560 Altrincham Road (see Volume 2: MA07 Map Book, map CT-06-359, D8);
- diversion of an underground United Utilities 1850mm combined sewer, for 76m in length, around the proposed extent of Altrincham Road vent shaft (see Volume 2: MA07 Map Book, map CT-06-359, C6 to C7);
- permanent diversion of minor utilities to accommodate Altrincham Road vent shaft, including United Utilities potable water mains (located within the section of route shown on Volume 2: MA07 Map Book, map CT-06-359);
- decommissioning of minor utilities to accommodate Altrincham Road vent shaft, including Electricity North West electricity cables (located within the section of route shown on Volume 2: MA07 Map Book, map CT-06-359);
- Palatine Road vent shaft and two headhouses, with associated landscape mitigation and hedgerow planting to provide visual screening for users of Withington Golf Course and local residents and to help integrate the Proposed Scheme into the surrounding landscape. The vent shaft will be an oval shape, 51m by 42m in internal diameter and 39m in depth. The headhouses will be 7m in height and located on raised earthwork platforms 2m in height. One headhouse will be 34m in length and 28m in width and the

other headhouse will be 34m in length and 10m in width. Access will be provided from the B5167 Palatine Road (see Volume 2: MA07 Map Book, map CT-06-360, D2 to E3);

- two areas of woodland habitat creation to the south-west of Palatine Road vent shaft, to provide replacement habitat (see Volume 2: MA07 Map Book, map CT-06-360, D2 to D3);
- Palatine Road vent shaft auto-transformer station, 34m by 24m in area, on the route of the Proposed Scheme, 40m east of the B5167 Palatine Road, with an access road from the B5167 Palatine Road to the west (see Volume 2: MA07 Map Book, map CT-06-360, D3 to E3);
- an underground attenuation tank for vent shaft drainage, 8m by 8m, 75m south-east of the B5167 Palatine Road (see Volume 2: MA07 Map Book, map CT-06-360, E3);
- replacement floodplain storage area on the eastern side of the route of the Proposed Scheme within the Didsbury flood storage basin in Withington Golf Club's golf course, adjacent to the River Mersey (see Volume 2: MA07 Map Book, map CT-06-360, C5 to F5 and D6 to E6);
- nine areas of woodland habitat creation in the vicinity of the replacement floodplain storage area within Withington Golf Club's golf course, to provide replacement habitat (see Volume 2: MA07 Map Book, map CT-06-360, D4 to E4, C5 to F5 and F4);
- an area of woodland habitat creation to the east of the route of the Proposed Scheme, to provide replacement habitat (see Volume 2: MA07 Map Book, map CT-06-360, F7 to F8, G6 to G7);
- Wilmslow Road vent shaft and headhouse, with associated landscape mitigation planting to provide visual screening for residents of Parkville Road and the B5093 Wilmslow Road and to help integrate the Proposed Scheme into the surrounding landscape. The vent shaft will be 24m in internal diameter and 49m in depth. The headhouse will be 31m in length, 30m in width and 8m in height. Access will be provided from the B5093 Wilmslow Road (see Volume 2: MA07 Map Book, map CT-06-361, F6 to G5);
- an underground attenuation tank for railway drainage, 8m by 8m, 60m east of the B5093 Wilmslow Road (see Volume 2: MA07 Map Book, map CT-06-361, G6);
- permanent diversion of minor utilities to accommodate Wilmslow Road vent shaft, including Electricity North West electricity cables (located within the section of route shown on Volume 2: MA07 Map Book, map CT-06-361);
- Birchfields Road vent shaft and headhouse, with associated landscape mitigation and hedgerow planting to provide visual screening for Birchfields Primary School. Fallowfield Retail Park and residents to the west of the A34 Birchfields Road and to help integrate the Proposed Scheme into the surrounding landscape. The vent shaft will be 24m in internal diameter and 48m in depth. The headhouse will be 30m in length, 30m in width and 8m in height. Access will be provided from the A34 Birchfields Road (see Volume 2: MA07 Map Book, maps CT-06-362, J6 and CT-06-363, A6);
- a substation, 5m by 6m in area, immediately east of the A34 Birchfields Road (see Volume 2: MA07 Map Book, map CT-06-363, A5);

- an underground attenuation tank for railway drainage, 8m by 8m, 80m east of the A34 Birchfields Road (see Volume 2: MA07 Map Book, map CT-06-363, A6);
- Birchfields Road vent shaft auto-transformer station, 51m by 12m, above the route of the Proposed Scheme in tunnel and 29m south of Birchfields Primary School, with access from the A34 Birchfields Road to the west (see Volume 2: MA07 Map Book, maps CT-06-362 J6 and CT-06-363, A6);
- an area of land to the west of Birchfields Road vent shaft, to be levelled and protected by hoarding, which will be returned to suitable development use following construction of the Proposed Scheme (see Volume 2: MA07 Map Book, maps CT-06-362, J5 to J6 and CT-06-363, A5 to A6);
- Manchester tunnel north portal, a porous portal 50m in length at the northern end of Manchester tunnel, with a headwall at the southern end of the portal cutting (see Volume 2: MA07 Map Book, map CT-06-364, I5 to J5);
- Manchester tunnel north portal building, 27m in length, 24m in width and 7m in height to the south of Manchester tunnel north portal, containing control equipment for rail tunnel operations. There will also be a surface water pumping station for portal area drainage. An emergency rescue area will also be located adjacent to the portal to accommodate emergency evacuation of passengers and vehicular access for emergency services. Access will be provided from Rondin Road to the east (see Volume 2: MA07 Map Book, maps CT-06-364, I5 to J5 and CT-06-365a, A5);
- decommissioning of minor utilities to accommodate Manchester tunnel north portal building, including Cadent Gas mains, Electricity North West electricity cables, Openreach and Virgin telecommunications cables and United Utilities wastewater sewers and potable water mains (located within the section of route shown on Volume 2: MA07 Map Book, map CT-06-365a);
- permanent diversion of minor utilities to accommodate Manchester tunnel north portal building, including Vodafone and Virgin telecommunications cables and Electricity North West electricity cables (located within the section of route shown on Volume 2: MA07 Map Book, map CT-06-365a);
- a pumping station storage tank for portal compound drainage, 21m south of Manchester tunnel north portal. Access will be provided from Rondin Road (see Volume 2: MA07 Map Book, map CT-06-364, I5 and J5);
- Manchester tunnel north portal telecommunications site, 6m by 6m, to the east of the route of the Proposed Scheme, including signalling equipment and a railway telecommunications mast 20m in height. Access will be provided from Rondin Road to the east (see Volume 2: MA07 Map Book, map CT-06-364, J5);
- a substation, 5m by 5m, 30m west of Rondin Road (see Volume 2: MA07 Map Book, maps CT-06-364, J5 and CT-06-365a, A5);
- areas of landscape mitigation planting to the north and south of Manchester tunnel north portal continuing into the Manchester Piccadilly Station area (MA08), to provide visual screening for sites which will be returned to suitable development use (see Volume 2: MA07 Map Book, map CT-06-364, I5 to J4 and map CT-06-365a A4, A5 to C5 and C6);

- two areas of land to the north of the route of the Proposed Scheme bounded by Ashburys Line and the A635 Ashton Old Road, to be levelled and protected by hoarding, which will be returned to suitable development use following construction of the Proposed Scheme (see Volume 2: MA07 Map Book, maps CT-06-364, H9 to J4 and CT-06-365a, A5 to C5, A6 to C6 and A7 to B7); and
- three areas of land to the south of the route of the Proposed Scheme, to be levelled and protected by hoarding, which will be returned to suitable development use following construction of the Proposed Scheme (see Volume 2: MA07 Map Book, maps CT-06-364, I5 to J4 and CT-06-365a, A4 to C5).

Ardwick South cutting to Ardwick North cutting

2.2.15 The route of the Proposed Scheme will emerge from Manchester tunnel at Manchester tunnel north portal in Ardwick, continuing between Ardwick South cutting and through Ardwick box structure (described under the NPR Manchester to Leeds junction section), north-west of the Siemens Ardwick Train Care Facility towards Manchester city centre. This section of route is illustrated in the Volume 2: MA07 Map Book, map CT-06-364 and map CT-06-365a. Key features of this 460m section will include:

- Ardwick South cutting, comprising retaining walls on both sides, 167m in length and up to 34m in width, all of which will be below ground level (see Volume 2: MA07 Map Book, maps CT-06-365a, A5 to B5);
- an area of grassland habitat creation to the south of Ardwick South cutting, to provide replacement habitat (see Volume 2: MA07 Map Book, map CT-06-365a B4 to B5 and C3 to C5);
- Ardwick North cutting, comprising retaining walls on both sides, 182m in length in this area, all of which will be below ground level. The cutting continues into the Manchester Piccadilly Station area (MA08) (see Volume 2: MA07 Map Book, map CT-06-365a, C5 to D5);
- closure of Hooper Street, Glenbarry Street and Rondin Close, which are within land to be returned to suitable development use (see Volume 2: MA07 Map Book, map CT-06-365a, B6, C5 and C6);
- closure of a section of the A665 Midland Street where it crosses the route of the Proposed Scheme, with access to the commercial properties retained off both Handsworth Street and Pittbrook Street. Users will be diverted via a realigned section of the A665 Midland Street and the A665 Chancellor Lane diversion, increasing the journey length by up to 860m (see Volume 2: MA07 Map Book, map CT-06-365a, C4 to C5 and D4 to D5);
- Midland Street sectioning auto-transformer station, 105m by 26m in area to the north of the route of the Proposed Scheme adjacent to the A665 Midland Street. There will also be signalling equipment and a railway telecommunications mast 15m in height. Associated landscaping mitigation planting to the north and west to help integrate the Proposed Scheme into the surrounding landscape and provide visual screening for residents to the

north of the A635 Ashton Old Road and for land that is to be returned to suitable development use. Access will be provided from the remaining section of the A665 Midland Street on the north side of the Proposed Scheme, which will connect to the A635 Ashton Old Road (see Volume 2: MA07 Map Book, map CT-06-365a, C5 to D6);

- a substation, 20m by 20m, 5m west of the A665 Midland Street (see Volume 2: MA07 Map Book, map CT-06-365a, C6); and
- decommissioning of minor utilities along the A665 Midland Street, including a United Utilities wastewater sewer and Openreach telecommunications cables (located within the section shown on Volume 2: MA07 Map Book, map CT-06-365a).

NPR Manchester to Leeds junction

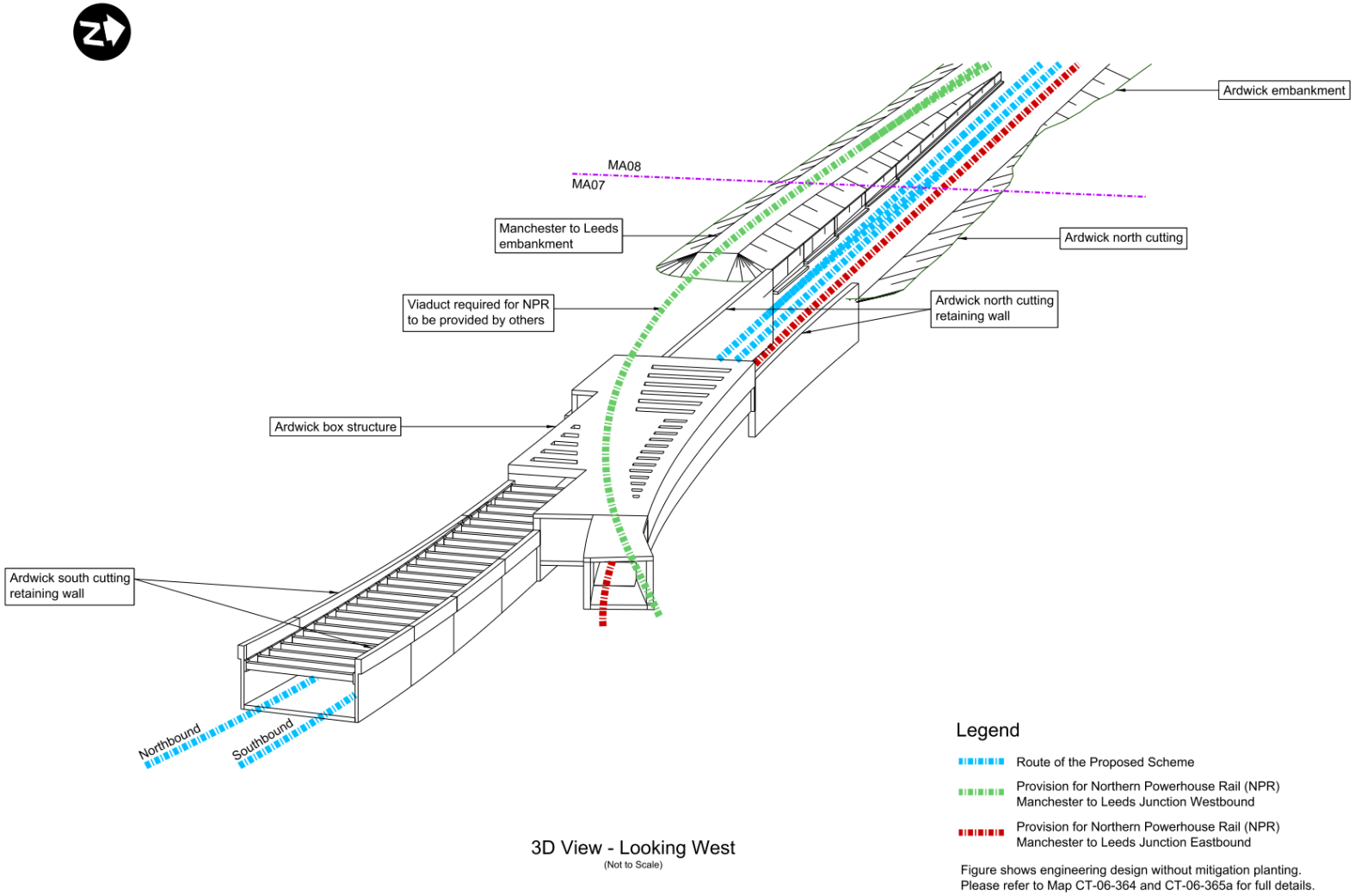
2.2.16 The Proposed Scheme in the Davenport Green to Ardwick area includes features which will enable provision for a future NPR route between Manchester and Leeds to HS2. This provision is referred to as NPR Manchester to Leeds junction.

2.2.17 The features which are directly associated with NPR Manchester to Leeds junction comprise:

- Ardwick box structure, 108m in length and up to 10m in height of which up to 6m will be above ground level. Landscape mitigation planting to the north and south will provide screening for land that is to be returned to suitable development use and help integrate the box structure into the surrounding landscape (see Figure 4 and Volume 2: MA07 Map Book, map CT-06-365a, B5 to C5); and
- Manchester to Leeds embankment, 81m in length and up to 5m in height, with associated landscape planting to help integrate the embankment into the surrounding landscape. The embankment will continue into the Manchester Piccadilly Station area (MA08) (see Volume 2: MA07 Map Book, map CT-06-365a, C5 to D5).

2.2.18 The future NPR Leeds-bound route will be carried on the roof of Ardwick box structure and continue northwards on Manchester to Leeds embankment. The future NPR Manchester-bound route will travel through Ardwick box structure and continue into Ardwick North cutting where it will run parallel to the route of the Proposed Scheme, as shown in Figure 4.

Figure 4: NPR Manchester to Leeds junction



Demolitions

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

2.2.20 The following have been identified for demolition: four residential properties, 31 commercial/business properties and nine other structures. These will be needed for construction of the permanent features or, in some cases, to enable the construction works for the Proposed Scheme. Demolitions will be managed from the same construction compounds as the permanent features with which they are associated. The identified demolitions are listed in Section 2.3 under the relevant construction compounds.

2.3 Construction of the Proposed Scheme

2.3.1 This section describes the key construction activities that are envisaged to be needed to build the Proposed Scheme in the Davenport Green to Ardwick area. It includes:

- an overview of the construction process;
- a description of the advance works;
- a description of the engineering works to build the Proposed Scheme;
- information on construction waste and material resources;
- a description of how the Proposed Scheme will be commissioned;
- an indicative construction programme; and
- monitoring arrangements during the construction period.

2.3.2 The construction arrangements described in this section provide the basis for the assessment presented in this ES.

2.3.3 Land used only for construction purposes will be restored as agreed with the owner of the land and the relevant planning authority once construction works on that land are complete.

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

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

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

Code of Construction Practice

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

2.3.8 In addition, HS2 Ltd has produced a Community Engagement Framework[7] which sets out how HS2 Ltd and its contractors, as well as their sub-contractors, will undertake community engagement during the construction of the HS2 project. The framework is being implemented on Phase One of HS2 and will apply to all phases of HS2.

2.3.9 The objectives of the framework include:

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

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

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

Overview of the construction process

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

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

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

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

Advance works

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

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

Engineering works

Introduction

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

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

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

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

General overview of construction compounds

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

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

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

2.3.19 The Manchester tunnel south portal main compound will be primarily located in the Hulseheath to Manchester Airport area (MA06) extending partially into the Davenport Green to Ardwick area. Details of this main compound are provided in Volume 2, Community Area report: Hulseheath to Manchester Airport (MA06). This main compound will be used to manage two civil engineering satellite compounds in the Davenport Green to Ardwick area.

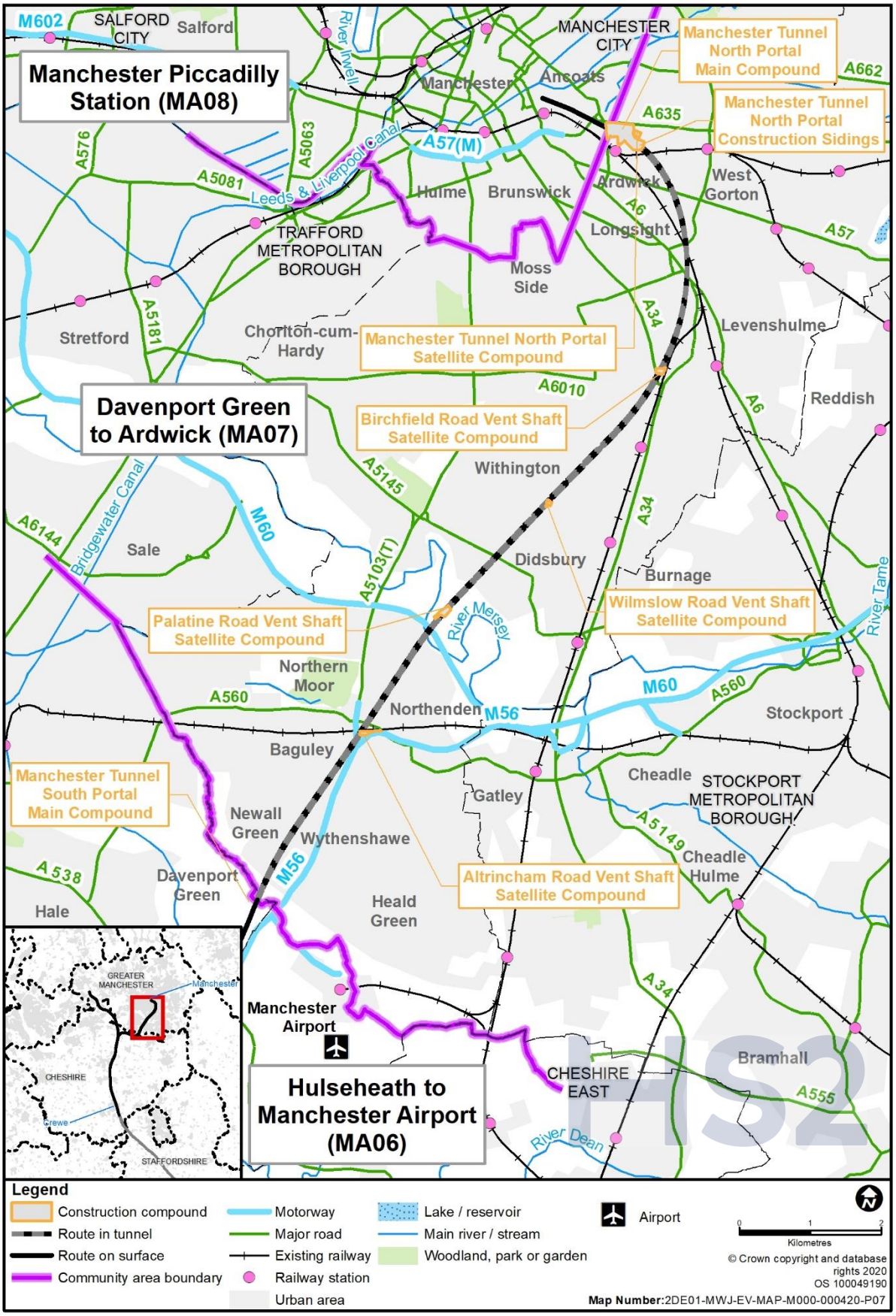
2.3.20 The Manchester tunnel north portal main compound will be primarily located in the Davenport Green to Ardwick area, extending partially into the Manchester Piccadilly area (MA08). Details of this main compound are provided in this report. This main compound will be used to manage three civil engineering satellite compounds in the Davenport Green to Ardwick area.

2.3.21 Of the five civil engineering satellite compounds in the Davenport Green to Ardwick area, four will continue to be used as railway systems installation satellite compounds following the completion of civil engineering works at those compounds. Manchester tunnel north portal construction sidings will also be used to manage the movement, removal, treatment and transfer of excavated material from the tunnel, by rail, throughout the Davenport Green to Ardwick area and the Manchester Piccadilly area (MA08).

2.3.22 The location of construction compounds in the Davenport Green to Ardwick area is shown on Figure 5. Map Series CT-05 (in the Volume 2: MA07 Map Book) show in detail the locations of the construction compounds described below.

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

Figure 5: Location of construction compounds in the Davenport Green to Ardwick area



2.3.24 Figure 6 shows the management relationship for civil engineering works compounds and Figure 7 for the railway installation works. Details of the works associated with individual compounds are provided in subsequent sections of this report.

2.3.25 Soil stripped as part of the works, prior to it being used when the land is reinstated, will be stored for the duration of construction. The location of topsoil storage areas will generally be adjacent to compounds and areas of construction activity. These areas are referred to as material stockpiles and are shown on maps CT-05-364 to CT-05-365a, in the Volume 2: MA07 Map Book.

2.3.26 Some areas will include transfer nodes. Transfer nodes are additional areas of land required to unload, store and load bulk earthworks materials that are moved to and from the site on public highways. These areas will allow material to be transferred between road vehicles and site vehicles during construction to balance traffic movements on the road network. The transfer nodes within the Davenport Green to Ardwick area are shown on map CT-05-364 in the Volume 2: MA07 Map Book.

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

Construction traffic routes, site haul routes and transfer nodes

2.3.28 The proposed Manchester tunnel north portal construction sidings will connect with the Glossop Line for the movement of excavated materials. This will reduce the volume of construction vehicles using the public road network.

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

2.3.30 The construction compounds, transfer nodes and construction sidings will provide the interface between the construction works and the public road or railway network. The likely road routes to access compounds in the Davenport Green to Ardwick area are described in subsequent sections of this report.

Use of borrow pits

2.3.31 The Proposed Scheme will require material with suitable engineering properties for the construction of a high speed railway. This is described as acceptable engineering material

and will be provided, in part, through excavation of cuttings and other earthworks undertaken to construct the Proposed Scheme. A borrow pit is an area where additional acceptable engineering material will be extracted for use in the construction of the Proposed Scheme.

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

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

Construction compounds

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

Figure 6: Construction compounds for civil engineering works

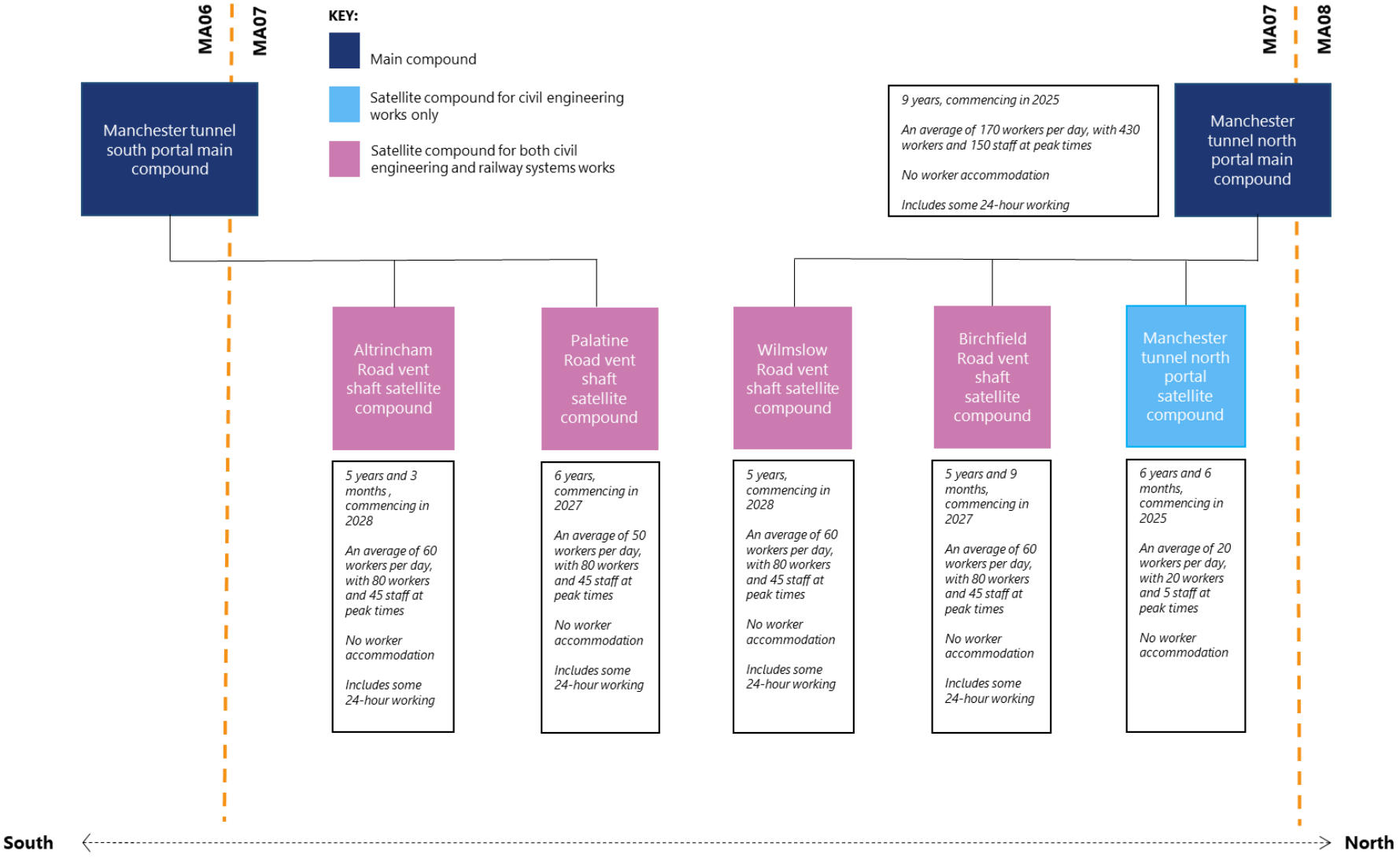
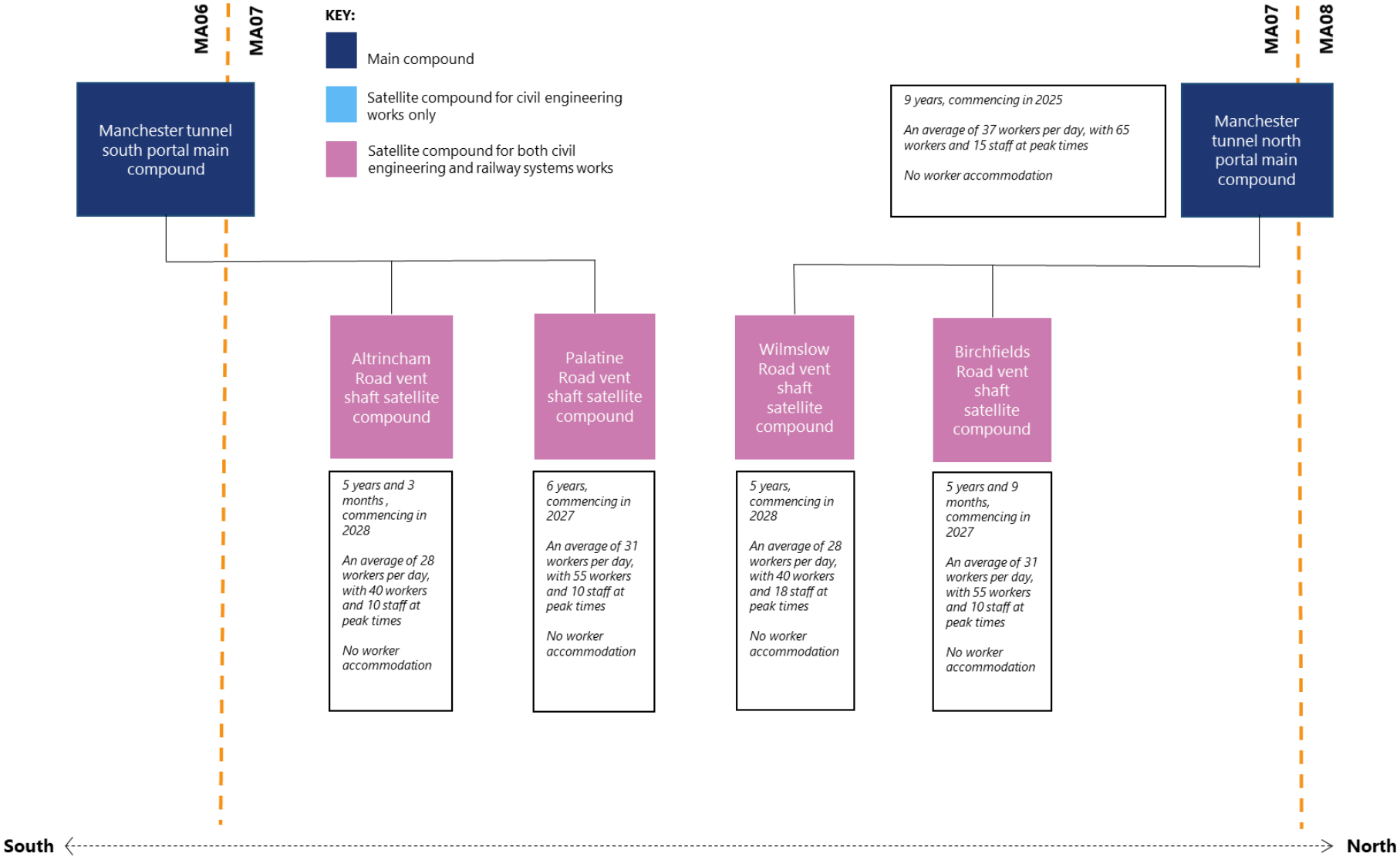


Figure 7: Construction compounds for railway systems works



Manchester tunnel south portal main compound

2.3.35 This compound will be located primarily in the Hulseheath to Manchester Airport area (MA06), partially extending into the Davenport Green to Ardwick area (see Volume 2: MA07 Map Book: map CT-05-357b, G5 to G7). It is described in Volume 2, Community Area report: Hulseheath to Manchester Airport area (MA06). This compound will be used to manage civil engineering and railway systems works. It will:

- be used to manage civil engineering works for a period of six years and three months followed by both civil engineering and railway system works for a period of one year, and then railway system works only for a period of one year and nine months;
- provide main compound support to two satellite compounds in the Davenport Green to Ardwick area, as illustrated in Figure 6 and Figure 7; and
- be accessed from Thorley Lane.

2.3.36 No demolitions will be required in the Davenport Green to Ardwick area as a result of the works to be managed from this compound.

2.3.37 The compound will be used to manage the construction of the following elements in the Davenport Green to Ardwick area:

- the section of Manchester tunnel between Manchester tunnel south portal and Palatine Road vent shaft, which will take three years and six months to complete;
- Manchester tunnel south portal, which will take one year and nine months to complete. Railway systems installation at the portal will be carried out later in the construction programme and take six months to complete;
- Manchester tunnel south portal building and emergency rescue area will be constructed as part of Manchester tunnel south portal, which will take one year and six months to complete; and
- a surface water pumping station and pumping station storage tank for drainage of Manchester tunnel, which will take six months to complete.

2.3.38 Two tunnel boring machines (TBMs) will be driven and serviced from this compound. The TBMs will be used to construct the twin bore sections of Manchester tunnel between Manchester tunnel south portal and Palatine Road vent shaft. This section of tunnel will be built progressively northwards. All material that is excavated will be conveyed to the compound via the partially constructed tunnel and Manchester tunnel south portal. Structural materials needed to build this section of tunnel will be taken from the main compound to the TBM via Manchester tunnel south portal and a temporary construction railway up to the TBM. Within the compound a temporary water treatment plant will be provided.

2.3.39 The compound will be used to manage the construction and installation of Manchester tunnel south portal auto-transformer station, which will take one year to complete. The

installation of Manchester tunnel south portal auto-transformer station railway systems equipment will take one year to complete.

2.3.40 Key railway systems installation works in the Davenport Green to Ardwick area to be managed from this compound include:

- track installation works, which will take one year and six months to complete;
- installation of the mechanical and electrical systems through Manchester tunnel which will take one year to complete; and
- installation of the mechanical and electrical systems at the tunnel portal buildings, which will take six months to complete.

Altrincham Road vent shaft satellite compound

2.3.41 This compound will be used to manage civil engineering and railway systems works (see Volume 2: MA07 Map Book, map CT-05-359, C6 to D8). It will be accessed via the A560 Altrincham Road and Greenwood Road. The compound will be used to manage civil engineering works for a period of three years and nine months, later followed by railway system works for a period of one year commencing in 2032.

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

2.3.43 This compound will be used to manage the construction and railway system installation of Altrincham Road vent shaft and headhouse. The construction of Altrincham Road vent shaft will take two years to complete. The construction of the headhouse will be carried out later in the construction programme and will take one year and three months to complete. The installation of railway systems equipment in Altrincham Road vent shaft and headhouse will take one year to complete.

2.3.44 The compound will provide an area for the transfer of materials associated with the vent shaft construction works.

2.3.45 The compound will be used to manage the construction of Altrincham Road vent shaft access road and retaining wall, which will take six months to complete.

2.3.46 The works to be managed from this compound will require the following works to utilities:

- permanent diversion of a United Utilities 1850mm combined sewer, which will take three months to complete;
- permanent relocation of a Network Rail telecommunications mast, which will take three months to complete; and
- permanent diversion or decommissioning of a number of minor utilities including United Utilities potable water main and Electricity North West underground electricity cables.

Palatine Road vent shaft satellite compound

2.3.47 This compound will be used to manage civil engineering and railway systems works (see Volume 2: MA07 Map Book, map CT-05-360, D3 to E3). It will be accessed via the B5167

Palatine Road. The compound will be used to manage civil engineering works for a period of three years and three months, later followed by both civil engineering and railway system works for a period of one year and nine months, and then railway system works only for a period of one year.

2.3.48 The works to be managed from this compound will require demolition of the buildings and structures identified in Table 1.

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

Type	Description	Location	Feature resulting in demolition
Residential	One residential property (above commercial property)	Withington Golf Club clubhouse, Palatine Road, Manchester	Palatine Road vent shaft
Commercial	One commercial property (below residential property)	Withington Golf Club clubhouse, Palatine Road, Manchester	Palatine Road vent shaft

2.3.49 The compound will be used to manage the construction of Palatine Road vent shaft and headhouses which will take five years to complete. The installation of railway systems equipment in Palatine Road vent shaft and headhouses will take nine months to complete.

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

- temporary diversion of a 140m section of Footpath Manchester 212 to the east of the Withington Golf Club clubhouse for a period of seven months, increasing journey length by up to 41m. On completion of construction, Footpath Manchester 212 will be reinstated along its existing alignment; and
- temporary diversion of Footpath Manchester 211 to the north of the Withington Golf Club clubhouse for a period of four years and six months, increasing journey length by up to 146m. On completion of construction, Footpath Manchester 211 will be reinstated along its existing alignment. A structure will be provided to carry users over the water channel on Withington Golf Course.

2.3.51 The compound will be used to manage the construction and installation of Palatine Road vent shaft auto-transformer station. The construction of the auto-transformer station will take one year to complete. The installation of rail systems for the auto-transformer station will take one year and three months to complete.

2.3.52 The compound will provide an area for the transfer of materials associated with the vent shaft construction works. It will be also used to manage removal of the four TBMs used for Manchester tunnel, two from the south portal and two from the north portal (which is described below).

Wilmslow Road vent shaft satellite compound

2.3.53 This compound will be used to manage civil engineering and railway systems works (see Volume 2: MA07 Map Book, map CT-05-361, F5 to G6). It will be accessed via the B5093 Wilmslow Road. This compound will be used to manage civil engineering works for a period of four years, followed by railway system works for a period of one year. The works to be managed from this compound will require demolition of the buildings and structures identified in Table 2.

Table 2: Demolitions required as a result of the works to be managed from the Wilmslow Road vent shaft satellite compound

Type	Description	Location	Feature resulting in demolition
Residential	Three residential properties (above commercial properties)	Wilmslow Road, Manchester	Wilmslow Road vent shaft
Commercial	Three commercial properties (below residential properties)	Wilmslow Road, Manchester	Wilmslow Road vent shaft
Other	Wheelchair shelter at The Christie Hospital Car Park	Wilmslow Road, Manchester	Wilmslow Road vent shaft

2.3.54 The compound will be used to manage the construction and installation of Wilmslow Road vent shaft and headhouse. The construction of Wilmslow Road vent shaft will take two years and three months to complete. The construction of the headhouse will be carried out later in the construction programme and take one year and three months to complete. The installation of railway systems equipment in Wilmslow Road vent shaft and headhouse will take one year to complete.

2.3.55 The compound will provide an area for the transfer of materials associated with the vent shaft construction works.

2.3.56 The works to be managed from this compound will require the permanent diversion of minor utilities during the construction period; including underground Electricity North West electricity cables.

Birchfields Road vent shaft satellite compound

2.3.57 This compound will be used to manage civil engineering and railway systems works (see Volume 2: MA07 Map Book, maps CT-05-362, J5 to J6 and CT-05-363, A5 and A6). It will be accessed via the A34 Birchfields Road. The compound will be used to manage civil engineering works for a period of three years, followed by both civil engineering and railway system works for a period of one year and nine months, and then railway system works only for a period of one year.

2.3.58 The works to be managed from this compound will require demolition of the building identified in Table 3.

Table 3: Demolitions required as a result of the works to be managed from the Birchfields Road vent shaft satellite compound

Type	Description	Location	Feature resulting in demolition
Commercial	One commercial property (comprising three retail units)	A34 Birchfields Road, Manchester	Birchfields Road vent shaft

2.3.59 The compound will be used to manage the construction and installation of Birchfields Road vent shaft and headhouse. The construction of Birchfields Road vent shaft will take two years and three months to complete. The construction of the headhouse will be carried out later in the construction programme and take one year and three months to complete. The installation of railway systems equipment in Birchfields Road vent shaft and headhouse will take one year to complete.

2.3.60 The compound will be used to manage the construction and installation of Birchfields Road vent shaft auto-transformer station. The construction of the auto-transformer station will take one year to complete. The installation of rail systems for the auto-transformer station will take one year and three months to complete.

2.3.61 The compound will provide an area for the transfer of materials associated with the shaft construction works.

Manchester tunnel north portal main compound

2.3.62 This compound will be located primarily in the Davenport Green to Ardwick area (shown on Volume 2: MA07 Map Book, maps CT-05-364 I5 to J3 and CT-05-365a, A4 to D6), partially extending into the Manchester Piccadilly Station area (MA08). It is described in detail in this report. This compound will:

- be used to manage civil engineering and rail systems works for a period of nine years. Within this period, civil engineering works will take seven years and three months to complete and installation of the rail systems will take four years to complete;
- provide main compound support to three satellite compounds in the Davenport Green to Ardwick area, as illustrated in Figure 6;
- provide a transfer node to the south of the compound accessed from Rondin Road to A635 Ashton Old Road and via a road track to Gorton Road (see Volume 2: MA07 Map Book, map CT-05-364, I8 to I9 and map CT-05-365a, A5 to A6); and
- be accessed via Rondin Road (see Volume 2: MA07 Map Book, map CT-05-364, J5 and map CT-05-365a, A5).

2.3.63 The works to be managed from this compound will require demolition of the buildings and structures identified in Table 4.

Table 4: Demolitions required as a result of the works to be managed from the Manchester tunnel north portal main compound

Type	Description	Location	Feature resulting in demolition
Commercial	Two industrial units	Rondin Road, Manchester	Manchester tunnel north portal
Commercial	Two industrial units	Rondin Road, Manchester	Ardwick South cutting retaining wall
Commercial	One car and van rental	Rondin Road, Manchester	Ardwick South cutting retaining wall
Commercial	Skip hire	Rondin Road, Manchester	Ardwick South cutting retaining wall
Commercial	One brick railway arch	Hooper Street, Manchester	Ardwick cutting retaining wall
Commercial	One brick railway arch	Adjacent to 42-46 A635 Ashton Old Road, Manchester	Ardwick box structure
Commercial	MOT Centre	A635 Ashton Old Road, Manchester	Ardwick box structure
Commercial	One service station	A635 Ashton Old Road, Manchester	Ardwick North cutting retaining wall
Commercial	Storage facility	A635 Ashton Old Road, Manchester	Ardwick box structure
Commercial	Six commercial properties	Hooper Street, Manchester	Ardwick box structure
Commercial	One commercial property	Hooper Street, Manchester	Ardwick North cutting retaining wall
Commercial	Eight commercial properties	A665 Midland Street, Manchester	Ardwick North cutting retaining wall
Other	Single story brick building	Rondin Road, Manchester	Ardwick South cutting retaining wall
Other	Electricity substation	Rondin Road, Manchester	Manchester tunnel north portal
Other	Lighting tower	Blind Lane, Manchester	Ardwick South cutting retaining wall
Other	Brick building	Blind Lane, Manchester	Ardwick South cutting retaining wall
Other	Advertising hoarding	A635 Ashton Old Road, Manchester	Ardwick North cutting retaining wall
Other	Steel fuel tank	Hooper Street, Manchester	Ardwick North cutting retaining wall
Other	Electricity substation	Glenbarry Street, Manchester	Ardwick North cutting retaining wall
Other	Advertising hoarding	Junction of the A665 Midland Street and the A635 Ashton Old Road	Ardwick North cutting retaining wall

2.3.64 The works to be managed from this compound will also require demolition of buildings and structures located within the Manchester Piccadilly Station area (MA08). Further details are provided in Volume 2, Community Area report: Manchester Piccadilly Station (MA08), Section 2.

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

- the section of Manchester tunnel between Manchester tunnel north portal and Palatine Road vent shaft, which will take three years and six months to complete;
- foundations and civil engineering works for Manchester tunnel north portal, which will take one year and six months to complete. Railway systems installation at the portal will be carried out later in the construction programme and take one year to complete;
- Manchester tunnel north portal building and emergency rescue area, which will take one year and three months to complete;
- a surface water pumping station and pumping station storage tank for drainage of Manchester tunnel, which will take six months to complete; and
- Manchester tunnel north portal telecommunications site, including telecommunications, telecommunication mast and signalling equipment, and installation which will take six months to complete.

2.3.66 Two TBMs will be driven and serviced from this compound. The TBMs will be used for construction of the twin bore section of Manchester tunnel between Manchester tunnel north portal and Palatine Road vent shaft. This section of tunnel will be built progressively southwards. All excavated material from this section of tunnel will be conveyed via the partially constructed tunnel and Manchester tunnel north portal to the compound. Structural material needed to build this section of tunnel will be taken from the main compound to the TBM via Manchester tunnel north portal and up to the TBM by a temporary construction railway.

2.3.67 The compound will be used to manage the construction of Manchester to Leeds embankment, which will take one year and six months to complete.

2.3.68 The compound will be used to manage the construction of retaining walls in the following cuttings:

- Ardwick South cutting, which will take two years and nine months to complete; and
- Ardwick North cutting, which will take two years to complete.

2.3.69 The compound will be used to manage the construction of Ardwick box structure which will take one year and nine months to complete.

2.3.70 The works to be managed from this compound will require the following works to public and private roads:

- temporary closure of a section of Handsworth Street for six months. Access along Handsworth Street will be maintained during construction with traffic controlled by temporary traffic signals, there will be no change in journey length;
- temporary realignment of Rondin Road for six years, Access along Rondin Road will be maintained during construction. The realignment will be constructed 15m west of the existing alignment, resulting in a 4m change in journey length; and
- closure of the A665 Midland Street at its northern end where it is crossed by the route of the Proposed Scheme. Users will be diverted via a retained 10m section of the A665 Midland Street and the A665 Chancellor Lane diversion, increasing the journey length by up to 860m.

2.3.71 The compound will be used to manage the construction of two relocated bunded diesel fuel tanks and access for HGV to deliver fuel to Siemens Ardwick Train Care Facility, which will take six months to complete (see Volume 2: MA07 Map Book, map CT-05-364, I4 to I5).

2.3.72 The compound will be used to manage the railway systems installation works associated with Manchester tunnel including:

- track installation works, which will take one year and nine months to complete, over a two year and nine month period;
- installation of the mechanical and electrical systems through Manchester tunnel which will take one year to complete; and
- installation of the mechanical and electrical systems at the tunnel portal buildings, which will take six months to complete.

2.3.73 The compound will be used to manage the construction and installation of Midland Street sectioning auto-transformer station. The construction of the sectioning auto-transformer station and installation of rail systems will each take one year to complete.

2.3.74 The compound will be used to manage the installation of railway systems equipment for Manchester tunnel north portal construction sidings. The railway systems installation for Manchester tunnel north portal construction sidings will take one year and three months to complete and the recovery works for the sidings will take six months.

2.3.75 The works to be managed from this compound will require the permanent diversion or decommissioning of minor utility works during the construction period, including Electricity North West underground electricity cables, Virgin, Vodafone and Openreach telecommunications cables, United Utilities wastewater sewers and potable water mains and Cadent Gas mains.

Manchester tunnel north portal satellite compound

2.3.76 This compound will be used to manage civil engineering works (see Volume 2: MA07 Map Book, map CT-05-364, I5 to J3 and map CT-05-365a, A5 to B7). It will:

- be used to manage civil engineering works for a period of six years and six months;
- provide one temporary material stockpile area (see Volume 2: MA07 Map Book, map CT-05-364, H9 to J5 and map CT-05-365a, A5 to B7); and
- be accessed via Rondin Road.

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

2.3.78 The compound will be used to manage the construction of Manchester tunnel north portal construction sidings. The construction of the earthworks and foundation for Manchester tunnel north portal construction sidings will take four years and six months to complete.

Manchester tunnel north portal construction sidings

2.3.79 Manchester tunnel north portal construction sidings will occupy an area, within the Manchester tunnel north portal satellite compound, between the Ashburys Line and Rondin Road (see Volume 2: map CT-05-364, H9 to J6 and map CT-05-365a, A5 to B7). The sidings will be operational for four years. The sidings will be capable of receiving and dispatching trains to/from existing conventional lines via purpose built sidings adjacent to the Ashburys Line. Excavated materials will be removed via Manchester tunnel portal construction sidings during day and night-time hours and at weekends, though loading will be undertaken during a standard 10 hour working day, where reasonably practicable.

2.3.80 The construction sidings will include:

- four 450m-long stabling tracks;
- a 400m-long headshunt, to the south of the stabling tracks, which is a length of track used to release trains in the direction from which they originated and to allow trains to change tracks and direction;
- a 40m-long headshunt for locomotive units, to the north of the stabling tracks; and
- two track connections to the Ashburys Line.

2.3.81 Excavated material from Manchester tunnel will be transported to the construction sidings by a 300m-long covered conveyor.

Construction waste and material resources

2.3.82 Excavated material generated across the Proposed Scheme will be reused as engineering fill material or in the environmental mitigation earthworks of the Proposed Scheme, where suitable and reasonably practicable.

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

2.3.84 Local excess or shortfall of excavated material within the Davenport Green to Ardwick area will be managed through the mitigation earthworks design approach adopted for the Proposed Scheme, as well as the use of borrow pits in other community areas, 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, Route-wide effects, Section 15.

Commissioning of the railway

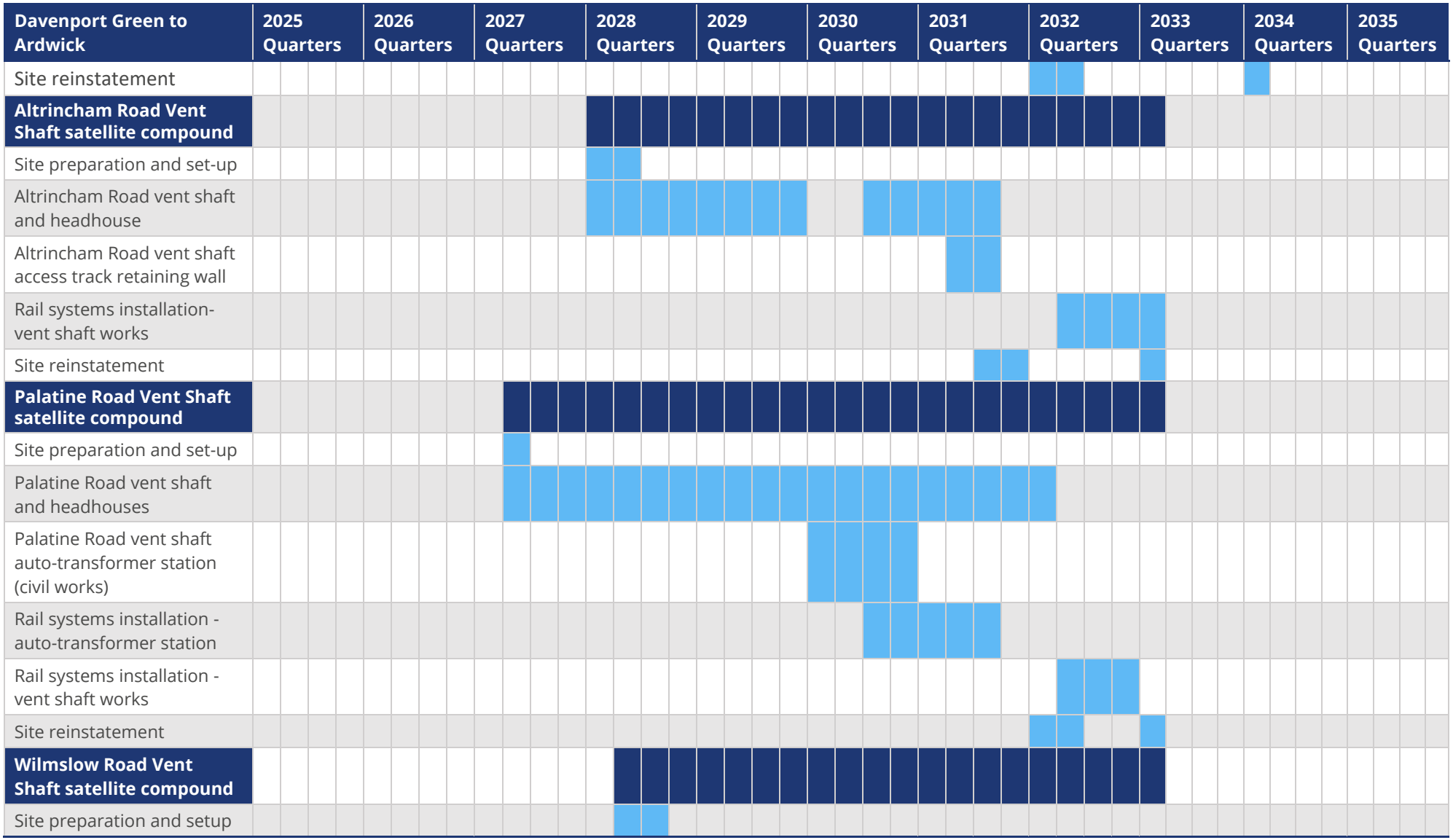
2.3.85 Commissioning is the process of testing the infrastructure to ensure that it operates as expected. It will be carried out in the period prior to opening. Further details are provided in Volume 1, Section 6.

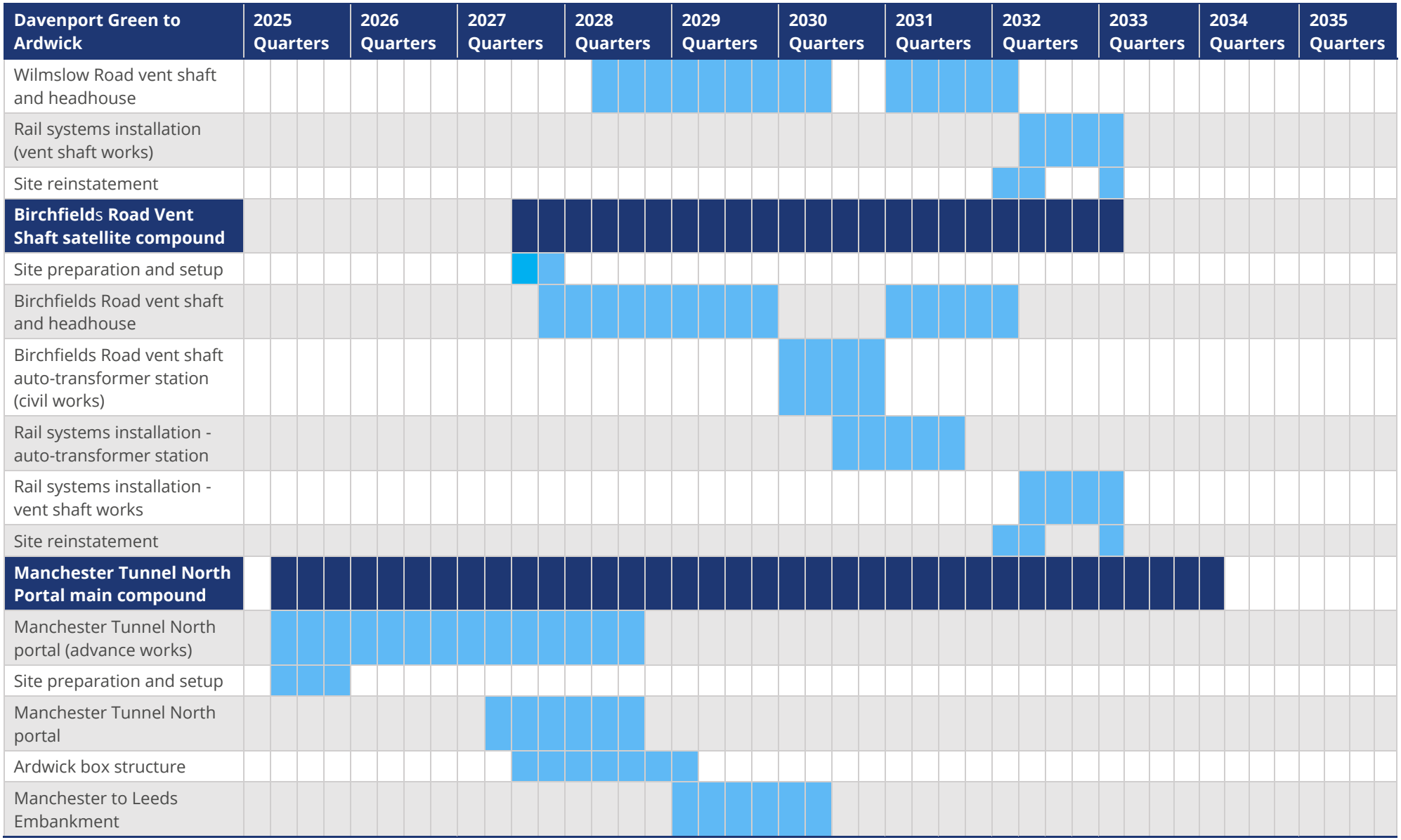
Construction programme

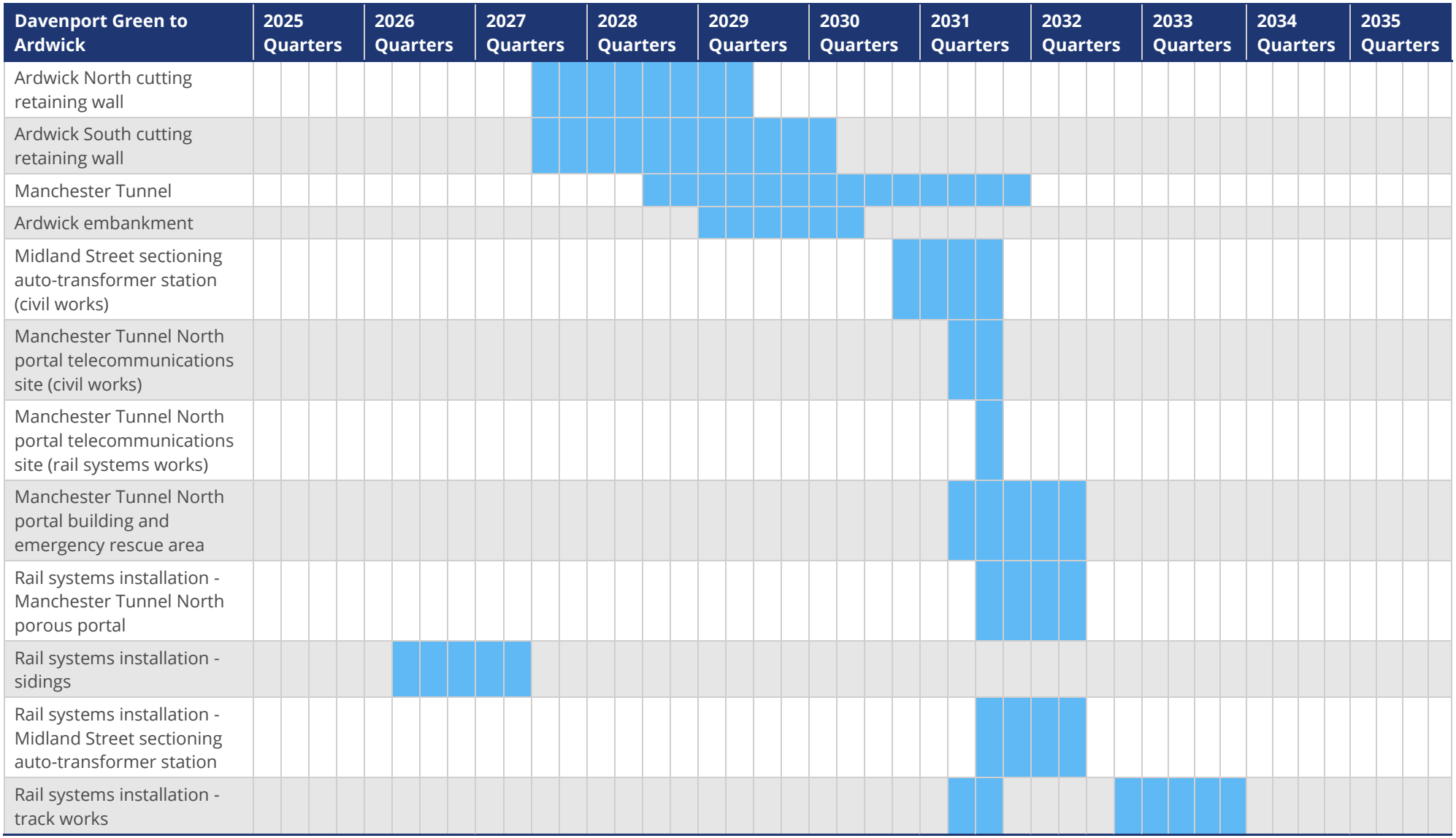
2.3.86 A construction programme illustrating indicative periods for each of the core construction activities described above is provided in Figure 8.

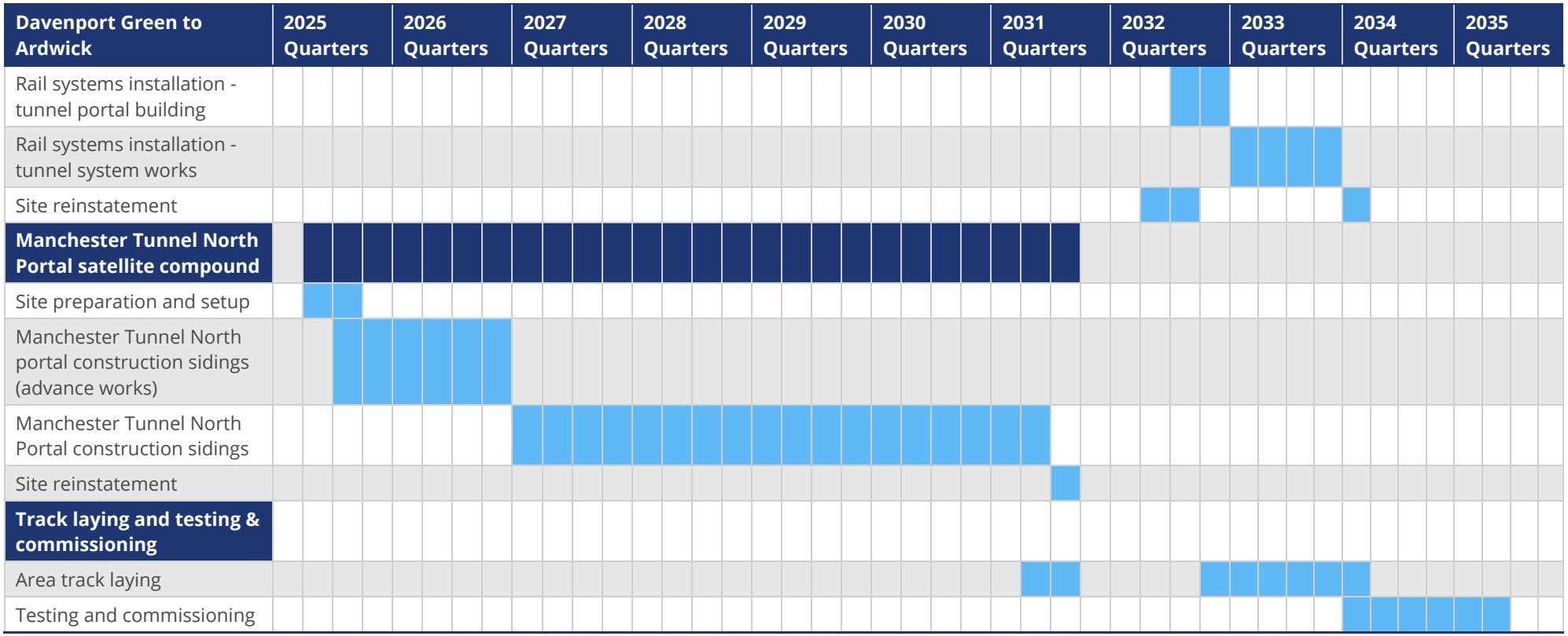
Figure 8: Indicative construction programme between 2025 and 2035

Davenport Green to Ardwick	2025 Quarters				2026 Quarters				2027 Quarters				2028 Quarters				2029 Quarters				2030 Quarters				2031 Quarters				2032 Quarters				2033 Quarters				2034 Quarters				2035 Quarters			
Construction activity	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
Advance works																																												
Manchester Tunnel South Portal main compound																																												
Manchester Tunnel South portal (advance works)																																											
Site preparation and setup																																											
Manchester Tunnel South portal																																											
Manchester Tunnel																																											
Manchester Tunnel South portal auto-transformer station																																												
Manchester Tunnel South portal building and emergency rescue area																																											
Rail systems installation - Manchester Tunnel South portal																																											
Rail systems installation - auto-transformer station																																												
Rail systems installation - tunnel portal buildings																																											
Rail systems installation - track works																																											
Rail systems installation - tunnel system works																																											


Davenport Green to Ardwick
2025 Quarters
2026 Quarters
2027 Quarters
2028 Quarters
2029 Quarters
2030 Quarters
2031 Quarters
2032 Quarters
2033 Quarters
2034 Quarters
2035 Quarters
Site reinstatement
Altrincham Road Vent Shaft satellite compound
Site preparation and set-up
Altrincham Road vent shaft and headhouse
Altrincham Road vent shaft access track retaining wall
Rail systems installation- vent shaft works
Site reinstatement
Palatine Road Vent Shaft satellite compound
Site preparation and set-up
Palatine Road vent shaft and headhouses
Palatine Road vent shaft auto-transformer station (civil works)
Rail systems installation - auto-transformer station
Rail systems installation - vent shaft works
Site reinstatement
Wilmslow Road Vent Shaft satellite compound
Site preparation and setup


Davenport Green to Ardwick
2025 Quarters
2026 Quarters
2027 Quarters
2028 Quarters
2029 Quarters
2030 Quarters
2031 Quarters
2032 Quarters
2033 Quarters
2034 Quarters
2035 Quarters
Wilmslow Road vent shaft and headhouse
Rail systems installation (vent shaft works)
Site reinstatement
Birchfields Road Vent Shaft satellite compound
Site preparation and setup
Birchfields Road vent shaft and headhouse
Birchfields Road vent shaft auto-transformer station (civil works)
Rail systems installation - auto-transformer station
Rail systems installation - vent shaft works
Site reinstatement
Manchester Tunnel North Portal main compound
Manchester Tunnel North portal (advance works)
Site preparation and setup
Manchester Tunnel North portal
Ardwick box structure
Manchester to Leeds Embankment


Davenport Green to Ardwick
2025 Quarters
2026 Quarters
2027 Quarters
2028 Quarters
2029 Quarters
2030 Quarters
2031 Quarters
2032 Quarters
2033 Quarters
2034 Quarters
2035 Quarters
Ardwick North cutting retaining wall
Ardwick South cutting retaining wall
Manchester Tunnel
Ardwick embankment
Midland Street sectioning auto-transformer station (civil works)
Manchester Tunnel North portal telecommunications site (civil works)
Manchester Tunnel North portal telecommunications site (rail systems works)
Manchester Tunnel North portal building and emergency rescue area
Rail systems installation - Manchester Tunnel North porous portal
Rail systems installation - sidings
Rail systems installation - Midland Street sectioning auto-transformer station
Rail systems installation - track works


Davenport Green to Ardwick
2025 Quarters
2026 Quarters
2027 Quarters
2028 Quarters
2029 Quarters
2030 Quarters
2031 Quarters
2032 Quarters
2033 Quarters
2034 Quarters
2035 Quarters
Rail systems installation - tunnel portal building
Rail systems installation - tunnel system works
Site reinstatement
Manchester Tunnel North Portal satellite compound
Site preparation and setup
Manchester Tunnel North portal construction sidings (advance works)
Manchester Tunnel North Portal construction sidings
Site reinstatement
Track laying and testing & commissioning
Area track laying
Testing and commissioning

Monitoring during construction

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

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

2.4 Operation of the Proposed Scheme

Introduction

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

HS2 services

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

2.4.3 In this area, trains will run at speeds of up to 145mph (230kph). The trains will be a single 200m-long train, a single 400m-long train or two 200m-long trains coupled together, depending on demand and time of day.

Maintenance

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

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

Operational waste and material resources

2.4.6 The assessment of the likely significant environmental effects associated with the disposal of operational waste has been undertaken for the Proposed Scheme as a whole and is reported in Volume 3, Section 15.

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

Monitoring during operation

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

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

2.5 Route section alternatives

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

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

- Altrincham Road vent shaft;
- Palatine Road vent shaft and auto-transformer station;
- Wilmslow Road vent shaft; and
- Birchfields Road vent shaft.

3 Stakeholder engagement and consultation

3.1 Introduction

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

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

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

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

3.2 Key stages of Phase 2b engagement and consultation

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

Draft EIA Scope and Methodology Report (SMR) consultation

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

3.2.3 The changes between the draft 2017 SMR and the publication of the 2018 SMR were set out in the EIA SMR Consultation Report[8], also published in October 2018. The assessment set out in this ES follows the scope and methodology in the EIA SMR[9] in Volume 5 of this ES.

Consultation on the working draft ES

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

3.2.5 As part of the consultation, information events were held in communities along both the Eastern and Western legs of the full Phase 2b route. Within the Davenport Green to Ardwick area, an event was held at Didsbury (December 2018).

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

- construction impacts near Manchester tunnel south and north portals, particularly additional traffic on busy roads;
- construction related noise impacts within residential areas and increased traffic delay on the road network around the vent shaft locations;
- construction noise and vibration impact from the tunnel boring machine (TBM);
- potential impact on house prices from tunnelling beneath properties;
- reduction of the operational capacity of Didsbury flood storage basin around the Palatine Road vent shaft;
- landscape and visual impacts, noise and vibration during the construction and operation associated with the proposed vent shaft headhouses and auto-transformer stations;
- request to find an alternative site for Lytham Road vent shaft and associated infrastructure as the site identified as part of the working draft ES has been developed as the Manchester Enterprise Academy (MEA) Central secondary school since the original survey of vacant land undertaken by HS2 Ltd;
- impact of construction activity on staff, visitors and patients of The Christie Hospital and the potential effects upon the operation of sensitive equipment from ground-borne noise and vibration and electromagnetic interference (EMI); and

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

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

- impact on the operation of the Siemens Mobility Limited, Ardwick Train Care Facility resulting from the proposed location of Manchester tunnel north portal.

3.2.7 A working draft ES Consultation Summary Report[10] has been published as part of the ES detailing how consultation responses have been taken into consideration in the development of the Proposed Scheme design and its assessment.

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

Consultation on design refinements

Design refinements 2019

3.2.9 Design refinements to the Proposed Scheme in Davenport Green to Ardwick area were consulted upon between June and September 2019. These design refinements involved the relocation of Palatine Road vent shaft in West Didsbury and the relocation of Lytham Road vent shaft to Birchfields Road. Details of the proposed design refinements, along with supporting information such as visualisations and plan and profile maps, were made available in public locations and online at the gov.uk website. As part of this process, stakeholders were invited to comment on the design refinements made to the full Phase 2b scheme since the working draft ES consultation.

3.2.10 As part of design refinement consultation, information events were held in areas where design refinements were being consulted. Within the Davenport Green to Ardwick area, information events were held at Didsbury (June 2019) and Levenshulme (July 2019).

3.2.11 A total of 1,307 responses were received through the consultation on the 11 design refinements across the full Phase 2b scheme. These responses were analysed and the themes and issues relevant to the Davenport Green to Ardwick area included:

- the impact on the viability of Withington Golf Club as a result of constructing the Palatine Road vent shaft. These impacts arise from the location of the Palatine Road vent shaft which will have direct impacts on the clubhouse, car park and part of the golf course playing area. In addition, the construction of a replacement floodplain storage area will also impact on the golf course playing area, affecting four holes of the golf course;
- the impact on the viability of Didsbury Golf Club. These impacts would have arisen from the construction of a replacement floodplain storage area on the golf course playing area, affecting four holes of the golf course;
- the loss of trees within the area required for the Palatine Road vent shaft satellite compound and the associated severance of the wildlife corridor that links the wooded area by the bank of the River Mersey with surrounding woodland habitats;

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

- the impact on Wrengate Wood Site of Biological Interest (SBI) in the vicinity of Ashfield Lodge as a result of the construction activity associated with the proposed Palatine Road vent shaft which could disrupt the wildlife corridor between the woods and the River Mersey;
- the loss of the 'park and stride' areas within the area required for the proposed Birchfields Road vent shaft that are in place as a result of an informal agreement between Fallowfield Retail Park and Birchfields Primary School, and the impact on car parking provision around the Birchfields Road area;
- the loss of three retail units within Fallowfield Retail Park within the area of the proposed Birchfields Road vent shaft; and
- the suggestion of alternative locations for the Birchfields Road vent shaft including on the site of the University of Manchester, Armitage Sports Centre playing fields, Moseley Road.

3.2.12 A summary of how the responses received were considered in the development of the Proposed Scheme is outlined in the High Speed Two: Design Refinement Consultation Response[11] available online at the gov.uk website. This report relates to development of the Western Leg of the Proposed Scheme only following decision by government to prioritise this leg.

Design refinements 2020

3.2.13 Further design refinements to the Proposed Scheme in Davenport Green to Ardwick area were consulted upon between October and December 2020. These design refinements involved changes to the design around Manchester Piccadilly High Speed station and included passive provision for future connectivity with Northern Powerhouse Rail (NPR); changes to the station approach to reduce impacts on Siemens Ardwick Train Care Facility; and improvements to the highways network around the station to reduce disruption for road users.

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

3.2.15 A total of 326 responses were received through the consultation on design refinements. These responses were analysed and the themes and issues relevant to the Davenport Green to Ardwick area included:

- future proofing the network and allowing for growth and integration with NPR which will help to alleviate overcrowding on the rail network;

[11] High Speed Two Ltd (2019), High Speed Two: Phase 2b Design Refinement Consultation. Available online at: https://www.gov.uk/government/consultations/hs2-phase-2b-design-refinement-consultation.

- the integration of HS2 and NPR proposals represented a cost-effective solution;
- welcoming the design of an integrated solution to provide future rail services in the north of England;
- avoiding disturbance of existing facilities in order to simplify construction of HS2 and the changeover from existing train services; and
- impacts on businesses concerned about how the Proposed Scheme could affect the viability of their operations, services and employment that they provide to the local area.

3.2.16 A summary of the comments received during this consultation is available at the gov.uk website.

3.3 Engagement and consultation with stakeholder groups

Communities

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

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

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

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

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

Table 5: Engagement to date with community stakeholders

Stakeholder	Area of focus	How this has informed the design and assessment of the Proposed Scheme
Ashfield Lodge Residents' Association	Series of meetings to discuss potential impacts of the Proposed Scheme including noise and visual impacts associated with the construction and operation of the Palatine Road vent shaft. Other discussion points included proposed changes to Fielden Park Brook that flows through Withington Golf Club golf course.	Information has been used to improve understanding of baseline conditions and provide an opportunity to consider any mitigation that may be required. In response to local engagement the Palatine Road vent shaft was relocated further from Ashfield Lodge.
Birchfields Primary School	Meetings to discuss the proximity of the Birchfields Road vent shaft and requests to relocate this further away from the site of MEA Central. The meetings also provided an opportunity to discuss potential impacts on traffic around the school and on safe drop off areas. In response to the design refinement consultation Birchfields Primary School raised issues regarding the construction impacts and existing 'park and stride' provision.	Information has been used to improve understanding of baseline conditions and provide an opportunity to consider any mitigation that may be required.
Didsbury Golf Club	Meetings to discuss the impact of the Proposed Scheme and in particular the proposed use of an area of the golf course for replacement floodplain storage associated with the construction of the Palatine Road vent shaft. Discussions also took place regarding business viability during construction and operation.	Feedback has been used to improve understanding of the baseline operational needs and activities associated with Didsbury Golf Club and provide an opportunity to consider and discuss mitigation. In response to local engagement and flood modelling assessment, land requirements from Didsbury Golf Club have been removed and direct impacts avoided.
Friends of Marie Louise Gardens	Meetings to discuss landscape and visual and traffic impacts related to the construction and operation of the Palatine Road vent shaft upon those living in nearby properties.	Information has been used to improve understanding of baseline conditions and provide an opportunity to consider any mitigation that may be required.
Greater Manchester Chamber of Commerce	Meetings to discuss the benefits of HS2 to Manchester and the wider region, and wider opportunities related to connectivity with NPR.	Information has been used to improve understanding of baseline conditions and provide an opportunity to consider any mitigation that may be required.
Hawthorn Medical Centre	Meetings to discuss the Birchfields Road vent shaft. The meetings provided an opportunity to discuss potential traffic impacts related to the construction and operation of the vent shaft on the Hawthorne Medical Centre.	Information has been used to improve understanding of baseline conditions and provide an opportunity to consider any mitigation that may be required.
Levenshulme Community Association	Meetings to inform the group on the Proposed Scheme and the consultation process, collate local data and understand their areas of interest and concern. This included concerns over traffic disruption during the construction works of the Birchfields Road vent shaft.	Information has been used to improve understanding of baseline conditions and provide an opportunity to consider any mitigation that may be required.

Stakeholder	Area of focus	How this has informed the design and assessment of the Proposed Scheme
MEA Central Secondary School	Engagement to discuss the proximity of the Proposed Scheme and in particular the proximity of the Lytham Road vent shaft to the site of the MEA Central.	Information has been used to improve understanding of baseline conditions and provide an opportunity to consider any mitigation that may be required. In response to local engagement, the former Lytham Road vent shaft was relocated to Birchfields Road vent shaft location outside the MEA Central Secondary School site.
Nazarene Theological College	Meeting to discuss project timescales, and potential construction and traffic impacts from Palatine Road vent shaft. Also, to review requests to reduce the area of proposed woodland habitat creation within their landholding.	Information has been used to improve understanding of baseline conditions and provide an opportunity to consider any changes to mitigation that may be required.
Northenden Players Theatre Group	Meeting to discuss project timescales and potential impact to the area and potential construction and traffic impacts.	Information has been used to improve understanding of baseline conditions and provide an opportunity to consider any mitigation that may be required.
Oglesby Cancer Research Centre, University of Manchester	Meetings to consider the potential operational effects upon sensitive equipment from ground-borne noise and vibration and EMI at this location related to the construction and operation of Manchester tunnel.	Information has been used to improve understanding of baseline conditions and provide an opportunity to consider any mitigation that may be required.
The Wolfson Molecular Imaging Centre, University of Manchester	Meetings to consider the potential operational effects upon sensitive equipment from ground-borne noise and vibration and EMI at this location related to the construction and operation of Manchester tunnel.	Information used to improve understanding of baseline conditions for the Proposed Scheme, as well as potential impacts and mitigation opportunities associated with the design and construction of Manchester tunnel.
The Christie Hospital	Meetings to discuss the impact of closing the existing Car Park D on patients and visitors and particularly those with disabilities. The mechanism that can be used to provide alternative car parking provision before the site is acquired was discussed. Other meetings have considered the potential operational effects on sensitive equipment from ground-borne noise, vibration and EMI.	Information has been used to improve understanding of baseline conditions and provide an opportunity to consider any mitigation that may be required.
West Gorton Residents' Association	Meeting to discuss noise and vibration impacts associated with proximity to Manchester tunnel north portal at West Gorton, including concerns regarding residential demolitions and proximity to the Armitage CofE Primary School.	Information has been used to improve understanding of baseline conditions and provide an opportunity to consider any mitigation that may be required. As a result of engagement and design changes around West Gorton, the Proposed Scheme now avoids the demolition of residential properties and construction work requirements near the Armitage CofE Primary School.

Stakeholder	Area of focus	How this has informed the design and assessment of the Proposed Scheme
West Points Residents' Association	Briefing to explain the design refinement consultation updates and the proposed design of the Birchfields Road vent shaft.	Information used to improve understanding of baseline conditions for the Proposed Scheme as well as potential loss of the "park and stride" provision used by pupils attending the Birchfields Primary School and MEA Central, air quality, and noise and vibration impacts on the schools and the long-term viability of the Fallowfield Retail Park as a result of constructing and operating the Birchfields Road vent shaft and associated mitigation.
Withington Golf Club	Meetings to discuss the impact of the Proposed Scheme on the Withington Golf Club clubhouse, car park and an area of the golf course for the Palatine Road vent shaft satellite compound, TBM extraction location and replacement flood storage area. Discussions took place regarding their business viability during both construction and operation of the Proposed Scheme.	Information used to improve understanding of baseline conditions for the Proposed Scheme as well as potential impacts and mitigation opportunities. HS2 has appointed specialist golf course consultants to support ongoing engagement.

MPs, local authorities and parish councils

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

3.3.7 Direct engagement has also been offered to and undertaken metropolitan, city and borough councils within the Davenport Green to Ardwick area. The purpose of this engagement was to collate local baseline information and knowledge to inform the design and assessment, identify and understand local issues and concerns, provide access to wider stakeholders and communities and provide a mechanism for ongoing dialogue and discussion on the assessment and design development.

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

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

Stakeholder	Area of focus	How this has informed the design and assessment of the Proposed Scheme
Afzal Khan MP for Manchester, Gorton	Discussion on the programme for construction of the Proposed Scheme. Engagement with residents from the Rusholme, Longsight and Levenshulme area to discuss construction traffic on the local road network and the location of the former Lytham Road vent shaft as described in the working draft ES (now the Birchfields Road vent shaft site). Following Design Refinement Consultation (2019), further meetings were held to discuss impacts on Birchfields Primary School, MEA Central secondary school and Fallowfield Retail Park associated with the proposed relocation of the vent shaft to Birchfields Road. Alternative locations for the site of the vent shaft were suggested.	Feedback informed the planning of engagement and consultation activity in the local area. Information obtained through engagement was used to improve understanding of baseline conditions within the local community and for consideration of mitigation proposals.
Jeff Smith MP for Manchester, Withington	Meeting to discuss the Proposed Scheme and provide an update on consultation activities related to the Palatine Road vent shaft including the long-term viability of the Withington Golf Club. Also provided an opportunity to understand local concerns and potential impacts on the local community.	Feedback informed the planning of engagement and consultation activity in the local area. Information obtained through engagement was used to improve understanding of baseline conditions within the local community and for consideration of mitigation proposals.
Mike Kane MP for Wythenshawe and Sale East	Meeting to discuss the Proposed Scheme and provide an update on consultation activities related to the Palatine Road vent shaft including the long-term viability of the Didsbury Golf Club. Also provided an opportunity to understand local concerns and potential impacts on the local community.	Feedback informed the planning of engagement and consultation activity in the local area. Information obtained through engagement was used to improve understanding of baseline conditions within the local community and for consideration of mitigation proposals. In response to local engagement and further flood modelling assessment, land requirements from Didsbury Golf Club have been removed and direct impacts have been avoided.
Manchester City Council (MCC)	A series of meetings to discuss the Proposed Scheme, provide updates on consultation activities and understand potential impacts on the local community. Key discussion points included the proposed locations for the Manchester tunnel portals and vent shafts, and their setting within the urban realm, construction activities, road access and the impact upon specific local sensitive receptors. Alternative locations for the site of Birchfields Road vent shaft were suggested.	Feedback used to gather information and inform understanding of baseline conditions, potential impacts and proposed mitigation concerns and opportunities. In response to local engagement there have been a number of changes to the Proposed Scheme in this area, including the relocation of the Palatine Road vent shaft and the former Lytham Road vent shaft location to the Birchfields Road vent shaft site. HS2 Ltd is continuing to engage with MCC on the proposed location of the Birchfields Road vent shaft. Changes to the Proposed Scheme have also been made to reduce impacts on Ardwick Train Care Facility.

Stakeholder	Area of focus	How this has informed the design and assessment of the Proposed Scheme
Greater Manchester Stakeholders (MCC, Trafford Metropolitan Borough Council (TMBC), Transport for Greater Manchester, Transport for the North (TfN))	A series of meetings to discuss the Proposed Scheme, provide updates on consultation activities and understand potential impacts on communities, particularly around the Altrincham Road, Palatine Road, Wilmslow Road and Birchfields Road vent shafts and Manchester tunnel north portal and Manchester tunnel south portal locations. Key discussion points included the proposed locations for the Manchester tunnel portals and vent shafts, and their setting within the urban realm, construction activities, road access and the impact upon specific local sensitive receptors.	Feedback used to gather information and improve understanding of baseline conditions, potential impacts, the mitigation measures proposed and opportunities for additional mitigation measures. In response to local engagement there have been a number of changes to the Proposed Scheme in this area, including relocating the Palatine Road vent shaft outside the Didsbury flood storage basin, relocating the Birchfields Road vent shaft from MEA Central to within the Fallowfield Retail Park. Changes to the Proposed Scheme have also been made to reduce impacts on Siemens Ardwick Train Care Facility.
Trafford Metropolitan Borough Council	A series of meetings to discuss the Proposed Scheme, provide updates on consultation activities and understand potential impacts on the local community. Key discussion points included the construction and operational landscape and visual impacts of Manchester tunnel south portal and the transport of the excavated material from Manchester tunnel.	Feedback used to gather information and improve understanding of baseline conditions, potential impacts and proposed mitigation concerns and opportunities.
Councillor John Leech, Didsbury West	Meeting to discuss the Proposed Scheme and provide an update on consultation activities related to the Palatine Road vent shaft and the proposal to extract the TBM during the construction works.	Information used to improve understanding of baseline conditions and inform the assessment of the Proposed Scheme, as well as provide an opportunity to consider any mitigation that may be required.
Councillor Rabnawaz Akbar, Councillor Jill Lovecy and Councillor Ahmed Ali, Rusholme	Briefings to explain the consultation on design refinements and the proposed design of the Birchfields Road vent shaft, particularly regarding alternative locations for the vent shaft.	Feedback used to inform understanding of emerging scheme design and consideration of mitigation proposals.

3.3.9 Local authorities and parish councils will continue to be engaged as part of the development of the Proposed Scheme with ongoing dialogue on key topics such as highways, PRoW and the draft Code of Construction Practice (CoCP)[12].

Expert, technical and specialist groups

3.3.10 Engagement has been undertaken with technical and specialist organisations to provide appropriate specialist input to inform the design and assessment of the Proposed Scheme. This includes engagement with statutory bodies, local authorities and utility companies operational within the Davenport Green to Ardwick area.

[12] Volume 5: Appendix CT-002-00000, draft Code of Construction Practice (CoCP).

3.3.11 Engagement with statutory bodies, local authorities and utility companies within the Davenport Green to Ardwick area has been undertaken in order to:

- collate local baseline information;
- identify and understand issues and concerns; and
- provide a mechanism for ongoing dialogue and discussion on the assessment and design development.

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

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

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

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

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

Type	Stakeholder	Area of focus	How this has informed the design and assessment of the Proposed Scheme
Statutory and national	British Geological Survey	Geological conditions	Information has been used to improve understanding of baseline geological issues route-wide and specifically along the route of Manchester tunnel and at the associated vent shaft and portal locations, informing the assessment and any proposed mitigation.
Statutory and national	Canal & River Trust	Waterways	Information has been used to inform the historic environment, landscape and visual assessment and improve understanding of baseline conditions for route-wide application, including the water resources and flood risk assessment.
Statutory and national	Coal Authority	Coal mining	Information has been used to improve understanding of baseline conditions for coal mining route-wide, informing the assessment and proposed mitigation.
Statutory and national	Department for Environment, Food and Rural Affairs	Agriculture and land quality issues	Informed agricultural and land quality assessment methodology, baseline conditions for route-wide application, assessment and proposed mitigation.

Type	Stakeholder	Area of focus	How this has informed the design and assessment of the Proposed Scheme
Statutory and national	Environment Agency	Land quality, ecology and biodiversity and water and flood risk issues	Informed land quality, ecology and biodiversity, water resources, surface water flood risk and Water Framework Directive methodology. Improved understanding of baseline conditions, (including the provision of data), along the route of the Proposed Scheme and the proposed mitigation. Specific discussion points included the Palatine Road vent shaft and the associated flood risk and associated mitigation relating to the Didsbury flood storage basin and the potential for saline upwelling or change in groundwater quality due to construction dewatering at the vent shafts.
Statutory and national	Animal and Plant Health Agency (APHA)	Land quality issues	Information on the location of farm burial and pyre sites associated with the 1967/8 and 2001 outbreaks of foot and mouth disease as well as anthrax infected cattle burial sites has been obtained from APHA. This has been used to improve understanding of land contamination baseline conditions along the route of the Proposed Scheme and to inform the assessment and proposed mitigation.
Statutory and national	Forestry Commission	Forestry, ecology and landscape issues	Informed the ecological and landscape assessment methodology, improved understanding of baseline conditions and the assessment and proposed mitigation.
Statutory and national	Highways England	Strategic road network, traffic and transport issues	Informed the assessment of road network capacity and identification of proposed future Highways England works that informed the design including the design of the Altrincham Road and the Palatine Road vent shafts.
Statutory and national	Historic England	Nationally designated heritage assets and the heritage assessment methodology	Informed methodology for assessing setting and impacts on historic landscape at national and regional level. Identification and assessment methodology of designated and non-designated heritage assets.
Statutory and national	National Farmers Union	Farming issues	Information was used to improve understanding of route-wide issues for farmers and growers.
Statutory and national	Country Land and Business Association	Farming issues	Information was used to improve understanding of route-wide issues for farmers and growers.
Statutory and national	National Trust	Owned assets and related impacts	Informed considerations around National Trust owned assets and factors to be considered in the design and assessment of the Proposed Scheme route-wide.
Statutory and national	Natural England	Ecology, agricultural land quality, surface water, groundwater and landscape and visual related issues	Provided further information regarding the natural environment on a route-wide basis. Informed methodological approach and detailed local conditions and factors to be taken into consideration in the assessment.

Type	Stakeholder	Area of focus	How this has informed the design and assessment of the Proposed Scheme
Statutory and national	Network Rail	Rail infrastructure	Informed route-wide considerations around rail infrastructure network and factors to be considered in the design and assessment of the Proposed Scheme, including the location of Manchester tunnel north portal.
Statutory and national	Public Health England	Public health issues	Informed methodology and factors to be taken into consideration in the health assessment.
Statutory and national	The Woodland Trust	Woodland and ancient woodland issues	Information was used to confirm that there are currently no sites within the Ancient Woodland Inventory in this area.
Statutory sub-national	Transport for the North	Connectivity to Northern Powerhouse Rail	Discussions around integration of HS2 with NPR including, where necessary, passive provisions in the Proposed Scheme and integration of NPR at Manchester Piccadilly High Speed station.
Local Authority technical meetings	Manchester City Council	Meeting to discuss the sound, noise and vibration and air quality assessments including proposed mitigation.	Information used to improve understanding of baseline conditions and provide an opportunity to consider any mitigation that may be required.
Local Authority technical meetings	Manchester City Council	Meetings with technical leads to collate data and discuss the historic environment assessment.	Information on local conditions and factors used to refine the design of the Proposed Scheme and assessment.
Local Authority technical meetings	Manchester City Council	Meeting to discuss known and potential contaminated land, the proposed assessment and mitigation measures for land quality.	Identified local areas of land contamination, potential impacts and proposed mitigation.
Local Authority technical meetings	Manchester City Council	Meetings with technical leads to collate data and discuss landscape and visual impacts, viewpoint locations and site walkovers.	Informed the identification of viewpoint locations to be assessed and reported within the ES, as well as the extent of the landscape and visual study area. Obtained information to improve understanding of baseline conditions.
Local Authority technical meetings	Manchester City Council	Meeting to collate baseline data on socio-economic characteristics.	Information used to improve understanding of baseline conditions and provide an opportunity to consider any mitigation that may be required.
Local Authority technical meetings	Manchester City Council	Meetings to provide information on the Proposed Scheme and obtain relevant baseline information and discuss transport survey requirements and assessment methodology relating to traffic and transport.	Improved understanding of local traffic flows, highways operations and future proposals, and informed the emerging design and assessment of the Proposed Scheme.

Type	Stakeholder	Area of focus	How this has informed the design and assessment of the Proposed Scheme
Local Authority technical meetings	Manchester City Council	Meetings with the Lead Local Flood Authorities to provide information on the Proposed Scheme and obtain relevant baseline information related to water resources and flood risk.	Information used to improve understanding of baseline conditions and provide an opportunity to consider any mitigation that may be required, including the Didsbury flood storage basin.
Local Authority technical meetings	Greater Manchester Combined Authority	Meetings with technical leads to collate data and discuss landscape and visual impacts, viewpoint locations and site walkovers.	Informed the identification of viewpoint locations to be assessed and reported within the ES, as well as the extent of the landscape and visual study area and obtaining information to improve understanding of baseline conditions.
Local Authority technical meetings	Greater Manchester Combined Authority	Meeting to collate baseline data on socio-economic characteristics.	Information has been used to improve understanding of baseline conditions and provide an opportunity to consider any mitigation that may be required.
Local Authority technical meetings	Greater Manchester Combined Authority	Meetings to provide information on the Proposed Scheme and obtain relevant baseline information and discuss transport survey requirements and assessment methodology relating to traffic and transport.	Improved understanding of local traffic flows, highways operations and future proposals, and informed the emerging design and assessment of the Proposed Scheme.
Local Authority technical meetings	Salford City Council	Meetings with technical leads to collate data and discuss the historic environment assessment.	Information on local conditions and factors used to refine the Proposed Scheme design and assessment.
Local Authority technical meetings	Tameside Metropolitan Borough Council	Meeting to discuss the ecology and biodiversity assessment, including the mitigation strategy.	Information used to improve understanding of baseline conditions, support the identification of sensitive ecological sites, and consider appropriate mitigation and compensation for habitat loss associated with the Proposed Scheme.
Local Authority technical meetings	Trafford Metropolitan Borough Council	Meeting to provide information on the Proposed Scheme, with a focus on wider impacts relating to air quality.	Information used to improve understanding of baseline conditions and provide an opportunity to consider any mitigation that may be required.
Local Authority technical meetings	Trafford Metropolitan Borough Council	Meeting to discuss the ecology and biodiversity assessment, including the mitigation strategy.	Information has been used to improve understanding of baseline conditions, support the identification of sensitive ecological sites, and consider appropriate mitigation and compensation for habitat loss associated with the Proposed Scheme.

Type	Stakeholder	Area of focus	How this has informed the design and assessment of the Proposed Scheme
Local Authority technical meetings	Trafford Metropolitan Borough Council	Meetings with technical leads to collate data and discuss the historic environment assessment.	Information on local conditions and factors used to refine the design of the Proposed Scheme and assessment.
Local Authority technical meetings	Trafford Metropolitan Borough Council	Meeting to discuss known and potential contaminated land, the proposed assessment and mitigation measures for land quality.	Identified local areas of land contamination, potential impacts and proposed mitigation.
Local Authority technical meetings	Trafford Metropolitan Borough Council	Meeting to collate baseline data on socio-economic characteristics.	Information has been used to improve understanding of baseline conditions and provide an opportunity to consider any mitigation that may be required.
Local Authority technical meetings	Trafford Metropolitan Borough Council	Meetings to provide information on the Proposed Scheme, obtain relevant baseline information and discuss transport survey requirements and assessment methodology relating to traffic and transport.	Information used to improve understanding of local traffic flows, highways operations and future proposals, and inform the emerging design and assessment of the Proposed Scheme.
Local Authority technical meetings	Transport for Greater Manchester	Meeting to provide information on the Proposed Scheme, with a focus on wider impacts relating to air quality.	Information used to improve understanding of baseline conditions and provide an opportunity to consider any mitigation that may be required.
Local Authority technical meetings	Transport for Greater Manchester	Meetings to provide information on the Proposed Scheme and obtain relevant baseline information and discuss transport survey requirements and assessment methodology relating to traffic and transport.	Information used to improve understanding of local traffic and highways operations, future proposals and traffic flows to inform baseline conditions, emerging design and assessment of the Proposed Scheme.
Local technical specialist group	Cheshire Wildlife Trust	Meeting to discuss the Proposed Scheme, provide an update on consultation activities and to understand key areas of concern relating to impacts on local wildlife sites.	Identified sensitive ecological sites and appropriate mitigation and compensation for habitat loss associated with the Proposed Scheme.
Local technical specialist group	Greater Manchester Archaeological Advisory Service	Meetings with technical leads to collate data and discuss the historic environment assessment.	Information on local conditions and factors used to refine the Proposed Scheme design and assessment.

Type	Stakeholder	Area of focus	How this has informed the design and assessment of the Proposed Scheme
Local technical specialist group	Greater Manchester Ecology Unit	Meeting to collate data related to the ecological assessment.	Information on local conditions and factors used to refine the Proposed Scheme design and assessment.
Local technical specialist group	Lancashire Wildlife Trust	Meeting to discuss the Proposed Scheme, provide an update on consultation activities and to understand key areas of concern relating to impacts on local wildlife sites.	Identified sensitive ecological sites and appropriate mitigation and compensation for habitat loss associated with the Proposed Scheme.
Utilities	Cadent Gas	Network provision of gas	Informed considerations relating to the utilities network and factors to be considered in the design and assessment of the Proposed Scheme, as well as diversions and mitigation requirements at a number of locations including Manchester tunnel north portal, Altrincham Road vent shaft, Wilmslow Road vent shaft, Palatine Road vent shaft and Birchfields Road vent shaft and satellite compound.
Utilities	Cityfibre	Network provision of telecommunications services	Identified telecommunication services and informed understanding of potential impacts of the Proposed Scheme and mitigation requirements at Birchfields Road vent shaft and the construction of Manchester tunnel.
Utilities	Colt	Network provision of telecommunications services	Identified telecommunication services and informed understanding of potential impacts of the Proposed Scheme and mitigation requirements at Birchfields Road vent shaft, any diversion of assets and mitigation required for the construction of Manchester tunnel.
Utilities	EE and Three	Network provision of telecommunications services	Identified telecommunication services and informed understanding of potential impacts of the Proposed Scheme and mitigation requirements at the Altrincham Road vent shaft and satellite compound, as well as any diversion of assets and mitigation required for the construction of Manchester tunnel.
Utilities	Electricity North West Limited	Network provision of electricity	Informed considerations relating to the utilities network and factors to be considered in the design and assessment of the Proposed Scheme. This comprised assets at Altrincham Road vent shaft, Palatine Road vent shaft, Birchfields Road -vent shaft, Wilmslow Road vent shaft and the Manchester tunnel north portal main compound as well as any diversion of assets and mitigation required for the construction of Manchester tunnel.
Utilities	Gamma	Network provision of telecommunications services	Identified telecommunication services and informed understanding of potential impacts of the Proposed Scheme and mitigation requirements associated with the construction of Manchester tunnel.

Type	Stakeholder	Area of focus	How this has informed the design and assessment of the Proposed Scheme
Utilities	Instalcom	Network provision of telecommunications services	Identified telecommunication services and informed understanding of potential impacts of the Proposed Scheme and mitigation requirements associated with the constructions of Manchester tunnel.
Utilities	Level 3	Network provision of telecommunications services	Identified telecommunication services and informed understanding of potential impacts of the Proposed Scheme and mitigation requirements associated with the construction of Manchester tunnel.
Utilities	Openreach	Network provision of telecommunications services	Identified telecommunication services and informed understanding of potential impacts of the Proposed Scheme and mitigation requirements. This comprises assets at satellite compounds including Altrincham Road vent shaft, Palatine Road vent shaft, Birchfields Road vent shaft and Wilmslow Road vent shaft, as well as Manchester tunnel north portal main compound. Discussions were also held relating to the impacts on assets at Palatine Road vent shaft auto-transformer station, Birchfields Road vent shaft auto-transformer station and Manchester tunnel north portal telecommunications site, as well as any diversion of assets at other locations and the mitigation required for the construction of Manchester tunnel.
Utilities	SSE Electric Limited	Network provision of electricity	Identified telecommunication services and informed understanding of potential impacts of the Proposed Scheme and mitigation requirements associated with the construction of Manchester tunnel.
Utilities	United Utilities	Network provision of potable water and wastewater services	Informed considerations relating to the utilities network and factors to be considered in the design and assessment of the Proposed Scheme. This comprised assets at Altrincham Road vent shaft, Palatine Road vent shaft, Birchfields Road -vent shaft, Wilmslow Road vent shaft, Manchester tunnel north portal main compound as well as any diversion of assets and mitigation required for the construction of Manchester tunnel.
Utilities	Virgin Media	Network provision of telecommunications services	Identified telecommunication services and informed understanding of potential impacts of the Proposed Scheme and mitigation requirements associated with the construction of Manchester tunnel.
Utilities	Vodafone and O2 Mobile Masts	Network provision of telecommunications services	Identified telecommunication services and informed understanding of potential impacts of the Proposed Scheme and mitigation requirements on the mobile mast at Altrincham Road vent shaft Satellite compound, as well as any diversion of assets and mitigation required for the construction of Manchester tunnel.
Utilities	Vodafone Ltd (Below Ground Assets)	Network provision of telecommunications services	Identified telecommunication services and informed understanding of potential impacts of the Proposed Scheme and mitigation requirements associated with the construction of Manchester tunnel.

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

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

Directly affected individuals

3.3.18 This group includes those with land and property potentially affected by the Proposed Scheme, including individuals within the Davenport Green to Ardwick area.

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

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

3.3.21 Engagement with directly affected individuals will continue as the project develops.

Major asset owners and businesses

3.3.22 This group includes those with property potentially affected by the Proposed Scheme, including major asset holders and businesses within the Davenport Green to Ardwick area.

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

3.3.24 Engagement has been undertaken with major asset owners and businesses within the Davenport Green to Ardwick area including Royal London Asset Management, Highways England, MCC, The Civil Aviation Authority Pension Scheme (owners of the Fallowfield Retail Park), University of Manchester, The Christie Hospital, Siemens Mobility Limited, Ardwick Train Care Facility and Network Rail. The purpose of this engagement has been to obtain

baseline information and provide these stakeholders with the opportunity to raise issues and discuss mitigation in relation to the Proposed Scheme.

3.3.25 Key issues raised during this engagement have included:

- the impact on the operational viability of Siemens Mobility Limited and Ardwick Train Care Facility;
- the impacts on Fallowfield Retail Park; and
- the loss of car parking facilities at The Christie Hospital.

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

4 Agriculture, forestry and soils

4.1.1 This environmental topic has been scoped out of the assessment for the Davenport Green to Ardwick area. There are no undisturbed natural soils, agricultural activities or forestry activities affected by the Proposed Scheme in this 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 arising from the construction and operation of the Proposed Scheme within the Davenport Green to Ardwick area. Oxides of nitrogen (NOx) including nitrogen dioxide (NO_2), fine particulate matter (particles of size less than 2.5µm and 10µm in diameter, referred to as $PM_{2.5}$ and PM_{10}, respectively) and dust have been considered in the assessment. Emissions of all or some of these air pollutants are likely to arise from construction activities, demolition, site preparation works, and the use of site haul routes. Emissions will also arise from road traffic during construction and operation of the Proposed Scheme.

5.1.2 Engagement with Manchester City Council (MCC), Trafford Metropolitan Borough Council (TMBC) and Transport for Greater Manchester (TfGM) has been undertaken. The purpose of this engagement has been to obtain relevant baseline information, which includes monitoring data in this area.

5.1.3 Detailed reports on the air quality data and assessments for this area are contained within Volume 5: Appendix AQ-001-0MA07. Additional information on air quality monitoring and traffic data used in the assessment is set out in Background Information and Data (BID), BID AQ-002-0MA07[13].

5.1.4 Maps showing the location of the key environmental features and the key construction and operational features of the Proposed Scheme can be found in the Volume 2: MA07 Map Book. Air quality mapping is presented in the Volume 5: Air quality Map Book, map AQ-01-307.

5.1.5 The Proposed Scheme is described in Section 2.

5.2 Scope, assumptions and limitations

5.2.1 The scope, assumptions and limitations for the air quality assessment are set out in Volume 1 (Section 8), the EIA Scope and Methodology Report (SMR)[14] and Volume 5: Appendix AQ-001-0MA07.

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

- from construction activities;

[13] High Speed Two Ltd (2022), High Speed Rail (Crewe-Manchester), *Background Information and Data, Air quality*, BID AQ-002-0MA07. Available online at: https://www.gov.uk/government/collections/hs2-phase-2b-crewe-manchester-environmental-statement.

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

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

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

5.2.4 The assessment has incorporated HS2 Ltd's policies on vehicle emissions[15]. These include the use of Euro VI heavy goods vehicles (HGV), Euro 4 petrol and Euro 6 diesel cars and light goods vehicles (LGV) during construction of the Proposed Scheme.

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

5.2.6 The predicted impacts across all assessed construction scenarios for each receptor are presented in Volume 5: Appendix AQ-001-0MA07. Predicted concentrations and significant effects are presented for the worst-case construction traffic scenario assessed.

5.2.7 The Government has proposed that clean air zones (CAZ) will be implemented in various cities in the country for reducing NO_2 concentrations and improving local air quality. The future baseline traffic models have assumed no improvements in the vehicle fleet due to the implementation of the CAZ. HS2 Ltd's policies on vehicle emissions comply with the requirements of all CAZ.

[15] High Speed Two Ltd (2022), *Phase 2b Western Leg Information Paper E14: Air Quality.* Available online at: https://www.gov.uk/government/collections/hs2-phase-2b-crewe-manchester-environmental-statement.

5.3 Environmental baseline

Existing baseline

Background air quality

5.3.1 The main sources of air pollution in the Davenport Green to Ardwick area are emissions from road vehicles and domestic activities. The main roads within the area are the M56, the M60, the A6 Stockport Road, the A34 Kingsway/Birchfields Road/Upper Brook Street, the A56 Chester Road, the A57 Hyde Road, the A62 Oldham Road, the A560 Altrincham Road, the A662 Droylsden Road/Manchester Road/Ashton Road and the A635 Ashton Old Road/Manchester Road.

5.3.2 There are nine industrial installations (regulated by the Environment Agency) with permits for emissions to air for NOx and/or PM_{10}, namely Centrica Business Solutions UK Limited (combustion plant), SUEZ Recycling and Recovery UK Limited, Vita Liquid Polymers Limited, Greyland Limited (chemical manufacturers), United Biscuits UK Limited, Concept Chemicals & Coatings Limited, Urban Reserve (AssetCo) Limited (electricity), Evonik Chemicals Limited and Carbogen Amcis Limited (chemical manufacturers). Their details are presented in BID AQ-002-0MA07. The contribution of these industrial processes to local air quality is included within the background concentrations.

5.3.3 Estimates of background air quality have been taken from the Department for Environment, Food and Rural Affairs (Defra)[16] for the baseline year of 2018. The data are estimated for 1km grid squares for NOx, NO_2, PM_{10} and $PM_{2.5}$. Background concentrations were within the air quality standards for all pollutants within the Davenport Green to Ardwick area.

Local monitoring data

5.3.4 There are currently 38 local authority diffusion tube sites located within the Davenport Green to Ardwick area for monitoring NO_2 concentrations. These are located in Heald Green, Newall Green, Sale, Cheadle, East Didsbury, West Didsbury, Stockport, Old Trafford, Reddish, Levenshulme, Gorton, West Gorton, Dane Bank, Clayton, Openshaw, Droylsden and Ashton-Under-Lyne.

5.3.5 There are also two continuous air quality monitoring sites within the Davenport Green to Ardwick area. These are located near the B5166 Styal Road (the 'Manchester Sharston' site, monitoring NO_2 and $PM_{2.5}$) and adjacent to the A34 Kingsway (the 'Stockport Cheadle' site monitoring NO_2 and PM_{10}).

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

[16] Department for Environment, Food and Rural Affairs (2020), *Defra Background Pollutant Concentration Maps*. Available online at: https://uk-air.defra.gov.uk/data/laqm-background-maps?year=2018.

5.3.7 Measurements of NO_2 were within the air quality standard at 36 locations in 2018. At nine locations, annual mean NO_2 concentrations were above the air quality standard in 2018. Annual mean PM_{10} and $PM_{2.5}$ concentrations were within the air quality standards at the Stockport Cheadle and Manchester Sharston monitoring sites respectively during 2018.

5.3.8 Details of the location of all monitoring sites are presented in map AQ-01-307 and the monitoring data are presented in Volume 5: Appendix AQ-001-0MA07 and BID AQ-002-0MA07.

Air quality management areas

5.3.9 There is one air quality management area (AQMA) within the Davenport Green to Ardwick area, the Greater Manchester Combined Authority AQMA. This AQMA covers several arterial routes in Greater Manchester and was designated in May 2016 for exceedances in the annual mean NO_2 standard. Details of its location are presented in Map AQ-01-307 and Volume 5: Appendix AQ-001-0MA07.

Clean air zones

5.3.10 A Class C CAZ is proposed to be implemented in Manchester by 2022. This will cover the Greater Manchester area. It will be a charging CAZ with the following emission standards:

- bus/coach Euro VI;
- minibus, taxi and private hire Euro 4 petrol and Euro 6 diesel;
- HGV Euro VI; and
- LGV Euro 4 petrol and Euro 6 diesel.

Receptors

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

5.3.12 Most of the receptors which may be affected by the Proposed Scheme are residential. Other receptors include a number of schools and nurseries.

5.3.13 The air quality assessment has also included receptors in ecological sites sensitive to nitrogen deposition and dust. There are two international/national ecological site designations of relevance to the air quality assessment identified in the Davenport Green to Ardwick area, namely Rochdale Canal Special Area of Conservation (SAC) and Site of Special Scientific Interest (SSSI) and Hollinwood Branch Canal SSSI. Other relevant local sensitive ecological sites identified close to the Proposed Scheme include Black Field Wood Ancient Woodland (AW) and Site of Biological Importance (SBI), Wythenshawe Park LNR, Wrengate Wood SBI and Heyscroft AW.

Future baseline

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

Construction (2025)

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

5.3.16 Committed developments that have been included as future receptors in the assessment of air quality impacts during construction of the Proposed Scheme are identified in Volume 5: AQ-001-0MA07. No additional committed developments have been identified in this study area that will materially alter the baseline conditions in 2025 for air quality.

Operation (2038)

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

5.3.18 Committed developments that have been included as future receptors in the assessment of air quality impacts during operation of the Proposed Scheme are identified in Volume 5: AQ-001-0MA07. No additional committed developments have been identified in this study area that will materially alter the baseline conditions in 2038 for air quality.

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

[17] Volume 5: Appendix CT-002-00000, draft Code of Construction Practice (CoCP).

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

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

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

5.4.4 Prior to commencement of activities, there will be further detailed assessment for each worksite to determine site specific dust mitigation.

Assessment of impacts and effects

Temporary effects

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

Construction dust effects

5.4.6 The risks of demolition of existing buildings, earthworks, construction of new structures and trackout have been assessed for their effect on dust soiling, human health and ecological sites. Trackout refers to the transport of dust and dirt from the construction site(s) onto the public road network, where it may be deposited and then re-suspended by vehicles using the network. The human health effects of dust relate mainly to short-term exposure to PM_{10}.

5.4.7 The identified risks potentially arising from construction dust within the Davenport Green to Ardwick area are shown in Table 8. The risks are dependent on the magnitude of dust generating activities and the location of sensitive receptors in relation to these activities. A range of risks is shown, as there are several construction locations in the area.

Table 8: Summary of risks for construction dust assessment

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

5.4.8 With the application of the established national best practice mitigation measures contained in the draft CoCP, no significant effects are anticipated from the risks associated with the dust generating activities. Further details of the assessment can be found in Volume 5: Appendix AQ-001-0MA07 where the scale of dust emissions and the sensitivity of the area and receptors are fully described.

Construction traffic effects

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

5.4.10 The assessment of construction traffic emissions has been undertaken for a 'without the Proposed Scheme' scenario and a 'with the Proposed Scheme' scenario. The traffic data for each scenario includes the additional traffic from future committed developments.

5.4.11 Construction traffic data in the study area have been screened to identify roads that required further assessment and to confirm the likely effect of the change in emissions from vehicles using those roads during construction of the Proposed Scheme. There were three construction traffic scenarios assessed in this area.

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

5.4.13 Nitrogen deposition is predicted to increase by more than 1% of the critical load at only one ecological receptor in this area, Rochdale Canal SSSI and SAC, as a result of the Proposed Scheme. The potential for this increase to result in significant ecological effects is addressed in Section 7, Ecology and biodiversity of this report. No significant air quality effects are anticipated at any other of the ecological receptors in this area.

Rail emissions at Manchester tunnel north portal construction sidings

5.4.14 The impact from diesel trains associated with Manchester tunnel north portal construction sidings has been assessed and is considered to be negligible. Therefore, no significant

effects are anticipated from the operation of diesel trains at this location during construction of the Proposed Scheme (see Volume 5: Appendix AQ-001-0MA07).

Permanent effects

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

Other mitigation measures

5.4.16 No other mitigation measures are considered necessary in relation to air quality during construction of the Proposed Scheme in this area.

Summary of likely residual significant effects

5.4.17 The methods outlined within the draft CoCP are considered effective at reducing dust and traffic emissions, and therefore, no significant residual effects are anticipated.

Cumulative effects

5.4.18 The data used in the air quality assessment take account of predicted changes in traffic as a result of committed developments in the area, and therefore, their impacts have been included within the assessment. It is assumed that dust emissions from construction of other developments in the area will be controlled by appropriate measures as set out within their respective environmental management controls, and therefore, no cumulative effects for air quality are anticipated.

5.5 Effects arising from operation

Avoidance and mitigation measures

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

Assessment of impacts and effects

5.5.2 Impacts from the operation of the Proposed Scheme will arise from changes in the volume, composition and/or speed of road traffic and changes in road alignment.

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

Operational traffic effects

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

5.5.5 Traffic data in the study area have been screened to identify roads that required further assessment and to confirm the likely effect of the change in emissions from vehicles using those roads during operation of the Proposed Scheme. There were 46 roads screened in for further assessment in the Davenport Green to Ardwick area, including the A635 Ashton Old Road, the A5103 Princess Parkway and the A6010 Pottery Lane.

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

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

Other mitigation measures

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

Summary of likely residual significant effects

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

Cumulative effects

5.5.10 The data used in the air quality assessment take account of predicted changes in traffic as a result of committed developments in the area, and therefore, their impacts have been included within the assessment.

Monitoring

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

5.5.12 On the basis of there being no significant residual operational effects, there are no area-specific requirements for monitoring air quality effects during operation of the Proposed Scheme in the Davenport Green to Ardwick area.

6 Community

6.1 Introduction

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

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

6.1.3 Further details of the community assessments undertaken within the Davenport Green to Ardwick area are contained in Volume 5: Appendix CM-001-0MA07.

6.1.4 Community assessment maps are provided in the Map Series CM-01 in Volume 5, Community Map Book. Maps showing the location of the key environmental features (Map Series CT-10) and the key construction (Map Series CT-05) and key operational (Map Series CT-06) features of the Proposed Scheme are provided in the Volume 2: MA07 Map Book. The Proposed Scheme is described in Section 2.

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

6.2 Scope, assumptions and limitations

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

6.2.2 The study area includes the land required both temporarily and permanently for the construction and operation of the Proposed Scheme. It also includes a wider area including proposed construction traffic routes within which community resources could be affected by a combination of two or more significant residual effects arising from noise, vibration, poor air quality, heavy goods vehicles (HGV)[19] traffic, and visual intrusion. Overall, the study area is taken as the area of land that encompasses the likely significant community effects of the Proposed Scheme.

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

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

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

6.2.4 Where reasonably practicable, public footpaths and routes will be 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. If a temporary or permanent alternative route cannot be provided in advance of any road or PRoW closure, then this will be discussed with the relevant local authority and local groups.

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

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

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

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

6.3 Environmental baseline

Existing baseline

6.3.1 The Proposed Scheme through the Davenport Green to Ardwick area will be 13.4km in length and will be within the Trafford Metropolitan Borough Council (TMBC), Manchester City Council (MCC) and the strategic authority of Greater Manchester Combined Authority (GMCA) areas. The route of the Proposed Scheme, most of which will be in a tunnel, will run from Fairywell Brook, just south of Newall Green and Woodhouse Park at the edge of the Manchester conurbation, passing under the settlements of Newall Green, Wythenshawe, Northenden, Didsbury, Withington, Longsight and West Gorton, before emerging from tunnel at Ardwick.

6.3.2 The area is predominantly suburban in character, with land use comprising dense residential development. There are light industrial and commercial uses through Northenden, Longsight, West Gorton and Ardwick. The River Mersey runs north to south between Northenden and Didsbury and there is a range of recreation and open space facilities. In general, the majority of community facilities are in the settlements of Northenden, Didsbury, Longsight and West Gorton with higher concentrations of amenities located closer to Manchester city centre. Promoted PRoW in the area include the Trans Pennine Trail, Medlock Valley Way, Cheshire Ring Canal Walk and Tameside Trail.

Manchester tunnel south portal

6.3.3 The Manchester tunnel south portal will be located in the Davenport Green to Ardwick area, west of the M56 junction 5 and accessed from a new access track off Thorley Lane. The study area around Manchester tunnel south portal is primarily residential and covers parts of Newall Green.

6.3.4 Community resources to the north of the proposed Manchester tunnel south portal site include Clever Clowns Pre-School, Anchors Away Soft Play Centre, Newall Green Baptist Church, St Peter's Catholic Primary School, St Paul's Catholic High School, Piper Hill High School, Newall Green Primary School and the Tree of Life Community Centre.

Altrincham Road vent shaft

6.3.5 Altrincham Road vent shaft will be located north of Wythenshawe and south of Northenden. The study area around the vent shaft is primarily residential.

6.3.6 Community resources to the north of the proposed vent shaft site include: a property used by the Open University for the Student Recruitment and Support Centre and the Faculty of Science, Technology, Engineering, Mathematics and Access; and the Church of Jesus Christ of Latter-Day Saints. To the south are Benchill Primary School, Benchill Community Centre and Kids Around the Clock day care centre.

6.3.7 There are a number of open spaces to the north and west of the study area, including Blackcarr Wood, Royalthorn Wood, Round Wood, Gib Lane Wood and Wythenshawe Park.

Palatine Road vent shaft

6.3.8 The Palatine Road vent shaft will be located north of Northenden and south-west of Didsbury. The study area around the vent shaft is a mix of residential and recreational uses.

6.3.9 There are three golf courses that cover much of the area around the proposed vent shaft site. Withington Golf Club is on the route of the Proposed Scheme, Northenden Golf Club is to the north and Didsbury Golf Club is to the south of the route of the Proposed Scheme. Other community facilities in the study area include: three allotment gardens, Baguley, Brooklands and Albermarle; Nazarene Theological College to the east; Northenden Community Library to the west; and Marie Louise Gardens to the north.

6.3.10 The Trans Pennine Trail and National Cycle Network Route 62 follow the River Mersey, which runs to the west of the vent shaft site.

Wilmslow Road vent shaft

6.3.11 The Wilmslow Road vent shaft will be located in Withington. The study area around the vent shaft site is primarily residential.

6.3.12 The Wilmslow Road vent shaft will occupy land that is currently used as Car Park D, a car park for patients and visitors to The Christie Hospital and Oglesby Cancer Research Building, University of Manchester. These buildings are north of the vent shaft site. To the south of the vent shaft site are: Fog Lane Park, which comprises playing fields, a skate park, playground, bowling green and a pavilion; Northern Tennis Club; and West Didsbury Church of England Primary School. Community facilities to the north of Wilmslow Road vent shaft site include: Manchester Muslim Preparatory School; The Methodist Homes for Aged (MHA) Laurel Court, which is a residential, nursing and dementia care home; St Paul's Church of England Church; Withington Methodist Church; St Cuthbert's RC Primary School; and St Paul's Church of England Primary School.

Birchfields Road vent shaft

6.3.13 The Birchfields Road vent shaft will be located in Fallowfield. The study area around the vent shaft site is primarily residential, with nearby retail and educational facilities.

6.3.14 The Birchfields Road vent shaft will cover the northern part of the Fallowfield Retail Park and car park. The Hawthorn Medical Centre is located at the southern end of the Fallowfield Retail Park. Community facilities in the study area in proximity to the vent shaft site include: Birchfields Primary School; Manchester Enterprise Academy (MEA) Central and Cringle Brook Primary School to the north; Kingswood City of Refuge Christian Centre to the south; and Manchester University Athletic Ground and the Armitage Centre, which is a sport centre for use by both students and the public, to the west.

Future baseline

Construction (2025)

6.3.15 Volume 5: Appendix CT-004-00000 provides details of the developments in the Davenport Green to Ardwick area that are assumed to have been implemented by 2025. The following committed developments of relevance to the community assessment that would materially alter the future baseline during construction of the Proposed Scheme in this area, are set out in Table 9.

Table 9: Committed developments of relevance to community during construction

Map book reference[20]	Planning reference	Description	How this is considered in the assessment
MA07/161	121232/P3OPA/2018	Location: Apex House 266 Moseley Road Manchester M19 2LH Notification for Prior Approval for a proposed change of use of a building from office (Class B1a) to 24 apartments (Class C3).	Informing future baseline
MA07/422	125652/FU/2019	Location: Unit 3 Fallowfield Retail Park Birchfields Road Manchester M14 6FS Change of use of Unit 3 from retail (Class A1) to health centre (Class D1) to facilitate relocation of Hawthorn Medical Centre from Unit 9.	Will not be implemented
MA07/298	116867/FO/2017	Location: 30 Palatine Road, Manchester, M20 3JJ Change of Use from Bridge Club, with residential accommodation at second floor level and existing Children's nursery at basement level into Children's Day Nursery (155 children and 3 staff) including introduction of access ramp to front and associated alterations to parking layout, alteration to vehicular and pedestrian access, elevational alterations, landscaping including boundary treatment and cycle and buggy store.	Informing future baseline
MA07/393	123330/FO/2019	Location: Land adjacent to 303 Greenbrow Road, Manchester, M23 2UH Erection of a four-storey building to form 10 self-contained flats, with associated undercroft car parking.	Informing future baseline
MA07/356	126581/FU/2020	Location: 6 Kempsford Close Manchester M23 1LH Change of use from dwellinghouse (Use Class C3) to residential accommodation for disabled adults (Use Class C2).	Informing future baseline
MA07/363	126182/VO/2020	Location: Land to west Of Roundwood Road Manchester M22 4AB City Council Development for the erection of a two storey school with associated external play areas, Multiple Use Games Area pitch, landscaping and boundary treatment, car parking and separate vehicular and pedestrian accesses onto Roundwood Road.	Informing future baseline

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

- MA07/161 will result in a residential development located 120m to the east of the land required for the construction of the Proposed Scheme;
- MA07/298 will result in a children's nursery, located 5m to the west of land required for the construction of the Proposed Scheme;

[20] Volume 5: Planning Data/Committed Development Map Book: Maps CT-13-322b to CT-13-326a.

- MA07/393 will result in a residential development located 255m to the west of the land required for the construction of the Proposed Scheme;
- MA07/356 will result in residential accommodation for disabled adults, located 500m to the south of the land required for the construction of the Proposed Scheme; and
- MA07/363 will result in a new school located 70m to the north of the land required for the construction of the Proposed Scheme.

6.3.17 Committed development MA07/422 lies wholly within the land required for the construction of the Proposed Scheme and is therefore unimplementable and does not form part of the future baseline.

Operation (2038)

6.3.18 Volume 5: Appendix CT-004-00000 also provides details of the developments in the Davenport Green to Ardwick area that are assumed to have been implemented by 2038. No additional committed developments of relevance for the Community assessment have been identified that would materially alter the future baseline in this area.

6.4 Effects arising during construction

Avoidance and mitigation measures

6.4.1 The Birchfields Road vent shaft has been located to avoid land being required from MEA Central secondary school. This measure has been incorporated into the Proposed Scheme as part of the design development process to avoid or reduce, insofar as reasonably practicable, the environmental impacts during construction.

6.4.2 The draft Code of Construction Practice (CoCP)[21] includes a range of provisions that will help mitigate community effects associated with construction of the Proposed Scheme within this area, including:

- implementation of a community engagement framework and the provision of appropriately experienced community relations personnel to implement the framework, to provide appropriate information and to be the first point of contact to resolve community issues (Section 5 of the draft CoCP);
- sensitive layout of construction sites to reduce nuisance as far as possible (Section 5 of the draft CoCP);
- maintenance of PRoW during construction where reasonably practicable (Section 14 of the draft CoCP);
- monitoring and management of flood risk and other extreme weather events, where reasonably practicable, which may affect community resources during construction (Section 16 of the draft CoCP);

[21] Volume 5: Appendix CT-002-00000, 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 of the draft CoCP); and
- where practicable, the avoidance of HGVs operating adjacent to schools during drop off and pick-up periods (Section 14 of the draft CoCP).

Assessment of impacts and effects

Manchester tunnel south portal

Temporary effects

6.4.3 No temporary construction effects are anticipated in this area.

Permanent effects

6.4.4 No temporary construction effects are anticipated in this area.

Altrincham Road vent shaft

Temporary effects

6.4.5 No temporary construction effects are anticipated in this area.

Permanent effects

6.4.6 No permanent construction effects are anticipated in this area.

Palatine Road vent shaft

Temporary effects

Residential properties

6.4.7 No temporary construction effects on residential properties are anticipated in this area.

Community facilities

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

Recreational facilities

6.4.9 The construction of the Palatine Road vent shaft and replacement floodplain storage area will require temporary use of part of Withington Golf Club in Didsbury. Withington Golf Club is a private members club which also offers tuition and 'pay and play' facilities to non-members. Construction of the Proposed Scheme will temporarily require 10ha (27%) of the

36ha site, with 2.5ha of the 10ha (7% of the 36ha site) required permanently. The land required temporarily for the construction of the Proposed Scheme covers four of the 18 holes, the clubhouse and the associated infrastructure and landscaping, such as footpaths. The land will be required for approximately five years. This will result in a moderate adverse effect, which is significant.

Public open space and recreational routes

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

Permanent effects

Residential properties

6.4.11 The construction of the Palatine Road vent shaft and replacement floodplain storage area will require the demolition of one residential property on the grounds of Withington Golf Club in Didsbury. This residential property will be permanently lost.

Community facilities

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

Recreational facilities

6.4.13 The construction of Palatine Road vent shaft and a replacement floodplain storage area will require permanent use of part of Withington Golf Club in Didsbury. Construction of the Proposed Scheme will permanently require 2.5ha (7%) of the site. The land permanently required for the construction of the Proposed Scheme includes one hole and includes the clubhouse, which will be permanently lost. The loss of the hole and clubhouse will affect its ability to function.

6.4.14 Northenden Golf Club and Didsbury Golf Club are 18-hole golf clubs in proximity to Withington Golf Club. These clubs provide tuition and 'pay and play' facilities and could serve as alternative recreational resources. As such, it is considered that the permanent loss of land at Withington Golf Club will result in a moderate adverse effect, which is significant.

Public open space and recreational routes

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

Wilmslow Road vent shaft

Temporary effects

Residential properties

6.4.16 Construction of the Proposed Scheme will be in proximity to approximately 150 properties to the east of the B5093 Wilmslow Road. Construction of Wilmslow Road vent shaft will result in significant noise and visual effects. The daytime and night-time noise effects will last for approximately four years. Together these noise and visual effects will result in a major adverse in-combination effect on amenity for residents at these properties, which is significant.

Community facilities

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

Recreational facilities

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

Public open space and recreational routes

6.4.19 No temporary construction effects on open space or PRoW are anticipated in this area.

Permanent effects

Residential properties

6.4.20 The construction of Wilmslow Road vent shaft will require the demolition of three residential properties on the B5093 Wilmslow Road in Didsbury, adjacent to The Christie Hospital Car Park D. These properties will be permanently lost.

Community facilities

6.4.21 Construction of the Wilmslow Road vent shaft will result in the permanent loss of The Christie Hospital Car Park D, which is accessed from the B5093 Wilmslow Road. Car Park D is one of the two designated patient and visitor car parks that serve The Christie Hospital. It has space for approximately 135 vehicles, including 30 blue badge spaces. The nearest alternative hospital car park is Car Park C, which has approximately 200 parking spaces and is located on the B5167 Palatine Road immediately north-west of the hospital. The 30 blue badge spaces will be relocated. There are limited further alternatives available for patients and visitors as the majority of on-street parking requires a permit. Given the high sensitivity of users of the car park, high demand and the limited nearby alternatives, the loss of the car park will result in a moderate adverse effect, which is significant.

Recreational facilities

6.4.22 No permanent construction effects on recreational facilities are anticipated in this area.

Public open space and recreational routes

6.4.23 No permanent construction effects on open space or PRoW are anticipated in this area.

Birchfields Road vent shaft

Temporary effects

Residential properties

6.4.24 The A34 Kingsway is a designated route for construction traffic and is expected to experience a significant increase in HGV traffic movements. These significant HGV traffic effects are expected to combine with significant traffic noise effects on approximately 45 residential properties on the A34 Kingsway (between Talbot Road and Mauldeth Road) during the peak months of construction. Together these noise and HGV traffic effects will result in a moderate adverse in-combination effect on amenity for residents at these properties, which is significant.

6.4.25 Construction of the Proposed Scheme will be in proximity to approximately 20 residential properties at the south of the A34 Birchfields Road. Construction of Birchfields Road vent shaft and the construction compound will result in significant noise and visual effects. Significant noise effects will last for approximately seven months. The A34 Birchfields Road is a designated route for construction traffic to enable access to Birchfields Road vent shaft satellite compound. It is expected to experience a significant increase in HGV traffic movements between the B5093 Moseley Road and Old Hall Lane. Residential properties will experience significant traffic noise effects during peak months of construction. Together these noise, visual and HGV traffic effects will result in a moderate adverse in-combination effect on amenity for residents at these properties, which is significant.

Community facilities

6.4.26 Construction of the Birchfields Road vent shaft will take place in the vicinity of Birchfields Primary School, located off the south of Lytham Road approximately 60m to the north of Birchfields Road vent shaft satellite compound. The construction activities will result in significant noise and visual effects. Significant noise effects will last for approximately five years and two months. One of the access routes to the school (from the south) is via the A34 Birchfields Road, which is a designated construction traffic route. Birchfields Road is expected to experience a significant increase in HGV traffic movements between the B5093 Moseley Road and Old Hall Lane. The noise, visual and HGV traffic effects will result in a major adverse in-combination effect on the amenity of users of Birchfields Primary School, which is significant.

Recreational facilities

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

Public open space and recreational routes

6.4.28 No temporary construction effects on open space or PRoW are anticipated in this area.

Permanent effects

Residential properties

6.4.29 No permanent construction effects on residential properties are anticipated in this area.

Community facilities

6.4.30 Construction of Birchfields Road vent shaft will permanently require 1.1ha out of 1.9ha (approximately 60%) of land at the Fallowfield Retail Park. Land used as part of the car park will be required, resulting in the loss of 123 of a total of 196 car parking spaces. The whole of the car park is used as part of an informal 'park and stride' scheme (promoted by Manchester City Council as part of a Living Streets programme), to access nearby educational facilities, namely Birchfields Primary School and MEA Central. Although it is possible that car parking spaces on the remaining area of the car park could be used by parents and carers to access education facilities, there is no direct pedestrian access, with users likely having to navigate past Birchfields Road vent shaft satellite compound. If the 'park and stride' scheme is operational when construction commences, the loss of the parking spaces providing access to the education facilities will result in a moderate adverse effect, which is significant.

Recreational facilities

6.4.31 No permanent construction effects on recreational facilities are anticipated in this area.

Public open space and recreational routes

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

Manchester tunnel north portal

Temporary effects

6.4.33 No temporary construction effects are anticipated in this area.

Permanent effects

6.4.34 No permanent construction effects are anticipated in this area.

Other mitigation measures

6.4.35 HS2 Ltd is continuing to engage with owners and operators of The Christie Hospital Car Park D, to identify reasonably practicable measures to help mitigate the likely significant effects identified in this assessment.

6.4.36 HS2 Ltd will work closely with Birchfields Primary School to identify reasonably practicable measures to mitigate the residual significant amenity effects, including discretionary measures identified in the draft CoCP.

6.4.37 HS2 Ltd is continuing to engage with owners and operators of Withington Golf Club, to identify reasonably practicable measures to help mitigate the likely significant effects identified in this assessment.

6.4.38 No other mitigation measures are proposed in the Davenport Green to Ardwick area.

Summary of likely residual significant effects

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

- approximately 150 residential properties to the east of the B5093 Wilmslow Road, due to the combination of noise and visual effects;
- approximately 45 residential properties along the A34 Kingsway, due to the combination of noise and HGV traffic effects;
- approximately 20 residential properties at the south of the A34 Birchfields Road, due to the combination of noise, visual and HGV traffic effects;
- Birchfields Primary School, due to the combination of noise, visual and HGV traffic effects; and
- loss of land at the Withington Golf Club.

6.4.40 The construction of the Proposed Scheme is likely to result in the following permanent residual significant effects:

- loss of land and the clubhouse at the Withington Golf Club;
- loss of Car Park D at The Christie Hospital; and
- loss of parking spaces used for ‘park and stride' scheme at the Fallowfield Retail Park car park.

Cumulative effects

6.4.41 No temporary or permanent cumulative effects have been identified in the Davenport Green to Ardwick area.

6.5 Effects arising from operation

Avoidance and mitigation measures

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

- landscape mitigation planting surrounding Manchester tunnel south portal to provide visual screening for residents of properties in Newall Green;
- landscape mitigation planting around all vent shafts to help integrate the Proposed Scheme into the surrounding landscape; and
- landscape mitigation planting to the north and south of Manchester tunnel north portal continuing into Manchester Piccadilly Station area (MA08), to provide visual screening for sites that are to be returned to suitable development use.

Assessment of impacts and effects

6.5.2 No operational effects are anticipated in the Davenport Green to Ardwick area.

Other mitigation measures

6.5.3 The above assessment has concluded there are no significant adverse effects arising during operation, therefore no further mitigation is proposed.

Summary of likely residual significant effects

6.5.4 There will be no significant residual effects in the Davenport Green to Ardwick area.

Cumulative effects

6.5.5 No cumulative effects have been identified in the Davenport Green to Ardwick area.

Monitoring

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

6.5.7 Any area-specific operational monitoring requirements in relation to air quality effects, noise and vibration effects, traffic effects and visual effects that have contributed to the in-combination assessments, are described in the relevant sections of this Volume 2 report.

7 Ecology and biodiversity

7.1 Introduction

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

7.1.2 Engagement has been undertaken with stakeholders including Natural England, the Environment Agency, the Forestry Commission, Cheshire Wildlife Trust, Lancashire Wildlife Trust, Greater Manchester Ecology Unit and Tameside Metropolitan Borough Council. The purpose of this engagement has been to obtain relevant baseline information and inform the design development and assessment of the Proposed Scheme.

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

- ecological baseline data – designated sites (see Volume 5: Appendix EC-001-00001);
- an ecological register of local level effects, which are not reported individually in Volume 2 (Volume 5: Appendix EC-015-0MA07); and
- documents to support the Habitat Regulations Assessment (HRA) Screening Report and Appropriate Assessment for the Rochdale Canal Special Area of Conservation (SAC) (Volume 5: Appendix EC-016-00004).

7.1.4 Map Series EC-01 showing statutory and non-statutory designated sites of relevance to the assessment in the Davenport Green to Ardwick area is provided in the Volume 5: Ecology Map Book.

7.1.5 Maps showing the location of the key environmental features (Map Series CT-10) and the key construction (Map Series CT-05) and key operational (Map Series CT-06) features of the Proposed Scheme can be found in the Volume 2: MA07 Map Book.

7.1.6 In addition, ecological baseline information relating to habitats and species recorded in the Davenport Green to Ardwick area is set out in Background Information and Data (BID)[22] (BID EC-002-00001 to BID EC-014-00001[23]) and accompanying Map Series EC-02 to EC-12 and EC-04 (BID Ecology Map Books).

7.1.7 The Proposed Scheme is described in Section 2.

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

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

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

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, the EIA Scope and Methodology Report (SMR)[24] and in the Field Survey Methods and Standards (FSMS), which is included as an annex to the SMR.

7.2.2 A route-wide Water Framework Directive (WFD) compliance assessment has been undertaken in conjunction with the environmental assessment (Section 15, Water resources and flood risk). Details of the assessment are set out in Volume 5: Appendix WR-003-0MA07: Water resource assessment and Appendix WR-005-0MA07: Water resources and flood risk.

7.2.3 Appropriate surveys have been undertaken where access was obtained. No surveys have been undertaken at the following sites that have the potential to support ecological features: the sites of Altrincham Road vent shaft, Wilmslow Road vent shaft and Birchfields Road vent shaft and sections of the existing Siemens Ardwick Train Care Facility. Further details are provided in BID EC-002-00001 to BID EC-014-00001.

7.2.4 Where data are limited, such as due to the absence of field surveys, a precautionary baseline has been built up according to the guidance reported in the SMR. This constitutes a 'reasonable worst case' basis for the subsequent assessment and development of mitigation.

7.2.5 BID EC-002-00001 to BID EC-014-00001 identifies these survey locations. Where the assessment has been based upon limited data, the ecological receptor is described as 'of up to' a specific value to indicate that a precautionary approach has been applied.

7.2.6 The precautionary approach to the assessment that has been adopted identifies the likely significant ecological effects of the Proposed Scheme. Use of the precautionary approach ensures that any limitations arising from the age of datasets are taken into account. Unless otherwise stated, the description of effects assumes that land within Bill limits will be subject to habitat loss resulting from development of the Proposed Scheme, with the land required for construction purposes only being reinstated following completion of construction. This includes areas identified specifically for habitat creation.

7.2.7 With respect to utility works, it is normally assumed that all habitat is lost from the land required for the Proposed Scheme. This is assumed to be temporary except for mature woodland and areas of high-quality habitat.

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

7.3 Environmental baseline

Existing baseline

Introduction

7.3.1 This section describes the ecological baseline relevant to the assessment: the designated sites, habitats and species recorded in this area. Further details are provided in the reports presented in Volume 5: Appendix EC-001-00001 and BID: BID EC-002-00001 to BID EC-015-0MA07, and maps presented in Volume 5: Map Series EC-01 and BID Ecology Map Books: Map Series EC-02 and EC-04 to EC-12. Statutory and non-statutory designated sites are shown on Volume 5: Map EC-01-322b to EC-01-326a-R2; more distant designated sites are identified on them that are not relevant to the assessment due to their distance from the Proposed Scheme. Such sites are not covered in this report.

7.3.2 The majority of the route of the Proposed Scheme in the Davenport Green to Ardwick area will be in the Manchester tunnel. Above ground elements will include the Altrincham Road vent shaft, Palatine Road vent shaft, Wilmslow Road vent shaft, Birchfields Road vent shaft and infrastructure at Ardwick. Land required for, and adjacent to, the Proposed Scheme in the Davenport Green to Ardwick area consists mainly of urban habitats associated with the built environment, including bare ground, amenity grassland, trees, hardstanding, residential and commercial properties, scrub and brownfield sites.

Designated sites

7.3.3 There is one statutory designated site of international importance of potential relevance to the assessment in the Davenport Green to Ardwick area. This is the Rochdale Canal Special Area of Conservation (SAC) covering an area of 24.9ha. This SAC is designated for extensive colonies of floating water-plantain, which is an Annex II species (i.e. species for which sites can be designated, as listed in Annex II of the EU Habitats Directive). The SAC is close to a number of roads on which there will be an increase traffic volumes as a result of the Proposed Scheme. It is located north-east of Siemens Ardwick Train Care Facility, 2.7km north-east of works to an underground high voltage power line in the Davenport Green to Ardwick area. It is also relevant to the Manchester Piccadilly Station area (MA08) where it is 4.2km from the land required for the construction of the Proposed Scheme.

7.3.4 There are two nationally important Site of Special Scientific Interest (SSSI) that are of potential relevance to the assessment in the Davenport Green to Ardwick area. They are:

- Rochdale Canal SSSI, covering an area of 25.6ha, with a boundary largely similar to Rochdale Canal SAC. Rochdale Canal SSSI is designated for important habitats for submerged and emergent aquatic 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. A number of waterside bird species including grey wagtail and kingfisher are also present. The SSSI is located north-east of Siemens Ardwick

Train Care Facility, 2.7km north-east of an underground high voltage power line in the Davenport Green to Ardwick area. It is close to a number of roads on which there will be an increase traffic volumes as a result of the Proposed Scheme. The SSSI is 4.2km north-east of the land required for the construction of the Proposed Scheme in the Manchester Piccadilly Station area (MA08); and

- Hollinwood Branch Canal SSSI, covering an area of 3.3ha, is designated for mesotrophic standing water system. The main habitats are open water, swamp and tall fen. Damp unimproved neutral grassland occurs on the eastern bank and unimproved neutral grassland, scattered trees and shrubs and a hedge to the west. As a consequence of the high water quality and profile of the canal, the open water plant communities are diverse and contain several regionally and nationally rare species. This SSSI is of relevance due to changes in traffic flows on the M60 as a result of the Proposed Scheme, which is situated 26m to the west. It is located 3.8km north-east of an underground high voltage power line in the Davenport Green to Ardwick area, and is 5.5km north-east of the land required for the construction of the Proposed Scheme in the Manchester Piccadilly Station area (MA08).

7.3.5 There are three statutory Local Nature Reserves (LNR) that are of potential relevance to the assessment in the Davenport Green to Ardwick area, each of which are of county/metropolitan value. They are:

- Wythenshawe Park LNR, which covers an area of 85ha. The LNR has areas of woodland and planted meadow habitats. It is located north of the Altrincham Road vent shaft site and is 192m north of the land required for the construction of the Proposed Scheme;
- Stenner Woods and Millgate Fields LNR, which covers an area of 36.6ha. The LNR has areas of wet woodland. It is located east of the Palatine Road vent shaft site and is 336m from land that has been identified for the purpose of habitat creation or enhancement, as part of the Proposed Scheme; and
- Clayton Vale LNR, which covers an area of 52ha. The LNR has areas of unimproved grassland, woodland, three ponds, and the river Medlock flowing through it. It is located 190m north-east of works to an underground high voltage power line and an existing substation.

7.3.6 There are five Sites of Biological Importance (SBI) that are of potential relevance to the assessment in the Davenport Green to Ardwick area, each of which is of county/metropolitan value. They are:

- Blackcarr Wood and Baguley Bottoms SBI, covering an area of 5.7ha, is designated for semi-natural broadleaved woodland and includes areas of ancient semi-natural woodland. Springs and a water body, connected to Baguley Brook, are also present. The SBI is located 88m west of the land required for construction of the Proposed Scheme, south of the Altrincham Road vent shaft site;
- Gib Lane Wood SBI, covering an area of 6.2ha, is designated for broadleaved woodland. The SBI is within the Wythenshawe Park LNR and is located 195m north of the land

required for the construction of the Proposed Scheme, north of the Altrincham Road vent shaft site;

- Round Wood SBI, covering an area of 1.9ha, comprises woodland, including areas of ancient semi-natural woodland, and supports a range of bird species. The SBI is located 105m north of the land required for the construction of the Proposed Scheme, north of the Altrincham Road vent shaft site;
- Fletchers Moss SBI, covering an area of 6.1ha, is designated for wet woodland. The SBI is located 340m south-east of the land that has been identified for the purpose of habitat creation as part of the Proposed Scheme; and
- Wrengate Wood SBI, covering an area of 2.2ha, is designated for broadleaved and wet woodland, a waterbody, a stream and a heronry, and includes an area of ancient semi-natural woodland. The SBI is partially within land that has been identified for the purpose of habitat creation or enhancement, as part of the Proposed Scheme.

7.3.7 There are three Ancient Woodland Inventory (AWI) sites of potential relevance to the assessment in Davenport Green to Ardwick area, each of which is of national value. They are:

- part of Blackcarr Wood (part of Blackcarr Wood and Baguley Bottoms SBI) covering an area of 3ha, is located 160m west of the land required for construction of the Proposed Scheme, south of Altrincham Road vent shaft;
- Round Wood, covering an area of 1.9ha and with the same footprint as Round Wood SBI. It is located 100m north of the land required for construction of the Proposed Scheme, north of Altrincham Road vent shaft; and
- Black Field Wood, covering an area of 0.8ha is located 283m from the land required for construction of the Proposed Scheme, north of Altrincham Road vent shaft.

7.3.8 Areas of semi-natural woodland within the AWI sites are likely to qualify as lowland mixed deciduous woodland, a habitat of principal importance in Section 41 of the Natural Environment and Rural Communities (NERC) Act 2006 and a conservation priority of the Greater Manchester Biodiversity Action Plan (local BAP).

7.3.9 On the basis of the heritage review undertaken by HS2 Ltd, Natural England has confirmed that a single woodland of potential relevance to the assessment in the Davenport Green to Ardwick area will be added to the AWI, and which is of national value. This is Heyscroft, which is largely within an area of more recent woodland at Wrengate Wood SBI, and covers an area of 0.2ha. It is located at Withington Golf Club, 7m north of land identified for the purpose of habitat creation or enhancement, as part of the Proposed Scheme, at the Palatine Road vent shaft site.

Habitats

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

Woodland

7.3.11 There are two other areas of lowland deciduous woodland that qualify or are likely to qualify as lowland mixed deciduous woodland, a habitat of principal importance. They are:

- Wrengate Wood SBI, which includes an area of 2ha of broad-leaved woodland, in addition to the area of ancient woodland at this site. The canopy comprises ash and sycamore, and the shrub layer contains non-native species including Wilson's honeysuckle, bamboo and cherry laurel. The ground flora contains common ivy and Himalayan balsam[25], which are dominant locally. The species composition is characteristic of National Vegetation Classification (NVC) W8d *Fraxinus excelsior-Acer campestre-Mercurialis perennis* woodland, *Hedera helix* sub-community. This woodland is adjacent to land identified for the purpose of habitat creation or enhancement, as part of the Proposed Scheme, at the Palatine Road vent shaft site. This woodland is of county/metropolitan value; and
- several areas of unnamed deciduous woodland at Withington Golf Course covering 6.8ha, and partially within the land required for the construction of the Proposed Scheme at the Palatine Road vent shaft site. They contain frequent black poplar, pedunculate oak, willow sp. and occasional lime sp., sycamore, beech, rowan, horse chestnut and alder. The ground flora is species-poor and contains common nettle, ivy and wood avens. These woodlands are of district/borough value.

Grassland

7.3.12 Semi-improved grassland covering an area of 0.4ha is present within the land required for the construction of the Proposed Scheme on previously developed land at Ardwick. The sward comprises abundant red fescue with frequent false oat grass and Yorkshire fog. Herbs such as hop trefoil and white clover are abundant in the sward, with frequent meadow vetchling, creeping thistle and bird's-foot-trefoil. Yellow-wort is locally frequent and common centaury is occasional. Semi-improved grassland is an uncommon habitat in Manchester city centre. The grassland is of district/borough value.

7.3.13 Areas of species-poor semi-improved grassland cover a total area of 5.8ha throughout the Davenport Green to Ardwick area within the land required for the construction of the Proposed Scheme. Areas of species-poor semi-improved grassland are of local/parish value.

Hedgerows

7.3.14 In total, there is 606m of hedgerow within the land required for the construction of the Proposed Scheme in the Davenport Green to Ardwick area. Hedgerow with at least 80% cover of native woody species is a habitat of principal importance.

[25] *The Invasive Alien Species (Enforcement and Permitting) Order 2019.* Her Majesty's Stationery Office, London. Available online at: http://www.legislation.gov.uk/uksi/2019/527/contents/made.

7.3.15 Of the 606m of hedgerow, 313m have not been subject to survey. To accord with Phase 1 habitat descriptions these are mapped as native species-rich on map series EC-02 and they are included as native species-rich in the list below. Based on survey data, and on a precautionary basis, the hedgerow is assumed to consist of:

- 293m of native species-poor; and
- 313m of native species-rich, of which none are also classified as 'Important' according to the 'Wildlife and Landscape' criteria described in The Hedgerows Regulations 1997[26].

7.3.16 As part of the precautionary assessment, it is assumed that further important hedgerows will be found within land that was not surveyed, but which will be required for the Proposed Scheme. The hedgerows within the area also function as wildlife corridors. The hedgerow network as a whole is of local/parish value.

Watercourses

7.3.17 The route of the Proposed Scheme will pass beneath the River Mersey in Manchester tunnel. The River Mersey is also adjacent to land required for the construction of the Proposed Scheme at Withington Golf Club. On a precautionary basis it is assumed that this watercourse is a habitat of principal importance and local BAP habitat. This watercourse and adjacent habitats are intrinsically important and provide corridors for wildlife dispersal, as such it is of up to county/metropolitan value.

7.3.18 Tributary of River Mersey 2 passes through land identified for the purpose of habitat creation or enhancement, as part of the Proposed Scheme, at Withington Golf Club. It is over 2m wide and flows through deciduous woodland, forming part of Wrengate Wood SBI, before joining with the River Mersey. On a precautionary basis it is assumed that this watercourse is a habitat of principal importance and is of up to district/borough value.

7.3.19 Fairywell Brook is approximately 1.5m wide and is located along the boundary between the Hulseheath to Manchester Airport area (MA06) and the Davenport Green to Ardwick area, above Manchester tunnel. The channel was dry at the time of survey and is bordered by areas of semi improved grassland and scrub. This watercourse is of local/parish value.

Water bodies

7.3.20 There are no ponds located within, or partly within, the land required for the construction of the Proposed Scheme, but there are 15 ponds within 250m of the land required for the construction of the Proposed Scheme. On a precautionary basis it is assumed that all ponds could support habitats of principal importance or local BAP habitats and are of district/borough value unless surveys have shown that they are of local/parish value only.

[26] *The Hedgerows Regulations 1997* (No. 1160). Her Majesty's Stationery Office, London.

Scrub

7.3.21 An area of 3.4ha of continuous scrub is located within the land required for the construction of the Proposed Scheme at Siemens Ardwick Train Care Facility. This area of scrub habitat is considered to be of local/parish value.

Ancient and veteran trees

7.3.22 Ancient and veteran[27] trees with potential relevance to the assessment in the Davenport Green to Ardwick area have been considered. An ancient tree is one that has passed maturity and is old, or aged, in comparison with other trees of the same species. Veteran trees are younger than ancient trees, but have features found on ancient trees such as decay in the trunk, branches and/or roots.

7.3.23 There are two trees recorded on the Ancient Tree Inventory located 25m north-west of land that has been identified for the purpose of habitat creation or enhancement, as part of the Proposed Scheme. These veteran ash trees (Tree 75041 and Tree 75040[28]) are located within Withington Golf Course. Each tree is considered to be of national value.

7.3.24 On the basis of surveys undertaken, there is single oak tree is within the land required for the construction of the Proposed Scheme, located south of Rowrath Road, that is considered to be of a sufficient age and/or support features to indicate its veteran status. There are further veteran oak trees 90m north west of the land required for the construction of the Proposed Scheme. Veteran trees are of national value.

Open mosaic habitat

7.3.25 An area of 0.6ha, within the land required for the construction of the Proposed Scheme at Ardwick, may qualify as open mosaic habitat on previously developed land, which is a habitat of principal importance. On a precautionary basis this habitat is considered to be of up to district/borough value.

Protected and/or notable species

7.3.26 A summary of the likely value of protected and/or notable species of relevance to the assessment is provided in Table 10.

[27] An ancient tree is one that has passed maturity and is old, or aged, in comparison with other trees of the same species. Veteran trees are younger than ancient trees, but have features found on ancient trees such as decay in the trunk, branches and/or roots. Ancient and veteran trees are included on the Ancient Tree Inventory.

[28] Woodland Trust, Ancient Tree Inventory. Available online at: https://ati.woodlandtrust.org.uk/.

Table 10: Protected and/or notable species within the Davenport Green to Ardwick area

Resource/ feature	Value	Receptor	Baseline and rationale for valuation
Bats	Regional	Bat assemblage between Withington and Ardwick	• Field surveys confirmed the presence of soprano pipistrelle, common pipistrelle, Nathusius' pipistrelle, noctule, and Leisler's bat within this assemblage; • no roosts were recorded during the field surveys; and • the assemblage is considered to be of regional value on the basis that high numbers of foraging and commuting noctule were recorded, which is considered to be a 'rarer' species in England.
Bats	Regional	Bat assemblage at Withington Golf Club	• Field surveys confirmed the presence of soprano pipistrelle, common pipistrelle, • brown long-eared bat, noctule, *Myotis* species and Leisler's bat within this assemblage; • desk study records show a single noctule maternity roost within the land that has been identified for the purpose of habitat creation or enhancement, as part of the Proposed Scheme and a soprano pipistrelle occasional roost was recorded in the golf clubhouse within land required for the Proposed Scheme; • the River Mersey is a key commuting corridor for bats which allows them to commute while foraging between Withington Golf Club and Chorlton Water Park; and • the assemblage is considered to be of regional value on the basis of the presence of the noctule maternity roost and high numbers of foraging and commuting noctule were recorded, which is considered to be a 'rarer' species in England.
Birds	Up to regional	Black redstart in Didsbury to Manchester city centre, at Ardwick	Black redstart was not recorded within the Davenport Green to Ardwick area during field surveys, however, desk study data provided four relevant records of black redstart since 2009. A single singing black redstart was recorded during field surveys in the Manchester Piccadilly Station area (MA08), within 1km from the land required for construction of the Proposed Scheme in the Davenport Green to Ardwick area. The brownfield habitat at Ardwick contains foraging habitat for black redstart. Buildings and structures within and adjacent to the land required for the construction of the Proposed Scheme are potential nesting sites and singing posts. Black redstart is a Schedule 1 species and a conservation priority of the local BAP.

Resource/ feature	Value	Receptor	Baseline and rationale for valuation
Birds	Up to county/ metropolitan	Breeding bird assemblage Didsbury to Manchester city centre, at Ardwick	There are desk study records for little ringed plover in the Davenport Green to Ardwick area since 2009 and records for peregrine falcon within 2km of the land required for the construction of the Proposed Scheme. Habitats within Ardwick, such as the brownfield sites, provide suitable habitat for little ringed plover, but the disturbed nature of these sites reduces the potential for this species to be present. High-rise buildings and other tall structures at Ardwick provide suitable nesting habitat for peregrine falcon. Little ringed plover and peregrine falcon are both Schedule 1 species and a conservation priority of the local BAP.
Birds	Up to county/ metropolitan	Breeding bird assemblage Newall Green to Northenden	Desk study records include cuckoo, curlew, jack snipe, peregrine, redstart, snipe, willow tit and woodcock, and a heronry at Wrengate Wood SBI. All are within 2km of land required for the construction of the Proposed Scheme around Newall Green to Northenden and were recorded since 2009. Habitats within Withington Golf Club provide suitable habitat for grey heron and barn owl. Barn owl is a Schedule 1 species.
Amphibians	Up to county/ metropolitan	Populations of great crested newt within un-surveyed ponds	Ponds that have not been surveyed are assumed to support breeding populations of great crested newt of medium size class.
Amphibians	Local/parish	Populations of other amphibian species including palmate newt, smooth newt, common toad and common frog	These common amphibian species have been identified through the desk study within the Davenport Green to Ardwick area and are assumed to be present within the ponds in this area. Woodland, rough grassland and hedgerow habitats are likely to be utilised by these species during their terrestrial phase for foraging, dispersal and shelter. Each of these species is common and widespread throughout the UK. Common toad is a species of principal importance.
Terrestrial Invertebrates	District/ borough	Terrestrial invertebrate assemblage associated with habitats at Didsbury Golf Club	Field surveys at Didsbury Golf Club recorded 97 terrestrial invertebrate species, all but three of which are common and widespread, and typical of the habitat types present. Species of note recorded are alder leaf beetle *Agelastica alni*, chestnut snailkiller *Sciomyza dryomyzina* and Opomyzid fly *Opomyza punctata*. Didsbury Golf Club is within 50m of the land required for the construction of the Proposed Scheme. Chestnut snailkiller is a Red Data Book category 2 (RDB 2) – Vulnerable Red Data Book species. Opomyzid fly is a Nationally Scarce Red Data Book species. Alder leaf beetle is a Nationally Rare (Data Deficient) Red Data Book Species[29].

[29] The status of alder leaf beetle is unreliable as it awaits formal review. However, National Biodiversity Network (NBN, https://nbnatlas.org/) data show that the species has expanded significantly over the last 15 years and its distribution no longer qualifies it as nationally rare.

Resource/ feature	Value	Receptor	Baseline and rationale for valuation
Fish	Up to district/ borough	Fish assemblage in the River Mersey	Desk study records show a single Environment Agency survey conducted approximately 46m upstream of land required for the construction of the Proposed Scheme. Species recorded include chub, gudgeon, roach, three-spined stickleback, bullhead and minnow. Bullhead is an Annex II species.
Badger	Local/parish	A single social group at an undisclosed location within the Davenport Green to Ardwick area	Desk study data contains records of setts in proximity to land required for the construction of the Proposed Scheme. This area has been surveyed for badgers and no badger field signs were identified. The presence of badger within land adjacent to this woodland in the Davenport Green to Ardwick area, has been confirmed by an incidental sighting of badgers reported during a bat survey.

Future baseline

Construction (2025)

7.3.27 Volume 5: Appendix CT-004-0000 provides details of the developments in the Davenport Green to Ardwick area that are assumed to have been implemented by 2025.

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

Operation (2038)

7.3.29 Volume 5: Appendix CT-004-00000 provides details of the developments in the Davenport Green to Ardwick area that are assumed to have been implemented by 2038.

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

7.4 Effects arising during construction

Avoidance and mitigation measures

7.4.1 The construction of Manchester tunnel through 12.8km of the Davenport Green to Ardwick area will reduce the potential for impacts on designated sites and habitats, and species including bats, great crested newt and birds. Landscape planting as shown on the Map Series CT-06 along the route of the Proposed Scheme, which will be largely a mixture of woodland/scrub and grassland), will also contribute towards limiting effects on habitats and species.

7.4.2 The assessment assumes implementation of the measures set out within the draft Code of Construction Practice[30] (CoCP), which includes sensitive construction practices and habitat management plans.

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

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

Assessment of impacts and effects

7.4.4 Effects arising during construction that are significant at the district/borough level or above are described below. Effects on ecological features of significance at the local/parish level are listed in Volume 5 Appendix: EC-015-0MA07.

Designated sites

7.4.5 Construction and operation of the Proposed Scheme will result in changes in traffic movements on roads near to the Rochdale Canal SAC. These changes are primarily due to HS2 construction workforce vehicle movements close to the M62 and redistribution of non HS2 traffic caused by the Proposed Scheme near the M60. Increases in traffic close to the Rochdale Canal SAC will increase nitrogen deposition which could result in adverse effects on floating water-plantation *Luronium natans*, which is the sole reason for designation of the SAC. Generally, the increase in nitrogen deposition due to the Proposed Scheme represents a small amount compared to the contribution from the growth of non HS2 related traffic in future years. On the information currently available, it has not been possible to rule out adverse effects from nitrogen deposition, and on a precautionary basis it is therefore concluded that there may be an adverse effect on the SAC that is significant at the international level. Further assessment will be carried out in accordance with Article 6(3) of

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

the Habitats Directive. Documents to inform the Appropriate Assessment for the Rochdale Canal SAC site will be made available to Parliament prior to approval of the hybrid Bill.

7.4.6 The Rochdale Canal SSSI is coincident with the SAC. On a precautionary basis it is concluded that there may be an adverse effect on aquatic plant community that forms the reason for the designation of the SSSI that is significant at the national level.

7.4.7 The Hollinwood Branch Canal SSSI is 26m to the west of the M60, which will be subject in changes in traffic flows as a result of the Proposed Scheme. There will be no significant effects on the SSSI as air quality modelling confirms that the additional nitrogen deposition levels does not exceed critical loads at this site.

Habitats

Woodland

7.4.8 There will be no significant effects on ancient woodlands in the Davenport Green to Ardwick area. However, there are a number of non-ancient woodlands that will be affected by the construction of the Proposed Scheme.

7.4.9 Construction of Palatine Road vent shaft will result in the removal of 1.4ha (20%) of woodland habitat at Withington Golf Club. The loss of woodland of this extent will have an adverse effect that is significant at the district/borough level.

Grassland

7.4.10 Construction of Ardwick box structure, Ardwick South cutting retaining wall and the Manchester tunnel north portal at Ardwick will result in the permanent loss of 0.4ha of semi-improved grassland. This will result in an adverse effect that is significant at up to district/borough level.

Hedgerows

7.4.11 On a precautionary basis, it is assumed that all hedgerows (616m) within the land required for the construction of the Proposed Scheme in the Davenport Green to Ardwick area will be permanently lost. This includes the native species-rich hedgerows at Palatine Road vent shaft and at Davenport Green. The combined loss and severance of hedgerows within the land required for the construction of the Proposed Scheme will have a permanent adverse effect that is significant at local/parish level.

Ancient and veteran trees

7.4.12 On a precautionary basis, it is assumed that a single veteran tree recorded within the land required for the construction of the Proposed Scheme in the Davenport Green to Ardwick area will be lost. The loss of a veteran tree is significant at the national level. Where reasonably practicable, measures will be taken to protect and retain this tree during the construction of the Proposed Scheme.

Open mosaic habitat

7.4.13 Construction of Manchester tunnel north portal will result in the permanent loss of 0.6ha of open mosaic habitat at Ardwick. Due to a lack of survey data it is considered on a precautionary basis that this will result in a permanent adverse effect that will be significant at up to district/borough level.

Species

Bats

7.4.14 The removal or disturbance of habitat features that are utilised by bats during breeding, hibernation or migrating between roosts is considered to have the potential to result in adverse effects on the bat populations or assemblages during construction. However, the point at which such impacts are considered likely to result in significant adverse effects on the conservation status of a population will differ depending on the status of the species concerned.

7.4.15 The impact of disturbance on bat populations will generally be localised and limited to the period of construction. Bats utilising retained habitats may be subject to irregular and localised disturbance from lighting and noise during the construction period where works in autumn, winter and spring may be carried out for short periods after dusk or prior to dawn. These impacts will only temporarily deter bats from using foraging and commuting habitats and the implementation measures that are described in the draft CoCP will reduce potential disturbance effects to a level that is not significant.

7.4.16 Construction of Palatine Road vent shaft will affect the bat assemblage at Withington Golf Club. The removal of the clubhouse will result in the loss of a non-breeding roost of soprano pipistrelle. The maternity noctule roost is located within an area identified for habitat creation for the Proposed Scheme and will therefore be retained. Construction of Palatine Road vent shaft will result in the disturbance of habitats used as a resource for foraging and commuting bats. However, habitat connectivity with the River Mersey and other commuting and foraging resources in retained habitats at the golf club will remain. There will be no significant impact to the assemblage. However, the direct loss of the soprano pipistrelle roost will result in a permanent adverse effect on the population of soprano pipistrelle at Withington Golf Club, which will be significant at the county/metropolitan level.

7.4.17 Loss of other suitable habitats within the land required for the construction of the Proposed Scheme may require some bats to travel further and expend more energy during day to day foraging and movement throughout their home range for the duration of construction. However, such effects alone are for all species considered unlikely to result in sufficient disturbance of the populations or assemblages concerned to result in an adverse effect on their conservation status.

Amphibians

7.4.18 No ponds will be lost due to the construction of the Proposed Scheme. On a precautionary basis, construction of the Palatine Road vent shaft and loss of terrestrial habitat could result in a temporary adverse effect on amphibian populations that will be significant at up to county/metropolitan level.

Other mitigation measures

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

Habitats

Woodland

7.4.20 The Proposed Scheme will result in the combined loss of 1.4ha of lowland mixed deciduous woodland at Withington Golf Course which is significant at the district/borough level.

7.4.21 In accordance with the Ecological Principles of Mitigation in the SMR, a route-wide, integrated strategic approach has been developed to compensate for the loss of woodland. The woodland habitat creation in this area is to compensate for the loss of woodland habitat in the local area as well as to ensure that the populations of protected and notable species including bats are maintained. With these objectives in mind, where reasonably practicable, the locations of woodland habitat creation have been selected so as to increase the size of existing higher quality habitat and to increase connectivity.

7.4.22 Within the Davenport Green to Ardwick area 2.7ha of woodland habitat creation will be undertaken in response to the loss of non-ancient woodland. This will connect Wrengate Wood SBI and Heyscroft Ancient Woodland with Stenner Woods and Millgate Fields LNR.

7.4.23 The target habitat type for woodland planting is mixed deciduous woodland habitat of principal importance. The new areas of woodland habitat will connect and help maintain the integrity of remaining areas of woodland. A temporary adverse effect is expected until these areas have become established, after which these measures will reduce the overall effect on woodland to a level that is not significant.

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

Grassland

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

7.4.26 The loss of 0.4ha of semi-improved grassland at Ardwick will be mitigated though the creation of 1ha of species-rich grassland along part of the River Medlock in the Manchester Piccadilly Station area (MA08). Maps showing the location of the grassland can be found in the Volume 2: MA08 Map Book (Map Series CT-06). Following establishment, the adverse effect on semi-improved grassland will be reduced to a level that is not significant.

Hedgerows

7.4.27 New hedgerows will be planted as replacement for those lost as a result of the Proposed Scheme. A total of 1.4km of new hedgerows will be planted and the species composition will be characteristic of the surrounding area. This represents a net increase in hedgerow of 0.8km after mitigation, which is a residual beneficial effect that is significant at the local/parish level.

Ancient and veteran trees

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

Open mosaic habitat

7.4.29 To compensate for the loss of 0.6ha of open mosaic habitat in Ardwick, an area of 1ha of open mosaic habitat will be created at ground level and on the retained section of an existing viaduct within the land required for construction of the Proposed Scheme. Following establishment, the adverse effect on open mosaic habitat will be reduced to a level that is not significant.

Species

Bats

7.4.30 To replace roosts that will be lost to construction, artificial roosts will be provided across the Proposed Scheme in accordance with the Ecological Principles of Mitigation within the SMR. The habitat creation measures detailed above in response to habitat loss, including creation of grasslands, hedgerows, new ponds and semi-natural woodlands will compensate for those bat foraging habitats lost within the land required for the construction of the Proposed Scheme as detailed below.

7.4.31 The loss of a non-breeding roost of soprano pipistrelle, which is a component species of the bat assemblage at Withington Golf Club, will be addressed through the provision of a suitable replacement roost at Withington Golf Club, adjacent to the land required for construction of Palatine Road vent shaft. Woodland habitat creation at Withington Golf Club will help to link existing woodlands and watercourses that provide habitat connectivity for

bats. Following the implementation of these measures, the effects on the bat assemblage will be reduced to a level that is not significant.

Amphibians

7.4.32 Broadleaved woodland included as part of the Proposed Scheme will be designed to compensate for the loss of foraging habitat and places of shelter used by great crested newts and other amphibians. Compensation will be provided within ecological habitat creation areas at Withington Golf Course. Woodland will be established in accordance with the Ecological Principles of Mitigation within the SMR. Following implementation, the adverse effects on amphibian populations in the Davenport Green to Ardwick area will be reduced to a level that is not significant.

Badger

7.4.33 Although there will be no significant effects on badger populations in this area, mitigation measures to address the potential disturbance of badgers will be provided in accordance with the Ecological Principles of Mitigation within the SMR. This will include the provision of badger proof fencing and replacement setts where necessary.

Summary of likely residual significant effects

7.4.34 This section describes likely significant residual ecological effects during construction, taking account of the mitigation and compensation proposed.

7.4.35 The assumed loss of a single veteran tree will result in a permanent adverse residual effect that is significant at national level.

7.4.36 There will be a net increase in hedgerow of 0.8km, which will result in a permanent beneficial residual effect that is significant at the local/parish level.

Cumulative effects

7.4.37 No cumulative effects on ecological receptors have been identified in the Davenport Green to Ardwick area.

7.5 Effects arising from operation

Avoidance and mitigation measures

7.5.1 Within this section of the Proposed Scheme, the Manchester tunnel, measuring 12.8km, through the Davenport Green to Ardwick area will limit the potential for impacts on designated sites, habitats and species including bats, great crested newt, and birds, and will avoid or reduce impacts on features of ecological value during operation.

Assessment of impacts and effects

7.5.2 It is not considered that the operation of the Proposed Scheme will result in adverse effects on ecological features present in the Davenport Green to Ardwick area.

7.5.3 Significant effects on ecological features at the local/parish level are listed in Volume 5 Appendix: EC-015-0MA07.

Other mitigation measures

7.5.4 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.

Summary of likely residual significant effects

7.5.5 There will be no significant residual effects in the Davenport Green to Ardwick area.

Cumulative effects

7.5.6 No cumulative effects on ecology receptors have been identified from other committed developments in the Davenport Green to Ardwick area.

Monitoring

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

7.5.8 There are no area-specific requirements for monitoring ecology and biodiversity effects or mitigation during the operation of the Proposed Scheme in the Davenport Green to Ardwick area.

8 Health

8.1 Introduction

8.1.1 This section identifies the communities within the Davenport Green to Ardwick area that will be subject to impacts associated with the Proposed Scheme and describes how these impacts are likely to affect the health and wellbeing of people within these communities, where these effects are considered to be consequential.

8.1.2 Engagement with key public health bodies, including Public Health England and local Directors of Public Health, has been undertaken to inform the health assessment process. Consultation with communities, local authorities and parish councils has been ongoing throughout the route design and assessment process, as described in Volume 1, Section 3. This has contributed to the measures identified to avoid and mitigate adverse health effects.

8.1.3 The assessment also draws on health-related information and views expressed in consultation responses from the owners and/or operators of the following affected resources within the Davenport Green to Ardwick study area:

- The Christie Hospital; and
- Birchfields Primary School

8.1.4 This section deals specifically with impacts at a local level within the Davenport Green to Ardwick area. Health effects assessed across the Proposed Scheme as a whole are reported in Volume 3, Route-wide effects, Section 8.

8.1.5 Further details of the health assessment, including the criteria used to assess effects on population health as described in the EIA Scope and Methodology Report (SMR)[31], are contained in Volume 5: Appendix HA-001-0MA07 Health assessment matrix.

8.1.6 Maps showing the location of the key environmental features (Map Series CT-10), construction features (Map Series CT-05), and key operational features (Map Series CT-06) of the Proposed Scheme can be found in the Volume 2: MA07 Map Book. The Proposed Scheme is described in Section 2.

8.2 Scope, assumptions and limitations

8.2.1 The scope, assumptions and limitations for the health assessment are set out in Volume 1, Section 8 and the SMR.

8.2.2 As set out in the SMR, the health assessment is based on a broad understanding of health, consistent with the World Health Organization (WHO) definition of health as 'a state of 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

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

a large enough population many other factors, or 'health determinants', are known to be important, and these factors may be affected by the Proposed Scheme.

8.2.3 The impacts of the Proposed Scheme on a range of environmental and socio-economic 'health determinants' could result in adverse or beneficial effects on health and wellbeing. This process of assessing these effects is documented in the health assessment matrices in Volume 5: Appendix HA-001-0MA07. Based on this a professional judgement has been made to identify those effects on population health and wellbeing that are sufficiently important to report within the health assessment sections found in this report and Volume 3, Route-wide effects.

8.2.4 The health determinants of relevance within the Davenport Green to Ardwick area during construction (temporary and permanent impacts) are:

- neighbourhood quality;
- access to services, health and social care;
- education; and
- social capital.

8.2.5 No specific operational health effects have been identified for the Davenport Green to Ardwick area.

8.2.6 Additionally, health effects that are relevant along the route of the Proposed Scheme as a whole are reported in Volume 3, Route-wide effects, Section 8.

8.2.7 The geographic extent of the health assessment covers those areas where impacts on health determinants are predicted to occur. Health effects arising from impacts on a particular resource may affect communities across a wide area. These effects are described in the report section corresponding to the location of the resource itself. Health effects arising from reduced access to resources, for example as a result of traffic delays, are described in the report section corresponding to the community whose access is restricted.

8.2.8 The health assessment methodology is based on a review of published evidence showing how impacts on health determinants are linked to health effects in a large population. The health assessment is based on a review of evidence linking changes in health determinants to potential health outcomes. This information is presented in Volume 5: Appendix HA-002-00000. The strength of evidence varies; for example, the evidence linking physical activity to health outcomes is strong, whereas the evidence linking social capital with health outcomes is moderate. The strength of evidence does not necessarily determine the importance of a health effect but is an indication of the level of certainty in the assessment. Additionally, there is greater certainty in the prediction of an impact on a health determinant than the consequent effect on health.

8.2.9 There is no established or widely accepted framework for assessing the significant health effects of a development proposal. The SMR sets out a methodology for describing the impacts on health determinants in terms of the magnitude and duration of the change and the extent of the population exposed to this change. It also draws attention to the strength

of evidence that links a change in health determinant with health effects. This framework permits the assessment to describe the impacts on determinants in a largely qualitative manner, with some structure to the relative scale of these impacts to give a sense of the importance of the potential health effects. This does not, however, provide a clear basis for drawing conclusions as to whether a health effect is likely to be 'significant'.

8.3 Environmental baseline

Existing baseline

Description of communities in the Davenport Green to Ardwick area

8.3.1 The route of the Proposed Scheme through the Davenport Green to Ardwick area will be principally in tunnel and therefore above ground infrastructure will be restricted to the location of four vent shafts and two tunnel portals and associated infrastructure. The area is predominantly suburban, comprising residential development in south Manchester and industrial and mixed-use areas in the Manchester city centre.

8.3.2 There is a range of community facilities along the section beneath which Manchester tunnel will pass; the study area covers the Proposed Scheme above ground infrastructure, which comprises Manchester tunnel south portal, Altrincham Road vent shaft, Palatine Road vent shaft, Wilmslow Road vent shaft, Birchfields Road vent shaft and Manchester tunnel north portal and associated infrastructure. Within these areas, key facilities include The Christie Hospital and associated car parking off the B5093 Wilmslow Road, Birchfields Primary School and MEA Central Secondary School at Lytham Road and Hawthorn Medical Centre at Fallowfield Retail Park.

8.3.3 A more detailed description of community facilities is provided in Section 6, Community.

Demographic and health profile of the Davenport Green to Ardwick area

8.3.4 A review of publicly available health and demographic information has been undertaken to inform the health assessment. The information gathered describes the populations that could be affected by the Proposed Scheme in terms of their key characteristics such as size, distribution, age structure, socio-economic status and health. It enables consideration of the nature of the populations affected and their sensitivity to potential health effects, as well as indicating the prevalence of specific vulnerable groups.

8.3.5 The communities affected by the Proposed Scheme in the Davenport Green to Ardwick area have a relatively high population density compared to the national average.

8.3.6 Public health indicators have been benchmarked by Public Health England[32] to show how a local authority compares to England for each specific indicator. The benchmark is presented on a three-point scale: worse than, similar to and better than the English average. The data provided by Public Health England show that this population has a worse health status compared with the English average.

8.3.7 The English Indices of Deprivation[33] rank neighbourhoods from most to least deprived, according to a range of criteria and an overall (combined) ranking. The neighbourhoods in the Davenport Green to Ardwick area are generally more deprived than the national average, falling mainly within the 10% to 50% most deprived bands.

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

8.3.9 The available data provide detail down to local authority and ward level and enable a profile to be made of the population within the Davenport Green to Ardwick area. The description of the whole population, and the populations within wards, does not preclude the possibility that there will be individuals or groups of people who do not conform to the overall profile.

Future baseline

Construction (2025)

8.3.10 Volume 5: Appendix CT-004-00000 provides details of the developments in the Davenport Green to Ardwick area that are assumed to have been implemented by 2025. The following committed developments of relevance to the health assessment that would materially alter the future baseline during construction of the Proposed Scheme in this area, are set out in Table 11.

Table 11: Committed developments of relevance to health during construction

Map book reference[34]	Planning reference	Description	How this is considered in the assessment
MA07/161	121232/P3OPA/2018	Location: Apex House, 266 Moseley Road, Manchester M19 2LH Notification for Prior Approval for a proposed change of use of a building from office (Class B1a) to 24 apartments (Class C3).	Informing future baseline

[32] Public Health England (2019), *Local Authority health profiles.* Available online at: https://fingertips.phe.org.uk/profile/health-profiles.

[33] Department for Communities and Local Government (2019), *English Indices of Deprivation 2019.* Available online at: https://www.gov.uk/government/statistics/english-indices-of-deprivation-2019.

[34] Volume 5, Planning Data/Committed Development Map Book: Maps CT-13-322b to CT-13-326a.

Map book reference[34]	Planning reference	Description	How this is considered in the assessment
MA07/422	125652/FU/2019	Change of use of Unit 3 from retail (Class A1) to health centre (Class D1) to facilitate relocation of Hawthorn Medical Centre from Unit 9.	Will not be implemented
MA07/298	116867/FO/2017	Location: 30 Palatine Road, Manchester M20 3JJ Change of Use from Bridge Club, with residential accommodation at second floor level and existing Children's nursery at basement level into Children's Day Nursery (155 children and 3 staff) including introduction of access ramp to front and associated alterations to parking layout, alteration to vehicular and pedestrian access, elevational alterations, landscaping including boundary treatment and cycle and buggy store.	Informing future baseline
MA07/393	123330/FO/2019	Location: Land adjacent to 303 Greenbrow Road, Manchester M23 2UH Erection of a four-storey building to form 10 self-contained flats, with associated undercroft car parking.	Informing future baseline
MA07/356	126581/FU/2020	Location: 6 Kempsford Close, Manchester M23 1LH Change of use from dwellinghouse (Use Class C3) to residential accommodation for disabled adults (Use Class C2).	Informing future baseline
MA07/363	126182/VO/2020	Location: Land to west Of Roundwood Road, Manchester M22 4AB City Council Development for the erection of a two-storey school with associated external play areas, Multiple Use Games Area pitch, landscaping and boundary treatment, car parking and separate vehicular and pedestrian accesses onto Roundwood Road.	Informing future baseline

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

- MA07/161 will result in a residential development located 120m to the east of the land required for the construction of the Proposed Scheme;
- MA07/298 will result in a children's nursery, located 5m to the west of land required for the construction of the Proposed Scheme;
- MA07/393 will result in a residential development located 255m to the west of the land required for the construction of the Proposed Scheme;
- MA07/356 will result in residential accommodation for disabled adults, located 500m to the south of the land required for the construction of the Proposed Scheme; and
- MA07/363 will result in a new school located 70m to the north of the land required for the construction of the Proposed Scheme.

Operation (2038)

8.3.12 Volume 5: Appendix CT-004-00000 also provides details of the developments in the Davenport Green to Ardwick area that are assumed to have been implemented by 2038. No additional committed developments of relevance for the health assessment have been identified that would materially alter the future baseline in this area.

8.4 Effects arising during construction

Avoidance and mitigation measures

8.4.1 Consideration of potential health issues is an integral part of the planning and design of the Proposed Scheme, alongside consideration of other environmental, community and economic issues. Insofar as reasonably practicable, mitigation measures have been incorporated into the design of the Proposed Scheme with the aim of avoiding or reducing adverse effects on people. The location of construction compounds and site haul routes have been selected to reduce the number of people exposed to construction impacts insofar as reasonably practicable. The mitigation measures incorporated into the design of the Proposed Scheme in the Davenport Green to Ardwick area are described in Section 2 and include the location of Birchfields Road vent shaft which has been located to avoid land being required from MEA Central secondary school.

8.4.2 Contractors will be required to comply with the environmental management regime for the Proposed Scheme, set out in the draft Code of Construction Practice (CoCP)[35], which provides a general basis for route-wide construction environmental management. Contractors will also be required to comply with the measures set out in Local Environmental Management Plans (LEMP), which will apply the environmental management strategies at a local level.

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

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

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

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

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

Assessment of impacts and effects

8.4.6 Impacts on health determinants resulting from the construction of the Proposed Scheme are presented in the health assessment matrix in Volume 5: Appendix HA-001-0MA07.The health assessment criteria are described within the SMR. Within the assessment matrix, the assessment criteria are applied to determine which impacts are likely to lead to health and wellbeing effects at the population level. These effects are reported in the assessment sections below.

Neighbourhood quality

8.4.7 The neighbourhood quality assessment identifies changes in the character and amenity of neighbourhoods along the route of the Proposed Scheme. It includes public realm such as streets, footpaths, public squares, parks and playing fields. It does not include residential or other private property. The assessment identifies combinations of impacts on two or more of the following environmental factors within the public realm: traffic, noise and vibration, landscape and visual impacts. When these factors are altered people's levels of satisfaction with their living environment may change, which in turn may affect their mental wellbeing. This may include reduced feelings of attachment to, and pride in, their neighbourhood and reduced enjoyment of outside space.

8.4.8 A review of published research evidence linking neighbourhood quality with health and wellbeing can be found in Volume 5: Appendix HA-002-00000. The evidence linking the various aspects of neighbourhood quality with health outcomes ranges from moderate to strong.

8.4.9 The neighbourhood quality assessment uses information from other topics but does not apply the same assessment thresholds, as it is focused on neighbourhoods rather than individual receptors. The construction of the Proposed Scheme will affect neighbourhood quality through impacts such as noise, visual impacts and additional traffic, including heavy goods vehicles (HGVs)[36]. These impacts are described in Section 11, Landscape and visual, Section 13, Sound, noise and vibration and Section 14, Traffic and transport.

[36] HGV traffic effects are where there is a 30% or more increase in HGV traffic movements which have been identified as significant by traffic and transport. The increase in HGV traffic results in a traffic-related

8.4.10 The construction of Wilmslow vent shaft will be visible from street level to the east of the B5093 Wilmslow Road. Construction noise will be noticeable during the daytime and night-time for approximately four years. People in this community are likely to experience these features of the Proposed Scheme as changing the quality of their neighbourhood and to regard that change as adverse, in diminishing the amenity of the settlement.

8.4.11 The A34 Kingsway (between Talbot Road and Mauldeth Road) is a designated route for construction traffic. There will be an increase in HGV traffic movements during the construction period. In addition, traffic noise effects are expected to affect some properties along the road. People in this community are likely to experience these effects as changing the quality of their neighbourhood and to regard that change as adverse, in diminishing the amenity of the settlement.

8.4.12 The construction of Birchfields Road vent shaft will be visible from street level at the south of the A34 Birchfields Road. Construction noise will be noticeable for approximately seven months. The A34 Birchfields Road is a designated route for construction traffic to enable access to Birchfields Road vent shaft satellite compound and there will be an increase in HGV traffic movements (between the B5093 Moseley Road and Old Hall Lane) during the construction period. In addition, traffic noise effects are expected to affect some properties along the road. People in this community are likely to experience these features of the Proposed Scheme as changing the quality of their neighbourhood and to regard that change as adverse, in diminishing the amenity of the settlement.

Access to services, health and social care

8.4.13 There is strong evidence linking access to health and social care services with mental and physical health outcomes, both directly, through access to treatment and care, or access to fresh food retailers, and indirectly through issues such as access to social networks. 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 facilities can affect health. This is based on a range of factors affecting quality of life, and includes mental health issues such as reducing feelings of isolation and enabling participation in society, and physical health issues such as food shopping and other basic needs. A review of published research evidence linking access to services, health and social care with health and wellbeing can be found in Volume 5: Appendix HA-002-00000.

8.4.14 The Wilmslow Road vent shaft will require land currently occupied by The Christie Hospital Car Park D on the B5093 Wilmslow Road. Car Park D is one of two designated patient and visitor car parks that serve the hospital, which is located approximately 250m north of the car park. Car Park D is approximately 0.5ha in area and has space for approximately 135 vehicles, including blue badge holders. The other designated patient car park, Car Park C, which has approximately 200 parking spaces, is located off the B5167 Palatine Road

severance effect for non-motorised users. They contribute to neighbourhood quality effects on health resources that are located adjacent to the routes that experience the increase in HGV movements.

immediately north-west of the hospital site. There are limited alternatives available for patients and visitors as the majority of on-street parking requires a permit. Given the high sensitivity of its users and the limited nearby alternatives, the loss of land at the car park will have an adverse health effect on patients and staff accessing the hospital.

8.4.15 The Christie Hospital is located off the B5093 Wilmslow Road, approximately 90m from the route of the Proposed Scheme. There are a number of hospital buildings with vibration sensitive equipment, including magnetic resonance imaging (MRI) facilities. The Paterson Redevelopment Project will introduce a new cancer research centre to the hospital (committed development MA07/445). The plans include a magnetic resonance imaging (MRI) room, which is considered to be the most vibration sensitive space and will be located in the basement of the new building. Sound, noise and vibration have identified, on the basis of a precautionary assessment, a significant vibration effect on the hospital for a period of greater than one month (see Section 13). This effect may cause temporary disruption to hospital activities which involve the use of very vibration sensitive equipment, for example, MRI and other imaging equipment.

Education

8.4.16 There is moderate evidence linking low levels of education with poor mental and physical health. The majority of evidence linking education with health outcomes looks at educational attainment in the context of broader socio-demographic status. Educational attainment influences socio-economic factors such as earnings and home ownership, as well as self-esteem and lifestyle choices. A review of published research evidence linking education with health and wellbeing can be found in Volume 5: Appendix HA-002-00000.

8.4.17 Health and wellbeing effects resulting from impacts on educational facilities are reported in this section. Health and wellbeing effects associated with construction skills and training are assessed in Volume 3: Route-wide effects, Section 8. Significant effects on education facilities resulting from noise are reported in Section 13, Sound, noise and vibration.

8.4.18 Birchfields Primary School is located off Lytham Road, approximately 60m north of the proposed Birchfields Road vent shaft site. One of the main access routes to Lytham Road is the A34 Birchfields Road, which will be used as a construction traffic route to access Birchfields Road vent shaft satellite compound. Construction of Birchfields Road vent shaft will result in significant visual effects. In addition, a significant adverse noise effect has been identified at the school on a precautionary basis for a period of approximately five years and two months. The A34 Birchfields Road is a designated route for construction traffic to enable access to Birchfields Road vent shaft satellite compound and there will be an increase in HGV traffic movements (between Moseley Road and Old Hall Lane) during the construction period. The noise and visual effects will result in indirect effects on the school. Given the existing environment of the school, the impact on the beneficial wellbeing effects associated with educational attainment may be small; however, this represents a health effect linked with the Proposed Scheme.

Social capital

8.4.19 The term 'social capital' refers to the connections between individuals within communities, and the increased likelihood that arises through these networks for individuals to feel valued, to feel a sense of belonging, to have companionship and to support each other. The Office for National Statistics[37] defines social capital as follows:

"In general terms, social capital represents social connections and all the benefits they generate. Social capital is also associated with civic participation, civic-minded attitudes and values which are important for people to cooperate, such as tolerance or trust."

8.4.20 There is moderate evidence for a link between social capital and mental and physical health outcomes. A change in social capital has the potential to influence the mental health effects that are gained through social contact and support, social participation, reciprocity and trust. Adverse effects on health from changes in social capital could be experienced as a reduction in mental wellbeing or as physiological effects on the body's hormonal and immune systems, with increased susceptibility to mental and physical illness. A review of published research evidence linking social capital with health and wellbeing can be found in Volume 5: Appendix HA-002-00000.

8.4.21 During the day, the workforce will be present on construction sites and compounds throughout the area, including main compounds and satellite compounds in the vicinity of Wythenshawe, Didsbury, Levenshulme, West Gorton and Beswick. The duration of the works at each site will range from approximately five years to approximately nine years. The presence of construction workers is likely to be noticeable. However, the size of the temporary construction workforce is unlikely to be substantial relative to the size of these communities and therefore no health effects are expected.

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

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

[37] Office for National Statistics (2014), *Measuring social capital.* Available online at: https://webarchive.nationalarchives.gov.uk/20160107115718/http://www.ons.gov.uk/ons/dcp171766_371693.pdf.

Other mitigation measures

8.4.24 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.

8.4.25 HS2 Ltd is continuing to engage with the owners and occupiers of The Christie Hospital Car Park D and Birchfields Primary School to identify reasonably practicable measures to help mitigate potential effects identified in the assessment.

Cumulative effects

8.4.26 The assessment has considered whether the cumulative effects of the Proposed Scheme and other committed developments are likely to give rise to additional health effects.

8.4.27 Cumulative effects may also occur where a number of individual health effects come together within a location, such that a considerable proportion of the population is likely to experience more than one type of health effect. This will place increased stress on those individuals affected and may exacerbate health outcomes associated with the individual effects.

8.4.28 No cumulative health effects have been identified.

8.5 Effects arising from operation

Avoidance and mitigation measures

8.5.1 Consideration of potential health issues is an integral part of the planning and design of the Proposed Scheme, alongside consideration of other environmental, community and economic issues. Insofar as reasonably practicable, mitigation measures have been incorporated into the design of the Proposed Scheme with the aim of avoiding or reducing adverse effects on people. The mitigation measures incorporated into the design of the Proposed Scheme in the Davenport Green to Ardwick area are described in Section 2 and include:

- landscape mitigation planting surrounding Manchester tunnel south portal to provide visual screening for residents of properties in Newall Green;
- landscape mitigation planting around all vent shafts to help integrate the Proposed Scheme into the surrounding landscape; and
- landscape mitigation planting to the north and south of Manchester tunnel north portal continuing into Manchester Piccadilly Station area (MA08), to provide visual screening for sites that are to be returned to suitable development use.

Assessment of impacts and effects

8.5.2 Impacts on health determinants resulting from the operation of the Proposed Scheme are presented in the health assessment matrix in Volume 5: Appendix HA-001-0MA07. The health assessment criteria are detailed within the SMR. Within the assessment matrix, the assessment criteria are applied to determine which impacts are likely to lead to health and wellbeing effects at population level.

8.5.3 Following the application of avoidance and mitigation measures, no operational health effects within the Davenport Green to Ardwick area are predicted to occur at the community level.

Other mitigation measures

8.5.4 Avoidance and mitigation measures are described above. No other mitigation measures have been identified.

Cumulative effects

8.5.5 No cumulative effects have been identified.

Monitoring

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

8.5.7 Proposals for monitoring of precursors to health effects, such as air quality and noise, are reported in Sections 5 and 13.

8.5.8 Any area-specific operational monitoring requirements in relation to air quality effects, noise and vibration effects, traffic effects and visual effects that have contributed to the health assessment are described in the relevant sections of this Volume 2 report.

9 Historic environment

9.1 Introduction

9.1.1 This section of the report provides a description of baseline conditions for heritage assets and the identified impacts and likely significant effects resulting from the construction and operation of the Proposed Scheme within the Davenport Green to Ardwick area. Consideration is given to the extent and value of heritage assets including archaeological and palaeoenvironmental remains, historic buildings, the built environment and historic landscape.

9.1.2 Engagement has been undertaken with Historic England, Manchester City Council, Salford City Council, Trafford Metropolitan Borough Council, Greater Manchester Archaeological Advisory Service, and Canal & River Trust. The purpose of this engagement has been to discuss the assessment approach, to obtain relevant baseline information and to inform the design development and assessment of the Proposed Scheme.

9.1.3 Appendices and Background Information and Data (BID[38]) reports accompany this section of the report. These are:

- Volume 5: Appendix HE-002-0MA07– Summary gazetteer, impact assessment table and archaeological character areas;
- Volume 5: Appendix HE-003-0MA07 – Historic landscape character areas;
- Volume 5, Map Book HE-01 and HE-02 – Heritage assets within the study area and Map Book HE-03 – Archaeological sub-zones; and
- BID HE-001-0MA07 – Historic environment baseline report (including a full gazetteer of heritage assets).

9.1.4 Heritage assets have been given a Unique gazetteer identifier (UID), for example MA07_0001. These have been allocated to all heritage assets within the gazetteer and are referenced throughout the ES, BID reports and in map books.

9.1.5 Maps showing the location of the key environmental features (Map Series CT-10), and the key construction (Map Series CT-05) and key operational (Map Series CT-06) features of the Proposed Scheme can be found in the Volume 2: MA07 Map Book. The Proposed Scheme is described in Section 2.

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

9.2 Scope, assumptions and limitations

9.2.1 The general scope, assumptions and limitations for the historic environment assessment are set out in full in Volume 1, Section 8 and the EIA Scope and Methodology Report (SMR)[39], including the method for determining the value of a heritage asset and magnitude of impact.

9.2.2 The assessment focuses on the extent to which the Proposed Scheme will affect designated and non-designated heritage assets. The Proposed Scheme could impact heritage assets through the alteration, demolition or removal of the asset, or as a result of changes within the asset's setting, where setting contributes to the value of the asset.

9.2.3 The study area for the assessment of effects on designated and non-designated heritage assets is the land required for the construction of the Proposed Scheme plus 250m on each side in urban areas. This is referred to in the remainder of this section as the 250m study area.

9.2.4 Designated heritage assets within a study area of up to 2km from the land required for the construction and operation of the Proposed Scheme have been considered in relation to potential effects arising from changes within an asset's setting. This is referred to in the remainder of this section as the 2km study area.

9.2.5 In areas of bored and mined tunnels, the study area for designated and non-designated assets is 100m from the route of the Proposed Scheme. This is referred to in the remainder of this section as the 100m study area. The built heritage assets that lie within the 10mm settlement contour are identified in Volume 5: Appendix HE-002-0MA07.

9.2.6 The historic environment methodology includes the consideration of the relevant interactions with other topics, including ecology and biodiversity, landscape and visual, socio-economics, sound noise and vibration, water resources and flood risk, and in-combination climate change impacts. These interactions have been included in the assessment of baseline conditions, impacts and effects.

9.2.7 Where noise is considered, this is within the context of the way in which sound and noise currently contribute to the heritage value of the assets and is not a reference to absolute noise levels or sound, or the noise or vibration impacts on the health and quality of life of people who live in or visit the area.

9.2.8 No areas were identified in the Davenport Green to Ardwick area as requiring geophysical survey.

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

9.3 Environmental baseline

Existing baseline

9.3.1 A full list of data sources used in establishing baseline conditions is provided in BID HE-001-0MA07. In addition to the desk-based assessment, the following surveys have been undertaken in the Davenport Green to Ardwick area: a walkover and site reconnaissance from areas of public access or in locations where site access was granted. This was carried out in order to understand the character of the historic landscape; review the nature, condition and setting of known heritage assets; and identify previously unknown assets.

Designated assets

9.3.2 Designated heritage assets within the 2km study area are described in Volume 5: Appendix HE-002-0MA07. The following designated heritage assets are located partially or wholly within the land required for the construction of the Proposed Scheme:

- Milestone adjacent to Withington Fire Station (MA07_0146), a Grade II listed building of moderate heritage value; and
- Withington Conservation Area (MA07_0224), of moderate heritage value.

9.3.3 The assets summarised below are located outside of the land required for the construction of the Proposed Scheme but are partially or wholly within the 2km study area:

- five scheduled monuments of high value, comprising an early medieval ditch and four medieval moated sites of which one is also Grade I listed;
- two Grade I listed buildings of high heritage value, comprising a former church and a hall which is also a scheduled monument, as described above;
- twenty-three Grade II* listed buildings of high heritage value including eight churches, nine houses and halls, two education buildings, a swimming pool, a bus depot and a health centre;
- two hundred and one Grade II listed buildings of moderate heritage value including 96 private houses and associated structures, 39 religious buildings and associated monuments, 11 buildings and monuments associated with cemeteries, 13 assets associated with the Ashton Canal, six leisure facilities, 11 public buildings, 15 educational buildings and associated monuments, five war memorials, two other memorials, one memorial clock tower and one mill;
- eleven conservation areas of moderate heritage value; and
- six Grade II listed registered parks and gardens of moderate heritage value.

Non-designated assets

9.3.4 The non-designated heritage assets summarised below lie wholly or partially within the land required for the construction of the Proposed Scheme. Only assets where a significant effect is predicted, as described in Section 9.4 and 9.5, are named below.

9.3.5 There is one non-designated heritage asset of high heritage value located wholly within the land required for the construction of Proposed Scheme, which is the Church of St Silas and possible graveyard (site of) (MA07_0270). There are no non-designated assets of moderate heritage value within the land required for the construction of the Proposed Scheme.

9.3.6 There are 18 non-designated assets of low heritage value within the land required for the construction of the Proposed Scheme. These date from the post-medieval period and relate to archaeological remains of domestic housing, industrial and transportation activity in the area. The assets include: Higher Ardwick School (site of) (MA07_0272); North Ardwick Primary School (site of) (MA07_0273); buildings on Hope Street (site of) (MA07_0274); buildings on Tempest Street (site of) (MA07_0245); buildings on York Street (site of) (MA07_0312); buildings on Hyde Street (site of) (MA07_0314); buildings on Coleman Street (site of) (MA07_0310); Victoria Brewery and Starch Works (site of) (MA07_0313); Chesters Brewery (site of) (MA07_0242); the King's Head Public House (site of) (MA07_0317); a saw mill (site of) (MA07_0258); a brick kiln (site of) off Gorton Road (MA07_0254); Ancoats Branch Railway Cutting (site of) (MA07_0271); and a goods shed (site of) (MA07_0275).

9.3.7 The non-designated heritage assets summarised below lie wholly or partially within the 100m and 250m study area. There are no non-designated assets of high or moderate heritage value within the 100m study area.

9.3.8 There are 73 assets of low heritage value within the 100m and 250m study area. These date from the Roman, medieval, post medieval and modern periods and relate to domestic, agricultural, industrial and transportation activity in the area. These include several farms, cottages and hall properties which represent the once rural landscape of the area. There are assets with an association to transport including roads, canals and railway infrastructure. There are also assets associated with the medieval period such as a medieval settlement and a ford. Among the 43 industrial assets are several associated with the manufacture of bricks, a number of mills or factories (including railway carriage manufacturers, chemical works and iron foundries), a colliery, a tannery and potteries. Assets that have an association to sport include a football ground and archery butts.

Historic environment overview

9.3.9 The bedrock geology of the Davenport Green to Ardwick area comprises mudstone with some siltstone and sandstone. It is overlain by superficial geology of glacial till and alluvium along the courses of streams and rivers. The main band of alluvium within the study area is associated with the River Mersey.

9.3.10 Evidence for Palaeolithic activity in north-west England is scarce, possibly because much of the region at this time was at the edge of, or under, glacial ice. The majority of artefactual

and faunal evidence in the region for this time period comes from upland contexts associated with sealed cave deposits, which are not present in the study area. Artefacts found in Greater Manchester indicate the presence of Mesolithic peoples. However, there is no evidence of Mesolithic activity recorded within the study area.

9.3.11 The Neolithic and Bronze Age saw hunting and gathering societies move towards a more settled farming lifestyle. The only evidence within the study area is individual artefacts. These include stone hammer heads and axes that may indicate woodland activity or the clearance of woodland for pasture. The introduction of bronze resulted in the production of weapons such as the bronze palstave axe head and the bronze spearhead found near Rusholme. Bronze artefacts tended to be high status objects believed to be indicative of a more hierarchical society and their deposition is believed to be for ritual reasons and not the result of accidental loss.

9.3.12 During the Iron Age the climate became cooler and wetter and the period saw an expanding population throughout the country. This required the intensification of agricultural practices and the use of marginal land that resulted in clearance of woodland. There are no confirmed Iron Age settlements or finds within the study area. Iron Age pottery was recovered in Castlefield and stone querns and figurines were recorded in Rusholme and Withington, all of which are located on the fringes of the study area.

9.3.13 Although Britain came under Roman control after AD 43 it was not until AD 70 that the Romans began to occupy the area of Greater Manchester. This followed the defeat of a tribal group known as the Brigantes in AD 75 by Gnaeus Julius Agricola. The Brigantes may have controlled the area stretching from the River Mersey to Northumberland. Their defeat resulted in new forts and settlements being constructed, including the fort of Mamucium in AD78. It was built as a part of the process of controlling the Pennine region. The fort is located just outside of the study area to the west. The fort had a network of roads connecting it to other regions. This is represented within the study area by the Manchester to Buxton Roman Road (MA07_0234). The A6 Stockport Road now follows the course of this former Roman road.

9.3.14 In the early medieval period, archaeological evidence becomes increasingly scarce and knowledge of the period is largely dependent on documentary sources. Within the study area certain place names can indicate early settlement. Names ending in -le or -ley originated from the Old English word leah, which means a clearing in a wood; Baguley and Gatley are examples of this. Early Norse settlements can also be deciphered from place names, for example the Mersey has origins which translates as ‘the river at the boundary’. A section of the Nico Ditch (MA07_0220), possibly dating to the 7th century, runs through the study area. The ditch may have formed part of an ancient linear frontier or boundary, possibly between Mercia and Northumbria or between two areas of wetland mosses. It runs for six miles in a predominantly east to west orientation between Ashton Moss and Hough Moss in Chorlton-cum-Hardy.

9.3.15 In the medieval period north-west England was relatively sparsely populated, compared to other parts of the country. The manorial system was the organising principle of the study

area at this time, where legal and economic power was vested in a lord of the manor. Halls were the nuclei of medieval manors and were often moated. The reasons for digging moats is not entirely clear, although it is thought they were for security or, to express social standing. The peak period for the moated hall was between the 12th and 14th centuries. There are several moated sites within the study area including Clayton Hall (MA07_0219) and Peel Moat (MA07_0221). The landscape of the manors consisted of arable fields, pasture meadows and large tracts of woodland. The Domesday Survey provides a record of settlement and land use shortly after the Norman conquest. Northenden is referred to in the survey and dates from at least this period. The Church of St Wilfrid was also founded in the medieval period. Similarly, a weir at Northenden is first documented in 1539, although it was already described as being of a significant age. Corn Mills are also present during this period in Northenden Conservation Area (MA07_0231) and Withington Conservation Area (MA07_0224).

9.3.16 The medieval manorial system of land use was reorganised from the 16th century, leading to the enclosure of former open fields that were communally farmed. This was due to population pressure and technological innovations in agricultural practice. In the early post-medieval period, the study area mainly consisted of hamlets and isolated farmsteads. Moss Nook (site of) (MA07_0319) and possible house and outbuildings (site of) (MA07_0318) are examples within the once more sparsely populated study area.

9.3.17 During the medieval and post-medieval period Manchester became a regional centre for textile processing. Manchester was key to the early stages of industrialisation and globalisation. The textile and coal industries were the driving force behind this growth and by 1664 Manchester was the largest town in Lancashire. The road system was improved from the mid-18th century. Milestones, such as the one adjacent to Withington Fire Station (MA07_0146), are indicative of these road improvements. Rapid industrial growth saw the expansion of the rail network in Manchester, which led to railway companies investing in new sidings, stations, warehouses and goods yards which are still prominent in the landscape today. Examples of these include Ardwick Branch Viaduct (MA07_0390), goods sheds (MA07_0275 and MA07_0276) and the site of the Ancoats Branch Railway Cutting (MA07_0271).

9.3.18 The expansion of industry in Manchester fuelled population growth in the suburbs. In the first half of the 19th century, the population of Manchester grew from 88,000 to over 400,000. This resulted in the widespread expansion of terraces of workers housing, transforming the suburbs, and defining the character of areas such as Ancoats, Hulme, Moss Side, Rusholme, Miles Platting, Ardwick and Longsight. In the now demolished areas around Ardwick Depot, the archaeological remains may survive for buildings on Tempest Street (site of) (MA07_0245), buildings on Hope Street (site of) (MA07_0274), buildings on York Street (site of) (MA07_0312), buildings on Coleman Street (site of) (MA07_0310) and buildings on Hyde Street (site of) (MA07_0314). There was a densely populated and industrial landscape in this area, where families and industry lived side by side. Within a few streets there were not only the terraces and back-to-back houses mentioned above, but factories, a saw mill (site of) (MA07_0258), and two breweries, which are Victoria Brewery and Starch Works (site

of) (MA07_0313) and Chesters Brewery (site of) (MA07_0242). One of the only remaining extant buildings from this period in this area is the mineral water works (MA07_0394) on Birch Street, a street which once also contained terraced houses and a 'Beer House'. Most of these buildings were constructed in brick which was being manufactured in the surrounding area. The archaeological evidence for this includes possible remains of a Brick Field (site of) off Gorton Road (MA07_0269), Brick Field (site of) off Ashton Old Road (MA07_0255) and brick works (site of) off Ashlar Drive (MA07_0257).

9.3.19 New places of worship were built for the expanding population. St Silas and possible graveyard (MA07_0270) was built in 1842 and a graveyard is recorded on maps from 1848. Although marked on historic maps, there are no burial records or archaeological evidence of burials. Its use as a graveyard remains possible. The church was demolished in 1957 and the land was subsequently developed for light industrial use and warehouses.

9.3.20 The dramatic social, political and economic transformation of England during this period served to reveal the inadequacy of the country's educational provision. The Factory Act of 1833 banned children under the age of nine from working in factories. This resulted in a need to provide schools within the new suburbs of terraces such as the North Ardwick. The Higher Ardwick School (site of) (MA07_0272) serves as an example of this.

9.3.21 In the early 20th century, industry in the region saw a phase of decline as a result of economic depression. Textile mills were frequently converted to other industries or abandoned completely. In contrast, this period saw extensive housing development, with improvements in the public transport system and roads influencing the building programme outside of Manchester city centre.

9.3.22 In the 1920s there began the construction of large housing estates of predominantly three-bedroom, semi-detached red brick houses. This accelerated, after the end of the Second World War, with the need to replace bombed homes and to rehouse working people and returning service personnel. Better housing and wider environmental improvements through town planning were central to the agenda embarked upon by the government at the time. Wythenshawe, in the study area, provides evidence of this policy approach. The housing estates continued to grow after the Second World War, until the 1960s. Today, these form one of the largest council estates in Europe. Other large estates of semi-detached houses were built in the areas around Withington and Didsbury, and this style of housing accounts for a large amount of the built environment in the area.

Future baseline

Construction (2025)

9.3.23 Volume 5: Appendix CT-004-00000 provides details of the developments in the Davenport Green to Ardwick area that are assumed to have been implemented by 2025. No committed developments have been identified in this study area that will materially alter the baseline conditions in 2025 for historic environment.

Operation (2038)

9.3.24 Volume 5: Appendix CT-004-00000 provides details of the developments in the Davenport Green to Ardwick area that are assumed to have been implemented by 2038. No additional committed developments have been identified in this study area that will materially alter the baseline conditions in 2038 for historic environment.

9.4 Effects arising during construction

Avoidance and mitigation measures

9.4.1 The design of the Proposed Scheme has sought to avoid adverse effects on heritage assets within the land required for construction insofar as reasonably practicable.

9.4.2 Section 8 of the draft Code of Construction Practice[40] sets out the measures that will be adopted, insofar as reasonably practicable, to control effects on heritage assets. These include:

- management measures that will be implemented for heritage assets that are to be retained within the land required for the Proposed Scheme;
- route-wide principles, standards and techniques for works affecting heritage assets;
- a programme of historic environment investigation and recording (including archaeology and historic buildings) to be undertaken prior to or during construction works affecting the heritage assets; and
- the use of appropriate equipment and methods to limit ground disturbance and settlement, followed by monitoring, protection and remediation.

Assessment of impacts and effects

9.4.3 Impacts on all heritage assets described above have been assessed and are set out in the Impact Assessment Table (Volume 5: Appendix HE-002-0MA07). Only impacts on heritage assets resulting in significant effects are described in the assessment set out below. Effects on Historic Landscape Character Areas are set out in Volume 5: Appendix HE-003-0MA07, and again only the significant effects are described below.

Temporary effects

9.4.4 The temporary construction works, such as excavations and earthworks for construction compounds, storage areas, and diversions of existing roads and services, have the potential to affect heritage assets during the construction period. Heritage assets could be affected as a result of changes within the assets' settings, where setting contributes to the value of the

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

asset. The duration of the activities giving rise to the temporary effect described below are set out in the indicative construction programme in Section 2.3.

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

Permanent effects

9.4.6 Permanent construction phase effects can occur either as a result of physical impacts on heritage assets within the land required for the Proposed Scheme, or through changes to the setting of heritage assets that affect the contribution made by setting to the asset's value.

9.4.7 The following significant effects will occur as a result of permanent physical impacts on heritage assets within the land required for the construction of the Proposed Scheme.

9.4.8 The milestone adjacent to Withington Fire Station (MA07_0146) is a Grade II listed asset of moderate heritage value. The 19th century whitewashed milestone is located within the land required for the construction of the Proposed Scheme, on the eastern side of the B5093 Wilmslow Road. The milestone will be removed during construction of the Proposed Scheme. This will constitute a high adverse impact and result in a major adverse significant effect.

9.4.9 The Church of St Silas and possible graveyard (site of) (MA07_0270) is a non-designated heritage asset of high heritage value. The possible graveyard located around the Church of St Silas may contain human remains. The archaeological remains of the church and graveyard will be removed to allow for the construction of the Proposed Scheme. This will constitute a high adverse impact and result in a major adverse significant effect.

9.4.10 The following non-designated heritage assets are all of low heritage value. They derive their heritage value from their archaeological interest as they illustrate the industrial and residential development of post-medieval Manchester. Any archaeological remains associated with these assets will be removed to enable the establishment of Manchester tunnel north portal main compound. This will constitute a high adverse impact and result in a moderate adverse significant effect on:

- the King's Head Public House (site of) (MA07_0317);
- a goods shed (site of) (MA07_0275);
- a saw mill (site of) (MA07_0258);
- Ancoats Branch Railway Cutting (site of) (MA07_0271);
- buildings on Tempest Street (site of) (MA07_0245);
- North Ardwick Primary School (site of) (MA07_0273);
- buildings on Hope Street (site of) (MA07_0274);
- Chesters Brewery (site of) (MA07_0242);
- Higher Ardwick School (site of) (MA07_0272);

- buildings on York Street (site of) (MA07_0312);
- buildings on Coleman Street (site of) (MA07_0310);
- Victoria Brewery and Starch Works (site of) (MA07_0313); and
- buildings on Hyde Street (site of) (MA07_0314).

9.4.11 A Brick Field (site of) off Gorton Road (MA07_0269) is a non-designated heritage asset of low heritage value. It derives its heritage value from its archaeological interest illustrating that bricks were possibly being made on-site for the 19th century buildings constructed in Manchester. The archaeological remains associated with this asset will be removed to enable the establishment of Manchester tunnel north portal satellite compound. This will constitute a high adverse impact and result in a moderate adverse significant effect.

9.4.12 No significant effects are expected to occur as a result of permanent changes to the setting of designated or non-designated heritage assets.

Other mitigation measures

9.4.13 Potential opportunities for further mitigation measures will continue to be considered through detailed design to reduce further the significant effects described above where practicable. These may include the identification of:

- locations where the physical impacts on heritage assets can be reduced through the detailed design of the works; and
- the Grade II listed Milestone adjacent to Withington Fire Station (MA07_0146) will be removed during construction and safely stored for the duration of construction activities and will be returned, insofar as reasonably practicable, to its original location, or an alternative location agreed with the relevant stakeholder, before the Proposed Scheme is in operation.

Summary of likely residual significant effects

9.4.14 The temporary effects of construction activity on the setting of heritage assets have been considered. However, as these effects result from temporary construction activities they are restricted to the duration of those activities and are reversible.

9.4.15 Mitigation measures have been incorporated as set out above and taken into account during assessment. Therefore, the residual effects are the same as those reported under permanent construction phase effects.

9.4.16 A major adverse effect is predicted in relation to the removal of the Grade II listed Milestone adjacent to Withington Fire Station (MA07_0146). However, replacing the milepost as set out above will reduce the effect to a level that is not significant.

Cumulative effects

9.4.17 No cumulative effects on heritage assets during construction have been identified in the Davenport Green to Ardwick area.

9.5 Effects arising from operation

Avoidance and mitigation measures

9.5.1 No mitigation measures are proposed in relation to the historic environment during the operation of the Proposed Scheme in the Davenport Green to Ardwick area.

Assessment of impacts and effects

9.5.2 The assessment considers the Proposed Scheme once operational; all effects are permanent.

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

Other mitigation measures

9.5.4 The Proposed Scheme includes a number of design measures to address potential impacts and significant effects. No additional operational mitigation measures beyond those included within the Proposed Scheme design have been identified. Potential opportunities for further mitigation such as additional planting and noise fencing will be considered as part of the detailed design process.

Summary of likely residual significant effects

9.5.5 No mitigation beyond that described above has been identified. As a result, it is currently anticipated that residual effects will be the same as those reported in the assessment of effects during operation.

Cumulative effects

9.5.6 No cumulative effects on heritage assets during operation have been identified in the Davenport Green to Ardwick area.

Monitoring

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

9.5.8 No area-specific heritage monitoring requirements during operation of the Proposed Scheme have been identified.

10 Land quality

10.1 Introduction

10.1.1 This section of the report presents the baseline conditions along the route of the Proposed Scheme in the Davenport Green to Ardwick area in relation to land quality and reports the likely impacts and significant effects resulting from construction and operation of the Proposed Scheme. Consideration is given to land that potentially contains contamination and land that has special geological significance, either from a scientific, historical, mining and mineral exploitation or mineral resources point of view including geological Sites of Special Scientific Interest (SSSI) and Local Geological Site (LGS), and areas of designated mineral resources. Consideration is also given to petroleum (including gas) prospects and licensing.

10.1.2 Engagement has been undertaken with Manchester City Council (MCC), Trafford Metropolitan Borough Council (TMBC), the Environment Agency 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.

10.1.3 Details of baseline information, conceptual site models (CSM) and risk assessments are outlined in Volume 5: Appendix LQ-001-0MA07. Baseline data relevant to land quality are presented on Maps LQ-01-322b to LQ-01-327a (in the Volume 5, Land quality Map Book).

10.1.4 Maps showing the location of the key environmental features (Map Series CT-10), key construction (Map Series CT-05) and key operational (Map Series CT-06) features of the Proposed Scheme can be found in the Volume 2: MA07 Map Book.

10.1.5 Land contamination issues are closely linked with those involving water resources and waste. Issues regarding water resources are addressed in Section 15, Water resources and flood risk. Issues regarding the disposal of waste materials, including contaminated soils, are addressed in Volume 3, Route-wide effects (Section 15).

10.1.6 The Proposed Scheme is described in Section 2.

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

10.2 Scope, assumptions and limitations

10.2.1 The scope, assumptions and limitations for the land quality assessment are set out in Volume 1, Section 8 and the EIA Scope and Methodology Report (SMR), Volume 5[41].

10.2.2 In accordance with the SMR, a risk-based approach was undertaken to identify contamination that may have an impact in relation to construction of the Proposed Scheme.

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

To support this, a desk-based assessment has been undertaken for the study area, defined as the land required for the construction of the Proposed Scheme plus a 250m buffer. In the case of groundwater abstractions, this buffer is increased to 1km.

10.2.3 For major above ground utilities, a pre-screening exercise has been completed to determine where these may break ground, or otherwise interact with land quality. In such cases, these are considered in the land quality assessment.

10.2.4 The majority of new and diverted minor utilities will be laid in the boundaries of existing highways within normal road construction layers and natural soils below. These have been considered in the context of the CSM approach. The lack of contact with nearby potentially contaminated sites, the usual approach to ensuring services are protected from contamination by design and choice of materials, and the absence of sensitive receptors within the roadways, reduces the risk of an impact occurring. The potential impacts of laying these new and diverted utilities has, therefore, been scoped out of the assessment as they are unlikely to cause any significant land quality effects.

10.2.5 Potentially contaminated areas of land have been identified that could affect, or be affected by, the construction of the Proposed Scheme (e.g. contaminated soils may need to be removed or construction may alter existing contamination pathways). Each of these areas has been studied to evaluate the scale of potential impacts caused by existing contamination (if present) and what needs to be done to avoid significant consequences to people and the wider environment.

10.2.6 The location of the Proposed Scheme was viewed from points of public access initially. In addition, and where permission could be obtained, visits to some key sites have been undertaken to verify desktop information. The details of site visits are provided in Background Information and Data (BID) LQ-002-0MA07[42].

10.2.7 A CSM approach has been used to provide an understanding of the sources and types of contaminants that may be present, the likely sources and/or pathways by which contamination can spread and the potential receptors (i.e. people and the wider environment) that could be affected. It indicates the types of impacts that existing contamination may be having at present and may have during and after construction.

10.2.8 The minerals assessment is based upon the mineral resources[43] identified in published mineral plans, and existing planning or licensed areas. Any inference of minerals provided by geological maps/reports is excluded (except where these are covered by a published mineral plan).

[42] High Speed Two Ltd (2022), High Speed Rail (Crewe – Manchester), *Background and Information Data, Land quality baseline data*, BID LQ-002-0MA07. Available online at: https://www.gov.uk/government/collections/hs2-phase-2b-crewe-manchester-environmental-statement.

[43] Defined in the SMR as 'mineral body including aggregates, salt, coal and other hydrocarbons, Petroleum Extraction and Development Licences (PEDL), Shale Prospective Area (SPA)'.

10.2.9 The geoconservation assessment is based upon local authority and publicly available local geological trust records.

10.3 Environmental baseline

Existing baseline

10.3.1 Baseline data have been collected from a range of sources including Ordnance Survey mapping, the British Geological Survey (BGS), Coal Authority, Oil and Gas Authority (OGA), Network Rail, MCC, TMBC, Public Health England, the Environment Agency, Natural England and the APHA records, as well as online sources such as local geological trusts. Further details are given in Volume 5: Appendix LQ-001-0MA07 and BID LQ-002-0MA07 and presented on maps LQ-01-322b to LQ-01-326a (Volume 5: Land quality Map Book).

Geology

10.3.2 This section describes the underlying ground conditions within the Davenport Green to Ardwick area. Recent changes in lithostratigraphic classifications by the BGS have been incorporated where appropriate[44].

10.3.3 Table 12 provides a summary of the geology (made ground, superficial and bedrock units) in the study area.

Table 12: Summary of the geology underlying the land quality study area

Category	Geology	Distribution	Formation description	Aquifer classification
Made ground	Made ground	Made ground is shown on 1:10,000 scale BGS geological mapping throughout the study area. This is predominantly associated with historical and existing brick fields within the Ardwick area, road embankments, railway construction, infilling of historical ponds, and embankments adjacent to the River Mersey. Localised deposits of made ground are also likely to be present across previously developed land within the majority of the study area.	Made ground comprising variable deposits of reworked natural and man-made materials.	Not designated
Superficial	Alluvium	Associated with the course (current and historical) of the River Mersey.	Clay, silt, sand and gravel	Secondary A
Superficial	River terrace deposits (Undifferentiated)	Localised pockets associated with the course of the River Mersey.	Sand and gravel	Secondary A

[44] British Geological Survey (2014), *Lithostratigraphy of the Sherwood Sandstone.* Available online at: http://pubs.bgs.ac.uk/publications.html?pubID=B07318.

Category	Geology	Distribution	Formation description	Aquifer classification
Superficial	Glaciofluvial sheet deposits	In extensive areas flanking the valley of the River Mersey.	Sand and gravel	Secondary A
Superficial	Glaciofluvial deposits	Some localised areas around Wythenshawe.	Sand and gravel	Secondary A
Superficial	Glacial till	Subcrops across much of the study area to north and south of the River Mersey valley, potentially present below younger superficial deposits.	Sandy silty clay with gravel	Secondary (Undifferentiated)
Superficial	Shirdley Hill Sand Formation	Small area located in the north of Withington.	Sand	Secondary A
Bedrock	Mercia Mudstone Group - Sidmouth Mudstone Formation; Bollin Mudstone Member	Located between Davenport Green and Partridge Avenue/Blackcarr Road junction.	Mudstone and siltstone	Secondary B
Bedrock	Mercia Mudstone Group - Tarporley Siltstone Formation	Located between Partridge Avenue/Blackcarr Road junction to Joseph Johnson Mews.	Siltstone, mudstone and sandstone	Secondary B
Bedrock	Sherwood Sandstone Group - Helsby Sandstone Formation	Located between Joseph Johnson Mews to Boat Lane.	Pebbly sandstone	Principal
Bedrock	Sherwood Sandstone Group - Wilmslow Sandstone Formation	Located between Boat Lane to 50m north of Mayville Drive.	Sandstone	Principal
Bedrock	Sherwood Sandstone Group – Chester Formation	Located between Withington, Didsbury and Rusholme and Fallowfield.	Pebbly sandstone	Principal
Bedrock	Cumbrian Coast Group - Manchester Marls Formation	Raincliff Avenue to Campbell Road. Chipping Square to Kirkmanshulme Lane. Blind Lane/Viaduct Street to the A665 Midland Street.	Mudstone	Secondary B
Bedrock	Appleby Group - Collyhurst Sandstone Formation	Located in the Rusholme and West Gorton areas.	Sandstone	Principal
Bedrock	Warwickshire Group - Halesowen Formation	Located between Birchfields Primary School to 40m west of Lindsay Avenue, and again between Redgate Lane to Rondin Road.	Mudstone, siltstone and sandstone	Secondary A
Bedrock	Warwickshire Group - Halesowen Formation; Great Mine Limestone	Subcrops as a thin band trending north-west to south-east. Located south of Hyde Road in Belle Vue, stretching north-west to Bradford Road near Ancoats.	Limestone	Secondary A

Category	Geology	Distribution	Formation description	Aquifer classification
Bedrock	Warwickshire Group - Etruria Formation	Subcrops in two parts of the study area: beneath Beswick in the north-east and between Rusholme and Levenshulme.	Sandstone and mudstone	Secondary A
Bedrock	Pennine Coal Measures Group - Pennine Upper Coal Measures Formation	Located in the far north-east of the study area near the Etihad Stadium.	Mudstone, siltstone and sandstone	Secondary A

10.3.4 Bedrock faults are recorded along the route of the Proposed Scheme throughout the study area, typically trending north/north-west to south/south-east.

10.3.5 Based on local authority records, no farm burial or pyre sites associated with the 1967/8 and 2001/2 outbreaks of foot and mouth disease (FMD) are known to be present within the Davenport Green to Ardwick area. However, the 2001/2 FMD outbreak risk assessment map[45] identifies the study area to lie within an 'at risk county'. In addition, older unrecorded sites may be present from the 1967 outbreak. Similarly, anthrax infected cattle burial sites may be present, generally relating to burials over 50 to 100 years ago. However, no records have been found of such burials.

Radon

10.3.6 Radon is a radioactive gas formed by the radioactive decay of naturally occurring uranium in rocks and soils. The occurrence of radon gas is shown in the BGS Radon Potential Dataset[46].

10.3.7 The majority of the study area lies within a lower probability radon area, where less than 1% of homes are estimated to be at or above the action level of 200 becquerels per cubic metre of air (Bq/m^3) for residential properties.

10.3.8 There are three discrete areas where 1% - 3% of homes are estimated to have radon levels at or above the action level. These coincide with the deposits of the Halesowen and Etruria bedrock including:

- an area from Ardwick railway junction north towards the Etihad Stadium and south-east towards Belle Vue; and
- an area between Levenshulme and Ladybarn. The Birchfields Road vent shaft site is on the northern border of this area.

[45] Animal and Plant Health Agency (2001), *Foot and Mouth Disease 2001 County Status Map 01.10.2001.*

[46] BGS Radon Potential Dataset. Available online at: http://www.bgs.ac.uk/radon/hpa-bgs.html. This dataset underpins Miles J.C.H. et al. (2007), *Indicative Atlas of Radon in England and Wales.* Available online at: www.ukradon.org/information/ukmaps.

Groundwater

10.3.9 Four aquifer designations have been identified within the study area, as defined by the Environment Agency. These are as follows:

- the Helsby Sandstone Formation, Wilmslow Sandstone Formation, Chester Formation and Collyhurst Sandstone Formation are designated as Principal aquifers;
- the alluvium, river terrace deposits, glaciofluvial sheet deposits, glaciofluvial deposits, Shirdley Hill Sand Formation, Pennine Upper Coal Measures Formation, Halesowen Formation and Etruria Formation are designated as Secondary A aquifers;
- the Bollin Mudstone Member, Tarporley Siltstone Formation and the Manchester Marls Formation are designated as Secondary B aquifers; and
- the glacial till is designated as a Secondary (undifferentiated) aquifer.

10.3.10 Table 13 sets out the groundwater designations and abstractions in the land quality study area of 1km from the land required for construction of the Proposed Scheme in the Davenport Green to Ardwick area.

Table 13: Groundwater designations and abstractions in the land quality study area

Feature	Details
Source Protection Zones (SPZ) associated with licensed public water supplies	SPZ3 near Rusholme lies within the study area. SPZ is associated with an abstraction 3km north-west of the route of the Proposed Scheme.
Private licensed groundwater abstractions	Seven licences, registered to six locations. Three are for non-evaporative cooling (industrial use) in Clayton. There are two licences for spray irrigation purposes, one at Didsbury Golf Club and one at Yew Tree Farm in Heald Green. Two licences are registered to a single location in the Etihad Campus, Openshaw for Sport Grounds/ Facilities use.
Registered unlicensed private groundwater abstractions	None

10.3.11 Further information on the groundwater in the Davenport Green to Ardwick area is provided in Section 15, Water resources and flood risk.

Surface water

10.3.12 The route of the Proposed Scheme will cross a number of canals and main rivers, as described in Section 15, Water resources and flood risk. The main rivers and watercourses, including unnamed streams, tributaries, drains, ponds and culverts located within the study area are described in Volume 5: Appendix WR-003-0MA07.

10.3.13 There are no surface water designations or licensed surface water abstractions in the study area.

10.3.14 Further information on surface water in the Davenport Green to Ardwick area is provided in Section 15, Water resources and flood risk.

Current and historical land use

10.3.15 Current potentially contaminative land uses within the study area include a former cemetery and 47 commercial and industrial land uses.

10.3.16 Historical land uses identified within the study area with the potential to have caused contamination include one limestone mining site and 61 industrial and commercial sites. Infilled pits and ponds may have been filled with a variety of waste materials but have not been licensed.

10.3.17 Table 14 and Table 15 summarise the key current and historical contaminative land uses in the Davenport Green to Ardwick area. These are categorised into:

- mining and mineral sites; and
- industrial, commercial and other sites identified with a high risk of potential contamination.

Table 14: Current and historical mining and mineral sites located within the study area

Name and area reference	Location	Description
Limestone shaft (MA07-202)	Located south of Gorton Road, north of Vaughan Industrial Estate on land required for the construction of the Proposed Scheme.	Identified using Coal Authority data. No other data are available on this shaft including any decommissioning data or backfill type.

Table 15: Current and historical industrial, commercial and other sites identified with a high risk of potential contamination located within the study area

Name and area reference	Location	Description
Former gas works (MA07-168)	South of Gorton Road and north of Vaughan Industrial Estate on land required for the construction of the Proposed Scheme.	Former gas works that has been demolished and land left as open space. No remediation or demolition data are known.
Former fuel station (Ardwick Service Station) (MA07-186)	South of Ashton Old Road and east of Midland Street on land required for the construction of the Proposed Scheme.	Former fuel station on Ashton Old Road. No demolition or decommission data are available.
Current fuel station (MA07-206)	Located on the junction of the A665 Chancellor Lane and the A665 Midland Street on land required for the construction of the Proposed Scheme.	Current fuel station with assumed underground storage tanks and associated infrastructure.
Current oil depot (MA07-40)	Located east of junction 3A of the M56, south of Sharston Industrial Area, 20m east of the land required for the construction of the Proposed Scheme.	Current oil depot with possible underground storage tanks and associated infrastructure.
Former fuel station (MA07-205)	Former fuel station located on the junction of Moseley Road and the A34 Birchfields Road.	Former fuel station, now a vacant plot near to the Birchfields Road vent shaft location. No demolition or decommissioning data are available.

10.3.18 Contaminants commonly associated with sites in Table 14 and Table 15 could include metals, semi-metals, asbestos, organic and inorganic compounds.

Other regulatory data

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

10.3.20 In the Davenport Green to Ardwick area this includes:

- seventeen incidents of pollution to controlled waters in the study area between 1991 and 1998. All are classed as Category 3 (minor), except for a single Category 1 (major incident), described as Miscellaneous pollutants (detergent) to the Ashton Canal in 1996;
- ten licensed discharge consents registered to five individual sites within the study area. The majority are registered to United Utilities and all for discharge of sewage;
- seven groundwater licences registered to six locations. The water is used largely for industrial, commercial and public services; and
- ten Sites of Biological Interest (SBI) within the study area. One site, Wrengate Wood, is partially within land that has been identified for the purpose of habitat creation or enhancement, as part of the Proposed Scheme. The remaining sites are off-site or are located in land required for new and diverted minor utilities in the boundaries of existing highways.

10.3.21 Further details of relevant regulatory data in the Davenport Green to Ardwick area are provided in Section 5 of BID LQ-002-0MA07.

10.3.22 Further information on ecological designations in the Davenport Green to Ardwick area is provided in Section 7, Ecology and biodiversity.

Mineral resources

10.3.23 There are a range of mining and mineral resources located within the study area that have the potential to be affected by the Proposed Scheme. These include sand and gravel and limestone, which can be protected via local or county level minerals plans and by the Coal Authority as well as other forms of petroleum hydrocarbons, such as shale gas, which are regulated by the OGA.

10.3.24 Historical mapping records indicate a number of historical clay pits in the area around Ardwick associated with former brick fields as well as shafts recorded as being used for the extraction of limestone. A number of mineshafts are recorded in the extreme north of the area near the Etihad Stadium associated with coal mining.

Minerals plans

10.3.25 MCC and TMBC are responsible for the regulation of minerals and waste in the Davenport Green to Ardwick area. The Manchester Core Strategy Development Plan document was adopted in July 2012[47]. Policy EN20 sets out the MCC policies aimed 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.

10.3.26 The Manchester Core Strategy Development Plan document indicates that Manchester does not have any active mineral workings; however, there are mineral resources within the Greater Manchester area, including sand and gravel resources at a number of locations in the River Mersey valley.

10.3.27 As the Davenport Green to Ardwick area falls within Greater Manchester, it adopts the policies set out in the Greater Manchester Joint Minerals Plan, which was adopted in April 2013. The Greater Manchester Joint Minerals Plan[48] outlines how the various boroughs within Greater Manchester can plan for minerals in a sustainable manner.

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

Sand and gravel deposits

10.3.29 Sands and gravels are recorded as mineral resources in the study area, although no quarries or mineral safeguarding areas (MSA) are recorded.

Limestone

10.3.30 There are 11 limestone mine entries recorded in Coal Authority data for the study area around Ardwick.

10.3.31 One is identified as being within land required for construction of the Proposed Scheme to the south of Gorton Road. Nearby lime works/kilns were recorded on mapping in a similar time span to the mine entries. Three of the mine entries are recorded as having no treatment details including the one that has been identified as being within the land required for construction of the Proposed Scheme.

10.3.32 A further three limestone mine entries are identified around Viaduct Street, close to the River Medlock within the study area. The Proposed Scheme in this area comprises highways improvements and utility works (Palmerston Street). Given the distance to the mine entries from the highway of over 100m, these are not considered further within the land quality assessment.

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[47] Manchester City Council (2012), *Adopted Manchester Core Strategy Development Plan 2012-2027*. Available online at: https://secure.manchester.gov.uk/downloads/download/4964/core_strategy_development_plan.

[48] Association of Greater Manchester Authorities (2013), *Adopted Greater Manchester Joint Minerals Plan*. Available online at: https://www.trafford.gov.uk/planning/strategic-planning/local-plan/greater-manchester-joint-minerals-development-plan-document.aspx.

10.3.33 A mining hazard area is identified in Coal Authority data in proximity to the Proposed Scheme in Ardwick. This mining hazard area is recorded as being associated with limestone and where underground mining is known, or considered likely, to have occurred within, or close to, the area. This information is substantiated by the location of mine entries as discussed above.

10.3.34 The individual mine entries discussed are classified in the Coal Authority data as Development High Risk areas.

Coal

10.3.35 No MSAs related to coal have been identified within the study area.

10.3.36 Coal is identified as a potential resource below the majority of the study area. Surface coal (located at less than 50m depth) is recorded at the north-eastern end of the study area to the south-east of the Etihad Stadium. Shallow coal resources (50 – 1200m), as identified on plans from Manchester City Council, are identified from the city centre to Withington and deep coal from Withington southwards to the edge of the study area.

10.3.37 However, available records from the Coal Authority show that the route of the Proposed Scheme, with the exception of highways and utilities works, will not cross areas of recorded current or historical underground coal mining activities.

10.3.38 Twenty-three mine entries have been identified within the north-east corner of the study area around the Regional Athletics Arena and Etihad Stadium. However, works in this area will be limited to utilities/highways works and so are not considered further within the land quality assessment.

10.3.39 The study area is located within a Coal Mining Reporting Area and the north-eastern corner is within a Development High Risk Area.

Petroleum Exploration and Development Licences/Hydrocarbons

10.3.40 The OGA indicates that the study area is within a shale prospective area (SPA).

Geoconservation resources

10.3.41 No geological SSSI or LGS sites have been identified within the study area. Therefore, no assessment of geoconservation resources has been undertaken.

Receptors

10.3.42 The sensitive receptors that have been identified within the study area are summarised in Table 16. A definition of receptor sensitivity is given in the SMR.

Table 16: Summary of sensitive receptors

Issue	Receptor type	Receptor description	Receptor sensitivity
Land contamination	People	Residents at existing properties, users of schools and playing fields	High
Land contamination	People	Employees and visitors of retail and business parks	Moderate
Land contamination	People	Employees and visitors of commercial or industrial development	Low
Land contamination	Groundwater	Principal bedrock aquifers (Helsby Sandstone Formation, Wilmslow Sandstone Formation, Chester Formation, Collyhurst Sandstone Formation)	High
Land contamination	Groundwater	Secondary A aquifers (river terrace deposits, glaciofluvial sheet deposits, glaciofluvial deposits, Shirdley Hill Sand, alluvium, Pennine Upper Coal Measures Formation, Halesowen Formation, Great Mine Limestone, Etruria Formation)	Moderate
Land contamination	Groundwater	Secondary B aquifers (Sidmouth Mudstone Formation, Tarporley Siltstone Formation, Manchester Marls Formation)	Low
Land contamination	Groundwater	Secondary (undifferentiated) aquifer (glacial till)	Low
Land contamination	Surface waters	River Mersey, Mill Brook, Baguley Brook, a tributary of the River Mersey, a culverted section of Fallowfield Brook, Gore Brook, Corn Brook, River Medlock, Cringle Brook, Fairywell Brook	Moderate
Land contamination	Surface waters	Unnamed tributaries and ponds	Low
Land contamination	Surface waters	Shaw Brook	Low
Land contamination	Built environment	Underground structures and buried services	Low
Land contamination	Ecological designations	Ten SBI* identified in the study area	Low
Impacts on mineral and petroleum (gas) sites (severance and sterilisation)	Mineral sites	SPA	Medium

** SBI is equivalent to LWS.*

Future baseline

Construction (2025)

10.3.43 Volume 5: Appendix CT-004-00000 provides details of the committed developments in the Davenport Green to Ardwick area that are assumed to have been implemented by 2025.

10.3.44 No committed developments have been identified in this study area that will materially alter the baseline conditions in 2025 for land quality.

Operation (2038)

10.3.45 Volume 5: Appendix CT-004-00000 provides details of the committed developments in the Davenport Green to Ardwick area that are assumed to have been implemented by 2038.

10.3.46 No committed developments have been identified in this study area that will materially alter the baseline conditions in 2038 for land quality.

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 will be applied to the construction of the Proposed Scheme and includes requirements to ensure the effective management and control of work in contaminated areas.

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

- methods to control noise, waste, dust, odour, gases and vapours (Sections 5, 7, 11, 13, 14 and 15);
- methods to control spillage and prevent contamination of adjacent areas (Sections 5, 11 and 16);
- the management of human exposure for both construction workers and people living and working nearby (Sections 5, 7, 11, 13 and 14);
- methods for the storage and handling of excavated materials (both contaminated and uncontaminated) (Sections 6, 7, 11 and 15);
- management of any unexpected contamination found during construction (Sections 11 and 15);
- a post-remediation permit to work system (Section 11);

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

- storage requirements for hazardous substances such as oil (Sections 5, 11 and 16);
- traffic management to ensure that there is a network of designated site haul routes to reduce compaction/degradation of soils (Sections 5, 6 and 14);
- methods to monitor and manage flood risk and other extreme weather events which may affect land quality during construction (Sections 5 and 16); and
- methods to manage discovery of unknown animal burial pits (Section 6).

10.4.3 The CoCP will require that prior to and during construction, a programme of further detailed investigations, which may include both desk based and site based work, takes place in order to confirm the full extent of areas of contamination. It also requires a risk assessment to be undertaken to determine what, if any, site specific remediation measures are required to allow the Proposed Scheme to be constructed safely and to prevent harmful future migration of contaminants. The investigation and assessment of potentially contaminated sites will be undertaken in accordance with Environment Agency's Land Contamination Risk Management (LCRM) framework[50], based on CLR11[51] and British Standards BS10175[52] and BS8576[53].

10.4.4 A remedial options appraisal will be undertaken to define the most appropriate remediation techniques. Where appropriate, this appraisal will be undertaken based on multi-criteria attribute analysis that considers environmental, resource, social and economic factors in line with the framework set out by the Sustainable Remediation Forum UK[54]. The preferred option will then be developed into a remediation strategy.

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

Assessment of impacts and effects

10.4.6 Construction of the Proposed Scheme in this area will require earthworks, utility diversions, deep foundations, tunnelling and other activities, including the construction of the retaining

[50] Environment Agency (2020), *Land Contamination Risk Management (LCRM).* Available online at: https://www.gov.uk/government/publications/land-contamination-risk-management-lcrm.

[51] Environment Agency (2004), *CLR11 Model Procedures for the Management of Land Contamination*. Available online at: http://webarchive.nationalarchives.gov.uk/20140328084622/http://cdn.environment-agency.gov.uk/scho0804bibr-e-e.pdf.

[52] British Standards Institution (2011), *BS10175:2011 Investigation of potentially contaminated sites. Code of practice (+A2:2017), Bsi.*

[53] British Standards Institution (2013), *BS8576 Guidance on investigations for ground gas – Permanent gases and Volatile Organic Compounds (VOCs).*

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

walls and road infrastructure works. These aspects of the Proposed Scheme, along with other construction features, are shown on the CT-05 Map Series in the Volume 2: MA07 Map Book.

Land contamination

10.4.7 In line with the assessment methodology, as set out in the SMR, an initial screening process has been undertaken to identify areas of current or historical contaminative use within the study area and to consider which of these areas might pose contaminative risks in relation to the Proposed Scheme. This includes areas with historical limestone mining activities. Sites that present a low risk have not been taken further in the assessment. Any moderate to higher risk sites have been taken forward to more detailed risk assessments, in which the potential risks are assessed more fully. All areas assessed are shown on maps LQ-01-322b to LQ-01-326a (Volume 5: Land quality Map Book) and those considered as potentially posing a risk in relation to the Proposed Scheme are labelled with a reference number (Site ID). In this report the site ID are presented as MA07-173 and on the related maps as 07-173.

10.4.8 In the Davenport Green to Ardwick area, 55 sites remain following initial screening to go through to detailed risk assessment and require CSM. The majority of the sites that have undergone the more detailed risk assessments are industrial or commercial sites.

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

- whether the site is located within the land required for the construction of the Proposed Scheme;
- the vertical profile of the Proposed Scheme in the vicinity of the site;
- the presence of underlying sensitive groundwater aquifers (Principal or Secondary A) or nearby watercourses; and
- the presence of adjacent residential properties or sensitive ecological receptors.

10.4.10 Clusters of potentially contaminated sites of a similar nature have been grouped and assessed together, where appropriate.

10.4.11 A simple summary of the baseline CSM is provided in Table 17. A more detailed assessment of baseline risk is provided in Volume 5: Appendix LQ-001-0MA07. The baseline risks quoted are those before any mitigation is applied. The assessed baseline risk is based on the information provided at the time of the assessment. Where limited information is available, the assessment is based on precautionary, worst case assumptions and may, therefore, report a higher risk than that which actually exists. A screening assessment of the effects of contamination has been completed by comparing the detailed CSM developed for potential contaminated areas at baseline with construction and post-construction stages. For clarity, ‘on-site’ means within the land required for the construction of the Proposed Scheme and ‘off-site’ refers to land beyond this boundary, but within the study area.

10.4.12 Not all sites referenced in Table 14 to Table 15 have been taken further in the assessment following the initial screening.

Table 17: Summary of baseline CSM for sites which may pose a contaminative risk in relation to the Proposed Scheme

Category	Site group/ID	Human health risk	Groundwater risk	Surface water risk	Ecosystem risk	Buildings risk
On-site	Former depots: MA07-173, MA07-182	Moderate/low to low	Very low to low	Low	N/A	Very low
On-site	Former and current laundries and former breweries: MA07-69, MA07-174, MA07-175, MA07-189, MA07-210	Moderate/low to low	Very low to low	Low	N/A	Very low
On-site	Former gas works: MA07-168	Moderate/low to low	Very low	N/A	N/A	Low
On-site	Former metal manufacturing and plating: MA07-185	Moderate/low to low	Very low to low	Low	N/A	Very low to low
On-site	Current tank and former/current fuel stations: MA07-179, MA07-186, MA07-206	Moderate/low to low	Very low to low	Low	N/A	Very low to moderate/low
On-site	Garage workshops: MA07-184	Moderate/low to low	Very low to low	Low	N/A	Very low
On-site	Former brick field: MA07-176	Moderate/low to low	Very low to low	Low	N/A	Very low
On-site	Electrical substation: MA07-183	Moderate/low to low	Very low	Low	N/A	Very low
On-site	Current and former railway land, tram depot and goods yard: MA07-41, MA07-45, MA07-92, MA07-166, MA07-167	Moderate/low to low	Very low to low	Moderate/ low	Very low to low	Very low to low
On-site	Former timber yards and sawmills: MA07-170, MA07-180, MA07-181	Moderate/low to low	Very low to low	Low	N/A	Low
On-site	Embankments; MA07-05, MA07-43	Moderate/low to low	Very low	Low	N/A	Low

Category	Site group/ID	Human health risk	Groundwater risk	Surface water risk	Ecosystem risk	Buildings risk
On-site	Mine shaft: MA07-202	N/A	Low to moderate/low	N/A	N/A	N/A
On-site	Waste transfer facility: MA07-203	Moderate/low to low	Very low to low	Low	N/A	Very low to low
Off-site	Former police and fire station and current hospital: MA07-42, MA07-77	Moderate/low to low	Very Low to low	Very low	N/A	Very low to low
Off-site	Current railway land and former tram depot: MA07-94, MA07-207	Moderate/low to low	Very low to low	Moderate/ low	N/A	Very low to low
Off-site	Former heavy industry and manufacturing sites: MA07-142, MA07-169, MA07-177, MA07-193, MA07-196	Moderate/low to low	Very low	Low	N/A	Very low to low
Off-site	Former engineering works: MA07-191, MA07-197	Moderate/low to low	Very low	Low	N/A	Low
Off-site	Current and former depots: MA07-160, MA07-165, MA07-171	Moderate/low to low	Very low to low	Low	N/A	Very low
Off-site	Current and former oil depots, fuel stations and tanks: MA07-40, MA07-47, MA07-71, MA07-139, MA07-152, MA07-161, MA07-205	Moderate/low to low	Very low to low	Very low to low	N/A	Moderate/low to low
Off-site	Scrap yard: MA07-178	Moderate/low to low	Very low	Low	N/A	Low
Off-site	Former timber yards: MA07-192, MA07-194	Moderate/low to low	Very low to low	Low	N/A	Very low to low
Off-site	Former cemetery: MA07-155	Moderate/low to low	Very low to low	N/A	N/A	Very low to low
Off-site	Embankment: MA07-36	Moderate/low to low	Low	Low	N/A	Very low to low
Off-site	Former farm: MA07-72	Moderate/low to low	Very low to low	Very low	N/A	Very low to low

Category	Site group/ID	Human health risk	Groundwater risk	Surface water risk	Ecosystem risk	Buildings risk
Off-site	Former laundry: MA07-208	Moderate/low to low	Very low to low	N/A	N/A	Very low to low

N/A means receptor/pathway not present.

Temporary effects

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

10.4.14 Where there is no change between the main baseline risk and the main construction risk, the temporary effect significance is deemed to be neutral even if the risk is deemed to be high. For example, this will be the case where the construction of the Proposed Scheme does not alter the risks from an existing potentially contaminated site that is off-site (i.e. outside the area required for construction).

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

10.4.16 All of the sites set out in Table 17 have been assessed for the change in impact associated with the construction stage of the work and were found to have no significant effects.

10.4.17 In the event that unexpected contamination is encountered during the construction of the Proposed Scheme in this area, this will be remediated as described in the draft CoCP resulting in an overall beneficial effect.

10.4.18 The application of the measures set out in the draft CoCP makes it unlikely that there will be significant adverse effects, but it is considered that there may still be some temporary minor adverse effects during the construction period from ground disturbance in these areas. These temporary minor adverse impacts at the construction stage are not regarded as significant in line with the methodology set out in the SMR.

10.4.19 Construction compounds located in this study area could include the storage of potentially hazardous substances, such as fuels and lubricating oils, and may also be used for temporary storage of potentially contaminated soils. Control and mitigation measures are contained within the draft CoCP including measures to manage the risks associated with the storage of such materials resulting in no significant effects.

Permanent effects

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

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

10.4.22 There are no post-construction stage significant effects identified in the study area.

Mineral resources

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

10.4.24 There are no MSA defined in the adopted minerals plan and so MSA are not considered as part of the assessment.

10.4.25 The Proposed Scheme will pass through a SPA.

Temporary effects

10.4.26 The following section outlines the potential temporary effects arising during the construction of the Proposed Scheme.

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

Petroleum Exploration and Development Licences/Hydrocarbons

10.4.28 The effect of construction of the Proposed Scheme on the identified SPA will be negligible as it is unlikely that construction of the Proposed Scheme would place a constraint on future exploitation of potential sources of shale gas or other forms of hydrocarbon resource.

Summary of temporary effects

10.4.29 Table 18 sets out a summary of the temporary effects identified for mineral resources.

Table 18: Summary of temporary effects for mineral resources

Mineral resource	Status	Description	Sensitivity/ value	Magnitude of impact	Effect and significance (Y/N)
Shale gas	SPA	SPA for shale gas	Medium	Negligible	Negligible (N)

10.4.30 There will be negligible temporary effects on the mineral resources, which are not significant.

Permanent effects

10.4.31 The following section outlines the potential permanent effects resulting from the construction of the Proposed Scheme.

Petroleum Exploration and Development Licences/Hydrocarbons

10.4.32 The permanent effects of the Proposed Scheme on the identified SPA will be negligible as it is unlikely that the Proposed Scheme would place a constraint on future exploitation of potential sources of shale gas or other forms of hydrocarbon resource. This is due to the large extent of the shale prospective area, and the limited area of land that will restrict potential well locations.

Summary of permanent effects

10.4.33 Table 19 sets out a summary of the permanent effects identified for mineral resources.

Table 19: Summary of permanent effects for mineral resources

Site name	Status	Description	Sensitivity/ value	Magnitude of impact	Effect and significance (Y/N)
Shale gas	SPA	SPA for shale gas	Medium	Negligible	Negligible (N)

10.4.34 There will be negligible permanent effects on the mining and mineral resources, which are not significant.

Other mitigation measures

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

10.4.36 Mitigation of the effects on mineral resources could include extraction of the resource within the land required for the construction of the Proposed Scheme adjacent to, rather than beneath the structural footprint of the Proposed Scheme. A plan will be discussed in

advance of the construction works with the landowner, the mineral planning department at MCC and any other relevant parties to assist in achieving an effective management of minerals within the affected locations.

Summary of likely residual significant effects

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

10.4.38 Where remediation at contaminated land sites is undertaken there may be significant beneficial residual effects.

Cumulative effects

10.4.39 Volume 5: Appendix CT-004-00000 sets out the committed developments that have been considered in the assessment of cumulative effects.

10.4.40 Based upon the review of committed development sites, it is assessed that there will be no significant cumulative effects arising from the construction of the Proposed Scheme with respect to land quality.

10.5 Effects arising from operation

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

Avoidance and mitigation measures

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

Assessment of impacts and effects

10.5.3 The Proposed Scheme within this area will include electrical substations and auto-transformer stations. These can, in principle, be a source of contamination through accidental discharge or leaks of coolant. However, in common with other modern infrastructure development, secondary containment appropriate to the level of risk will be included in the installed design.

10.5.4 The operation of the trains may give rise to minor contamination through leakage of hydraulic or lubricating oils. However, such leakage or spillage is expected to be very small and unlikely to result in significant contamination.

Other mitigation measures

10.5.5 No 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.

Cumulative effects

10.5.7 There are anticipated to be no significant cumulative residual effects from operation of the Proposed Scheme.

Monitoring

10.5.8 Volume 1, Section 9 sets out the general approach to environmental monitoring during operation of the Proposed Scheme. Requirements for monitoring will be determined as part of the investigation, treatment and validation of contamination on a site specific basis as part of the detailed design process. During the operational phase, monitoring works for groundwater and mine gas will continue, where required, depending on the site being considered.

11 Landscape and visual

11.1 Introduction

11.1.1 This section of the report presents the assessment of the likely significant landscape and visual effects within the Davenport Green to Ardwick 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 Greater Manchester Combined Authority (GMCA), Manchester City Council (MCC), Historic England and Natural England has been undertaken. The purpose of this engagement has been to discuss the assessment methodology, the extent of the landscape and visual study area, the extent of the landscape character boundaries and the locations of visual assessment and verifiable photomontage viewpoints.

11.1.4 Further details on the landscape and visual assessment, including engagement, baseline information and assessment findings, are presented in the Volume 5, Landscape and visual Map Book and Volume 5: Appendix LV-001-0MA07, which comprises the following:

- Part 1: Engagement with technical stakeholders;
- Part 2: Landscape character assessment;
- Part 3: Visual assessment;
- Part 4: Assessment matrices; and
- Part 5: References.

11.1.5 The Proposed Scheme is described in Section 2. The Volume 2: MA07 Map Book shows the locations of key environmental features (Map Series CT-10) and the key construction (Map Series CT-05) and operational (Map Series CT-06) features of the Proposed Scheme. It also shows the locations of landscape and visual impact mitigation measures (Map Series CT- 06), viewpoints that will be significantly affected at the construction (Map Series LV-03) and operation (Map Series LV-04) phases and landscape character areas (LCA) that will be significantly affected at the construction and operation phases (Map Series LV-02).

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

11.2 Scope, assumptions and limitations

11.2.1 The scope, key assumptions and limitations for the landscape and visual assessment are set out in full in Volume 1 (Section 8) and the EIA Scope and Methodology Report (SMR)[55].

11.2.2 Surveys were undertaken during the following periods to inform the landscape and visual assessment:

- summer surveys from July to September in 2017, 2018, 2019 and 2020; and
- winter surveys in February and March 2018, 2019, 2020 and 2021.

11.2.3 The extent of the study area has been informed by construction and operational phase zones of theoretical visibility (ZTV). The ZTV have been produced in line with the methodology described in the SMR and are an indication of the theoretical visibility of the Proposed Scheme. In some locations, extensive vegetation cover means that the actual extent of visibility will be substantially less than that shown in the ZTV, and professional judgement has been used to further refine the study area to focus on likely significant effects.

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

11.2.5 Landscape and visual receptors within 750m of the centreline of the route of the Proposed Scheme have been assessed as part of the study area. This reflects the limited ZTV available in this predominantly urban area. Long distance views of up to 1km have been considered within areas of open space.

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

11.2.7 Professional judgements on landscape value are provided in the baseline descriptions and judgements on susceptibility of the landscape to the Proposed Scheme and overall

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

landscape sensitivity are provided as part of the assessment of effects on each significantly affected LCA.

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

11.2.9 Within urban areas, it is assumed that on 'land returned to suitable development', construction compounds will be removed and hoardings retained.

11.2.10 It has been assumed that all vegetation within the land required for construction of the Proposed Scheme will be removed during construction unless stated otherwise. This excludes areas included only for the purpose of mitigation planting. Removed vegetation will be reinstated insofar as is reasonably practicable and would provide screening and integration benefits by year 15.

11.2.11 It has also been assumed that with respect to utilities and utility decommissioning, it is likely that the majority of existing vegetation can be retained. Vegetation will be removed along new utility lines, based on easement guidance from specific utility companies. All vegetation removed during utilities construction work will be reinstated insofar as is reasonably practicable. The assessment has been based on the assumption that any reinstatement planting will provide integration benefits by year 15. Works associated with underground utilities within highways will follow the principles set out in the draft Code of Construction Practice (CoCP)[56] and existing street trees and property boundary vegetation will be retained insofar as is reasonably practicable.

11.3 Environmental baseline

Existing baseline

Landscape baseline

11.3.1 The study area extends from the urban fringes of Manchester at Davenport Green and Manchester Airport in the south, to Manchester city centre in the north. The area is generally flat, with urban development overlying the natural landform. The area has its highest point at the southern end, near Newall Green, approximately 74m above Ordnance Datum (AOD). The ground falls away along the valley of the River Mersey to approximately 28m AOD at Northenden.

11.3.2 The south Manchester suburbs of Wythenshawe and Northenden are on gently undulating land, which drops northwards towards the Mersey Valley. In places, particularly near the River Mersey, the natural landform has been artificially modified, examples being the flood defences of the river and the road embankments of the M60. This part of the study area is crossed by several strategic east-west and north-south highways. These include the M60, the

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

M56 and other arterial routes connecting Manchester city centre, Davenport Green, Stockport and Altrincham. These largely residential neighbourhoods were built primarily during the 20th century, when Manchester's expansion radiated out from the city centre. Wythenshawe was planned and built along garden city principles in the 1920s and 1930s and comprises well-ordered, low density housing with generously proportioned gardens, and many public parks with mature vegetation.

11.3.3 The valley of the River Mersey is low-lying with gently sloping sides. The valley floor is largely occupied by recreational uses including golf courses, sports pitches, water parks and long-distance footpaths. Woodland in the valley includes areas around East Didsbury and stands of trees within the designed golf course landscapes of Northenden Golf Club, Withington Golf Club and Didsbury Golf Club. These areas of woodland soften the appearance of the surrounding built-up areas and screen the Mersey Valley from heavy traffic on the nearby highways creating a feeling of tranquillity, which contrasts with the adjoining built up neighbourhoods.

11.3.4 North of the Mersey Valley are the south Manchester suburbs of Withington, Didsbury and West Didsbury. This area has a high building density and is crossed by arterial routes and railways. The area is predominantly residential, including villas in leafy suburbs, 19th century workers' terraces and mid to late 20th century social housing, as well as more recent development. The area incorporates many street trees in avenues, gardens and parkland, as well as vegetation along the railway embankments and these contribute to its leafy suburban character.

11.3.5 Neighbourhoods close to the city centre, such as Ardwick and parts of West Gorton, are characterised by high-density built form, with areas of industrial and commercial development commonplace. These neighbourhoods, along with parcels of previously developed and degraded land and transport infrastructure, give the area its predominantly industrial character. Public open space is limited and there are few street trees. Recent redevelopment includes residential estates in Beswick, parts of West Gorton and Longsight. There is a strong visual connection between these neighbourhoods and the city centre, with prominent buildings, such as the Beetham Tower and Piccadilly Tower, seen on the skyline particularly along the wider arterial routes.

11.3.6 The LCA have been determined as part of an integrated process of environmental characterisation, informed by a review of historic mapping, historic landscape characterisation datasets and the outcome from other topics including ecological assessments. Use has been made of published landscape character assessments and a wide range of supporting Geographical Information Systems (GIS) data, aerial photography and Ordnance Survey mapping, plus desk study and fieldwork. Landscape character assessments reviewed include the relevant National Landscape Character Areas[57] and the Greater

[57] 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.

Manchester Landscape Character and Sensitivity Assessment Produced for GMCA[58] and Local Development Framework: Strategic Level City-Wide Urban Characterisation for Core Strategy[59].

11.3.7 These published LCA have been adapted for this assessment to provide LCA of an appropriate, consistent scale. Minor amendments have been made to some published LCA boundaries to reflect existing conditions, as verified on-site, or to draw out specific aspects susceptible to change from the Proposed Scheme.

11.3.8 For the purposes of this assessment, the study area for the Davenport Green to Ardwick area has been subdivided into 11 LCA. Full descriptions of these LCA are provided in Volume 5: Appendix LV-001-0MA07. Ten of the 11 LCA will not be significantly affected by the Proposed Scheme due to the presence of intervening built elements and vegetation and because the majority of the Proposed Scheme will pass through the area in tunnel.

11.3.9 A summary of the LCA that will be significantly affected within the Davenport Green to Ardwick area is shown in Figure 9 and described below.

11.3.10 In addition to the 11 LCA in this area, the Altrincham and Hale Urban Fringe Farmland LCA will be significantly affected by the Proposed Scheme. Part of this LCA is within the Davenport Green to Ardwick area; however, as it is located for the most part within the Hulseheath to Manchester Airport area (MA06), it is reported in Volume 2, Community Area report: Hulseheath to Manchester Airport (MA06).

11.3.11 Similarly, the Piccadilly, Ardwick, and West Gorton, Industrial and Infrastructure LCA will be significantly affected by the Proposed Scheme. Part of this LCA is within the Davenport Green to Ardwick area; however, as it is located for the most part within the Manchester Piccadilly Station area (MA08), it is reported in Volume 2, Community Area report: Manchester Piccadilly Station (MA08).

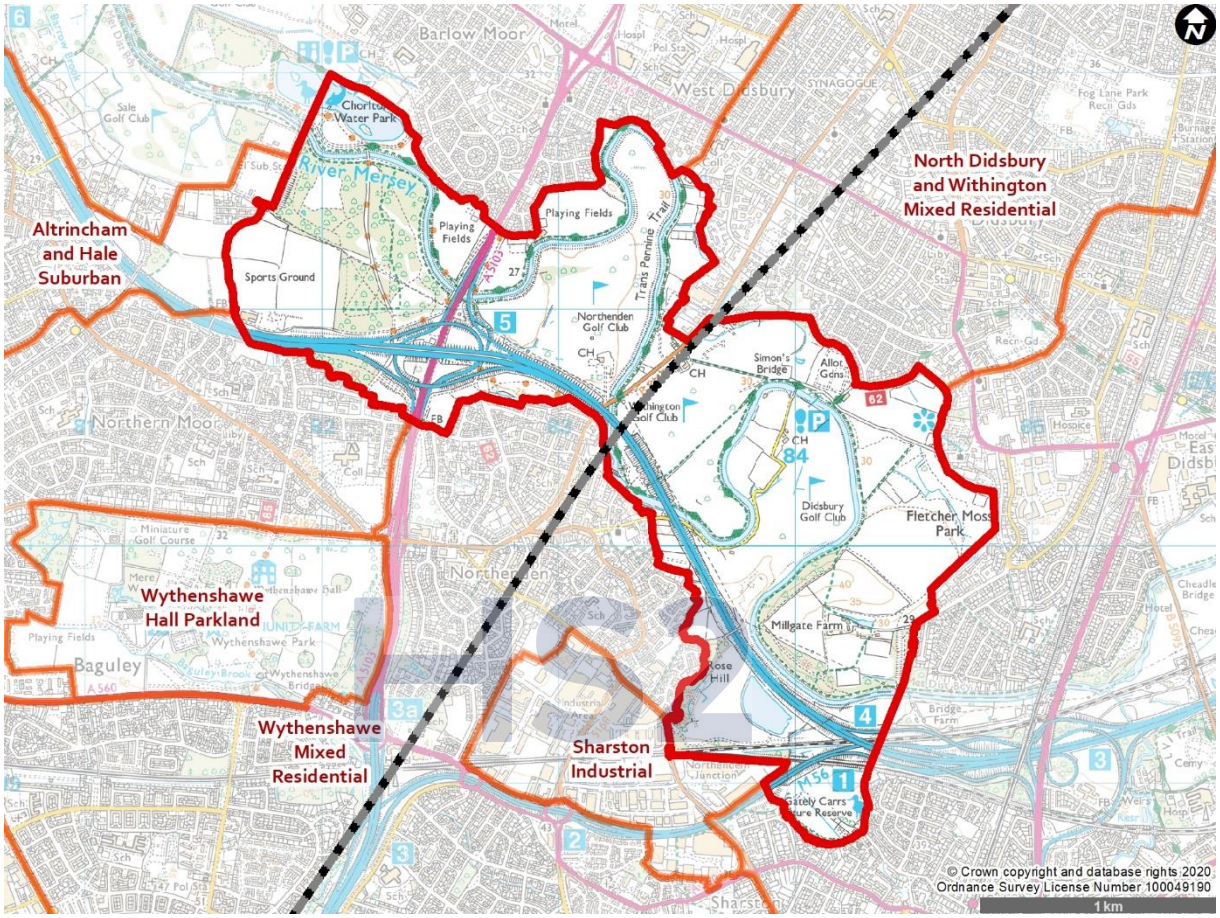
[58] LUC (on behalf of Greater Manchester Combined Authority) (2018), *Greater Manchester Landscape Character and Sensitivity Assessment*. Available online at: https://www.greatermanchester-ca.gov.uk/media/1727/greater-manchester-landscape-character-and-sensitivity-report.pdf.

[59] Manchester City Council (2010), *Local Development Framework: Strategic Level City-Wide Urban Characterisation for Core Strategy*. Available online at: https://www.manchester.gov.uk/download/downloads/id/15520/strategic_level_city-wide_urban_characterisation_for_core_strategy.

Significantly affected landscape character areas

Mersey Valley Managed Open Space

Figure 9: Mersey Valley Managed Open Space



11.3.12 The Mersey Valley Managed Open Space LCA occupies the length of the Mersey Valley between Northenden to the south and West Didsbury to the north. The LCA includes the flat valley bottom and its gently sloping sides. The predominant land use is recreation occurring on the highly manicured landscapes associated with the golf courses of the Northenden, Withington and Didsbury golf clubs as well as a series of formal playing fields. This recreational use contrasts with the surrounding built form and road infrastructure. There is an extensive network of well-used PRoW including the Trans Pennine Trail which follows the River Mersey. The River Mersey contributes to the scenic value of the LCA, although it is physically and visually separated from its floodplain by artificial flood banks on either side. Interwoven through and between the large open spaces of the LCA is a network of woodland belts and boundary vegetation. This, in combination with the flat terrain provides a sense of enclosure and screening and provides a buffer to the built form of the suburban areas to the north. The vegetation continues along both the M60 to the south and the B5167 Palatine Road which crosses the LCA in a north-south orientation. Although traffic can be heard within the LCA, overall, it has a feeling of relative tranquillity which is of value to its many

recreational users. Vegetation and footpaths are generally well-maintained. The LCA is influenced by the presence of the elevated structures of the A5103 Princess Parkway/Princess Road and the M60. Although the LCA is not built-up, typical urban artificial lighting is present in surrounding LCA.

11.3.13 The Mersey Valley Managed Open Space LCA is assessed as having an overall **medium-high** landscape value. This is based on its mosaic of managed open and wooded land and its recreational value, the latter being partly supported by a footpath network including long-distance trails adjacent to dense urban areas.

Visual baseline

11.3.14 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: MA07 Map Book, Map Series LV-03 and LV04). In each case, the middle number (xxx.**xx**.xxx) identifies the type of receptor that is present in this area – 1: Protected views (none within this area), 2: Residential, 3: Recreational[60], 4: Transport, 5: Hotels/healthcare/schools and 6: Employment.

11.3.15 Views experienced by occupants of residential properties are typically restricted by intervening buildings and other structures. For those living closer to Manchester city centre the dense urban grain tends to restrict and frame views, but from certain locations, such as on the edge of housing estates adjacent to open areas, visibility can be more open. Established trees, whether forming part of mature garden vegetation or growing in open spaces, filter the views experienced by residents in Newall Green, East Didsbury and Withington. Views are more open across the Mersey Valley from Didsbury and West Didsbury.

11.3.16 Recreational routes crossing the Davenport Green to Ardwick area are concentrated in the Mersey Valley. These include the Trans Pennine Trail; National Cycle Routes 6, 60 and 62; cycle routes promoted by MCC; and local PRoW. Views for users of recreational routes are relatively open, particularly when looking east and west along the Mersey Valley, although filtered by intervening vegetation in places. Elsewhere, cycle routes and PRoW pass through more built-up areas with views often restricted by intervening buildings.

11.3.17 Views experienced by transport users tend to be restricted by intervening buildings, structures and vegetation.

[60] 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.

Future baseline

Construction (2025)

11.3.18 Volume 5: Appendix CT-004-00000 provides details of the developments in the MA07 area that are assumed to have been implemented by 2025. The following committed developments of relevance to landscape and visual during construction in this area are set out in Table 20.

Table 20: Committed developments of relevance to landscape and visual during construction

Map book reference[61]	Planning reference/ Allocation reference	Description	How this is considered in the assessment
MA07/161	121232/P3OPA/2018	Location: Apex House, 266 Moseley Road, Manchester M19 2LH. Notification for Prior Approval for a proposed change of use of a building from office (Class B1a) to a 24 apartments (Class C3).	Informing future baseline.
MA07/469	125186/FO/2019	Location: Riverside Lodge, 208 Palatine Road, Manchester M20 2WF. Rooftop extension to Block A to form 4 x 2 bedroom apartments and provision of an additional 5 car parking spaces.	Informing future baseline.

11.3.19 Committed developments MA07/161 and MA07/469 have been included as part of the future baseline and considered within this assessment as they will introduce additional residential accommodation at Apex House, Moseley Road near to the Birchfields Road vent shaft and at Riverside Lodge along Palatine Road near to Palatine Road vent shaft, respectively. The additional receptors of MA07/161 are represented by viewpoint 337-02-00: view north-west from the B5093 Moseley Road, and for MA07/469 are represented by viewpoint 336-02-003: view south-west from Palatine Road.

Operation (2038)

11.3.20 In addition to the committed developments assumed to be fully built and in use by the time the Phase 2b construction starts in 2025 set out in Table 3, Volume 5: Appendix CT-004-00000 also provides details of the developments in the Davenport Green to Ardwick area that are assumed to have been implemented by 2038. No additional committed developments of relevance for landscape and visual have been identified that would materially alter the future baseline in this area.

[61] Volume 5: Planning Data/Committed Development Map Book: Maps CT-13-322b to CT-13-326a.

11.4 Temporary effects arising during construction

11.4.1 As is commonplace with major infrastructure works, the scale of the construction activities means that works will be visible from many locations and will have the potential to give rise to significant temporary effects that cannot practicably be mitigated. Such effects will vary over the construction period depending on the intensity and scale of the works at the time. The assessment of landscape and visual effects has been based on the activities occurring during the peak construction phase, which is defined as the period during which the main construction works will take place, including the presence of compounds, main earthworks and structure works.

11.4.2 The effects associated with the peak construction stage in this area are generally considered to be medium-term, based on the indicative construction programme in Section 2.3. Effects during other stages of works are likely to be less intensive due to less construction equipment being required at the time and a reduced intensity of construction activity.

11.4.3 Section 2.2 sets out the key permanent features of the Proposed Scheme and Section 2.3 describes the construction compounds and associated temporary works that have been considered in this assessment.

Avoidance and mitigation measures

11.4.4 Measures that have been incorporated into sections 12 and 14 of the draft CoCP to avoid or reduce landscape and visual effects, where reasonably practicable, during construction include the following:

- avoidance of unnecessary tree and vegetation removal, and protection of existing trees in accordance with BS 5837: Trees in relation to design, demolition and construction[62];
- use of well-maintained hoardings and fencing;
- prevention of damage to the landscape features adjacent to the construction sites due to movement of construction vehicles;
- designing lighting to avoid unnecessary intrusion onto adjacent buildings and other land uses; and
- replacement of any trees intended to be retained should they die as a consequence of nearby construction works.

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

[62] British Standards Institution (2012*), BS 5837:2012 Trees in relation to design, demolition and construction – Recommendations*.

Assessment of temporary impacts and effects

11.4.6 The most apparent changes to the landscape and to the views experienced by visual receptors during construction will relate to the presence of construction plant, compounds and soils and material storage and stockpiling. Key construction activities that will give rise to the most apparent changes to landscape and visual receptors are: the removal of trees and other vegetation; the addition of night time lighting; the construction of the tunnel portals; the construction of headhouses and vent shafts at Altrincham Road, Palatine Road, Wilmslow Road and Birchfields Road; demolition of commercial and residential properties; and earthworks associated with the construction of the replacement floodplain storage area.

11.4.7 Non-significant effects are reported in Volume 5: Appendix LV-001-0MA07.

Landscape assessment

11.4.8 The LCA set out in Table 21 will be significantly affected during construction of the Proposed Scheme.

Table 21: Summary description and assessment of effects on LCA

Location	Level of effect
Mersey Valley Managed Open Space The Mersey Valley Managed Open Space LCA of **medium-high** value will be directly affected by the construction activity associated with the construction of Palatine Road vent shaft and Palatine Road vent shaft auto-transformer station. Construction activity will be limited to a localised but central part of the LCA in the grounds of the Withington Golf Club. The removal of the established tree belt along the B5167 Palatine Road and the presence of hoardings around the Palatine Road vent shaft satellite compound will accentuate the prominence of the construction activity. The demolition of the Withington Golf Club clubhouse, removal of vegetation, creation of the replacement floodplain storage area, and activities in and around the Palatine Road vent shaft satellite compound including movement of traffic and tall construction plant will create a localised reduction in tranquillity. Due to the LCA's **medium-high** value, including relatively high levels of tranquillity, and open undeveloped nature facilitating high levels of recreational use, the landscape has a **medium-high** susceptibility to change arising from the Proposed Scheme. The removal of vegetation, building demolition and construction activities will result in a **medium** magnitude of change to the landscape. The **medium** magnitude of change for the Mersey Valley Managed Open Space LCA and its **medium-high** sensitivity will result in a **moderate** adverse significant effect.	**Moderate** adverse (significant)

Visual assessment

Introduction

11.4.9 The following section describes the likely significant effects on visual receptors during construction. The construction assessment has been undertaken for the winter period, in line with best practice guidance, to ensure a robust assessment. However, in some cases, visibility of construction activities may be reduced during summer when vegetation, if

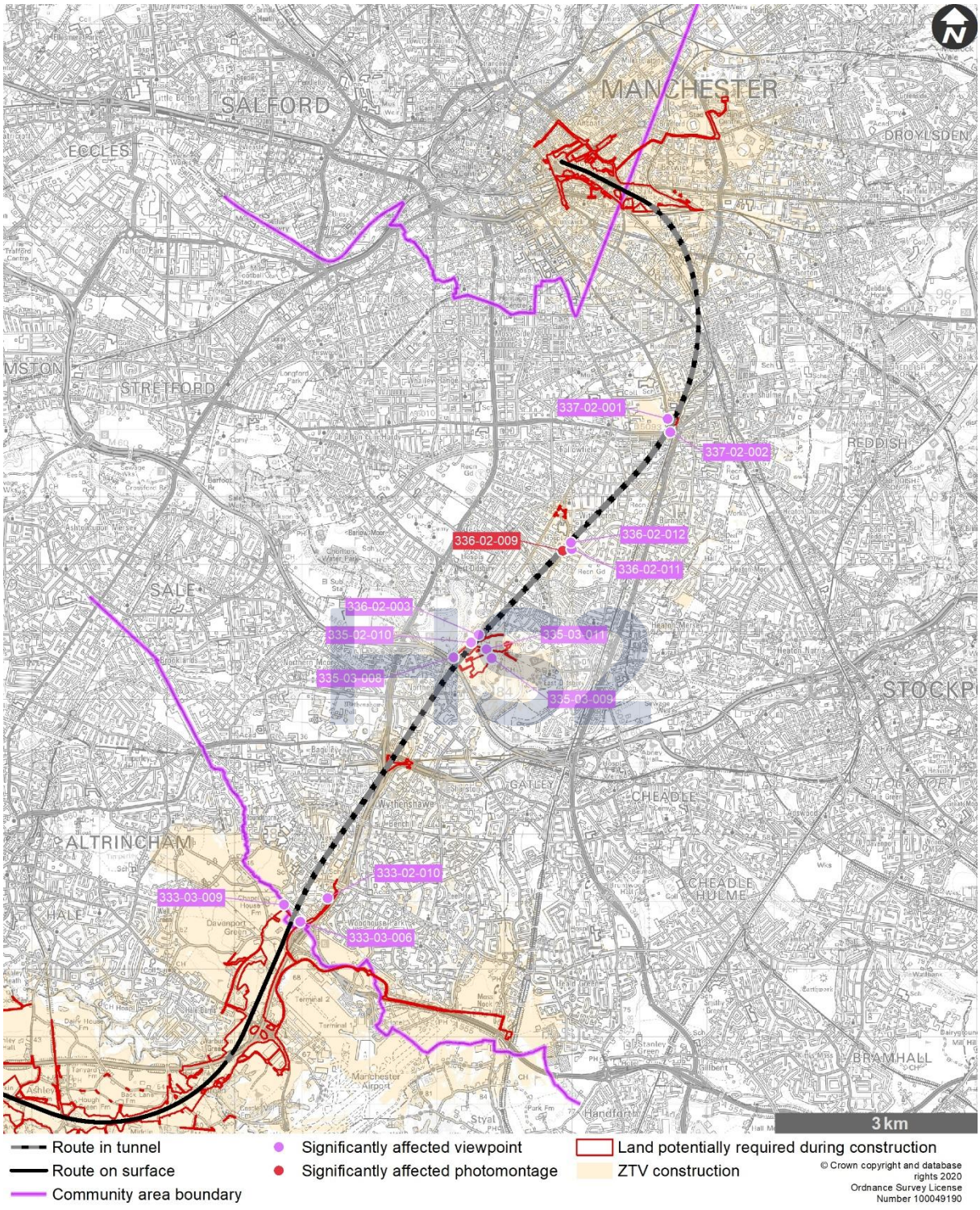
present in a view, will be in leaf. Where visual receptors are predicted to experience significant effects at night-time arising from additional lighting, these are also presented in this section.

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

11.4.11 The visual assessment has identified locations where continuous night working and/or overnight working during construction will result in significant effects on visual receptors (summarised in Table 22 and described in detail in Volume 5: Appendix LV-001-0MA07, Part 3).

11.4.12 Table 22 describes the construction phase potentially significant visual effects. Viewpoint locations are shown in Map Series LV-03 in the Volume 2 MA07 Map Book.

Table 22: Construction phase significant visual effects



View south-west from the embankment south of Newall Green (Medium-high sensitivity receptors) (VP 333-03-006)	Level of effect
Recreational users of the local green space of **medium-high** susceptibility and with **medium** value views will have middle distance views from an elevated location of large-scale construction work, including the movement of materials and tall construction plant and the removal of existing features. Some of the existing vegetation on the embankment will be removed to accommodate utility diversions works. Construction of Manchester tunnel south portal will be visible in the middle ground above temporary site hoardings as well as through gaps within and above the intervening vegetation on the embankment. Path users will experience views of large-scale construction plant and construction activities associated with the taller aspects of Manchester tunnel south portal, appearing above intervening vegetation. This will result in noticeable changes to key characteristics within the view. Due to the elevated position, the construction works will be visible across the majority of the view. The combination of the above will result in a **medium** magnitude of visual change. The **medium** magnitude of visual change and **medium-high** sensitivity will result in a **moderate** adverse significant effect.	**Moderate** adverse (significant)

View south from Davenport Green (Medium-high sensitivity receptor) (VP 333-03-009)	Level of effect
Recreational users of the local green space of **medium-high** susceptibility and with **medium** value views will experience near distance views of large-scale construction work, including the movement of materials and tall construction plant, removal of existing hedgerow features and construction of Manchester tunnel south portal in the foreground. To the south, the adjacent field boundary vegetation will be cleared during construction resulting in open visibility of the works. This will result in a substantial change to key characteristics of the view. The construction works will be visible across the majority of the view. This combination will result in a **high** magnitude of visual change. The **high** magnitude of visual change and **medium-high** sensitivity will result in a **major** adverse significant effect.	**Major** adverse (significant)

View east from the corner of Kennett Road and Heartwood Road (Medium-high sensitivity receptors) (VP 333-02-010)	Level of effect
Residents of **high** susceptibility and with **medium** value views will experience near and middle- distance views of large-scale works which will be clearly visible during construction. Construction works within the view associated with the Proposed Scheme will comprise modifications to existing utilities which will include the removal of existing vegetation which currently screens the adjacent M56. This will open up views towards large-scale road infrastructure and a high volume of fast moving vehicles. Construction works will be visible in proximity to residential properties and across the majority of the view. The combination of the above will result in a **high** magnitude of visual change. The **high** magnitude of visual change and **medium-high** sensitivity will result in a **moderate** adverse significant effect.	**Moderate** adverse (significant)

View north-east from the B5167 Palatine Road, the Mersey Path and Footpath Manchester 139 (Medium sensitivity receptor) (VP 335-03-008)	Level of effect
Footpath users of **high** susceptibility and with **medium-low** value views will experience large-scale construction works associated with Palatine Road vent shaft and Palatine Road vent shaft auto-transformer station in the middle ground and background above and through existing vegetation. Construction traffic on the B5167 Palatine Road will be visible in the foreground. Much of the dense foreground vegetation along the boundary of Withington Golf Club golf course will remain and will largely continue to obscure the existing pylon, and construction activities. Beyond the immediate foreground section, large areas of the existing vegetation will be removed along the boundary of Palatine Road vent shaft satellite compound, opening up the middle ground and views beyond. Visible activities will include the movement of materials, the use of tall construction plant, clearance of further vegetation and other site features, as well as the construction of the emerging Palatine Road vent shaft headhouse and Palatine Road vent shaft auto-transformer station. For recreational users of the Mersey Path, Footpath Manchester 139 and the neighbouring Northenden Golf Club, visibility of the Proposed Scheme will be filtered by the remaining vegetation along the B5167 Palatine Road. The combination of the above will result in a **medium** magnitude of visual change. The **medium** magnitude of visual change and **medium** sensitivity will result in a **moderate** adverse significant effect.	**Moderate** adverse (significant)

View north-west from Footpath Manchester 139, Footpath Manchester 212 and the River Mersey (High sensitivity receptor) (VP 335-03-009)	Level of effect
Footpath users of **high** susceptibility and with **medium-high** value views will see large-scale construction works in the foreground and background. These construction works will include the movement of materials and tall construction plant and the removal of existing features associated for the construction of Palatine Road vent shaft and Palatine Road vent shaft auto-transformer station. The works will include the demolition of Withington Golf Club clubhouse and the removal of vegetation and car park hardstanding. The removal of vegetation will open up views of construction activity associated with the replacement floodplain storage area in the near and middle distance and users of Footpath Manchester 212 will be temporarily diverted south-eastwards along the boundary of the replacement floodplain storage area. Construction activities associated with the Palatine Road vent shaft will be visible in the far distance, beyond retained, intermittent mature vegetation of the Withington Golf Club golf course and partially obscured by site hoardings. The removal of vegetation and demolition of the Withington Golf Club clubhouse will open up distant views towards the B5167 Palatine Road. Together these will result in noticeable changes to key characteristics within the view. The combination of the above will result in a **medium** magnitude of visual change. The **medium** magnitude of visual change and **high** sensitivity will result in a **moderate** adverse significant effect.	**Moderate** adverse (significant)

View south from the B5167 Palatine Road and Footpath Manchester 211 (Medium-high sensitivity receptor) (VP 335-02-010)	Level of effect
Residents of **high** susceptibility and footpath users of lower susceptibility with **medium** value views will experience large-scale construction works in near-distance views associated with Palatine Road vent shaft and Palatine Road vent shaft auto-transformer station, including the movement of materials and construction vehicles travelling along the B5167 Palatine Road.	**Major** adverse (significant)

View south from the B5167 Palatine Road and Footpath Manchester 211 (Medium-high sensitivity receptor) (VP 335-02-010)	Level of effect
Part of Footpath Manchester 211, adjacent to the existing Withington Golf Club clubhouse, will be temporarily diverted. In the near distance, the removal of existing vegetation that currently borders the eastern side of the B5167 Palatine Road and the demolition of the Withington Golf Club clubhouse will open up views towards Palatine Road vent shaft satellite compound. Visibility of the construction activity will be clear and open from the B5167 Palatine Road and Footpath Manchester 211. Intervening vegetation and features will partially filter some views from the residential properties but the removal of other vegetation within Withington Golf Club golf course will be apparent above site hoardings and beyond the temporary storage and car park facilities. This will result in substantial changes to key characteristics across the majority of the view. The combination of the above will result in a **high** magnitude of visual change. The **high** magnitude of visual change and **medium-high** sensitivity will result in a **major** adverse significant effect.	
Night-time effects: The presence of the Palatine Road vent shaft satellite compound to the south will add further light spill beyond the B5167 Palatine Road street lighting and intensify sky glow in the surrounding area. The controls on light spill set out in the draft CoCP will limit the change these new light sources introduce to the wider view, but the extent of the new lighting will result in a **medium** magnitude of visual change. This, combined with a **medium-high** sensitivity will result in a **moderate** adverse significant effect.	**Moderate** adverse (significant)

View west from Footpath Manchester 211 and Withington Golf Club golf course (High sensitivity receptor) (VP 335-03-011)	Level of effect
Footpath users of **high** susceptibility, and visitors to Withington Golf Club of lower susceptibility, and with **medium-high** value views will experience large-scale construction works in the middle and far distance, including the movement of materials and tall construction plant, and removal of existing features close to Palatine Road vent shaft and Palatine Road vent shaft auto-transformer station. Construction activity will be apparent above and through gaps in intervening Withington Golf Club golf course vegetation. Activities will include site clearance, including the removal of vegetation, works to demolish the clubhouse at Withington Golf Club and to the south, activity associated with the replacement floodplain storage area. The construction and use of the temporary Palatine Road vent shaft satellite compound will also be visible. The footpath will be used during the construction processes to access the area identified for mitigation planting to the east (not within the view). This will result in noticeable changes to key characteristics within the view. The combination of the above will result in a **medium** magnitude of visual change. The **medium** magnitude of visual change and **high** sensitivity will result in a **moderate** adverse significant effect.	**Moderate** adverse (significant)

View south-west from the B5167 Palatine Road (Medium-high sensitivity receptor) (VP 336-02-003)	Level of effect
Residents of **high** susceptibility and with **medium** value views will experience the loss of existing vegetation along the B5167 Palatine Road in the near distance as well as large-scale construction works in the middle and far distance, including the movement of materials and tall construction plant associated with the construction of Palatine Road vent shaft and auto-transformer station. Receptors looking south, including those at Ashfield Lodge, will see the	**Moderate** adverse (significant)

View south-west from the B5167 Palatine Road (Medium-high sensitivity receptor) (VP 336-02-003)	Level of effect
removal of vegetation to make way for a temporary access track leading to areas of new woodland habitat creation. This will be accessed via the B5167 Palatine Road and will cut through the middle of existing woodland planting between Ashfield Lodge and Withington Golf Club golf course. The visibility of the main construction activity will be partially filtered by the intervening vegetation within the property boundaries to the west of the B5167 Palatine Road and retained vegetation in Withington Club golf course. The combination of the above will result in a **medium** magnitude of visual change. The **medium** magnitude of visual change and **medium-high** sensitivity will result in a **moderate** adverse significant effect.	
Night-time effects: The B5167 Palatine Road is lit by street lighting and, to the west, by lighting from private properties, with an unlit area of golf course to the east. Residential receptors views are relatively well screened by existing garden vegetation. However, the presence of the Palatine Road vent shaft satellite compound will intensify sky glow in the surrounding area. The controls on light spill set out in the draft CoCP will limit the change these new light sources introduce to the wider view, but the extent of the new lighting will result in **medium** magnitude of visual change, together with a **medium-high** sensitivity will result in a **moderate** adverse significant effect.	**Moderate** adverse (significant)

View north-east from B5093 Wilmslow Road (Medium-high sensitivity receptors) (VP 336-02-009)	Level of effect
Residents of **high** susceptibility with **medium** value view will experience large-scale construction works in the middle distance and clear, direct views of construction traffic accessing the site via the B5093 Wilmslow Road in the near distance. To the north, beyond the junction with Ferndene Road, views of The Christie Hospital Car Park D will be replaced by construction hoarding. Construction activities at Wilmslow Road vent shaft satellite compound will be visible above the site hoarding and include the demolition and removal of existing site features and trees, the movement of tall construction plant and materials as well as the emerging vent shaft headhouse. Removal of some of the mature trees will change key characteristics of the view, allowing properties to be seen in the distance which otherwise would be screened. This will result in substantial changes to key characteristics within the view at near distance. The combination of the above will result in a **high** magnitude of visual change. The **high** magnitude of visual change and **medium-high** sensitivity will result in a **moderate** adverse significant effect. A photomontage illustrating the scenario is included Volume 5: Appendix LV-001-0MA7, Part 3.	**Moderate** adverse (significant)

View west from Lynway Drive (Medium-high sensitivity receptors) (VP 336-02-011)	Level of effect
Residents of **high** susceptibility and with **medium** value views will experience large-scale construction works in proximity to the properties. Construction activity will be visible over the boundary wall and rear gardens as well as through gaps between buildings on Lynway Drive. Construction works associated with the Wilmslow Road vent shaft satellite compound will include the movement of materials, tall construction plant and the removal of existing	**Moderate** adverse (significant)

View west from Lynway Drive (Medium-high sensitivity receptors) (VP 336-02-011)	Level of effect
features. Due to site clearance of the eastern boundary vegetation within The Christie Hospital Car Park D, views for residents will be more open towards construction activities. For residents overlooking the Wilmslow Road vent shaft satellite compound, this will result in substantial changes to key characteristics within the view in proximity to properties. The combination of the above will result in a **high** magnitude of visual change. The **high** magnitude of visual change and **medium-high** sensitivity will result in a **moderate** adverse significant effect.	
Night-time effects: Existing artificial lighting associated with the urban area is visible throughout the view. The additional night-time lighting required for the Wilmslow Road vent shaft compound will intensify the existing light spill to neighbouring properties and sky glow resulting in a noticeable change in the characteristics of the existing view. The controls on light spill set out in the draft CoCP will limit the change these new light sources introduce to the wider view, but the extent of the new lighting will result in a **medium** magnitude of visual change, together with a **medium-high** sensitivity will result in a **moderate** adverse significant effect.	**Moderate** adverse (significant)

View south-west from Parkville Road (Medium-high sensitivity receptor) (VP 336-02-012)	Level of effect
Residents of **high** susceptibility and with **medium** value views will experience large-scale construction works in proximity to the properties at the western end of Parkville Road with direct views over rear gardens and boundary fencing. For residents in properties not immediately adjacent to The Christie Hospital Car Park D, construction activities will be visible through gaps between buildings and where garden vegetation is absent. Demolition and site clearance will result in the removal of existing trees within The Christie Hospital Car Park D and this will allow views of the movement of site vehicles, tall construction plant activity, and the construction of the emerging Wilmslow Road vent shaft headhouse. For residents overlooking the Wilmslow Road vent shaft satellite compound, this will result in substantial changes to key characteristics within the view in proximity to properties. The combination of the above will result in a **high** magnitude of visual change. The **high** magnitude of visual change and **medium-high** sensitivity will result in a **moderate** adverse significant effect.	**Moderate** adverse (significant)
Night-time effects: Existing artificial lighting associated with the urban area is visible throughout the view. The additional night-time lighting required for the Wilmslow Road vent shaft compound will intensify the existing light spill to neighbouring properties and sky glow resulting in a noticeable change in the characteristics of the existing view. The controls on light spill set out in the draft CoCP will limit the change these new light sources introduce to the wider view, but the extent of the new lighting will result in a **medium** magnitude of visual change. The **medium** magnitude of visual change together with a **medium-high** sensitivity will result in a **moderate** adverse significant effect.	**Moderate** adverse (significant)

View east from Footpath Manchester 156 and the A34 Birchfields Road (Medium-high sensitivity receptors) (VP 337-02-001)	Level of effect
Residents of **high** susceptibility and with **medium** value views, and footpath users of lower susceptibility, will experience large-scale construction works in the middle distance, including the movement of materials and tall construction plant, and the removal of existing features	**Moderate** adverse (significant)

View east from Footpath Manchester 156 and the A34 Birchfields Road (Medium-high sensitivity receptors) (VP 337-02-001)	Level of effect
associated with the construction of Birchfields Road vent shaft and Birchfields Road vent shaft auto-transformer station. Construction traffic accessing the Birchfields Road construction compound will be seen travelling along the A34 Birchfields Road in the foreground. Site hoardings enclosing the Birchfield Road vent shaft satellite compound area will be seen on the other side of the A34 Birchfields Road in place of Fallowfield Retail Park, and elevated structures will form a prominent detracting, but temporary, element. Views of construction activity from Footpath Manchester 156 will be largely screened by site hoardings. This will result in a substantial change to features in the middle distance. Residents of this part of the A34 Birchfields Road will have clear and direct views of construction activity. The combination of the above will result in a **high** magnitude of visual change. The **high** magnitude of visual change and **medium-high** sensitivity will result in a **moderate** adverse significant effect.	
Night-time effects: The A34 Birchfields Road and the existing Fallowfield Retail Park are currently lit and artificial lighting associated with the surrounding urban area is prevalent. The additional night-time lighting required for the Birchfields Road vent shaft satellite compound will intensify the existing light spill and sky glow resulting in a noticeable change in the characteristics of the view. The controls on light spill set out in the draft CoCP will limit the change these new light sources introduce to the wider view, however the proximity to the additional lighting will result in a **medium** magnitude of change. The **medium** magnitude of visual change and **medium-high** sensitivity will result in a **moderate** adverse significant effect.	**Moderate** adverse (significant)

View north-east from A34 Birchfields Road (Medium-high sensitivity receptors) (VP 337-02-002)	Level of effect
Residents of **high** susceptibility and with **medium** value views will experience large-scale construction activity in the far distance, including the movement of materials and tall construction plant and the removal of existing features close to Birchfields Road vent shaft and Birchfields Road vent shaft auto-transformer station. Construction traffic accessing the Birchfields Road vent shaft satellite compound will be seen travelling along the A34 Birchfields Road in the foreground. Site hoardings enclosing the Birchfield Road vent shaft satellite compound will be seen on the far side of the A34 Birchfields Road instead of the current view of the northern end of the Fallowfield Retail Park. Street trees and a fast food restaurant at the southern end of Fallowfield Retail Park will partly obscure construction activity. The presence of construction activity will result in a noticeable change to features in the background. Residents and road users will experience filtered oblique views towards the site and the associated construction activities, including views of elevated construction machinery. The combination of the above will result in a **medium** magnitude of visual change. The **medium** magnitude of visual change and **medium-high** sensitivity will result in a **moderate** adverse significant effect.	**Moderate** adverse (significant)
Night-time effects: The additional night-time lighting required for the Birchfields Road vent shaft satellite compound will intensify existing sky glow although this will be viewed in the context of existing lighting features. The controls on light spill set out in the draft CoCP will limit the change these new light sources introduce to the wider view, but the extent of the new lighting	**Moderate** adverse (significant)

View north-east from A34 Birchfields Road (Medium-high sensitivity receptors) (VP 337-02-002)	Level of effect
will result in a **medium** magnitude of visual change**.** The **medium** magnitude of visual change and **medium-high** sensitivity will result in a **moderate** adverse significant effect.	

Other mitigation measures

11.4.13 No further mitigation measures are considered reasonably practicable during construction. Not all landscape and visual effects can be mitigated due to the visibility of construction activity and the sensitivity of surrounding receptors.

11.4.14 However, consideration will be given during the detailed design stage to where mitigation planting can be established early in the construction programme to help achieve landscape integration or visual screening at an earlier time.

Summary of likely residual significant effects

11.4.15 The temporary residual significant effects during construction remain as described above. These effects will be temporary and reversible in nature lasting only for the duration of the construction works. These residual effects will generally arise from the widespread presence of construction activity and construction plant within the landscape and viewed by surrounding residents, pedestrians, road users and people at commercial and institutional premises within the study area.

11.4.16 The significant effects that will remain after implementation of construction phase mitigation are summarised below:

- moderate adverse effects in relation to one LCA;
- major adverse visual effects at one representative residential viewpoint location;
- major adverse visual effects at one representative recreational viewpoint location;
- moderate adverse visual effects at seven representative residential viewpoint locations;
- moderate adverse visual effects at four representative recreational viewpoint locations; and
- moderate adverse night-time visual effects at six representative residential viewpoint locations.

Cumulative effects

Cumulative landscape effects

11.4.17 No significant cumulative temporary effects during construction are anticipated.

Cumulative visual effects

11.4.18 No significant cumulative temporary effects during construction are anticipated.

11.5 Permanent effects arising from operation

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

Avoidance and mitigation measures

11.5.2 The operational assessment of impacts and effects is based on year 1 (2038), year 15 (2053) and year 30 (2068) of the Proposed Scheme. A process of iterative design and assessment has been employed, and is ongoing, to avoid or reduce adverse effects during the operation of the Proposed Scheme. Measures that will be integrated into the design of the Proposed Scheme include:

- the Proposed Scheme will be predominantly in tunnel as it passes through the Davenport Green to Ardwick area;
- landscape mitigation planting to screen views of headhouses associated with Altrincham Road vent shaft, Palatine Road vent shaft, Wilmslow Road vent shaft and Birchfields Road vent shaft;
- landscape mitigation planting to screen views of Manchester tunnel south portal auto-transformer station, Palatine Road vent shaft auto-transformer station, Birchfields Road vent shaft auto-transformer station and Midland Street sectioning auto-transformer station;
- compensatory planting in areas of loss, such as mitigation planting at Palatine Road vent shaft, using the same species composition, planting types and appropriate planting density, where reasonably practicable. The planting will also provide habitat and historic landscape feature connectivity, as well as enhance landscape/green infrastructure connectivity and will soften embankments and viaduct abutments; and
- hedgerow replacement in areas of loss to restore connectivity and landscape pattern, where reasonably practicable, and using an appropriate palette of species to tie the Proposed Scheme mitigation into the wider landscape.

Assessment of impacts and effects

11.5.3 The likely effects on landscape and visual receptors during operation of the Proposed Scheme relate to the presence of new structures and elements in the landscape including:

- Manchester tunnel south portal, a portal building, a rescue area, Manchester tunnel south portal auto-transformer station and a railway telecommunications mast;
- Altrincham Road vent shaft headhouse and ancillary features such as access, fencing and lighting;
- Palatine Road vent shaft headhouses, Palatine Road vent shaft auto-transformer station and ancillary features such as access, fencing and lighting;

- Wilmslow Road vent shaft headhouse and ancillary features such as access, fencing and lighting;
- Birchfields Road vent shaft headhouse, Birchfields Road vent shaft auto-transformer station and ancillary features such as access, fencing and lighting;
- Manchester tunnel north portal, Ardwick box structure, Ardwick North cutting retaining wall and Ardwick South cutting retaining wall;
- Manchester to Leeds embankment, Northern Powerhouse Rail Manchester to Leeds junction and Midland Street sectioning auto-transformer station;
- road closures and/or realignments of the A665 Midland Street, Hooper Street, the A665 Chancellor Lane and Glenbarry Street; and
- the presence of cleared urban land referred to as sites to be 'returned to suitable development use'.

11.5.4 Non-significant effects are reported in Volume 5: Appendix LV-001-0MA07.

Landscape assessment

11.5.5 The LCA described in Table 23 will be significantly affected during operation of the Proposed Scheme.

Table 23: Operational phase significant landscape effects

Location	Level of effect
Mersey Valley Managed Open Space	
Year 1: This LCA will be directly affected by the introduction of Palatine Road vent shaft headhouses and Palatine Road vent shaft auto-transformer station. These new structures will replace the existing clubhouse of Withington Golf Club and the associated car park. This change, together with the loss of an adjoining block of established vegetation along B5167 Palatine Road, which will be removed during construction, will result in a noticeable change in some key components of the immediate landscape. Landscape mitigation planting will be immature and not established enough to provide any integration of Palatine Road vent shaft and Palatine Road vent shaft auto-transformer station. Due to its **medium-high** value, including relatively high levels of tranquillity, together with the open undeveloped nature facilitating high levels of recreational use, the landscape has a **medium-high** susceptibility to change arising from the Proposed Scheme. The introduction of uncharacteristic built form, and replacement of mature vegetation with younger planting will result in a **medium** magnitude of change to the landscape. The **medium** magnitude of change for the Mersey Valley Managed Open Space and its **medium-high** sensitivity will result in a **moderate** adverse significant effect.	**Moderate** adverse (significant)
Year 15 and year 30: Effects will reduce to non-significant for year 15 and remain so for year 30 due to the growth and maturity of the landscape mitigation planting, which will help integrate the Proposed Scheme into its landscape setting (reported in detail in Volume 5).	Non-significant

Visual assessment

Introduction

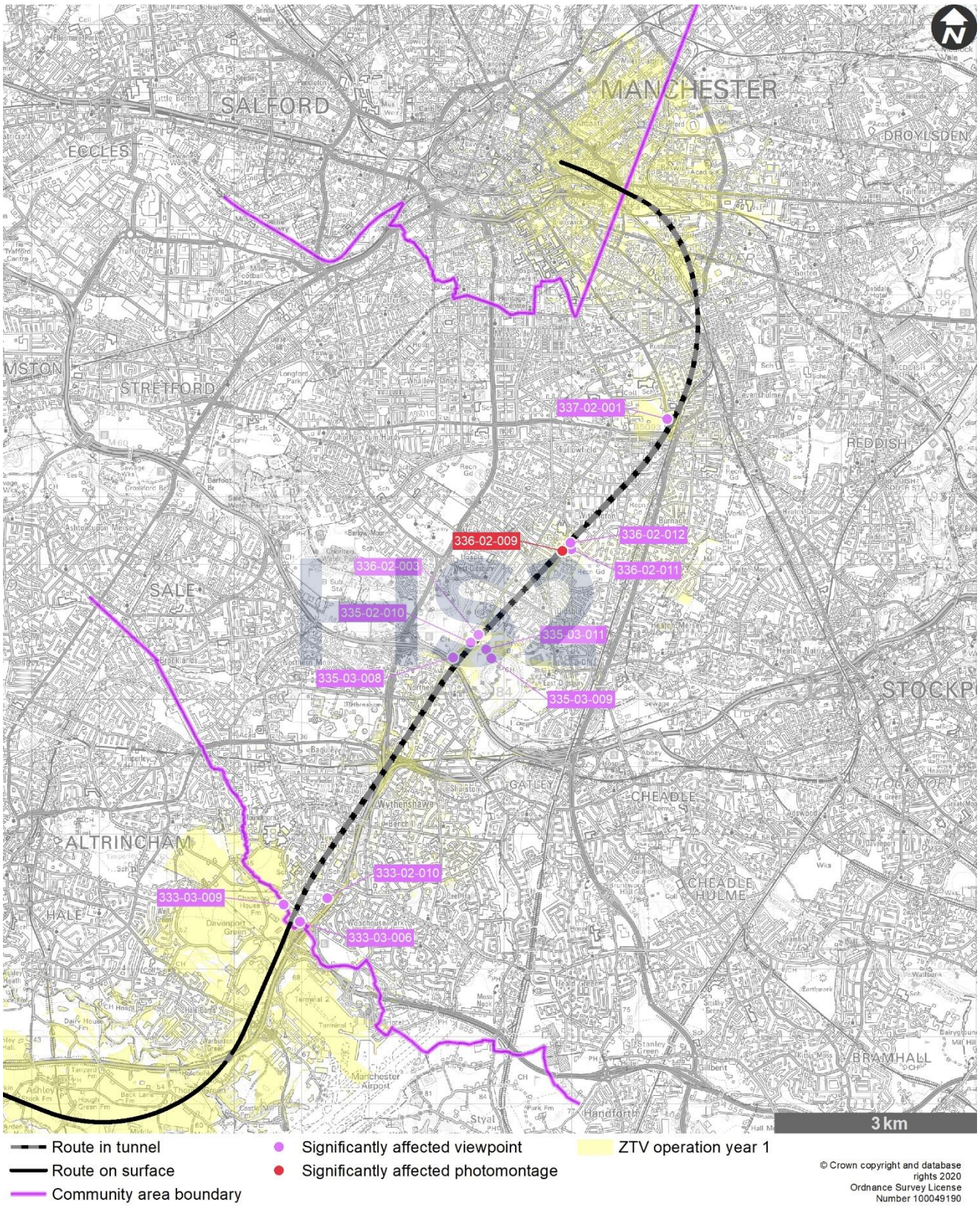
11.5.6 The following section describes the likely significant effects on visual receptors during operation in the winter and summer of year 1 and in the summer of both year 15 and year 30. The year 1 assessment includes the winter period, in line with best practice guidance, to ensure a robust assessment. In some cases, visibility of the operational Proposed Scheme may be reduced during summer when vegetation, if present in a view, will be in leaf. Where visual receptors are predicted to experience significant effects at night-time arising from additional lighting, these are also presented in this section.

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

11.5.8 The assessment has not identified any locations within this study area where additional lighting during operation will result in significant visual effects at night.

11.5.9 Table 24 identifies the locations where the operation of the Proposed Scheme will potentially result in significant effects. Viewpoint locations are shown in Map Series LV-04 in the Volume 2: MA07 Map Book.

Table 24: Operation phase significant visual effects



View south-west from the embankment south of Newall Green (Medium-high sensitivity receptors) (VP 333-03-006)	
Year 1 – winter and summer: Recreational users of the local green space of **medium-high** susceptibility and with **medium** value views will experience substantial changes to middle distance views. Existing views over an open field with hedgerows and mature woodland beyond will be replaced by infrastructure elements, including Manchester tunnel south portal auto-transformer station and Manchester tunnel south portal beyond immature landscape mitigation planting. The removal of existing mature vegetation during the construction stage, including that in the foreground to accommodate utilities works, will reduce screening and open up views. Where vegetation is removed, recreational users will have open views of the Proposed Scheme including Manchester tunnel south portal building, access roads to Manchester tunnel south portal auto-transformer station and Thorley Lane overbridge. Newly planted landscape mitigation planting at this stage will not provide any screening or integration. The majority of infrastructure associated with the Proposed Scheme will be seen in the middle ground with the Thorley Lane overbridge and its associated earthworks in the background. As a result of the removal of vegetation, the M56 slip roads will be more apparent in the view. This will result in a substantial change to the composition of the view. In summer, the dense foliage of retained vegetation will partially enclose westward views towards the Proposed Scheme. The combination of the above will result in a **medium** magnitude of visual change. The **medium** magnitude of visual change and **medium-high** sensitivity will result in a **moderate** adverse significant effect.	Level of effect: **Moderate** adverse (significant)
Year 15 and year 30 – summer: Effects will reduce to non-significant for year 15 and remain so for year 30 due to the growth and maturity of the landscape mitigation planting (reported in detail in Volume 5).	Level of effect: Non-significant

View south from Davenport Green (Medium-high sensitivity receptors) (VP 333-03-009)	
Year 1 – winter and summer: Recreational users of the local green space of **medium-high** susceptibility and with **medium** value views will experience middle distance views of Manchester tunnel south portal auto-transformer station and Manchester tunnel south portal beyond the immature landscape mitigation planting. The removal of existing mature vegetation at the construction stage will reduce screening and allow open views to the south. Recreational users of the local green space will have views of the Proposed Scheme including Manchester tunnel south portal building, access roads to Manchester tunnel south portal auto-transformer station and Thorley Lane overbridge. Landscape mitigation planting at this stage will not be sufficiently established to provide any screening or integration. The majority of infrastructure associated with the Proposed Scheme will be seen in the middle ground with the Thorley Lane over bridge and its associated earthworks in the background. This will result in a substantial change to the composition of the view. The combination of the above will result in a **high** magnitude of visual change. The **high** magnitude of visual change and **medium-high** sensitivity will result in a **moderate** adverse significant effect.	Level of effect: **Moderate** adverse (significant)
Year 15 and year 30 – summer: Effects will reduce to non-significant for year 15 and remain so for year 30 due to the growth and maturity of the landscape mitigation planting (reported in detail in Volume 5).	Level of effect: Non-significant

View east from the corner of Kennett Road and Heartwood Road (Medium-high sensitivity receptors) (VP 333-02-010)	
Year 1 – winter and summer: Residents of **high** susceptibility and with **medium** value views will see immature replacement mitigation planting in the near and middle distance. The M56 and associated structures will be clearly visible in proximity to residential properties and across the majority of the view as a result of the vegetation clearance for utilities during the construction stage. The combination of the above will result in a **high** magnitude of visual change. The **high** magnitude of visual change and **medium-high** sensitivity will result in a **moderate** adverse significant effect.	Level of effect: **Moderate** adverse (significant)
Year 15 and year 30 – summer: Effects will reduce to non-significant for year 15 and remain so for year 30 due to the growth and maturity of the landscape mitigation planting (reported in detail in Volume 5).	Level of effect: Non-significant

View north-east from B5167 Palatine Road, the Mersey Path and Footpath Manchester 139 (Medium sensitivity receptor) (VP 335-03-008)	
Year 1 – winter and summer: Users of the footpaths of **high** susceptibility and with **medium-low** value views will have middle and far distance, framed views along the B5167 Palatine Road of Palatine Road vent shaft headhouses and Palatine Road vent shaft auto-transformer station plus a wider view of the Withington Golf Club golf course due to the removal of vegetation during construction. As a consequence, the sense of enclosure will no longer be available. Newly planted landscape mitigation planting will not provide any screening or integration at year 1. The majority of infrastructure associated with the Proposed Scheme will be seen in the background. This will result in a noticeable change to the composition of part of the view, with new discordant structures added against the skyline. In summer, the dense foliage of retained vegetation will partially obscure the new infrastructure in the Withington Golf Club golf course. This combination will result in a **medium** magnitude of visual change. The **medium** magnitude of visual change and **medium** sensitivity will result in a **moderate** adverse significant effect.	Level of effect: **Moderate** adverse (significant)
Year 15 and year 30 – summer: Effects will reduce to non-significant for year 15 and remain so for year 30 due to the growth and maturity of the landscape mitigation planting (reported in detail in Volume 5: Appendix LV-001-0MA07).	Level of effect: Non-significant

Viewnorth-west from Footpath Manchester 139, Footpath Manchester 212 and the River Mersey (High sensitivity receptor) (VP 335-03-009)	
Year 1 – winter and summer: Users of the footpaths of **high** susceptibility and with **medium-high** value views will experience changes in the near and far distance views through the removal of existing vegetation and buildings during construction which will open up views to the north and west. Immature landscape mitigation planting will replace of some of the existing background hedgerow and trees associated with the Withington Golf Club clubhouse and along the B5167 Palatine Road allowing some visibility of vehicular movement along the road. The demolition of the Withington Golf Club clubhouse, during construction, and replacement with Palatine Road vent shaft headhouses and Palatine Road vent shaft auto-transformer station will be noticeable in the far distance. In near and middle distance views, some of the existing belts of trees and shrubs will be replaced by young landscape mitigation planting where ground levels have been adjusted to	Level of effect: **Moderate** adverse (significant)

Viewnorth-west from Footpath Manchester 139, Footpath Manchester 212 and the River Mersey (High sensitivity receptor) (VP 335-03-009)	
accommodate the replacement floodplain storage area. Footpath Manchester 212 will be reinstated to its original alignment. The majority of the Proposed Scheme elements will be seen in the background, with a mixture of retained vegetation and immature mitigation planting in the near and middle distance. This will result in a noticeable change to the composition of the view, with new discordant built structures present in the background as well as greater visibility across the Withington Golf Club golf course. In summer, retained vegetation will partially filter visibility of the new infrastructure in the Withington Golf Club golf course. This combination will result in a **medium** magnitude of visual change. The **medium** magnitude of visual change and **high** sensitivity will result in a **moderate** adverse significant effect.	
Year 15 and year 30 – summer: Effects will reduce to non-significant for year 15 and remain so for year 30 due to the growth and maturity of the landscape mitigation planting (reported in detail in Volume 5).	Level of effect: Non-significant

View south from B5167 Palatine Road and Footpath Manchester 211 (Medium-high sensitivity receptor) (VP 335-02-010)	
Year 1 – winter and summer: Residents of **high** susceptibility and with **medium** value views will experience an increased sense of openness due to the absence of the mature trees, removed during construction, along B5167 Palatine Road and within the Withington Golf Club. Palatine Road vent shaft headhouses and Palatine Road vent shaft auto-transformer station will be prominent elements in the view from the B5167 Palatine Road and the reinstated Footpath Manchester 211. The current entrance to the Withington Golf Club clubhouse will be replaced by immature mitigation planting and a new entrance located to the south. Landscape mitigation planting will not provide any screening or integration at year 1. Intervening vegetation and features will partially filter some views from the residential properties but the removal of vegetation during construction along the B5167 Palatine Road within Withington Golf Club golf course will be apparent. The majority of infrastructure associated with the Proposed Scheme will be seen in the middle distance. With new prominent structures added, this will result in a substantial change to the composition of the view. In summer, the dense growth of retained vegetation will partially filter views of the new infrastructure. The combination of above will result in a **high** magnitude of visual change. The **high** magnitude of visual change and **medium-high** sensitivity will result in a **major** adverse significant effect.	Level of effect: **Major** adverse (significant)
Year 15 – summer: The maturing landscape mitigation planting will help integrate the Palatine Road vent shaft headhouse and Palatine Road vent shaft auto-transformer station into the surrounding landscape. Due to the growth of the maturing landscape mitigation planting along the B5167 Palatine Road to replace vegetation removed during construction, the infrastructure elements will be less perceptible and more integrated, reducing the magnitude of visual change to **medium**. The **medium** magnitude of visual change and **medium-high** sensitivity will result in a **moderate** adverse significant effect.	Level of effect: **Moderate** adverse (significant)
Year 30 – summer: Effects will reduce to non-significant for year 30 due to the growth and maturity of the landscape mitigation planting (reported in detail in Volume 5).	Level of effect: Non-significant

View west from Footpath Manchester 211, Withington Golf Club golf course (High sensitivity receptor) (VP 335-03-011)	
Year 1 – winter and summer: Footpath users of high susceptibility and visitors to Withington Golf Club of lower susceptibility and with **high** value views will experience changes in middle and far distance views through the removal of existing vegetation and built features during construction which will open up views to the west. Immature landscape mitigation planting will replace of some of the existing background hedgerow and trees associated with the Withington Golf Club clubhouse and along the B5167 Palatine Road allowing some visibility of vehicular movement along the road. The landscape mitigation planting supplementing the foreground tree belt, surrounding Palatine Road vent shaft and Palatine Road vent shaft auto-transformer station will not be sufficiently established to provide screening or landscape integration. There will be a change to the composition of part of the view with new prominent built structures seen in the background, although retained vegetation will partially obscure these in summer. This combination will result in a **medium** magnitude of visual change. The **medium** magnitude of visual change and **High** sensitivity will result in a **moderate** adverse significant effect.	Level of effect: **Moderate** adverse (significant)
Year 15 and year 30 – summer: Effects will reduce to non-significant for year 15 and remain so for year 30 due to the growth and maturity of the landscape mitigation planting (reported in detail in Volume 5).	Level of effect: Non-significant

View south-west from B5167 Palatine Road (Medium-high sensitivity receptors) (VP 336-02-003)	
Year 1 – winter and summer: Residents of **high** susceptibility and with **medium** value views will experience an increased sense of openness due to the absence of the mature trees, removed during construction, along the B5167 Palatine Road. In the middle and far distance, Palatine Road vent shaft headhouse and vent shaft auto-transformer station will be noticeable structures but partially filtered by the intervening vegetation within the property boundaries to the west of the B5167 Palatine Road and retained vegetation in Withington Golf Club golf course. Landscape mitigation planting will not provide any screening or integration at year 1. In summer, the dense summer growth of retained vegetation will partially obscure visibility of the new infrastructure to the background within the Withington Golf Club golf course. The combination of the above will result in a **low** magnitude of visual change. The **low** magnitude of visual change and **medium-high** sensitivity will result in a **moderate** adverse significant effect.	Level of effect: **Moderate** adverse (significant)
Year 15 and year 30 – summer: Effects will reduce to non-significant for year 15 and remain so for year 30 due to the growth and maturity of the landscape mitigation planting (reported in detail in Volume 5).	Level of effect: Non-significant

View north-east from B5093 Wilmslow Road (Medium-high sensitivity receptors) (VP 336-02-009)	
Year 1 – winter and summer: Residents of **high** susceptibility and with **medium** value views will experience changes in the middle distance with the presence of Wilmslow Road vent shaft headhouse and immature landscape mitigation planting. These structures will replace views of The Christie Hospital Car Park D, which is at ground level. The large existing mature trees along the B5093 Wilmslow Road will remain a key feature of the view. The absence of the demolished building to the north, removed during construction, will be a noticeable change in the streetscape. The previous views	Level of effect: **Moderate** adverse (significant)

View north-east from B5093 Wilmslow Road (Medium-high sensitivity receptors) (VP 336-02-009)	
towards the tops of houses at Lynway Drive and Parkville Road will be screened by the Proposed Scheme. Mitigation planting at this stage will not provide any screening or integration at year 1. Wilmslow Road vent shaft headhouse will represent a new visible structure that will be comparable in scale with the surrounding residential properties and replaces an existing utilitarian use. In summer, retained vegetation will partially filter the appearance of the Proposed Scheme in the middle ground. The combination of the above will result in a **medium** magnitude of change visual change. The **medium** magnitude of visual change and **medium-high** sensitivity will result in a **moderate** adverse significant effect. A photomontage illustrating the scenario is included in Volume 5: Appendix LV-001-0MA07, Part 3.	
Year 15 and year 30 – summer: Effects will reduce to non-significant for year 15 and remain so for year 30 due to the growth and maturity of the landscape mitigation planting (reported in detail in Volume 5).	Level of effect: Non-significant

View west from Lynway Drive (Medium-high sensitivity receptors) (VP 336-02-011)	
Year 1 – winter and summer: Residents of **high** susceptibility and with **medium** value views will have direct views towards Wilmslow Road vent shaft headhouse over rear gardens and boundary fences/walls as well as partially screened views through gaps between buildings on Lynway Drive. The loss of existing established trees to the east of The Christie Hospital Car Park D, removed during construction, will open up the visibility of these structures to residents and will change the visual character of the locality. The spaces between the houses will appear filled with built components in contrast to the current relatively open gaps occupied by trees set against the sky. For residents overlooking Wilmslow Road vent shaft headhouse, the Proposed Scheme will result in substantial changes within the view in proximity to properties. This combination will result in a **high** magnitude of visual change. The **high** magnitude of visual change and **medium-high** sensitivity will result in a **moderate** adverse significant effect.	Level of effect: **Moderate** adverse (significant)
Year 15 and year 30 – summer: Effects will reduce to non-significant for year 15 and remain so for year 30 due to the growth and maturity of the landscape mitigation planting (reported in detail in Volume 5).	Level of effect: Non-significant

View south-west from Parkville Road (Medium-high sensitivity receptor) (VP 336-02-012)	
Year 1 – winter and summer: Residents of **high** susceptibility and with **medium** value views will experience direct views over rear gardens towards Wilmslow Road vent shaft headhouse and immature landscape mitigation planting from properties immediately adjacent to The Christie Hospital Car Park D. Views from other properties will be through gaps between the houses on Parkville Road where intervening garden vegetation is absent. Wilmslow Road vent shaft headhouse will be seen in place of The Christie Hospital Car Park D and its mature trees. The spaces between the houses will appear filled with built form in contrast to the current relatively open gaps occupied by mature trees silhouetted against the sky. The demolition of buildings on B5093 Wilmslow Road and removal of established trees in the car park during construction will open up views from residential properties towards the Proposed Scheme as well as increasing visibility of the B5093 Wilmslow Road. Landscape mitigation planting will not provide any screening or integration at year 1. This will result in a substantial change to the composition of the view. This combination will result in a **high** magnitude of visual change.	Level of effect: **Moderate** adverse (significant)

View south-west from Parkville Road (Medium-high sensitivity receptor) (VP 336-02-012)	
The **high** magnitude of visual change and **medium-high** sensitivity will result in a **moderate** adverse significant effect.	
Year 15 and year 30 – summer: Effects will reduce to non-significant for year 15 and remain so for year 30 due to the growth and maturity of the landscape mitigation planting (reported in detail in Volume 5).	Level of effect: Non-significant

View east from Footpath 156 and A34 Birchfields Road (Medium-high sensitivity receptors) (VP 337-02-001)	
Year 1 – winter and summer: Residents of **high** susceptibility and with **medium** value views and footpath users of lower susceptibility will experience changes to the middle distance view, beyond the existing A34 Birchfields Road corridor, where Birchfields Road vent shaft headhouse and Birchfields Road vent shaft auto-transformer station replace the northern part of Fallowfield Retail car park. In near distance views, the Birchfields Road vent shaft satellite compound will have been removed and levelled but the boundary hoardings will remain in place, demarking open land to be returned to suitable development use. Immature landscape mitigation planting will be visible along the Proposed Scheme boundary with Footpath Manchester 156 and surrounding Birchfields Road vent shaft; however, its immature form will not provide any screening or integration at year 1. New structures introduced to the near and middle distance will be visible and result in a noticeable change to visual composition although the structures will be consistent with the prevailing character. The magnitude of change will therefore be **medium.** The **medium** magnitude of visual change and **medium-high** sensitivity will result in a **moderate** adverse significant effect.	Level of effect: **Moderate** adverse (significant)
Year 15 and Year 30 – summer: Effects will reduce to non-significant for year 15 and remain so for year 30 due to the growth and maturity of the landscape mitigation planting (reported in detail in Volume 5).	Level of effect: Non-significant

Other mitigation measures

11.5.10 The permanent effects of the Proposed Scheme on landscape and visual receptors have been reduced through integration of the measures described in this section. Effects in year 1 may also be further reduced through establishing planting early or in advance of the main construction programme.

Summary of likely residual significant effects

11.5.11 Significant effects will reduce over time as the proposed mitigation planting matures and reaches its designed intention. However, one residential viewpoint location will likely result in a moderate adverse visual effect at year at year 15 of operation.

Cumulative effects

Cumulative landscape effects

11.5.12 No significant cumulative temporary effects during operation are anticipated.

Cumulative visual effects

11.5.13 No significant cumulative temporary effects during operation are anticipated

Monitoring

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

11.5.15 There are no area-specific requirements for monitoring landscape and visual mitigation during the operation of the Proposed Scheme in the Davenport Green to Ardwick area.

12 Socio-economics

12.1 Introduction

12.1.1 This section reports on the environmental baseline, likely economic and employment impacts as well as significant effects during construction and operation of the Proposed Scheme within the Davenport Green to Ardwick area. The assessment considers existing businesses, community organisations, local employment and local economies, including planned growth and development.

12.1.2 Engagement with Trafford Metropolitan Borough Council (TMBC), Manchester City Council (MCC) and the strategic authority of Greater Manchester Combined Authority (GMCA) has been undertaken as part of the development of the Proposed Scheme. The purpose of the engagement was to increase the understanding of socio-economic characteristics identified through a review of publicly available data.

12.1.3 The socio-economic effects on employment at a route-wide level are reported in Volume 3, Route-wide effects (Section 12). Maps showing the location of the key environmental features (Map Series CT-10) and the key construction (Map Series CT-05) and operational (Map Series CT-06) features of the Proposed Scheme can be found in the Volume 2: MA07 Map Book. The Proposed Scheme is described in Section 2.

12.2 Scope, assumptions and limitations

12.2.1 The scope, assumptions and limitations for the socio-economics assessment are set out in Volume 1 (Section 8) and the EIA Scope and Methodology Report (SMR)[63]. The assessment of in-combination effects draws upon the findings of other technical disciplines (e.g. air quality, sound, noise and vibration, landscape and visual and traffic and transport).

12.2.2 It is assumed that existing business resources can be retained within areas of land required for some utility works including the raising or lowering of pylons, the re-stringing of cables, utility decommissioning or the provision of access routes to such works. On the basis of this assumption, no direct assessment has been undertaken in relation to the following business resources:

- School playing fields on Firbank Road; and
- Siemens Ardwick Traincare Facility.

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

12.3 Environmental baseline

Existing baseline

Study area description

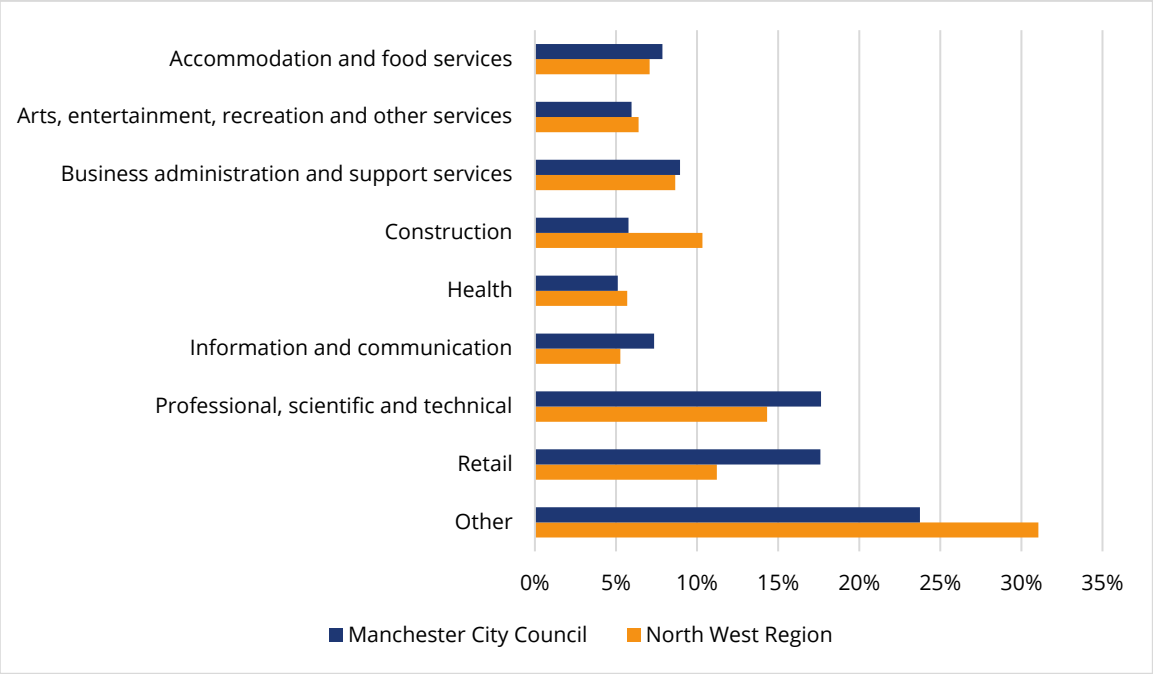
12.3.1 The following provides a brief overview of employment, economic structure, labour market and business premises availability within the Davenport Green to Ardwick area which lies within the administrative area of TMBC and MCC and within the North West region. Only a small section (105m) of the 13.4km long route of the Proposed Scheme through the Davenport Green to Ardwick study area falls within the area administered by TMBC. Since data for the MCC area are considered more representative of the Davenport Green to Ardwick study area, information which relates to TMBC has not been included within this socio-economic baseline.

Business and labour market

12.3.2 Within the MCC administrative area there is a wide spread of business types reflecting a diverse range of commercial activities. In 2020 the professional, scientific and technical (18%) and retail (18%) sectors accounted for the two largest proportion of businesses, followed by business administration and support services (9%) and accommodation and food services (8%), as shown in Figure 10. For comparison within the North West region, the largest sectors were professional, scientific and technical (14%) and retail (11%), followed by construction (10%) and business administration and support services (9%)[64].

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

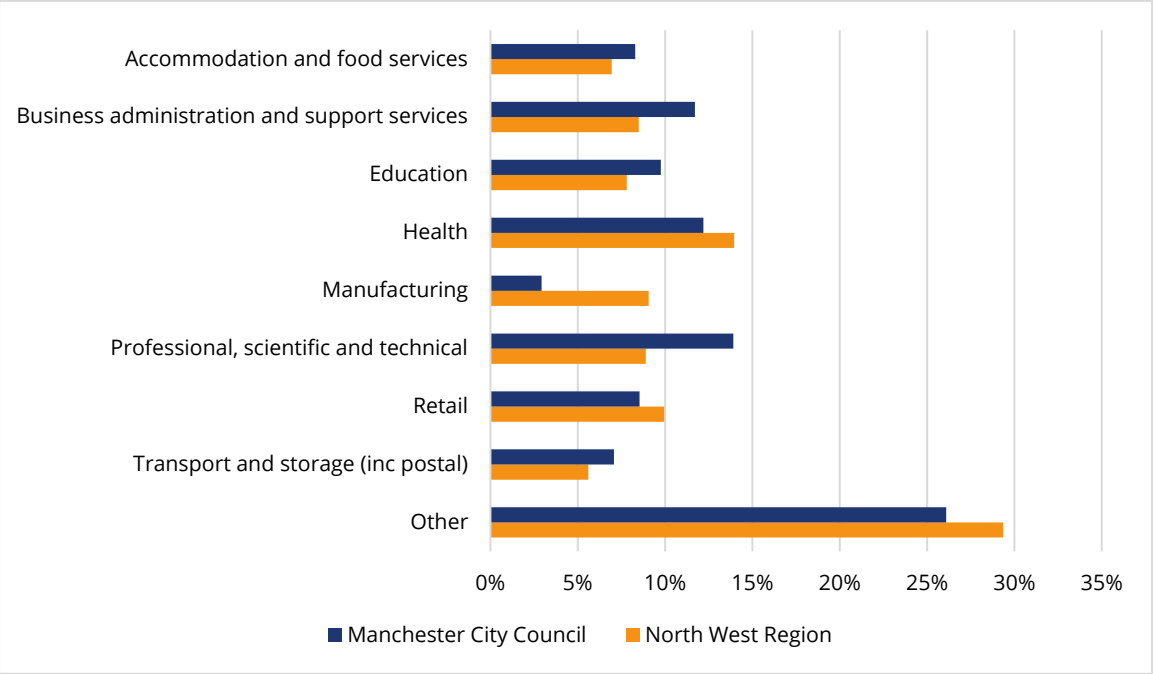
Figure 10: Business sector composition in the Manchester City Council area and the North West region



12.3.3 In 2019[65], approximately 410,000 people worked in the MCC area. According to the Office for National Statistics Business Register and Employment Survey 2019, the top four sectors in terms of share of employment were: professional, scientific and technical (14%); health (12%); business administration and support services (12%); and education (10%). These compare with the top four sectors for the North West region, which were: health (14%); retail (10%); manufacturing (9%); and professional, scientific and technical (9%), as shown in Figure 11.

[65] Office for National Statistics (2019), *Business Register and Employment Survey*. Available online at: http://www.nomisweb.co.uk/datasets/newbres6pub. This number includes both residents and non-residents of MCC who work within its boundaries.

Figure 11: Employment by industrial sector in the Manchester City Council area and the North West region



12.3.4 According to the Annual Population Survey (2020)[66], the employment rate[67] within the MCC area was 66% (257,800 people), which was lower than that recorded for both the North West region (74%) and England (76%). In 2020, unemployment in the MCC area was 8.6%, which was higher than that recorded both for the North West region (4.3%) and England (4.8%).

12.3.5 The Annual Population Survey (2020)[68] also shows that 48% of MCC residents aged 16-64 were qualified to National Vocational Qualification Level 4 (NVQ4) and above, which was higher than that recorded for both the North West region (39%) and England (43%), while 7.8% of residents had no qualifications, which was higher than that recorded both for the North West region (7.5%) and England (6.2%).

Property

12.3.6 According to the latest Economy and Employment Space Study (2010), the MCC area has a need for up to 249ha of employment land to 2027 and has a current supply of 258ha (of which 233ha is allocated for office use, 15ha for industrial, 10ha for general employment and less than 1ha for distribution). Whilst this indicates a slight over-supply, the study

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

[67] The proportion of working age (16-64 year olds) residents that is in employment.

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

assumes that some sites are unlikely to be fully developed in the plan period and that there is an estimated shortfall of employment land to 2027 of up to 50ha[69].

12.3.7 Following the decision of Stockport Council on 03 December 2020, Greater Manchester's Plan for Homes, Jobs and the Environment (the Spatial Framework)[70] is no longer being progressed. Although the draft Greater Manchester Spatial Framework (GMSF) is no longer being progressed, the employment land evidence base prepared for that Framework remains valid.

12.3.8 The draft GMSF (2020) provides more recent data on the MCC employment land requirements. This identified a need for 245ha of employment land between 2020 and 2037 within the MCC area. The MCC area had an existing supply of 240ha (of which 232ha was allocated for office use, along with 8ha for industrial and warehousing). It identified Manchester city centre as an area of considerable economic growth in Greater Manchester, with the priority being to protect its economic role. The importance of developing adequate employment sites was seen as central to the GMCA's strategy to support economic growth.

12.3.9 Based on the latest available data from the Estates Gazette (February 2021), the average vacancy rate for industrial and warehousing property in the MCC area has been assessed as 9.4% based on marketed space against known stock[71].

12.3.10 Based on the latest available data from the Estates Gazette (February 2021) the average vacancy rate for office space in the MCC area[72] is 21%.

Future baseline

Construction (2025)

12.3.11 Volume 5: Appendix CT-004-00000 provides details of the developments in the Davenport Green to Ardwick area that are assumed to have been implemented by 2025. The following committed developments of relevance to socio-economics that would materially alter the future baseline during construction of the Proposed Scheme in this area, are set out in Table 25.

[69] Nathaniel Lichfield and Partners (2010), *Manchester Economy and Employment Space Study.* Based on upper range and including a 20% flexibility factor, which is a buffer to ensure that future land supply is flexible enough to account for uncertainties in certain sites being developed.

[70] Greater Manchester Combined Authority (2020), *Greater Manchester's Plan for Homes, Jobs and the Environment: Greater Manchester Spatial Framework Publication Plan 2020*.

[71] Vacant space is based on marketed space identified from Estates Gazette data (EGi) (February 2021).

[72] Based on marketed space identified from Estates Gazette data (EGi) (February 2021).

Table 25: Committed developments of relevance to socio-economics during construction

Map book reference[73]	Planning reference	Description	How this is considered in the assessment
MA07/260	123120/FO/2019	Location: Land to the north-east and south-west of Enterprise Way; bounded by Ringway Road west to the south; and Thaxted Walk, Roxholme Walk, the rear of 27-67 Lincombe Road and 2-8 Dentdale Walk to the north, Manchester. Outline application with all matters to be considered for development comprising: The erection of a six storey building comprising 26,803 sqm gross office floorspace (use class B1(a)) and erection of a six storey multi-storey car park to provide 1,147 parking spaces, landscaping and public realm, with vehicular access onto Enterprise Way and associated works (Phase 1); and, Outline application with all matters reserved for 39,673 sq. m gross office space (use class B1(a)) and associated car parking (maximum 832 spaces) (Phases 2 and 3).	Informing future baseline.
MA07/371	123120/FO/2019	Location: Site of former Wing Fat Cash and Carry, Ashton Old Road. Erection of a single storey cash and carry/wholesale warehouse (Sui Generis) (2,260sqm) including ancillary bakery (113sqm) together with new vehicular access from Gorton Road, car parking, landscaping, boundary treatments, lighting and other associated works.	Informing future baseline.
MA07/445	123748/FO/2019	Location: The site of the fire damaged Paterson Building on Wilmslow Road and north of Oak Road Christie Hospital NHS Trust, 550 Wilmslow Road, Manchester, M20 4BX. Erection of a part three, part seven and part 10 storey building, plus a basement level, to accommodate biomedical research laboratories, consultant workspace, collaboration spaces, and an ancillary café, together with external storage and servicing compound, cycle storage facility, external hard and soft landscaping, and plant and equipment.	Informing future baseline.
MA07/447	124268/FO/2019	Location: Manchester College of Arts and Technology, Ashton Old Road, Manchester. Proposed erection of a three storey (with partial basement) Sports & Social Care Building, single storey extension of existing workshop accommodation, construction of new full size artificial turf football pitch (106m x 70m) with 8 no. 15m high floodlights and spectator seating, associated changes to the existing landscaping and car parking arrangements, and new boundary treatments following the demolition of existing buildings.	Informing future baseline.

12.3.12 Implementation of committed developments MA07/260, MA07/131, MA07/445 and MA07/447 could result in approximately 1,100 additional jobs, altering the future baseline against which the Proposed Scheme is assessed. As such, these committed developments have been included as part of the future baseline and considered within this assessment.

[73] Volume 5: Planning Data/Committed Development Map Book: Maps CT-13-322b to CT-13-326.

12.3.13 The existing composition and numbers of employers, employees and economic sectors in the area is likely to change over time in ways that cannot be accurately forecast.

Operation (2038)

12.3.14 Volume 5: Appendix CT-004-00000 also provides details of the developments in the Davenport Green to Ardwick area that are assumed to have been implemented by 2038. No additional committed developments of relevance for socio-economics have been identified that would materially alter the future baseline in this area.

12.4 Effects arising during construction

Avoidance and mitigation measures

12.4.1 The draft Code of Construction Practice (CoCP)[74] includes a range of provisions that will help mitigate socio-economic effects associated with construction within this area, including:

- reducing nuisance through the sensitive layout of construction sites (Section 5);
- consulting businesses located close to hoardings on the design, materials used and construction of the hoarding, to reduce impacts on access to and visibility of their premises (Section 12);
- applying best practicable means during construction works to reduce noise (including vibration) at sensitive receptors (including local businesses) (Section 13);
- monitoring and managing flood risk and other extreme weather events that may affect socio-economic resources during construction (Section 16);
- site specific traffic management measures including requirements relating to the movement of traffic from business and commercial operators of road vehicles, including goods vehicles (Section 14); and
- maintaining access to businesses for the duration of construction works where reasonably practicable (Section 14).

Assessment of impacts and effects

Temporary effects

In-combination effects

12.4.2 No businesses have been identified within the Davenport Green to Ardwick area that are expected to experience significant in-combination effects as a result of the Proposed Scheme.

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

Isolation

12.4.3 No businesses have been identified within the Davenport Green to Ardwick area that are expected to experience significant isolation effects as a result of the Proposed Scheme.

Construction employment

12.4.4 There will be one main civil engineering compound (Manchester tunnel north portal main compound) partially within, and five civil engineering satellite compounds wholly within, the Davenport Green to Ardwick area. The main compound and four of the satellite compounds will continue to be used as railway systems compounds following the completion of civil engineering works. A second main civil engineering compound (Manchester tunnel south portal main compound) will be located partially within the Davenport Green to Ardwick area. It is included in the Volume 2, Community Area report: Hulseheath to Manchester Airport (MA06) for construction employment purposes as it will be primarily located within that area.

12.4.5 Up to 4,900 person years of construction employment opportunities will be created at these sites[75], broadly equivalent to 490 full time jobs[76]. Depending on the skill levels required and the skills of local people, these jobs are potentially accessible to residents in the locality and to others living further afield. The impact of the direct construction employment creation has been considered as part of the route-wide assessment (see Volume 3, Route-wide effects).

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

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

Permanent effects

Businesses

12.4.8 Businesses directly affected, comprising those that lie within land required for the Proposed Scheme, are reported in groups, where possible, to form defined resources based on their location and operational characteristics. A group could contain either one or a number of businesses reflecting the fact that a building may have more than one occupier or that similar businesses and resources are clustered together.

12.4.9 Overall, 42 resources in the study area will experience direct impacts as a result of the Proposed Scheme. These are as follows:

[75] 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.

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

- Withington Golf Club on the B5167 Palatine Road;
- The Christie Hospital Car Park D;
- three resources on the B5093 Wilmslow Road;
- three resources at Fallowfield Retail Park;
- ten identified resources on Rondin Road consisting of two separate groups;
- fifteen identified resources on the A635 Ashton Old Road;
- four resources on Hooper Street; and
- five resources on the A665 Midland Street.

12.4.10 The resources listed above are those that are anticipated to experience job losses or displacement as a result of construction of the Proposed Scheme. Additionally, land required for the construction of the Proposed Scheme will directly impact other business resources. These businesses are not listed above, as the effect upon them is not expected to result in job losses or displacement.

12.4.11 Four of the groups of resources are subject to potentially significant effects on business activities and employment. These resources are listed in Table 26.

Table 26: Resources which will potentially experience significant direct effects

Resource	Description of business activity
Businesses at Fallowfield Retail Park	A supermarket, a large discount shop and a vacant retail unit at a purpose-built shopping centre along with part of the car park.
Businesses on Rondin Road	A group of seven yard-based businesses including a metal recycling facility, a vehicle pound and a demolition contractor.
Businesses on Hooper Street	A group of four local authority owned buildings, which act as a base for a number of services including pest control, security, lighting and street wardens.
Businesses on the A665 Midland Street	A group of five businesses comprising a computer support company, a packaging supplier and three clothing manufacturers and retailers.

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

12.4.13 The following factors were taken into account when considering the sensitivity of resources:

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

12.4.14 Taking account of the sensitivity of the resource and the magnitude of impact, the significance of the resultant effects is set out in Table 27.

Table 27: Significance of effects

Resource	Impact magnitude	Sensitivity	Significance of effect
Businesses at Fallowfield Retail Park	High	Medium	Major adverse – significant
Businesses on Rondin Road	High	Medium	Major adverse – significant
Businesses on Hooper Street	High	Medium	Major adverse – significant
Businesses on the A665 Midland Street	High	Medium	Major adverse – significant

12.4.15 The construction of the Proposed Scheme will require the acquisition of land and buildings. An overview of the resources expected to be significantly affected has been included below.

12.4.16 The construction of Birchfields Road vent shaft will require the demolition of three businesses at Fallowfield Retail Park along with a proportion of the car park used by other businesses at the retail park. The two retail businesses might have difficulties finding suitable alternative land and premises given the requirement for large purpose-built retail premises in the same locality and appropriate parking. The two retail businesses also act as anchors drawing customers to the other shops, which may experience reduced passing trade as a result of the loss of part of the retail park and part of the car park. Although land and premises are generally available in the Greater Manchester area, there are fewer suitable retail premises available. For these reasons the sensitivity of the resources is assessed to be medium. The magnitude is high based on the number of jobs at the three business premises which will be demolished. The effect is assessed to be major adverse and will therefore be significant.

12.4.17 Ardwick South cutting retaining wall and Ardwick box structure will require the demolition of a group of businesses on Rondin Road. Although land is generally available in the Greater Manchester area, there is less availability of similar industrial premises and sites in inner Manchester. These businesses might have particular difficulties finding suitable alternative land and premises as their on-site recycling activities and size requirements could constrain the ability of the firms to relocate. The sensitivity of all the resources in this group is assessed to be medium. The magnitude is high based on the number of jobs located on Rondin Road. The effect is assessed to be major adverse and will therefore be significant.

12.4.18 Ardwick box structure, Ardwick North cutting retaining wall and Ardwick embankment will require the demolition of a group of businesses on Hooper Street and a group of businesses on the A665 Midland Street. Although land is generally available in the Greater Manchester area, there is less availability of similar storage sites in inner Manchester, and for this reason the sensitivity of the resources in these two groups is assessed to be medium. The magnitude of both groups is high based on the likely number of jobs located on Hooper Street and the A665 Midland Street. The effect on both groups is assessed to be major adverse and will therefore be significant.

12.4.19 Across all of the employment areas reviewed, it is expected that an estimated 640 jobs[77] will either be displaced or possibly lost within the Davenport Green to Ardwick area. The impact from the relocation or loss of jobs is considered to be minor in the context of the total number of people employed in the MCC area (approximately 410,000 jobs) and the scale of economic activity and opportunity in the area. There is a reasonable probability that most businesses will be able to relocate to places that will still be accessible to residents within the local area. However, there may be cases where alternative locations are problematic, especially due to the fact that a number of similar businesses will be looking to relocate at the same time, and the businesses may be unable to relocate on a like-for-like basis within the area.

Isolation

12.4.20 Businesses within the Davenport Green to Ardwick area may experience significant isolation effects as a result of the Proposed Scheme. As a consequence, this could lead to a loss of trade for the affected businesses.

12.4.21 Increased vehicle traffic associated with the construction of the Proposed Scheme, combined with the diversion of traffic associated with permanent highway changes and additional passengers and staff accessing Manchester High Speed station will lead to congestion for vehicle users at junctions on the A57 Hyde Road during the construction and operation phases of the Proposed Scheme.

12.4.22 These congestion effects will disrupt the commercial activities of a group of 12 manufacturing and wholesale businesses, which are mainly accessed via the junction of the A57 Hyde Road and Bennett Street, relying heavily on ease of regular vehicular access. Avoiding the congestion will require a diversion of 1.2km to access the main road network at the A6010 Pottery Lane via Bennett Street, Vaughan Street and Gorton Road.

12.4.23 The congestion will also lead to reduced visibility and vehicular accessibility for the Diamond Hand Car Wash, located at the junction of the A57 Hyde Road/Bennett Street due to customers avoiding the A57 Hyde Road and the high level of competition for this type of business in the area.

12.4.24 For the reasons stated above, the disruption as a result of the Proposed Scheme is considered to represent a temporary major adverse isolation effect and a permanent moderate adverse isolation effect on these 13 businesses, which commences part way through the construction phase and continues into operation.

[77] 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.

Other mitigation measures

12.4.25 Businesses displaced by the Proposed Scheme will be compensated in accordance with the Compensation Code. HS2 Ltd recognises the importance of businesses displaced from their existing premises being able to relocate to suitable alternative premises and will, therefore, offer additional support over and above statutory requirements to facilitate this process[78,79]. Businesses with an interest in land that is either being acquired or possessed temporarily may also be eligible for compensation in accordance with the Compensation Code.

12.4.26 The construction of the Proposed Scheme offers considerable opportunities to businesses and residents along the line of route in terms of supplying goods and services and obtaining employment. HS2 Ltd is committed to working with its suppliers to build a skilled workforce that promotes further economic growth across the UK.

Summary of likely residual significant effects

12.4.27 Likely significant residual effects are shown in Volume 5, Socio-economics Map Book: Maps SE-01-322 to SE-01-326a. The Proposed Scheme will require the demolition of one group of socio-economic resources at Fallowfield Retail Park and three groups of socio-economic resources in the Ardwick area: Rondin Road, Hooper Street and the A665 Midland Street, all of which will be adverse residual significant effects.

12.4.28 During construction and continuing into operation of the Proposed Scheme, businesses accessed from the junction of the A57 Hyde Road and Bennett Street will experience permanent adverse residual significant isolation effects as a result of congestion.

Cumulative effects

12.4.29 No significant cumulative temporary or permanent effects during construction have been identified.

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.

[78] High Speed Two Ltd (2022), *Phase 2b Western Leg Information Paper C7: Business relocation.*

[79] High Speed Two Ltd (2022), *Phase 2b Western Leg Information Paper C8: Compensation code for compulsory purchase*.

Assessment of impacts and effects

12.5.2 No resources are expected to experience significant direct socio-economic, in-combination or isolation effects during the operation of the Proposed Scheme.

Operational employment

12.5.3 Operational employment will be created at locations along the route including stations, train crew facilities and infrastructure/maintenance depots. There will be no operational employment created within the Davenport Green to Ardwick area. Within the adjacent Hulseheath to Manchester Airport area (MA06) to the south, there will be a station at Manchester Airport creating 160 HS2 related jobs and a further 60 concourse retail jobs. Within the adjacent Manchester Piccadilly Station area (MA08) to the north, there will be a station at Manchester Piccadilly creating 660 HS2 related jobs and a further 150 concourse retail jobs[80]. These employment opportunities will be accessible to residents in the locality.

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

12.5.5 Some of these employment opportunities will be accessible to residents in the locality and, given the transport accessibility within the local area, to residents living further afield.

12.5.6 The impact of operational employment creation has been assessed as part of the route-wide assessment (see Volume 3).

Other mitigation measures

12.5.7 The assessment has concluded that operational effects within the area will be either negligible or beneficial and therefore mitigation is not required.

Summary of likely residual significant effects

12.5.8 There are no significant effects arising during operation.

Cumulative effects

12.5.9 No significant cumulative effects on socio-economic receptors have been identified in the Davenport Green to Ardwick area during operation.

[80] These employment figures are estimates based on the current design and knowledge gained from previous phases of HS2.

Monitoring

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

12.5.11 On the basis of there being no significant residual operational effects, there are no area-specific requirements for monitoring socio-economic effects during the operation of the Proposed Scheme in the Davenport Green to Ardwick area.

13 Sound, noise and vibration

13.1 Introduction

13.1.1 This section reports the assessment of the noise and vibration likely significant effects arising from the construction and operation of the Proposed Scheme within the Davenport Green to Ardwick area on:

- 'residential receptors': people, primarily where they live, in terms of individual dwellings and on a wider community basis including any shared community open areas; and
- 'non-residential receptors' such as:
  - community facilities including schools, hospitals, places of worship and 'quiet areas'; and
  - commercial properties such as hotels.

13.1.2 'Shared community open areas' are amenity spaces that the Planning Practice Guidance[81] identifies may partially offset a noise effect experienced by residents at their dwellings and are either a) relatively quiet nearby external amenity spaces for sole use by a limited group of residents as part of the amenity of their dwellings or b) a relatively quiet external publicly accessible amenity space (e.g. park or local green space) that is nearby.

13.1.3 Non-residential receptors with multiple uses were assessed either based on the most noise sensitive use or were subject to multiple assessments as appropriate.

13.1.4 'Quiet Areas' are defined in the EIA Scope and Methodology Report (SMR)[82] as:

- areas designated under Local Plans as being prized for their tranquillity;
- areas designated under Local Plans or Neighbourhood Development Plans as Local Green Spaces; and
- areas identified as Quiet Areas through implementation of the Environmental Noise (England) Regulations[83,84].

[81] Department for Communities and Local Government (2019), *Planning Practice Guidance – Noise*. Available online at: https://www.gov.uk/guidance/noise--2.

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

[83] *The Environmental Noise (England) Regulations 2006.* Her Majesty's Stationery Office, London. Available online at: https://www.legislation.gov.uk/uksi/2006/2238.

[84] *Environmental Noise (England) (Amendment) Regulations 2009.* (SI 2009/1610). Available online at: https://www.legislation.gov.uk/uksi/2009/1610.

13.1.5 The methodology for the assessment of likely significant noise and vibration effects was developed in line with Government noise policy[85], planning policy, planning practice guidance on noise[81] and EIA Regulations as described in the SMR.

13.1.6 Engagement has been undertaken with Manchester City Council (MCC) with respect to the sound, noise and vibration assessment. The purpose of this engagement has been twofold. Firstly, engagement has been undertaken on a route-wide basis covering matters including process, scope, method, approach to baseline and mitigation strategy. Secondly, local engagement has been undertaken to obtain relevant information regarding residential and non-residential receptors, existing baseline sound levels and to discuss the development of the mitigation to be included in the Proposed Scheme. Officers from local authorities have been invited to attend and witness baseline sound measurements. Where appropriate, relevant information identified by the authorities has been taken into account in the assessment.

13.1.7 More detailed information regarding the sound, noise and vibration assessment for the Davenport Green to Ardwick area is available in the relevant appendices in Volume 5:

- Sound, noise and vibration, route-wide assumptions and methodology (Appendix SV-001-00000);
- Sound, noise and vibration baseline and construction assessment (Appendix SV-002-0MA07); and
- Sound, noise and vibration operation assessment (Appendix SV-003-0MA07).

13.1.8 Maps showing the location of the key environmental features (Map Series CT-10) and the key construction (Map Series CT-05) and operational (Map Series CT-06) features of the Proposed Scheme can be found in the Volume 2: MA07 Map Book. Mapping to support the sound, noise and vibration assessment is presented in Map Series SV-05 (Volume 2: MA07 Map Book) and Map Series SV-02, SV-03, SV-08 and SV-09 (Volume 5: Sound, noise and vibration Map Book).

13.1.9 The assessment of likely significant effects from noise and vibration on community, ecological, health, heritage and socio-economic receptors and the assessment of tranquillity are presented in Section 6, Community; Section 7, Ecology and biodiversity; Section 8, Health; Section 9, Historic environment; Section 12, Socio-economic; and Section 11, Landscape and visual of this report respectively. The Proposed Scheme is described in Section 2.

[85] Department for Environment, Food and Rural Affairs (2010), *Noise Policy Statement for England (NPSE).* Available online at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/69533/pb13750-noise-policy.pdf.

13.2 Scope, assumptions and limitations

13.2.1 The approach to assessing sound, noise and vibration and identifying envisaged mitigation is outlined in Volume 1 (Section 8 and Section 9) and the SMR.

13.2.2 In this assessment 'sound' is used to describe the acoustic conditions that people experience as a part of their everyday lives. Noise is taken as unwanted sound and hence adverse effects are noise effects.

13.2.3 Effects can either be temporary from construction or permanent from the operation of the Proposed Scheme. These effects may be direct, resulting from the construction or operation of the Proposed Scheme, and/or indirect, resulting from changes in traffic patterns on existing roads or railways that result from the construction or operation of the Proposed Scheme.

13.2.4 It is likely that the majority of receptors adjacent to the route of the Proposed Scheme in the Davenport Green to Ardwick area are not currently subject to appreciable vibration[86]. The predicted vibration levels at all receptors as a result of the Proposed Scheme, has, therefore been assessed using specific absolute thresholds, below which receptors will not be affected by vibration, rather than vibration change criteria. Further information is provided in Volume 1 (Section 8).

13.3 Environmental baseline

Existing baseline

13.3.1 The Davenport Green to Ardwick area is predominantly suburban in character becoming more urban towards the north and interspersed with commercial premises and larger industrial estates. The sound environment is generally dominated by local and distant road traffic, overflying aircraft to and from Manchester Airport, local rail services and local neighbourhood sources, with contributing natural sounds.

13.3.2 There are several main roads that contribute to the sound environment near to the Proposed Scheme within the Davenport Green to Ardwick area. These include: the M56 and the M60 in the south of the area, and the main roads into central Manchester including the A5103 Princess Parkway/Princess Road, the A34 Kingsway/Birchfields Road, the A6 Stockport Road, the A57 Hyde Road and the A635 Ashton Old Road.

13.3.3 There are a number of railway lines in this area: Mid-Cheshire Line (Manchester to Chester via Stockport), south of the M56 junction 3a; Crewe to Manchester Line (Crewe north-east to Manchester); Styal Line (Manchester to Wilmslow), adjacent to the A5079 Slade Lane;

[86] Further information is available in the Volume 5: Appendix SV-001-00000, Sound, noise and vibration. methodology, assumptions and assessment report and the Volume 5: Appendix CT-001-00001, Environmental Impact Assessment Scope and Methodology Report.

Ashburys Line (north of Ardwick Depot); and Glossop Line (Manchester to Derbyshire) adjacent to the A57 Hyde Road.

13.3.4 Sound levels close to these main transportation routes are high during the daytime and are generally lower at night. Sound levels decrease with increasing distance from the main transportation routes. Manchester Airport restricts the operations permitted at night so that the noise climate is much reduced from daytime levels.

13.3.5 Further information on the existing baseline, including baseline sound levels and baseline monitoring results, is provided for the Davenport Green to Ardwick area in Volume 5: Appendix SV-002-0MA07.

Future baseline

13.3.6 Without the Proposed Scheme, existing sound levels in this area are likely to increase slowly over time. This is primarily due to road traffic growth, which may be as a result of local or national trends or due to specific committed developments. Changes in car technology may offset some of the expected sound level increases due to traffic growth on low speed roads. On higher speed roads, tyre sound dominates and hence the expected growth in traffic is likely to continue to increase ambient sound levels.

13.3.7 The future operational baseline takes account of proposed and likely noise reduction provided in Important Areas identified in Defra's Noise Action Plans for agglomerations[87], roads[88] or railways[89]. Following engagement with Highways England, trunk roads, likely to be resurfaced under future routine maintenance programmes, before the opening of the Proposed Scheme, are assumed to have a low noise surface. Airborne noise levels from railways in Important Areas are assumed to be controlled, where necessary, to the level where there is no Noise Action Plan requirement to investigate further mitigation. Map Series SV-05 (Volume 2: MA07 Map Book) shows any noise Important Areas in the Davenport Green to Ardwick area. Further information is reported for the Davenport Green to Ardwick area in Volume 5: Appendix SV-002-0MA07.

13.3.8 Committed developments involving sound or vibration sensitive uses within the relevant study area have been included within the assessment and are reported for the Davenport

[87] Department for Environment, Food and Rural Affairs (2019), *Noise Action Plan: Agglomerations (Urban Areas)*. Available online at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/813663/noise-action-plan-2019-agglomerations.pdf.

[88] Department for Environment, Food and Rural Affairs (2019), *Noise Action Plan: Roads (including major roads)*. Available online at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/813666/noise-action-plan-2019-roads.pdf.

[89] Department for Environment, Food and Rural Affairs (2019), *Noise Action Plan: Railways (including major railways)*. Available online at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/813664/noise-action-plan-2019-railways.pdf.

Green to Ardwick area in Volume 5: Appendix SV-002-0MA07[90]. Where applicable, noise or vibration significant effects on these committed developments are discussed in sections 13.4 and 13.5. The committed developments reported in sections 13.4 and 13.5 are summarised in Table 28.

Table 28: Committed developments relevant to sound, noise and vibration

Map book reference[91] (SNV Assessment location ref.)	Planning reference	Description	How this is considered in the assessment
MA07/445 (615112)	123748/FO/2019	Location: The Site of the Fire Damaged Paterson Building on Wilmslow Road and North of Oak Road Christie Hospital NHS Trust 550 Wilmslow Road Manchester M20 4BX Erection of a part 3, part 7 and part 10 storey building, plus a basement level, to accommodate biomedical research laboratories, consultant workspace, collaboration spaces, and an ancillary café, together with external storage and servicing compound, cycle storage facility, external hard and soft landscaping, and plant and equipment.	Informing future baseline (construction)

Construction (2025)

13.3.9 The assessment of noise from construction activities assumes a future construction baseline year of 2025, which represents the period immediately prior to the start of the construction period. As a reasonable worst case, it has been assumed that no change in baseline sound levels will occur between the existing baseline year of 2018 and the future construction baseline year.

Operation (2038)

13.3.10 The operational assessment is based upon the absolute sound level and/or predicted change in sound levels that will result from operation of the Proposed Scheme. The future operational baseline is the sound environment that would exist in 2038 without the Proposed Scheme. This is presented in Table 1 in Volume 5: Appendix SV-002-0MA07.

[90] Volume 5: Appendix CT-004-00000 provides details of all of the developments assumed to be implemented.

[91] Volume 5, Planning Data/Committed Development Map Book: Maps CT-13-322b to CT-13-326a.

13.4 Effects arising during construction

Assumptions and limitations

Local assumptions

13.4.1 The construction arrangements that form the basis of the assessment are presented in Section 2.3 of this report, in Volume 1 (Section 8) and in the draft Code of Construction Practice (CoCP)[92].

13.4.2 The following activities have been assumed to be undertaken during the evening and night-time for reasons of safety, engineering practicability or to reduce the impact on existing transport:

- activities to support construction of Manchester tunnel and portals (including erection of each tunnel boring machine (TBM), support for the TBM as it excavates, excavated material handling, installation of the tunnel lining and tunnel fit-out) will require 24-hour working; and
- works at the vent shafts (Birchfields Road vent shaft, Wilmslow Road vent shaft, Palatine Road vent shaft and Altrincham Road vent shaft) including concrete batching plant.

13.4.3 Piling and vibratory compaction is likely to result in short-term appreciable ground-borne vibration at a small number of receptors, situated very close to these activities. These receptors will also be exposed to appreciable noise from the construction of the Proposed Scheme. The significance of the identified vibration effects has been assessed in combination with the airborne noise effects also identified at these receptors. The assessment is presented in Volume 5: Appendix SV-002-0MA07.

13.4.4 Track laying, power system and signalling installation works are unlikely to result in significant construction noise effects, given the short duration close to any communities, and where included in the Proposed Scheme, the presence of the permanent noise fence barriers.

Avoidance and mitigation measures

13.4.5 The assessment assumes the implementation of the principles and management processes set out in the noise and vibration section of the draft CoCP (Section 13), which are:

- best practicable means (BPM) as defined by the Control of Pollution Act 1974 (CoPA) and Environmental Protection Act 1990 (EPA), which will be applied during construction activities to minimise noise (including vibration) at neighbouring residential properties and other sensitive receptors (including local businesses and quiet areas designated by the local authority);

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

- as part of BPM, mitigation measures are applied in the following order:
  - noise and vibration control at source: for example, the selection of quiet and low vibration equipment, review of construction methodology to consider quieter methods, location of equipment on-site, control of working hours, the provision of acoustic enclosures and the use of less intrusive alarms, such as broadband vehicle reversing warnings;
  - screening: for example, local screening of equipment or 2.4m high perimeter hoarding or the use of temporary stockpiles; and
  - where, despite the implementation of BPM, the noise exposure exceeds the criteria defined in the draft CoCP, noise insulation or ultimately temporary re-housing will be offered at qualifying properties.
- lead contractors will seek to obtain prior consent from the relevant local authority under Section 61 of the CoPA for the proposed construction works. The consent application will set out BPM measures to minimise construction noise and vibration, including control of working hours, and provide a further assessment of construction noise and vibration, including confirmation of noise insulation/temporary re-housing provision;
- contractors will undertake and report such monitoring as is necessary to assure and demonstrate compliance with all noise and vibration commitments. Monitoring data will be provided regularly to, and be reviewed by, the nominated undertaker and made available to the local authorities; and
- contractors will be required to comply with the terms of the CoCP and appropriate action will be taken by the nominated undertaker as required to ensure compliance.

13.4.6 In addition to this mitigation, to avoid or reduce likely community significant effects, taller screening (provided by solid temporary hoarding, temporary stockpiles, screening close to activities or other means to provide equivalent noise reductions), as described in the draft CoCP, has been assumed at the following construction sites and compounds:

- Altrincham Road vent shaft satellite compound in Wythenshawe;
- Birchfields Road vent shaft satellite compound in Fallowfield;
- Wilmslow Road vent shaft satellite compound near Withington; and
- Palatine Road vent shaft satellite compound near Didsbury.

13.4.7 Noise insulation will be offered for qualifying buildings as defined in the draft CoCP. Noise insulation or, where appropriate, temporary re-housing will avoid residents being significantly affected by levels of construction noise inside their dwellings. The assessment reported in this section provides an estimate of the buildings that are likely to qualify for noise insulation. None are predicted to qualify for temporary re-housing.

13.4.8 Qualification for noise insulation and, where appropriate, temporary re-housing will be confirmed, as part of seeking prior consent from the local authority under Section 61 of the CoPA. Qualifying buildings will be identified, as required in the draft CoCP, so that noise insulation can be installed, or where appropriate any temporary re-housing provided, before the start of the works predicted to exceed noise insulation or temporary re-housing criteria.

Assessment of impacts and effects

Residential receptors: direct effects – individual dwellings

13.4.9 The avoidance and mitigation measures, set out in the previous section, including noise insulation, will reduce noise inside all dwellings such that it will not reach a level where it will significantly affect residents.

Residential receptors: direct effects – communities

13.4.10 The avoidance and mitigation measures to be implemented during construction will reduce airborne construction noise adverse effects on receptors and communities. Residual temporary noise or vibration effects are identified later in this section.

13.4.11 In locations with lower existing sound levels[93], construction noise effects are likely to be caused by changes to noise levels outside dwellings relative to existing sound levels. These may be considered by the local community as an effect on the acoustic character of the area and hence be perceived as a change in the quality of life for that community. These effects are considered to be significant when assessed on a community basis taking account of the local context.

13.4.12 The temporary adverse effects on the residential areas identified in Table 29, including shared open areas, are considered to be significant on a community basis. The duration of impact is the period where the relevant assessment category is exceeded. The predicted monthly construction noise level will vary throughout this period and as a guide the typical and highest monthly noise levels at the closest properties in the community identified are presented in the 'cause' column of this table.

[93] Further information is provided in High Speed Two Ltd (2022), *Phase 2b Western Leg Information Paper E13: Control of construction noise and vibration.* Available online at: https://www.gov.uk/government/collections/hs2-phase-2b-crewe-manchester-environmental-statement.

Table 29: Direct adverse construction effects on residential communities and shared open areas that are considered to be significant on a community basis

Significant effect number (and map reference)[94]	Type of significant effect	Time of day	Location	Cause (construction activities)[95]	Assumed approximate duration of impact
MA07-C-C1 (SV-03-324)	Construction noise and vibration	Daytime and night-time	Withington: Approximately 155 dwellings in the vicinity of Wilmslow Road vent shaft.	During the daytime, general site works at Wilmslow Road vent shaft. The typical and highest monthly noise levels are approximately 55dB to 65dB and 60dB to 70dB[96]. During the night-time, vent shaft construction (for ventilation and intervention purposes) at Wilmslow Road. The typical and highest monthly noise levels are approximately 45dB to 55dB and 45dB to 60dB[97]. Vibratory rollers associated with general site works are predicted to create a minor to moderate vibration impact at properties near to the Proposed Scheme.	Day: Noise for up to two years and 10 months. Night: Noise for up to four years. Day: Vibration for up to three months.
MA07-C-C2 (SV-03-325)	Combined construction site noise and vibration and traffic noise	Daytime	Rusholme: Approximately 35 dwellings in the vicinity of Birchfields Road vent shaft.	During the daytime, general site works and vent shaft construction at the A34 Birchfields Road. The typical and highest monthly noise levels are approximately 65dB and 70dB to 75dB[96]. Vibratory rollers associated with general site works are predicted to create a minor to moderate vibration impact at properties near to the Proposed Scheme.	Noise for up to seven months. Vibration for up to three months.
MA07-C-C3 (SV-03-326)	Construction noise	Daytime	Beswick: Approximately 20 dwellings in the vicinity of Paxton Place.	Demolition works. The typical and highest monthly noise levels are approximately 60dB to 65dB and 65dB to 70dB[96].	Noise for up to one year and 10 months.

[94] See MA07 Sound, noise and vibration report, Volume 5: Appendix SV-002-0MA07 and Volume 5, Map Book SV-03.

[95] The construction activity giving rise to the highest predicted noise or vibration level is reported. Multiple construction activities may contribute to the typical noise levels and the approximate duration of impact.

[96] Equivalent continuous sound level at the facade, $L_{pAeq,0700\text{-}1900}$.

[97] Equivalent continuous sound level at the facade, $L_{pAeq,2300\text{-}0700}$.

Residential receptors: indirect effects

13.4.13 Construction traffic is likely to cause adverse noise effects on residential receptors along the A34 Birchfields Road between the B5093 Moseley Road and Lytham Road. Approximately 35 dwellings located immediately adjacent to the road are forecast to experience an increase in road traffic noise levels during the peak months for one or more months of between 1dB and 2dB $L_{pAeq,0700–2300}$, due to additional construction vehicles using this route in an area currently exposed to high levels of sound . This is considered to be a likely significant effect on a community basis at the dwellings on this road. This temporary adverse effect will combine with the effects from construction site noise and vibration denoted as MA07-C-C2 in Table 29 and Volume 5: Appendix SV-002-0MA07. This combined effect represents a change in the acoustic character of the area, which may be perceived as a change in the quality of life for that community.

13.4.14 Construction traffic is likely to cause adverse noise effects on residential receptors along the A34 Kingsway between Mauldeth Road and Talbot Road. Approximately 45 dwellings located immediately adjacent to the road are forecast to experience an increase in road traffic noise levels during the peak months for one or more months of around 1dB $L_{pAeq,0700–2300}$, due to additional construction vehicles using this route in an area currently exposed to high levels of sound . This is considered to be a likely significant effect on a community basis at the dwellings on this road, denoted as MA07-C-C4 in Volume 5: Appendix SV-002-0MA07. This temporary adverse effect represents a change in the acoustic character of the area, which may be perceived as a change in the quality of life for that community.

13.4.15 Construction traffic is likely to cause adverse noise effects on residential receptors along Scarcroft Road between Kirkmanshulme Lane and the A57 Hyde Road. Approximately 65 dwellings located immediately adjacent to the road are forecast to experience an increase in road traffic noise levels of around 5dB $L_{pAeq,0700-2300}$ for one or more months during the peak months, due to traffic diverting away from construction routes on nearby roads. This is considered to be a likely significant effect on a community basis at the dwellings on this road, denoted as MA07-C-C5 in Volume 5: Appendix SV-002-0MA07. This temporary adverse effect represents a change in the acoustic character of the area, which may be perceived as a change in the quality of life for that community.

13.4.16 Construction traffic is likely to cause adverse noise effects on residential receptors along the A635 Manchester Road between Capital Road and Ashton Hill Lane. Approximately 150 dwellings located immediately adjacent to the road are forecast to experience an increase in road traffic noise levels during the peak months for one or more months of around 1dB $L_{pAeq,0700–2300}$, due to additional construction vehicles using this route currently exposed to high noise levels. This is considered to be a likely significant effect on a community basis at the dwellings on this road, denoted as MA07-C-C6 in Volume 5: Appendix SV-002-0MA07. This temporary adverse effect represents a change in the acoustic character of the area, which may be perceived as a change in the quality of life for that community.

Non-residential receptors: direct effects

13.4.17 The assessment has identified the following non-residential receptors where the predicted airborne noise levels exceed both the relevant screening criteria and the noise change criterion (typically a change of greater than 3dB[98] compared with the existing baseline sound level):

- Open University (office), 351 Altrincham Road, Wythenshawe (assessment location ref: 615041);
- The Royals (offices), The Royals, Altrincham Road, Wythenshawe (assessment location ref: 615043); and
- Birchfields Primary School, Lytham Road, Rusholme (assessment location ref: 615141).

13.4.18 These locations are identified in the Davenport Green to Ardwick area, as shown in Map Series SV-03 (Volume 5: Sound, noise and vibration Map Book). At each of the non-residential receptors identified above an assessment has been undertaken to determine if this impact would result in a significant effect, using the significance criteria set out in Annex A of Volume 5: Appendix SV-001-00000.

13.4.19 The Open University is located off the A560 Altrincham Road, approximately 45m north of the land required for the construction of Altrincham Road vent shaft. The building is occupied by the student recruitment and support centre of The Open University. The three-storey building features double-glazed windows which are openable. The southern façade of the building will face the Altrincham Road vent shaft satellite compound. The Open University has been assessed against the office category[99]. The typical and highest predicted daytime monthly construction noise levels at this building are 16dB and 13dB respectively above the screening criteria defined in the SMR for office use for a period of three years and nine months. The change during the month with the highest noise level is 7dB. The Open University is identified, on the basis of a precautionary assessment, as being subject to a likely significant adverse effect (denoted by MA07-C-N1 in Table 6 Volume 5: Appendix SV-002-0MA07). This temporary adverse effect may take the form of activity disturbance to office users.

13.4.20 The Royals is an office building located off the A560 Altrincham Road, approximately 60m north of land required for the construction of Altrincham Road vent shaft. The four-storey building has a sealed double-glazed façade and is assumed to be mechanically ventilated throughout. The Royals has been assessed against the office criteria. The typical and highest predicted daytime monthly construction noise levels at this building are 10dB and 13dB respectively above the screening criteria defined in the SMR for office use[100] for a period of one year. The change during the month with the highest noise level is 5dB. The Royals is

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[98] The exception is where the use and sensitivity of the receptor or land use is very sensitive to noise and have been included in the detailed assessment where there is a change less than 3dB. Further information can be found in Volume 5: Appendix SV-002-0MA07.

[99] 55dB $L_{pAeq,0700-2300}$ (free-field) during the day which is equivalent to 58dB $L_{pAeq,0700-2300}$ (façade).

[100] 55dB $L_{pAeq,0700-2300}$ (free-field) during the day which is equivalent to 58dB $L_{pAeq,0700-2300}$ (façade).

identified, on the basis of a precautionary assessment, as being subject to a likely significant adverse effect (denoted by MA07-C-N2 in Table 6 Volume 5: Appendix SV-002-0MA07). This temporary adverse effect may take the form of activity disturbance to office users.

13.4.21 Birchfields Primary School is located off Lytham Road, approximately 60m north of the land required for the construction of Birchfields Road vent shaft. The two-storey brick building features openable windows, providing natural ventilation. The southern façade of the building and its external amenity spaces will face the Birchfields Road vent shaft satellite compound. The Birchfields Primary School has been assessed against the criteria for schools. The typical and highest predicted daytime monthly construction noise levels at this building are 12dB and 18dB respectively above the screening criteria defined in the SMR for schools[101] for a period of five years and two months. The change during the month with the highest noise level is 11dB. Birchfields Primary School is identified, on the basis of a precautionary assessment, as being subject to a likely significant adverse effect (denoted by MA07-C-N3 in Table 6 Volume 5: Appendix SV-002-0MA07). This temporary adverse effect may take the form of activity disturbance to users of the school.

13.4.22 The Christie Hospital is located off the B5093 Wilmslow Road, approximately 90m from the route of the Proposed Scheme. The Paterson Redevelopment Project will introduce a new cancer research centre to the hospital (committed development MA07/445). The plans include a magnetic resonance imaging (MRI) room, which is considered to be the most vibration sensitive space and will be located in the basement of the new building. Other existing Christie Hospital buildings have also been identified as having vibration sensitive equipment/operations. In accordance with the SMR, a specific risk assessment has been carried out. Full details of the established assessment methodology and vibration criteria are provided in Volume 5: Appendix SV-002-0MA07. The assessment outcomes indicate that predicted vibration levels at the closest hospital building with vibration sensitive equipment is above the established criteria during TBM works for a period of approximately one month. The Christie Hospital is identified, on the basis of a precautionary assessment, as being subject to a likely significant adverse effect in terms of vibration (denoted by MA07-C-N4 in Table 6 Volume 5: Appendix SV-002-0MA07). This temporary effect may take the form of temporary disruption to hospital activities which involve the use of equipment that is very sensitive to vibration, for example, MRI and other imaging equipment.

Non-residential receptors: indirect effects

13.4.23 The assessment of construction noise and vibration indicates that significant indirect effects are unlikely to occur on non-residential receptors in the Davenport Green to Ardwick area.

Other mitigation measures

13.4.24 No other mitigation measures are proposed in this area.

[101] 50dB $L_{pAeq,0700-2300}$ (free-field) during the day which is equivalent to 53dB $L_{pAeq,0700-2300}$ (façade).

Summary of likely residual significant effects

13.4.25 The proposed avoidance and mitigation measures will reduce construction noise inside all individual dwellings from the construction activities such that residents will not be significantly affected[102].

13.4.26 The measures will also reduce the construction noise and vibration effects on the acoustic character in the majority of residential communities. Despite these measures, the noise and vibration effects on the acoustic character in the following residential community areas are considered likely to be significant:

- Withington;
- Rusholme; and
- Beswick (noise effects only).

13.4.27 Construction traffic in this area is likely to cause significant noise effects to adjacent residential properties on:

- the A34 Birchfields Road between the B5093 Mosely Road and Lytham Road;
- the A34 Kingsway between Mauldeth Road and Talbot Road;
- Scarcroft Road between Kirkmanshulme Lane and the A57 Hyde Road; and
- the A635 Manchester Road between Capital Road and Ashton Hill Lane.

13.4.28 Noise from specific construction activities has been identified as resulting in significant residual temporary effects on the non-residential buildings at:

- The Open University, the A560 Altrincham Road;
- The Royals (offices), the A560 Altrincham Road; and
- Birchfields Primary School, Lytham Road.

13.4.29 Vibration from specific construction activities has been identified as resulting in significant residual temporary effects on the MRI scanner proposed to be installed within The Christie Hospital Paterson Building, Wilmslow Road.

13.4.30 HS2 Ltd will continue to seek reasonably practicable measures to further reduce or avoid these significant effects. In doing so HS2 Ltd will continue to engage with stakeholders to fully understand the receptors, their use and the benefit of the measures.

[102] Refer to Volume 5: Appendix SV-001-00000, Sound, noise and vibration methodology, assumptions and assessment.

Cumulative effects

13.4.31 This assessment has considered the potential cumulative construction noise effects of the Proposed Scheme and other committed developments[103]. It is not anticipated that there will be any significant cumulative noise effects during construction of the Proposed Scheme.

13.5 Effects arising from operation

Assumptions and limitations

Local assumptions

13.5.1 The assessment of the effects of noise and vibration from the operation of the Proposed Scheme is based on the envisaged design as described in Section 2.2 of this report and in Volume 1 (Sections 4 and 8) and the highest likely train flows, assuming the service pattern including Phase One and Phase Two services. The expected passenger service frequency for the Proposed Scheme is described in Volume 1 (Section 4) and as outlined below for the Davenport Green to Ardwick area.

13.5.2 For the purpose of the operational sound, noise and vibration assessment it is assumed that passenger services in this area will start around 05:00. Services will increase to the number of trains per hour in each direction on the main lines set out in Table 30[104]. This number of services is generally assumed to operate throughout the day then decrease as trains are stabled with services typically finishing by midnight. The number of trains, shown in Table 30, takes account of HS2 Phase One, Phase 2a and the Proposed Scheme in operation, and other services using HS2 as a result of connections to other conventional lines, including Northern Powerhouse Rail (NPR). Assumptions for maximum operational train speeds are also shown in Table 30. Further information is presented in Volume 1 (Section 8).

Table 30: Local passenger service assumptions

Description of line	No. of trains per hour in each direction	Speed
Route of the Proposed Scheme (north of NPR Manchester to Leeds junction)	16	70mph (110kph)
Route of the Proposed Scheme (south of NPR Manchester to Leeds junction)	10	145mph (230kph)
NPR Manchester to Leeds junction	6	70mph (110kph)

[103] Refer to Volume 5: Appendix CT-004-00000, Planning data.

[104] The effects of noise and vibration from the operation of the Proposed Scheme are assessed based on the reasonably foreseeable worst case train flows which differ from the train flows described in Section 2. For further information see Volume 1 (Section 8).

Avoidance and mitigation measures

13.5.3 The development of the Proposed Scheme has sought to reduce noise impact as far as reasonably practicable.

13.5.4 Envisaged avoidance and mitigation measures that apply route-wide are described in Volume 1 (Section 9).

Airborne noise

13.5.5 Through the procurement process for the trains and the track, the use of proven international technology will enable the railway to be quieter than implied by current minimum UK[105] and European standards[106].

13.5.6 Along the route of the Proposed Scheme airborne noise will be reduced by engineering structures such as cuttings, safety fences on viaducts and tunnels. The location of the relevant engineering structures is shown on Map Series SV-05 (Volume 2: MA07 Map Book).

13.5.7 Significant noise effects from the operational static sources, such as line-side equipment, will be avoided through their design and the specification of noise emission requirements. Further information is presented in Volume 5: Appendix SV-001-00000.

13.5.8 As required by statute, noise insulation measures would be offered for qualifying buildings as defined in the Noise Insulation (Railways and Other Guided Transport Systems) Regulations 1996[107] and the Noise Insulation Regulations 1975[108] ('the NI Regulations'). Additionally, HS2 Ltd will apply criteria, to provide the same mitigation as defined in 'the NI Regulations' at residential buildings where noise from the use of the Proposed Scheme measured outside a dwelling exceeds the Interim Target defined by the World Health Organization's (WHO) Night Noise Guidelines for Europe[109] or the maximum noise level criteria[110] defined in the SMR. Noise insulation is designed to avoid residents experiencing any residual significant effect on health and quality of life from resulting noise inside their dwelling.

13.5.9 Noise can be generated at exits from tunnels due to pressure waves created inside the tunnel as the train enters. This is a well understood phenomenon and is mitigated by

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[105] Department for Transport (2021), *National Technical Specification Notice (NTSN) Rolling Stock – Noise (NOI)*. Available online at: https://www.gov.uk/government/publications/railway-interoperability-national-technical-specification-notices-ntsns.

[106] European Commission (2014), Technical Specification for Interoperability (TSI) Noise – Regulation No 1304/2014.

[107] *The Noise Insulation (Railways and Other Guided Transport Systems) Regulations 1996.* Her Majesty's Stationery Office, London.

[108] *The Noise Insulation Regulations 1975.* London, Her Majesty's Stationery Office, London. Available online at: http://www.legislation.gov.uk/uksi/1975/1763/contents/made.

[109] World Health Organization (2010), *Night Noise Guidelines for Europe*. Available online at: http://www.euro.who.int/__data/assets/pdf_file/0017/43316/E92845.pdf.

[110] Dependent on the number of train passes.

appropriate design and construction techniques. Porous tunnel portals, tunnels and vent shafts will be designed to avoid any significant airborne noise effects caused by the trains entering the tunnel.

Ground-borne noise and vibration

13.5.10 Significant ground-borne noise or vibration effects from the operational railway will be reduced or avoided through the design of the track and track-bed.

Assessment of impacts and effects

Residential receptors: direct effects – individual dwellings

13.5.11 The avoidance and mitigation measures, set out in the previous section, including noise insulation, will reduce noise inside all dwellings such that it will not reach a level where it will significantly affect residents.

Residential receptors: direct effects – communities

13.5.12 The proposed mitigation measures in the Davenport Green to Ardwick area will avoid or reduce adverse effects due to airborne noise on the majority of receptors.

13.5.13 Taking account of the envisaged mitigation, Map Series SV-05 (Volume 2: MA07 Map Book) shows the long-term 40dB[111] night-time and the 50dB daytime sound level contours. In general, below these levels adverse effects are not expected.

13.5.14 Above 40dB during the night and 50dB during the day the community effect of noise is dependent on the baseline sound levels in that area and the change in sound level (magnitude of effect) brought about by the Proposed Scheme. The airborne noise impacts and effects forecast for the operation of the Proposed Scheme are presented on Map Series SV-05 (Volume 2: MA07 Map Book). The changes in noise levels shown on these maps are likely to affect the acoustic character of the area such that taking account of the local context[112], there may be a significant effect when assessed on a community basis[113].

13.5.15 The assessment of operational noise and vibration indicates that significant operational sound, noise or vibration effects are unlikely to occur on communities in this area.

[111] Defined as the equivalent continuous sound level from 23:00 to 07:00 or $L_{pAeq,night}$.

[112] Further information is provided in Volume 5: Appendices SV-001-00000 and SV-003-0MA07.

[113] Further information is contained in Volume 1.

Residential receptors: indirect effects

13.5.16 The assessment of operational noise and vibration indicates that significant indirect effects on residential receptors are unlikely to occur in this area.

Non-residential receptors: direct effects

13.5.17 The assessment has not identified any airborne sound levels greater screening criteria relevant to the particular building use[114] and typically a change of greater than 3dB[115] compared to the existing baseline sound level at any of the non-residential receptors in the Davenport Green to Ardwick area.

13.5.18 The assessment has identified ground-borne vibration levels greater than the relevant screening criteria at The Christie Hospital, Wilmslow Road, Manchester and committed development MA07/445 (assessment location ref.: 615112) in the Davenport Green to Ardwick area, as shown in Map Series SV-03 (Volume 5: Sound, noise and vibration Map Book).

13.5.19 The Christie Hospital has been identified as a hospital with vibration sensitive equipment/operations and in accordance with the SMR, a specific risk assessment has been carried out. Full details of the established assessment methodology and vibration criteria are provided in Volume 5: Appendix SV-003-0MA07. The assessment outcomes indicate that predicted vibration levels in the hospital buildings with vibration sensitive equipment are below the established criteria. As such it is predicted that the vibration from passing trains will not affect the operation of vibration sensitive equipment. On this basis a likely significant effect is not identified at The Christie Hospital.

Non-residential receptors: indirect effects

13.5.20 The assessment of operational noise and vibration indicates that significant indirect effects are unlikely to occur on non-residential receptors in this area.

Other mitigation measures

13.5.21 No other mitigation measures are proposed in this area.

Summary of likely residual significant effects

13.5.22 At individual residences, the proposed mitigation measures will reduce operational noise inside all dwellings such that it does not reach a level where it will significantly affect residents, and therefore, no likely residual significant effects are identified.

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[114] As defined in the SMR and SV-001-00000.

[115] The exception is where the use and sensitivity of the receptor or land use is very sensitive to noise and has been included in the detailed assessment where there is a change of less than 3dB. Further information can be found in Volume 5: Appendix SV-001-00000.

13.5.23 The assessment of operational noise and vibration indicates that residual significant operational sound, noise or vibration effects are unlikely to occur on communities in this area.

13.5.24 The assessment of operational noise and vibration indicates that residual significant direct effects on non-residential receptors are unlikely to occur in this area.

Cumulative effects

13.5.25 It is not anticipated that there will be any significant cumulative noise effects during operation of the Proposed Scheme.

Monitoring

13.5.26 Volume 1 (Section 9) sets out the general approach to environmental monitoring during operation of the Proposed Scheme.

13.5.27 Operational noise and vibration monitoring will be carried out at different times during the lifetime of the Proposed Scheme at a combination of carefully selected monitoring locations including: adjacent or attached to moving vehicles, at fixed positions or in the vicinity of individual assets; and locations within the surrounding areas and communities alongside the railway corridor.

13.5.28 The expected noise and vibration performance of the Proposed Scheme, operational noise and vibration measurement data, associated asset information, description of corrective actions, results of measured performance compared to expected conditions, and monitoring reports will be shared with the relevant local authorities at appropriate intervals.

14 Traffic and transport

14.1 Introduction

14.1.1 This section considers the likely impacts on all forms of transport and the consequential potential significant effects on transport users arising from the construction and operation of the Proposed Scheme through the Davenport Green to Ardwick area. The effects on traffic and transport are assessed quantitatively, based on existing baseline traffic conditions and future scenarios.

14.1.2 Engagement with Highways England, Greater Manchester Combined Authority (GMCA), Trafford Metropolitan Borough Council (TMBC), Manchester City Council (MCC), Transport for Greater Manchester (TfGM) and Transport for the North (TfN) has been undertaken. An important focus of this engagement has been to obtain relevant baseline information and discuss transport survey requirements and assessment methodology.

14.1.3 A detailed report on traffic and transport impacts within the Davenport Green to Ardwick area is contained in the Transport Assessment (see Volume 5: Appendices TR-001, 002, 003 and 005).

14.1.4 Maps showing the location of the key environmental features (Map Series CT-10) and the key construction (Map Series CT-05) and key operational (Map Series CT-06) features of the Proposed Scheme can be found in the Volume 2: MA07 Map Book.

14.1.5 Maps showing traffic and transport significant effects during construction (Map series TR-03) and operation (Map series TR-04) and construction HGV routes to compounds (Map Series TR-08) can be found in Volume 5, Traffic and transport Map Book.

14.1.6 In addition, further traffic and transport data are set out in Background Information and Data (BID)[116] (see BID TR-004-00001: Transport Assessment policy and data report).

14.1.7 The Proposed Scheme is described in Section 2.

14.2 Scope, assumptions and limitations

14.2.1 The scope, key assumptions and limitations for the traffic and transport assessment are set out in Volume 1 (Section 8) and the EIA Scope and Methodology Report (SMR)[117] .

14.2.2 The peak level of construction traffic activity is expected to be 2030 and the opening year to be 2038. The forecasts used in the assessment have been produced prior to the development of a full understanding of the likely impact of COVID-19 on economic growth

[116] HS2 Ltd (2022), High Speed Two (HS2) Phase 2b (Crewe – Manchester), *Background Information and Data*. Available online at: https://www.gov.uk/government/collections/hs2-phase-2b-crewe-manchester-environmental-statement.

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

and travel behaviour. The full impact of COVID-19 is not yet known but is considered likely to result in lower travel demand in the medium term than the forecasts used in the assessment for background traffic and rail, including HS2.

14.2.3 Consequently, the assessment is considered to overstate travel demand for both construction and operation scenarios and therefore to present a robust case for traffic and transport. This also means that the operational assessment for 2046 is likely to include a level of growth more representative of 2048 or later, representing likely impacts at least 10 years post-opening of the Proposed Scheme.

14.2.4 The study area for traffic and transport includes Cheadle, Longsight, Northenden, Northern Moor, Old Trafford, Reddish, West Gorton, Withington and Wythenshawe.

14.2.5 The study area for traffic and transport also includes all strategic and local roads potentially affected by the Proposed Scheme, including the strategic routes: the M56 (including junctions 1 to 4) and the M60 (including junctions 1 to 7 and 21 to 27). It also includes rail stations at Gatley, Stockport, Burnage and Levenshulme, and tram stops on the East Didsbury and Ashton lines of the Metrolink network.

14.2.6 Forecast future transport movements by road and public transport, with and without the Proposed Scheme, have been derived from the Greater Manchester SATURN Model and the Greater Manchester Public Transport Model. These models have been developed by TfGM and cover an area approximating to Greater Manchester. These models represent the average weekday morning (08:00-09:00) evening (17:00-18:00) peak hours.

14.2.7 For operation, passenger demand for future year HS2 and long-distance rail passengers is derived from Department for Transport's (DfT) PLANET Framework Model (PFMv9.6).

14.2.8 Junction assessments for construction have been undertaken against the peak month of construction traffic and include robust assumptions on the level of construction traffic in the peak hours. The assessments also address the impact of highway interventions. The effects identified are considered to be a reasonable worst case.

14.2.9 Where the effects vary through the construction programme the highest magnitude significant effects are reported. Where there are both adverse and beneficial effects at different times, the highest magnitude adverse and highest magnitude beneficial are both reported.

14.3 Environmental baseline

Existing baseline

14.3.1 Existing conditions in the study area have been determined through site visits, traffic and transport surveys, liaison with Highways England, MCC, TMBC, GMCA and TfGM (including

provision of information on public transport, public rights of way (PRoW) and accident[118] data) and desktop analysis.

Surveys

14.3.2 Traffic surveys, comprising junction turning counts, manual classified counts, queue length surveys and automatic traffic counts, were undertaken in June 2017 with additional surveys undertaken in November 2017 and July 2018. These data have been supplemented by existing traffic data from other sources, including from Highways England, MCC, TMBC, GMCA and TfGM. Assessment of the data indicates that the weekday peak hours in the area are generally 07:00-08:00 and 17:00-18:00 with the latter corresponding to the Proposed Scheme assessment hour. However, there is only a small difference (1%-3%) for the AM peak between the observed peak hour and the period 08:00-09:00, which is the period when HS2 construction traffic movements and workforce arrivals and departures will have the greatest impact. Consequently, 08:00-09:00 and 17:00-18:00 have been used as the assessment hours representing a reasonable worst case.

14.3.3 PRoW surveys were undertaken in August and September 2017 to establish their nature and usage by non-motorised users (pedestrians, cyclists and equestrians). The surveys included PRoW and roads that will be crossed by the route of the Proposed Scheme, and any additional PRoW and roads that may be affected by the Proposed Scheme. The majority of the PRoW surveys were undertaken during the weekend, at times when recreational use is expected to be highest, but where routes are likely to be used for non-leisure uses such as commuting, surveys were undertaken on a weekday.

Strategic and local highway network

14.3.4 The strategic routes in this area are the M56 and the M60. The strategic road network in and around the area is generally busy during peak hours and delays can be experienced.

14.3.5 The local roads include (ordered by road class from south to north):

- A34 Kingsway/Birchfields Road/Anson Road/Upper Brook Street;
- A560 Altrincham Road/Gateley Road/Stockport Road/Brinksway/Chestergate;
- A5103 Princess Road/Princess Parkway;
- A5145 Wilmslow Road/Barlow Moor Road;
- A56 Cross Street/Chester Road/Bridgewater Way;
- A5079 Slade Lane;
- A6 Stockport Road;
- A6017 Stockport Road;
- A57 Hyde Road;

[118] The term accident in this report refers to injury related collisions reported to/recorded by the police. This data, known as STATS19, relate only to personal injury accidents on public roads that are reported to the police, and subsequently recorded, using the STATS19 accident reporting form.

- A6010 Wilbraham Road/Wilmslow Road/Dickenson Road/St John's Road/Kirkmanshulme Lane/Pottery Lane;
- A635 Ashton Old Road/Manchester Road;
- A662 Droylsden Road/Manchester Road/Ashton Road/Ashton New Road;
- A665 Midland Street;
- A665 Chancellor Lane/Devonshire Street North;
- B5166 Church Road/Royle Green Road;
- B5167 Palatine Road;
- B5095 Wilmslow Road;
- B5093 Wilmslow Road/Moseley Road/Albert Road;
- Greenbrow Road;
- Southmoor Road;
- Tatton Grove;
- Marriott Street;
- Belle Vue Street;
- Higher Ardwick;
- Handsworth Street;
- Hooper Street;
- Glenbarry Street;
- Rondin Road;
- Gorton Road;
- Stainforth Street;
- Albert Street;
- Palmerston Street;
- Darley Street;
- Grey Mare Lane; and
- Clayton Lane.

14.3.6 The local road network in this area is generally busy during peak hours and delays can be experienced.

14.3.7 Relevant accident data for the road network subject to assessment have been obtained from DfT[119]. Data for the three year period July 2016 to June 2019 have been assessed and any identified clusters (i.e. where there are nine or more accidents in the three year period) have been examined.

[119] Department for Transport (2021), *STATS19 Road Safety Data July 2016 - June 2019*. Available online at: https://www.gov.uk/government/collections/road-accidents-and-safety-statistics.

14.3.8 Fifteen accident clusters were identified within the Davenport Green to Ardwick area:

- A6010 Wilmslow Road/A6010 Wilbraham Road/B5093 Moseley Road/B5093 Wilmslow Road junction – in total there were nine accidents, of which one was classified as serious and eight were classified as slight;
- B5117 Wilmslow Road/Walmer Street junction – in total there were 10 accidents, of which two were classified as serious and eight were classified as slight;
- B5218 Chorlton Road/B5219 Moss Lane West/B5218 Upper Chorlton Road/Withington Road junction – in total there were 10 accidents, of which four were classified as serious and six were classified as slight;
- A635 Ashton Old Road/A6010 Alan Turing Way/A6010 Pottery Lane junction – in total there were 11 accidents, of which four were classified as serious and seven were classified as slight;
- Parkhouse Street/Greenside Street junction – in total there were 10 accidents, all of which were classified as slight;
- A662 Ashton New Road/Clayton Lane/Clayton Street junction – in total there were 11 accidents, of which three were classified as serious and eight were classified as slight;
- A6188 Manchester Road/B6167 Sandy Lane/Tiviot Way/Lancashire Hill/Belmont Way junction – in total there were nine accidents, of which two were classified as serious and seven were classified as slight;
- B5166 Styal Road/Finney Lane/Simonsway junction – in total there were nine accidents, all of which were classified as slight;
- A6 Stockport Road between B5093 Albert Road and Cromwell Grove – in total there were 12 accidents, of which two were classified as serious and 10 were classified as slight;
- A34 Birchfields Road between Meldon Road and Birch Hall Lane – in total there were nine accidents, all of which were classified as slight;
- A5103 Princess Parkway/B5167 Palatine Road junction – in total there were 11 accidents, all of which were classified as slight;
- A5145 Barlow Moor Road/A5103 Princess Road junction – in total there were nine accidents, all of which were classified as slight;
- A5103 Princess Road/A6010 Wilbraham Road junction – in total there were nine accidents, all of which were classified as slight;
- B5117 Wilmslow Road between B5219 Moss Lane East and Banff Road – in total there were 12 accidents, of which five were classified as serious and seven were classified as slight; and
- M60 junction 24/M67/A57 Manchester Road – in total there were 15 accidents, of which one was classified as serious and 14 were classified as slight.

14.3.9 The route of the Proposed Scheme will cross one road with roadside footways within the Davenport Green to Ardwick area. This is the A665 Midland Street. The remainder of the route in the Davenport Green to Ardwick area will be in tunnel.

Parking and loading

14.3.10 There is on-street marked and unmarked parking on some roads within the Davenport Green to Ardwick area that may be impacted by the Proposed Scheme. This includes on-street parking on the A5145 Barlow Moor Road, the B5167 Palatine Road, the B5093 Wilmslow Road, Marriott Street, Tatton Grove, the B5093 Moseley Road, the A34 Kingsway, Gorton Road and the A635 Ashton Old Road/Manchester Road, which are on construction traffic routes. There are also loading bays on the A5145 Barlow Moor Road and the B5093 Wilmslow Road that may be affected.

14.3.11 There is off-street parking within the Davenport Green to Ardwick area that may be impacted by the Proposed Scheme. This includes parking at The Christie Hospital (Car Park D), located off the B5093 Wilmslow Road, and parking at Fallowfield Retail Park, located off the A34 Birchfields Road, which is used by both users of the retail park and as a pick-up/drop-off facility for Birchfields Primary School.

Public transport network

14.3.12 Although the route of the Proposed Scheme in the Davenport Green to Ardwick area will largely be within tunnel, there are 57 bus services operating on 14 roads that will be crossed or could be affected by the route of the Proposed Scheme. There are also bus stops primarily located to serve the main built-up areas. The bus services that could be affected by the Proposed Scheme include:

- A560 Altrincham Road: route 11A (Stockport - Altrincham); route 288 (East Didsbury - Altrincham - Manchester Airport); and route X5 (Stockport - Sale);
- A5103 Princess Parkway/Princess Road: route 101 (Manchester - Wythenshawe); route 103 (Manchester Airport - Manchester); route 108 (Timperley - Manchester); route 288 (Manchester Airport - Altrincham - East Didsbury); route 763 (St Ambrose College - Burnage); route 766 (St Ambrose College - Flixton - Davyhulme); and route X5 (Stockport - Sale);
- A5145 Barlow Moor Road: route 23 (Stockport - The Trafford Centre); route 86 (Manchester - Chorlton); route 111 (Manchester - Withington Community Hospital - Southern Cemetery); route 172 (Newton Health - Chorlton); route 288 (Manchester Airport - Altrincham - East Didsbury); and route 743 (Heald Green - Loreto College);
- A5145 Wilmslow Road: route 23 (Stockport - The Trafford Centre); route 42 (Stockport - Withington - Manchester); route 42A (Manchester - East Didsbury - Reddish); route 42B (Woodford - Bramhall - Manchester); route 42C (Handforth Dean - Piccadilly Gardens); route 142 (Manchester - Fallowfield - East Didsbury); route 171 (Withington Hospital - Levenshulme - Newton Heath); and route 288 (Manchester Airport - Altrincham - East Didsbury);
- A34 Kingsway/A34 Birchfields Road/A34 Anson Road: route 42B (Woodford - Bramhall - Manchester); route 42C (Manchester - Cheadle - Handforth); route 50 (MediaCityUK - Manchester - East Didsbury); route 51 (East Didsbury - Media City); route 750 (Barlow

High School - Manchester); route 751 (Manchester - Barlow High School); and route 869 (Burnage - Didsbury - Gatley - Wythenshawe - Hale Barns);

- A6010 Pottery Lane: route 53 (Cheetham Hill - Rusholme - Old Trafford - Pendleton) and route 733 (Cheetham Hill - West Gorton - Longsight - Whalley Range);
- A6 Stockport Road: route 192 (Manchester City Centre - Stockport - Heaviley - Hazel Grove); route 733 (Whalley Range - Moss Side - Longsight - Cheetham Hill); and route X92 (Hazel Grove - Heaviley - Stockport - Manchester City Centre);
- A57 Hyde Road: route 201 (Manchester City Centre - Denton - Hyde - Hattersley); route 202 (Manchester City Centre - Haughton Green - Hyde - Gee Cross); route 203 (Manchester - Debdale Park - Reddish - Stockport); and route 205 (Manchester City Centre - Debdale Park - Denton - Dane Bank);
- A635 Ashton Old Road: route 7 (Stockport - Reddish - Gorton - Ashton); route 7A (Stockport - Reddish - Gorton - Ashton); route 7B (Stockport - Reddish - Droylsden - Ashton); route 171 (Withington Hospital - Levenshulme - Newton Heath); route 172 (Newton Health - Chorlton); route 219 (Manchester - Guide Bridge - Stalybridge); route 220 (Manchester - Audenshaw - Stalybridge); route 221 (Manchester - Openshaw - Dukinfield); route 703 (Abbey Hey - Openshaw - Clayton - Holt Town - Collyhurst); route 704 (Abbey Hey - Droylsden - Clayton - Moston - Harpurhey); route 707 (Fairfield - Gorton - Debdale Park - Denton - Dane Bank); route 719 (Beswick - Audenshaw - Guide Bridge - Hooley Hill - Denton); route 725 (Trinity High School - Manchester); route 747 (Haughton Green - Denton - Audenshaw - Fairfield); route 768 (Abbey Hey - Fairfield - Greenside - Droylsden - Littlemoss); route Y1 (St Peter's High School - Newton Heath); route Y2 (St Peter's High School - Beswick); route Y3 (St Peter's High School - Harpurhey); and route Y4 (St Peter's High School - Moss Side);
- A662 Ashton New Road: route 216 (Manchester - Clayton - Droylsden - Ashton - Stalybridge); route 230 (Ashton-under-Lyne - Droylsden - Piccadilly Gardens); and route 231 (Ashton-under-Lyne - Hurst - Droylsden - Piccadilly Gardens);
- B5167 Palatine Road: route 41 (Sale - Manchester - Middleton); route 43 (Manchester - Northenden - Wythenshawe - Manchester Airport); route 103 (Manchester - Moss - Side Wythenshawe - Manchester Airport); route 143 (Manchester - Fallowfield - West Didsbury); route 147 (Piccadilly Rail Station - West Didsbury); route 288 (Manchester Airport - Altrincham - East Didsbury); route 743 (Heald Green - Loreto College); and route 763 (St Ambrose College - Burnage);
- B5093 Wilmslow Road: route 41 (Sale - Manchester - Middleton); route 42 (Stockport - Withington - Manchester); route 42A (Manchester - East Didsbury - Reddish); route 42B (Woodford - Bramhall -Manchester); route 42C (Handforth Dean - Heald Green - Cheadle - Manchester); route 43 (Manchester - Withington - Wythenshawe - Manchester Airport); route 142 (Manchester - Fallowfield - East Didsbury); route 143 (Manchester - Fallowfield - West Didsbury); route 147 (Piccadilly Rail Station - West Didsbury); and route 743 (Heald Green - Loreto College);

- B5093 Moseley Road: route 150 (Gorton - Stretford - Trafford Centre); route 171 (Withington Hospital - Levenshulme - Newton Heath); route 750 (Barlow High School - Manchester); and route 763 (St Ambrose College - Burnage); and
- Church Road: route 43 (Manchester - Withington - Wythenshawe - Manchester Airport); route 103 (Manchester Airport - Wythenshawe - Manchester); and route 743 (Heald Green - Loreto College).

14.3.13 National and local rail services are accessible via Stockport Station and local rail services are accessible via Burnage, Gatley and Levenshulme. Stockport Station provides access to local and national services on the Crewe to Manchester Line and Burnage, Gatley and Levenshulme stations provide access to local services on the Styal Line.

14.3.14 There are a number of Metrolink stops in the Davenport Green to Ardwick area including: all stops between East Didsbury and Trafford Bar on the East Didsbury Line; all stops between Shadowmoss and Trafford Bar on the Airport Line; and all stops between Ashton-under-Lyne and Etihad Campus on the Ashton Line.

Non-motorised users

14.3.15 There are pedestrian footways adjacent to many of the roads in the built-up areas of Cheadle Hulme, Gatley, Cheadle, Wythenshawe, Sale, Didsbury, Heaton Moor, Withington, Burnage, Reddish, Stretford, Old Trafford, Levenshulme, Rusholme, Gorton and Droylsden. Roadside footways vary in width and condition within these areas. Where there is no formal roadside footway provision, non-motorised user numbers are generally low.

14.3.16 In the Davenport Green to Ardwick area, National Routes 6, 55, 60 and 62 and Regional Routes 82 and 85 (part of the National Cycle Network) pass through the area.

14.3.17 No PRoW will be crossed by the route of the Proposed Scheme in the Davenport Green to Ardwick area. There are, however, roadside footways alongside most local roads that could be affected by the Proposed Scheme and have been included in the assessment.

14.3.18 The surveys undertaken to inform the assessment showed that the route with the greatest daily usage during the survey period was Footpath Manchester 211 (through Withington Golf Club golf course), which was used by 98 pedestrians and 19 cyclists.

Waterways and canals

14.3.19 There are three navigable waterways in the Davenport Green to Ardwick area, the Manchester Ship, Ashton and Bridgewater canals. It is not expected that there will be any effects on these navigable waterways and this topic is not considered further in this assessment.

Air transport

14.3.20 Manchester Airport is 500m south of the Davenport Green to Ardwick area, within the Hulseheath to Manchester Airport area (MA06). The airport is primarily accessed from the

strategic road network via the M56 junctions 5 and 6. It is not expected that there will be any effects on air transport and this topic is not considered further in this assessment.

Future baseline

14.3.21 The future baseline traffic volumes have been calculated for the future years of 2030, 2038 and 2046. These have been used to support the assessment of construction and operation of the Proposed Scheme, reflecting the assumed route-wide construction peak (2030), opening year (2038) and a future assessment year (2046). Growth factors have been checked to ensure that committed developments are appropriately reflected in the growth forecasts. The assumptions underlying committed developments and transport schemes for each assessment year have been discussed with MCC, TMBC, TfGM and GMCA and are considered to be appropriately reflected in the traffic forecasts.

14.3.22 The TfGM transport models include assumptions on how public transport and highway infrastructure is expected to change in the future. At the time of the assessment, major committed changes to the transport network relevant to the assessment of the area that have been taken into account in the future baseline include:

- the M60 junction 8 to M62 junction 20 Smart Motorways (variable speed limits M60 junction 8 to junction 18) (opened 2018);
- new Metrolink zonal fare system (implemented 2019);
- new Metrolink trams as part of Metrolink Capacity Improvement Programme (all new trams expected to be in service by 2022);
- Stockport Town Centre Access Plan (expected to open 2025);
- Trafford Park Road Safety Scheme (expected to open 2025);
- B5211 Barton Dock Road Pedestrian Accessibility (expected to open 2025);
- Trafford Centre Bus Station Access Improvements (expected to open 2025);
- bus lanes on the B5211 Barton Dock Road (expected to open 2025);
- new bus lane on the A56 Chester Road at Sir Matt Busby Way (expected to open 2025); and
- the M60 junction 24 Denton Island Improvements (expected to open 2025).

14.3.23 Future year baseline forecasts have been interpolated and extrapolated as necessary from available TfGM model forecasts.

14.3.24 In the Davenport Green to Ardwick area, there are no known substantial committed changes to parking and pedestrian facilities.

14.3.25 The future baseline takes into account changes to cycling facilities associated with TfGM's plan to introduce a network of active travel routes across Greater Manchester, known as the Bee Network, including the Heatons Cycle Link, the Offerton to Stockport Beeway and the Chorlton Busy Beeway which are due to open in 2021.

Construction

14.3.26 Construction of the Proposed Scheme is expected to commence in 2025 with construction activity continuing to 2038 (although activity in 2038 will be limited to testing and commissioning). Construction activities have been assessed against 2030 baseline traffic flows, irrespective of when they occur during the construction period.

14.3.27 The year 2030 is the common future baseline year and the impact of individual or overlapping activities are considered against this single year.

14.3.28 Future baseline traffic volumes in the peak hours are forecast to grow by an average of 12% by 2030 compared to a baseline year of 2018.

Operation

14.3.29 Future baseline traffic volumes in the peak hours are forecast to grow by an average of 18% by 2038 compared to the baseline year of 2018.

14.3.30 Future baseline traffic volumes in the peak hours are forecast to grow by an average of 24% by 2046 compared to the baseline year of 2018.

14.4 Effects arising during construction

Avoidance and mitigation measures

14.4.1 The following measures are currently proposed to avoid or reduce effects on transport users:

- new highways (roads and PRoW) will be constructed and will be operational prior to the permanent closure of any existing highways, insofar as reasonably practicable;
- the majority of roads crossed by the route of the Proposed Scheme will be maintained or locally diverted during construction;
- traffic management measures will be implemented to limit any disruption;
- road closures will be restricted to overnight and weekends, insofar as reasonably practicable;
- temporary alternative routes for roadside footways and PRoW will be provided during construction, insofar as reasonably practicable, where either the existing or final proposed route is not available;
- where reasonably practicable, site haul routes will be created adjacent to the route of the Proposed Scheme to transport construction materials and equipment to reduce heavy goods vehicle (HGV) movements on public roads with access taken via the main road network;
- HGVs will be routed, insofar as reasonably practicable, along the strategic and/or primary road network;

- the use of the local road network will, insofar as reasonably practicable, be limited to use for site set-up, access for surveys and on-going servicing (including refuse collection and general deliveries to compounds) during construction;
- the reuse of excavated material along the route of the Proposed Scheme, insofar as reasonably practicable;
- highway measures including junction improvements, passing places and carriageway widening will be provided, as required, to manage the safe and efficient movement of vehicles on construction HGV routes;
- on-site welfare facilities will be provided, which will reduce daily travel by site workers;
- the Proposed Scheme within the Davenport Green to Ardwick area will be mainly in tunnel, reducing surface level interactions; and
- introduction of the temporary Manchester tunnel north portal construction sidings to manage the movement, removal, treatment and transfer of excavated material from Manchester tunnel.

14.4.2 Section 14 of the draft CoCP includes measures that aim to reduce the adverse impacts and effects on local communities and maintain public access. This includes the impacts of deliveries of construction materials and equipment.

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

14.4.4 The draft CoCP includes the requirement to develop local traffic management plans in consultation with the highway and traffic authorities and the emergency services. These will consider the local traffic management strategy including consideration of sensitive receptors, such that adverse impacts will be reduced, insofar as reasonably practicable.

14.4.5 Specific measures include core site operating hours of 08:00 to 18:00 on weekdays and 08:00 to 13:00 on Saturdays with site staff and workers generally arriving before the morning peak hour and departing after the evening peak hour. Activities such as major concrete pours may involve extended working hours for reasons of engineering practicability. Tunnelling and directly associated activities may be carried out on a 24-hour, seven days a week basis, with very few workers travelling within the peak traffic hours.

14.4.6 The number of private car trips to and from the construction compounds (both workforce and visitors) will be reduced by encouraging alternative sustainable modes of transport or vehicle sharing. This will be supported by an overarching framework travel plan that will require construction workforce travel plans to be produced that will include a range of potential measures to mitigate the impacts of workers' traffic and transport movements associated with construction of the Proposed Scheme. The travel plans will promote the use of sustainable transport modes as appropriate to the location and types of trip. They will include measures such as: provision of information on and promotion of public transport

services; provision of good cycle and pedestrian facilities; liaison with public transport operators; promotion of car sharing; and the appointment of a travel plan coordinator to ensure suitable measures are in place and are effective.

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

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

Assessment of impacts and effects

Temporary effects

14.4.8 The following section considers the impacts on traffic and transport and the likely consequential significant effects resulting from the construction of the Proposed Scheme.

Key construction transport issues

14.4.9 The assessment takes account of all of the impacts of the Proposed Scheme in the Davenport Green to Ardwick area. The main traffic and transport impacts during the construction period within this area will include:

- construction vehicle movements to and from the various construction compounds;
- road closures, realignments and diversions;
- associated highway works in adjoining community areas, including major works at the M56 junction 6 in the Hulseheath to Manchester Airport area (MA06) and the introduction of a gyratory system between the A635 Mancunian Way, the A635 Fairfield Street, the A665 Pin Mill Brow and the A665 Chancellor Lane (referred to as the A635/A665 Pin Mill Brow Gyratory in the remainder of this document) in the Manchester Piccadilly Station area (MA08);
- alternative routes for roadside footways; and
- possessions and blockades on the conventional rail network.

14.4.10 The construction assessment has also considered any impacts in the Davenport Green to Ardwick area that arise from construction of the Proposed Scheme in the adjoining community areas.

14.4.11 Construction vehicle movements required to construct the Proposed Scheme will include the delivery of plant and materials, movement of excavated materials and site worker trips.

Works will include utility works, earthworks, tunnelling, underpass, viaduct, bridge and highway construction.

14.4.12 Details of the construction compounds are provided in Section 2.3. Table 31 provides details of the compound set up date and the duration of active use. The duration of active use excludes any period where there are no substantial workforce trips or movement of materials to and from the compound.

14.4.13 Table 31 also provides a summary of the HGV and car/light goods vehicle (LGV) access trips at each compound in the peak month of activity and during the busy period. For each compound, the peak month of activity is the month within which HGV traffic is at its highest for that compound. The busy period is the period during which HGV traffic serving that compound will be greater than 50% of the HGV traffic in the peak month. Two-way trips refer to the total number of vehicle movements in both directions (e.g. with 200 westbound vehicles and 100 eastbound, there would be 300 two-way trips). The average daily combined two-way vehicle trips for the busy period is the lower end of the range shown in Table 31 and the average daily combined two-way vehicle trips for the peak month is the upper end of the range shown. The estimated duration of busy period is also provided.

Table 31: Typical vehicle trip generation for construction compounds in the Davenport Green to Ardwick area

Compound type	Compound name	Indicative start/set up date (years/ quarter)	Estimated duration of active use (years/ months)	Average daily combined two–way car/LGV trips during busy period and within peak month of activity	Average daily combined two–way HGV trips during busy period and within peak month of activity	Estimated duration of busy period (months)
Satellite	Altrincham Road vent shaft satellite compound	2028 Q1	4 years and 6 months	84-92	64-86	8
Satellite	Palatine Road vent shaft satellite compound	2027 Q2	6 years	133-182	128-154	6
Satellite	Wilmslow Road vent shaft satellite compound	2028 Q2	4 years and 6 months	84-92	85-92	4
Satellite	Birchfields Road vent shaft satellite compound	2027 Q3	5 years and 9 months	131-182	78-92	5
Main	Manchester tunnel north portal main compound	2025 Q2	9 years	225-306	156-210	63

Compound type	Compound name	Indicative start/set up date (years/ quarter)	Estimated duration of active use (years/ months)	Average daily combined two–way car/LGV trips during busy period and within peak month of activity	Average daily combined two–way HGV trips during busy period and within peak month of activity	Estimated duration of busy period (months)
Satellite	Manchester tunnel north portal satellite compound	2025 Q2	6 years and 6 months	22-22	253-316	7

14.4.14 The locations of the compounds and the associated construction HGV routes are shown in Map Series TR-08 (Volume 5, Traffic and transport Map Book). Table 32 summarises the construction HGV routes to and from each compound to the main road network. For some compounds, Table 32 includes multiple construction HGV routes. This is either because the construction HGV route varies depending on the origin/destination of the trip or because the construction HGV route varies over time to account for changes to the highway network through the construction period.

14.4.15 The average daily combined two-way HGV trips reported in Table 31 represent the total number of HGV movements to and from each compound during the busy period and in the peak month of activity on all of the available construction HGV routes combined. Where multiple construction HGV routes are shown in Table 32, the split of construction traffic between the available construction HGV routes will vary based on the point in the construction programme and the origin/destination of the construction HGV traffic.

Table 32: Construction HGV routes for construction compounds in the Davenport Green to Ardwick area

Compound name(s)	Access routes to/from compound(s) to main road network
Altrincham Road vent shaft satellite compound	• A560 Altrincham Road
Palatine Road vent shaft satellite compound	• B5167 Palatine Road and A5103 Princess Parkway • B5167 Palatine Road, A5145 Barlow Moor Road and A5103 Princess Parkway
Wilmslow Road vent shaft satellite compound	• B5093 Wilmslow Road, A5145 Barlow Moor Road and A5103 Princess Parkway • B5093 Wilmslow Road, A5145 Wilmslow Road and A34 Kingsway • B5093 Wilmslow Road, Tatton Street (westbound), B5167 Palatine Road, A5145 Barlow Moor Road and A5103 Princess Parkway (outgoing only) • A5103 Princess Parkway, A5145 Barlow Moor Road, B5093 Wilmslow Road, Marriott Street (eastbound) and B5167 Palatine Road (incoming only) • B5093 Wilmslow Road, A6010/A34 Moseley Road and A34 Kingsway
Birchfields Road vent shaft satellite compound	• A34 Birchfields Road, A34 Moseley Road and A34 Kingsway • A34 Birchfields Road/Anson Road/Upper Brook Street and A57(M) Mancunian Way • A34 Birchfields Road, A6010 Moseley Road, B5093 Wilmslow Road, A5145 Barlow Moor Road and A5103 Princess Parkway (for infrequent use only)

Compound name(s)	Access routes to/from compound(s) to main road network
Manchester tunnel north portal main compound	• Rondin Road and A635 Ashton Old Road
Manchester tunnel north portal satellite compound	• Rondin Road and A635 Ashton Old Road

14.4.16 Information on the indicative construction programme is provided in Section 2.3 and the construction methodology is summarised in Volume 1 (Section 6). This illustrates how the phasing of activities at different compounds will generally be staggered and that construction activities at individual compounds may not occur over the whole duration presented in Table 31.

14.4.17 The effects of construction of the Proposed Scheme on the highway network in the Davenport Green to Ardwick area have been assessed by undertaking strategic model runs for a number of 'with HS2' construction scenarios, and by comparing the flows and delays against the 2030 future baseline scenario. The assessment is based on the highest volume of construction traffic on each construction HGV route in each construction scenario. Where construction HGV routes will serve more than one construction compound, the assessment is based on the highest combined volume of construction traffic on each section of each construction HGV route in each construction scenario.

14.4.18 Whilst the Proposed Scheme within the Davenport Green to Ardwick area will be mainly in tunnel, the construction of Manchester Piccadilly High Speed station in the adjacent Manchester Piccadilly Station area (MA08) will lead to changes to traffic levels in the Davenport Green to Ardwick area.

14.4.19 In using the strategic model, the impacts and effects have been considered in a utilities scenario and four scenarios representing the main construction phases. These scenarios ensure that the assessment addresses the different combinations and interactions of advance works, utility works, temporary highway closures and diversions and construction lorry movements through the construction period. The scenarios are:

- utilities scenario, 2025 Q1. This corresponds with the utility works in the area including any works to low voltage overhead or underground lines, gas pipes, sewers and telecommunication cables. Whilst there will be some construction traffic during this period, it is likely to be minimal;
- scenario 1, peak between 2025 Q2 and 2029 Q3. This corresponds with the peak in construction traffic movements following the closure of roads on the north side of the existing Manchester Piccadilly Station and initial construction works at the A635/A665 Pin Mill Brow Gyratory (in the adjacent Manchester Piccadilly Station area (MA08)). This scenario equates to 96% of the overall peak in construction traffic across the whole construction period;
- scenario 2, peak between 2029 Q4 and 2030 Q2. This corresponds with the peak in construction traffic movements associated with the main construction works and includes the temporary road layout at the A635/A665 Pin Mill Brow Gyratory. This

scenario equates to 100% of the overall peak in construction traffic across the whole construction period;

- scenario 3, peak between 2030 Q3 and 2031 Q2. This corresponds with the peak in construction traffic movements following the opening of the new A635/A665 Pin Mill Brow Gyratory. This scenario equates to 74% of the overall peak in construction traffic across the whole construction period; and
- scenario 4, peak after 2031 Q2. This corresponds with the peak in construction traffic movements during the decommissioning of construction compounds following the completion of all construction works. This scenario equates to 57% of the overall peak in construction traffic across the whole construction period.

14.4.20 The construction works and construction traffic movements associated with the Proposed Scheme differ for each of these scenarios, the assessment considers the impacts in all scenarios and reports the highest magnitude of significant effects, regardless of which scenario they arise in. The most relevant highway interventions and works for each scenario are shown in Table 33.

Table 33: Construction highway interventions by scenario

Type	Intervention	Utilities scenario	Scenario 1	Scenario 2	Scenario 3	Scenario 4
Main works	Temporary traffic management at the A560 Altrincham Road/M56 junction 3	Not included	Included	Not included	Not included	Not included
Main works	Closure of the A665 Midland Street	Not included	Included	Included	Included	Included
Main works	Temporary closure of the Metrolink Ashton Line (Manchester Piccadilly Station area (MA08))	Not included	Not included	Not included	Included	Included
Main works	Diversion of the A665 Chancellor Lane (Manchester Piccadilly Station area (MA08))	Not included	Not included	Included	Included	Included
Main works	Temporary road layout around the A635/A665 Pin Mill Brow Gyratory (Manchester Piccadilly Station area (MA08))	Not included	Not included	Included	Not included	Not included
Main works	New A635/A665 Pin Mill Brow gyratory (Manchester Piccadilly Station area (MA08))	Not included	Not included	Not included	Not included	Included
	Construction HGV traffic as percentage of peak construction HGV traffic	Minimal	96%	100%	74%	57%

14.4.21 The strategic model has been used to assess these construction scenarios taking account of the construction traffic movements and any road closures, traffic management or changes to junction operations in each scenario. The strategic model outputs for each of these scenarios are only relevant to the assessment of the effects on traffic delays to vehicle occupants, traffic related severance and public transport delay.

Highway network

Strategic and local highway network

14.4.22 The primary HGV access routes for construction vehicles will be the strategic and/or primary road network with the use of the local road network limited, so far as reasonably practicable. The construction HGV routes will also provide access to compounds. Where reasonably practicable, site haul routes alongside the route of the Proposed Scheme will be used to reduce the impact on the local road network. In this area, the main construction HGV routes will be (ordered by road class from south to north):

- M56 (including junction 2 and junction 3a);
- M60 (including junction 3, junction 5 and junction 23);
- A34 Kingsway/Birchfields Road/Anson Road (between the M60 junction 3 and the A57(M) Mancunian Way);
- A5145 Barlow Moor Road/Wilmslow Road (between the A5103 Princess Road and the A34 Kingsway);
- A560 Altrincham Road;
- A5103 Princess Parkway/Princess Road (between the M56 junction 3a and the A5145 Barlow Moor Road);
- A5145 Wilmslow Road;
- A6010 Pottery Lane (between Gorton Road and the A635 Ashton Old Road);
- A635 Ashton Old Road/Manchester Road (between the M60 junction 23 and the A665 Pin Mill Brow);
- A665 Midland Street (between the A665 Chancellor Lane and the A635 Ashton Old Road);
- B5167 Palatine Road (between the A5103 Princess Parkway and the B5093 Wilmslow Road);
- B5166 Church Road;
- B5093 Wilmslow Road/Moseley Road (between the A5145 Barlow Moor Road and the A6010 Moseley Road);
- Tatton Grove (between the B5167 Palatine Road and the B5093 Wilmslow Road);
- Marriott Street (between the B5167 Palatine Road and the B5093 Wilmslow Road);
- Gorton Road (between Gable Street and the A6010 Pottery Lane);
- Stainforth Street (between the A635 Ashton Old Road and Gorton Street);
- Gable Street (between the A635 Ashton Old Road and Gorton Road); and
- Rondin Road (south of the A635 Ashton Old Road).

14.4.23 In addition to changes in traffic flows due to construction traffic, temporary highway closures and diversions or realignments will be required in a number of locations as set out in Section 2.3. The works to construct both temporary and permanent highway diversions/realignments could also result in disruption to highway users. In most cases,

these works will be restricted to short-term overnight and/or weekend closures, and are not, therefore, considered significant. The following works will have a longer duration:

- Rondin Road – temporary realignment of Rondin Road for six years during construction. Access along Rondin Road will be maintained. The realignment will be constructed 15m west of the existing alignment, resulting in a negligible change in journey length; and
- Handsworth Street – temporary closure of a section of Handsworth Street for six months during construction. Access will be maintained during construction with traffic controlled by temporary traffic signals. There will be no change in journey length.

14.4.24 The temporary diversions or realignments will not change journey length for vehicle occupants and will not result in any significant effects with regards to changes to journey times for vehicle occupants.

14.4.25 The movement of excavated or fill material and construction vehicles accessing construction compounds during the construction of the Proposed Scheme together with temporary road closures and diversions is expected to result in changes in daily traffic flows. These movements, closures and diversions include those in the adjacent Hulseheath to Manchester Airport area (MA06) and the adjacent Manchester Piccadilly Station area (MA08).

14.4.26 These changes in traffic flow will lead to changes in delays to vehicle occupants and congestion, which are significant. The significant effects with the highest magnitude at each junction will be:

- A34 Handforth Bypass/B5094 Stanley Road - minor adverse effect during scenarios 1, 2, 3 and 4;
- A555/A555 Ringway Road/B166 Styal Road - minor adverse effect during scenarios 1, 2 and 3;
- B5166 Styal Road/Finney Lane/Simonsway - minor adverse effect during scenarios 1, 2, 3 and 4;
- Greenbrow Road/Newall Road/Foxfield Road - moderate adverse effect during scenarios 1, 2, 3 and 4 and minor beneficial effect during the utilities scenario;
- Greenbrow Road/Tuffley Road - minor beneficial effect during scenarios 1 and 2;
- A34 Kingsway/Broadway - minor adverse effect during scenario 2;
- A34 Kingsway/A560 Gatley Road - moderate adverse effect during scenarios 1, 2 and 3;
- M60 junction 3 - moderate adverse effect during scenarios 1, 3 and 4;
- M56 junction 3a/A560 Altrincham Road - moderate adverse effect during scenarios 2 and 4;
- A560 Altrincham Road/B5165 Stockport Road/A560 Shaftesbury Avenue/Brooklands Road - minor adverse effect during scenario 1;
- A560 Stockport Road/B5465 Edgeley Road - minor adverse effect during scenarios 1, 2 and 3;
- A560 Stockport Road/St Lesmo Road/Essex Avenue - minor adverse effect during scenarios 1, 2, 3 and 4;

- A5103 Princess Road/B5167 Palatine Road - minor adverse effect during scenarios 1, 2 and 3;
- B5167 Palatine Road/Longley Lane/Greenpark Road - minor adverse effect during scenario 1;
- B5167 Wythenshawe Road/Moorcroft Road - moderate adverse effect during scenarios 1 and 2;
- Brooklands Road/Norris Road - minor adverse effect during scenario 1;
- M60 junction 27 (A560 Portwood Roundabout) - minor adverse effect during scenarios 1, 2, 3 and 4;
- B5166 Northenden Road/Norris Road - minor adverse effect during scenarios 1, 2, 3 and 4;
- A6188 Tiviot Way/Water Street - minor adverse effect during scenarios 1 and 2;
- A6144 Northenden Road/A6144 Old Hall Road - moderate adverse effect during scenario 1;
- A5145 Barlow Moor Road/B5167 Palatine Road - minor adverse effect during scenarios 1, 2, 3 and 4;
- B5093 Wilmslow Road/Fog Lane/Lapwing Lane - major adverse effect during scenario 2;
- Mauldeth Road West/Nell Lane - minor adverse effect during scenarios 1, 2 and 3;
- A5103 Princess Road/Whitchurch Road - minor beneficial effect during the utilities scenario and scenarios 3 and 4;
- A34 Kingsway/Grangethorpe Drive/Talbot Road - minor adverse effect during scenarios 1, 2, 3 and 4;
- Yew Tree Road/Mauldeth Road West - minor adverse effect during scenario 3 and moderate beneficial effect during the utilities scenario;
- B5093 Wilmslow Road/Egerton Road - minor adverse effect during scenarios 1 and 2;
- A6010 Edge Lane/A6010 Wilbraham Road/A5145 Edge Lane/Hampton Road - minor adverse effect during scenario 1;
- A6010 Wilmslow Road/A6010 Wilbraham Road/B5093 Moseley Road/B5093 Wilmslow Road - moderate adverse effect during scenario 2;
- A5181 Barton Road/A5145 Kingsway/B5213 Urmston Lane - minor adverse effect during scenario 1;
- A34 Birchfields Road/Old Hall Lane - minor adverse effect during scenarios 1, 2 and 3;
- A6010 Dickenson Road/A6010 Wilmslow Road/B5117 Wilmslow Road - minor adverse effect during scenario 3;
- A34 Birchfields Road/A34 Anson Road/A6010 Dickenson Road - moderate adverse effect during scenario 2;
- B5217 Seymour Grove/Kings Road - minor adverse effect during the utilities scenario and scenarios 1, 2, 3 and 4;
- M60 junction 24/A57 Manchester Road - major adverse effect during scenario 2;

- A6 Stockport Road/A6010 Dickenson Road/Stanley Grove - minor adverse effect during scenario 2;
- A34 Upper Brook Street/Hathersage Road - minor adverse effect during scenario 2;
- A57 Hyde Road/Tan Yard Brow/Willow Grove - major adverse effect during scenarios 2, 3 and 4;
- A57 Hyde Road/Chapman Street - major adverse effect during the utilities scenario and scenarios 1, 2, 3 and 4;
- A57 Hyde Road/Knutsford Road/Whitwell Way - minor adverse effect during the utilities scenario and scenarios 2, 3 and 4;
- A57 Hyde Road/B6178 Hyde Road/B6178 Mount Road - major adverse effect during scenario 2;
- Chapman Street/Cross Lane - moderate adverse effect during scenarios 2, 3 and 4;
- A57 Hyde Road/Birch Street - major adverse effect during scenario 2;
- A6010 Pottery Lane/A57 Hyde Road - major adverse effect during scenario 2;
- A57 Hyde Road/Clowes Street - major adverse effect during scenarios 2, 3 and 4;
- A665 Devonshire Street/Coverdale Crescent/Hellidon Close - moderate adverse effect during scenario 2;
- A57 Hyde Road/Bennett Street - major adverse effect during scenarios 2, 3 and 4;
- A665 Devonshire Street North/A57 Hyde Road/A665 Devonshire Street - moderate adverse effect during the utilities scenario and scenario 1 and minor beneficial effect during scenarios 3 and 4;
- Gorton Lane/Belle Vue Street - major adverse effect during scenarios 2 and 3;
- A6010 Pottery Lane/Gorton Lane/Wenlock Way - major adverse effect during scenario 2;
- A665 Chancellor Lane/A665 Devonshire Street North/Higher Ardwick - major adverse effect during scenarios 1 2, 3 and scenario 4;
- A635 Ashton Old Road/Capital Road - minor beneficial effect during scenarios 3 and 4;
- A635 Ashton Old Road/Vine Street - minor adverse effect during the utilities scenario and scenario 1;
- A635 Ashton Old Road/Ogden Lane/Fairfield Road - moderate adverse effect during scenario 1 and minor beneficial effect during the utilities scenario and scenarios 2 and 3;
- A635 Manchester Road/Ashton Hill Lane - major adverse effect during scenario 2;
- A635 Ashton Old Road/Stainforth Street - moderate adverse effect during the utilities scenario and scenario 1;
- A635 Ashton Old Road/Gable Street - moderate adverse effect during the utilities scenario and scenario 1;
- M60 junction 23/A6140 Moss Way - minor adverse effect during scenarios 1, 2 and 3;
- A662 Ashton New Road/Hillkirk Street - moderate adverse effect during the utilities scenario and scenarios 1 and 3;

- Briscoe Lane/Grimshaw Lane - minor adverse effect during the utilities scenario and scenarios 1, 2 and 3;
- Briscoe Lane/Ten Acres Lane - minor adverse effect during scenarios 2 and 3; and
- A663 Broadway/Long Lane/Costco access - minor adverse effect during the utilities scenario and scenarios 1, 2, 3 and 4.

14.4.27 Construction of the Proposed Scheme will result in substantial changes in traffic flows (i.e. more than 30% for HGVs or for all vehicles) in some locations, which can lead to changes in traffic-related severance for non-motorised users, which are significant. The significant effects with the highest magnitude in each location are set out in Table 34 and Table 35.

Table 34: Roads with changes in daily all vehicle movements (more than 30%) resulting in significant effects on traffic-related severance for non-motorised users, 2030

Road name	Significant effect	Construction scenario
Whitwell Way (between Garratt Way and A57 Hyde Road)	Moderate adverse	Scenario 2
Devonshire Street South (between A6 Stockport Road and A5184 Plymouth Grove)	Moderate adverse	Scenario 2
Belle Vue Street (between A57 Hyde Road and Birch Street)	Major adverse	Scenario 2
Birch Street (between A57 Hyde Road and Belle Vue Street)	Moderate adverse	Scenarios 2 and 3
Belle Vue Street (between Birch Street and Gorton Lane)	Major adverse	Scenario 2
Vine Street (between Abbey Hey Lane and A635 Ashton Old Road)	Major adverse	Scenario 2
Cornwall Street (between Ogden Lane and A635 Ashton Old Road)	Major adverse	Scenario 2
A665 Devonshire Street North (between Higher Ardwick and A57 Hyde Road)	Moderate beneficial	Scenario 2
Abbey Hey Lane (between A635 Ashton Old Road and Capital Road)	Moderate adverse	Scenario 2
Gorton Road (between A635 Ashton Old Road and A6010 Pottery Lane)	Moderate adverse	Scenarios 1 and 2
A665 Midland Street (between A665 Chancellor Lane and Handsworth Street)	Moderate beneficial	Scenarios 1, 2, 3 and 4
Greenside Street (between A635 Ashton Old Road and Parkhouse Street)	Minor adverse	Utilities scenario
Stainforth Street (between A635 Ashton Old Road and Gorton Road)	Moderate adverse	Scenario 2
Gable Street (between Stainforth Street and A635 Ashton Old Road)	Moderate adverse	Utilities scenario and scenarios 1 and 2

Road name	Significant effect	Construction scenario
A635 Ashton Old Road (between Stainforth Street and A6010 Pottery Lane)	Moderate beneficial	Scenario 2
A635 Ashton Old Road (between A665 Midland Street and Gable Street)	Moderate beneficial	Scenario 2
A635 Ashton Old Road (between A665 Chancellor Lane and A665 Midland Street)	Moderate beneficial	Scenario 2
Greenside Street (between Parkhouse Street and Clayton Lane)	Moderate adverse	Scenario 2
Grey Mare Lane (between Sunny Lowry Road and Albert Street)	Major adverse	Scenario 2
Albert Street (between Darley Street and Grey Mare Lane)	Moderate adverse	Scenario 2
Albert Street (between Councillor Street and Darley Street)	Moderate adverse	Utilities scenario
Palmerston Street (between Councillor Street and Gurney Street)	Moderate adverse	Scenario 2
Grey Mare Lane (between Albert Street and A662 Ashton New Road)	Major adverse	Utilities scenario and scenarios 2 and 3
Darley Street (between Albert Street and A662 Ashton New Road)	Minor adverse	Scenario 2
Councillor Street (between Palmerston Street and A662 Ashton New Road)	Moderate adverse	Scenario 2
Hallkirk Street/Cambrian Street (between A662 Ashton New Road and Phillips Park Road)	Moderate adverse	Utilities scenario and scenarios 2 and 3
Bradford Road (between A6010 Alan Turing Way and Varley Street)	Moderate beneficial	Scenario 2

Table 35: Roads with changes in daily HGV movements (more than 30%) resulting in significant effects on traffic-related severance for non-motorised users, 2030

Road name	Significant effect	Construction scenario
A34 Kingsway (between Fairmile Drive and B5095 Wilmslow Road)	Moderate adverse	Scenarios 1 and 2
A34 Kingsway (between B5095 Wilmslow Road and A5145 Wilmslow Road)	Moderate adverse	Scenarios 1 and 2
A34 Kingsway (between A5145 Parrs Wood Lane and Queensway)	Moderate adverse	Scenarios 1 and 2
A626 Tiviot Way (between Water Street and M60 junction 27)	Major adverse	Scenarios 1, 2 and 3
A34 Kingsway (between Queensway and Lane End Road)	Moderate adverse	Scenarios 1 and 2
A34 Kingsway (between Lane End Road and Southlea Road)	Moderate adverse	Scenarios 1 and 2
A34 Kingsway (between Southlea Road and Green End Road)	Moderate adverse	Scenarios 1 and 2
A34 Kingsway (between Green End Road and Mauldeth Road)	Moderate adverse	Scenarios 1 and 2

Road name	Significant effect	Construction scenario
A34 Kingsway (between Mauldeth Road and Talbot Road)	Moderate adverse	Scenarios 1 and 2
A34 Kingsway (between Talbot Road and B5093 Moseley Road)	Moderate adverse	Scenarios 1 and 2
A34 Moseley Road (between A34 Birchfields Road and A34 Kingsway)	Moderate adverse	Scenarios 1 and 2
A34 Birchfields Road (between A34 Moseley Road and Lytham Road)	Major adverse	Scenarios 1 and 2
A34 Birchfields Road (between Lytham Road and Old Hall Lane)	Moderate adverse	Scenarios 1 and 2
Platt Lane (between Lloyd Street South and A5103 Princess Road)	Moderate adverse	Scenario 2
Platt Lane (between Hart Road and Lloyd Street South)	Moderate adverse	Scenario 2
A34 Birchfields Road (between Old Hall Lane and Birch Hall Lane)	Moderate adverse	Scenarios 1 and 2
A34 Birchfields Road (between Birch Hall Lane and A6010 Dickenson Road)	Major adverse	Scenarios 1 and 2
A34 Anson Road (between A6010 Dickenson Road and Denison Road)	Major adverse	Scenarios 1 and 2
A34 Upper Brook Street (between Hathersage Road and Grafton Street)	Moderate adverse	Scenarios 1 and 2
Belle Vue Street (between A57 Hyde Road and Birch Street)	Major adverse	Scenario 2
Belle Vue Street (between Birch Street and Gorton Lane)	Major adverse	Scenario 2
Higher Ardwick (between Union Street and A665 Chancellor Lane)	Major adverse	Scenarios 1, 2, 3 and 4
A635 Ashton Old Road (between Greenside Street and Dakley Street)	Moderate adverse	Scenario 3
A635 Ashton Old Road (between A6010 Pottery Lane and Greenside Street)	Moderate adverse	Scenarios 1 and 3
A635 Manchester Road (between B6390 Audenshaw Road and A662 Lumb Lane)	Major adverse	Scenarios 2, 3 and 4
A662 Lumb Lane (between A635 Manchester Road and A662 Droylsden Road)	Moderate adverse	Scenarios 1 and 2
Albert Street (between Darley Street and Grey Mare Lane)	Moderate adverse	Scenario 3
A662 Manchester Road (between Market Street and Davenport Street)	Moderate adverse	Scenarios 1 and 2
Palmerston Street (between Councillor Street and Gurney Street)	Moderate adverse	Scenario 3
A6140 Lord Sheldon Way (between A635 Manchester Road and Ashton Leisure Park)	Moderate adverse	Scenarios 1 and 2
A6140 Wellington Road (between A627 Cavendish Street and A627 Oldham Road)	Moderate adverse	Scenarios 1 and 2
A6140 Lord Sheldon Way (between A627 Cavendish Street and Richmond Street)	Moderate adverse	Scenarios 1 and 2

14.4.28 Utility works have been included in the assessment where they are major and where the traffic or transport impacts from the works separately, or in combination with other works, will be greater than other construction activities arising within the area. Some utility works are expected to result in only localised traffic and pedestrian diversions, which will be of short-term duration and are not expected to result in significant effects.

Accidents and safety

14.4.29 There will be no significant effects on accidents and safety as there are no locations where there are both accident clusters and substantial changes in traffic during construction.

Parking and loading

14.4.30 No significant effects on parking and loading have been identified during construction in the Davenport Green to Ardwick area.

14.4.31 Permanent loss of parking is reported under the operational assessment.

Public transport network

14.4.32 Construction of the Proposed Scheme will require temporary diversions and traffic management on bus routes, with consequential changes in journey times and the need to relocate bus stops. This will result in changes in public transport delays with effects, which are significant, on the users of:

- bus routes 7, 7A, 7B, 171, 172, 219, 220, 221, 703, 704, 707, 719, 747 and 768 operating on the A635 Ashton Old Road between the A6010 Alan Turing Way and Manchester City Centre – moderate adverse effect;
- bus routes 192, 733 and X92 operating on the A6 Stockport Road between the A6010 Alan Turing Way and Manchester City Centre – moderate adverse effect;
- bus routes 201, 202, 203 and 205 operating on the A57 Hyde Road between the A6010 Alan Turing Way and Manchester City Centre – moderate adverse effect; and
- bus routes 216, 230 and 231 operating on the A662 Ashton New Road between the A6010 Alan Turing Way and Manchester City Centre – moderate adverse effect.

14.4.33 There will also be impacts for passengers on the Metrolink Ashton Line. This is associated with the temporary closure of the line for a period of approximately two years to enable the relocation and extension of the Piccadilly Metrolink stop beneath the Manchester Piccadilly High Speed station in the adjacent Manchester Piccadilly Station area (MA08). A replacement bus service will be in place during this period. The effect of the temporary closure is reported in Volume 2, Community Area report: Manchester Piccadilly Station (MA08), Section 14.4.

14.4.34 The replacement bus service will call at bus stops close to the majority of the existing stops on the Metrolink Ashton Line, however, users of the Etihad Campus Metrolink stop will be required to board and alight the service at bus stops on the A662 Ashton New Road with an increase in journey length of up to 750m. This will result in a major adverse effect, which is significant.

14.4.35 There are interfaces with the existing rail network in this area, in particular on the operation of the Ashburys Line and its passenger and rail freight services.

14.4.36 The construction of the Proposed Scheme is expected to require a number of rail possessions and blockades over a period of up to four years in this area. Overall, there will be four possessions up to 54 hours and one blockade of four days. The possessions and blockades will be required to enable the construction of scheme elements including Manchester tunnel north portal construction sidings.

14.4.37 Disruption to rail users will be reduced by limiting possessions, where reasonably practicable, to existing maintenance periods. Possessions and blockades will affect users of the Ashburys Line and will be managed through a combination of measures that could include rail service diversions or replacement bus services, which will reduce the disruption to the travelling public. However, while individually these possessions and blockades are not considered significant, the possessions will occur over a lengthy period and their cumulative impact is considered to have a minor adverse effect, which is significant.

14.4.38 HS2 Ltd will work with Network Rail and the train and freight operating companies to ensure that any need for additional possessions can be reduced with good planning and communication (including appropriate advance notice).

Non-motorised users

14.4.39 The construction works associated with the Proposed Scheme will require the temporary closure, diversion or realignment of PRoW and roads in the vicinity of the Proposed Scheme, including, where necessary, around construction compounds. In most cases, these will be of a short duration and/or distance and will not have a significant effect on users.

14.4.40 Nonetheless, there will be temporary effects, which are significant, on non-motorised users during construction at Footpath Manchester 211 resulting in a minor adverse effect from an increase in journey length of up to 146m.

14.4.41 Permanent diversions to PRoW and roads are reported under the operational assessment.

Permanent effects

14.4.42 Any permanent effects of construction are considered in the assessment of operation for traffic and transport. This is because the impacts and effects of ongoing changes in travel demand and the wider impacts and effects of the operational phase need to be considered together.

Other mitigation measures

14.4.43 The implementation of the measures in the draft CoCP, including travel plans, will help mitigate the transport-related effects during construction of the Proposed Scheme.

14.4.44 No further appropriate traffic and transport mitigation measures have been identified. HS2 Ltd will, however, continue to work with the relevant highway authorities to identify whether further mitigation measures should be provided.

Summary of likely residual significant effects

14.4.45 The temporary residual significant effects during construction remain as described above. These effects will be temporary and reversible in nature lasting only for the duration of the construction works.

14.4.46 The most intensive periods of construction of the Proposed Scheme will cause changes in traffic that will result in the following temporary effects, which are significant, through changes to congestion and/or delays for road users:

- major adverse effects at 13 junctions;
- moderate adverse effects at 15 junctions;
- minor adverse effects at 31 junctions;
- moderate beneficial effects at one junction; and
- minor beneficial effects at six junctions.

14.4.47 Changes in traffic during the construction period will result in the following temporary effects, which are significant, on traffic-related severance for non-motorised users:

- major adverse effects on 13 roads;
- moderate adverse effects on 35 roads;
- minor adverse effects on two roads; and
- moderate beneficial effects on seven roads.

14.4.48 Changes in bus journey times resulting in public transport delays during the construction period will result in temporary moderate adverse effects, which are significant, on four bus corridors.

14.4.49 There will be a temporary effect, which is significant, on users of the Metrolink Ashton Line associated with the temporary closure and replacement bus service. This effect has been reported in Volume 2, Community Area report: Manchester Piccadilly Station (MA08), Section 14.4.

14.4.50 There will be a temporary major adverse significant effect on users of one public transport interchange due to an increase in journey length.

14.4.51 Rail possessions and blockades will result in a minor adverse effect, which is significant, for users of one railway line.

14.4.52 Changes in journey length for non-motorised users during the construction period will result in a minor adverse effect, which is significant, on users of one PRoW.

Cumulative effects

14.4.53 The assessment includes the cumulative effects of planned and committed development during construction by taking this into account within the background traffic growth.

14.4.54 The assessment also takes into account Proposed Scheme construction traffic and transport impacts of works to construct the Proposed Scheme being undertaken in neighbouring community areas.

14.5 Effects arising from operation

14.5.1 This section presents the likely significant environmental effects of the operation of the Proposed Scheme in 2038 and 2046.

Avoidance and mitigation measures

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

- the Proposed Scheme within the Davenport to Ardwick Green area will be mainly in tunnel, reducing surface level interactions;
- reinstatement of roads on or close to their existing alignments, where reasonably practicable; and
- replacement, diversion or realignment of PRoW.

14.5.3 Station travel plans for the Manchester Airport High Speed station, in the adjacent Hulseheath to Manchester Airport area (MA06), and the Manchester Piccadilly High Speed station, in the adjacent Manchester Piccadilly Station area (MA08), will be developed and will include measures that aim to reduce the impacts and effects of traffic and transport movements across the Greater Manchester area including in the Davenport Green to Ardwick area.

Assessment of impacts and effects

14.5.4 The following section considers the impacts on traffic and transport and the consequential effects resulting from the operational phase of the Proposed Scheme in 2038 and 2046.

Key operation transport issues

14.5.5 The assessment takes account of all of the impacts of the Proposed Scheme in the Davenport Green to Ardwick area. The main impacts of the operation of the Proposed Scheme will be on the highway and public transport networks within this area due to increased rail users and traffic associated with the Manchester Airport High Speed station in the Hulseheath to Manchester Airport area (MA06) and Manchester Piccadilly High Speed station in the Manchester Piccadilly Station area (MA08). However, the maintenance of the Proposed Scheme will generate limited vehicular trips and their effect will not be significant.

14.5.6 The operational impacts will, therefore, primarily relate to the improved public transport provision together with changes to traffic due to highway changes and reconfiguration and traffic associated with passenger access to Manchester Airport High Speed station and Manchester Piccadilly High Speed station and the permanent diversion, realignment and stopping up of roads. This includes a modified junction at the M56 junction 6 in the adjacent Hulseheath to Manchester Airport area (MA06) and the introduction of a new gyratory

system, known as the A635/A665 Pin Mill Brow Gyratory, in the adjacent Manchester Piccadilly Station area (MA08).

Highway network

Strategic and local highway network

14.5.7 The Proposed Scheme will require the permanent widening, diversion, closure or realignment of (ordered by road class from south to north):

- A665 Midland Street – closure of the A665 Midland Street at its northern end where it is crossed by the route of the Proposed Scheme. Users will be diverted via a retained 10m section of the A665 Midland Street and the A665 Chancellor Lane diversion, increasing the journey length by up to 860m; and
- permanent closure of Glenbarry Street, Hooper Street and Rondin Close. The industrial units and commercial properties that are served by these roads will also be removed, therefore, there will be no change in journey length.

14.5.8 The permanent diversions or realignments will change journey length for vehicle occupants. However, the diversions or realignments are less than 1km in length and will not result in any significant effects with regard to increased journey times for vehicle occupants.

14.5.9 The operation of Manchester Piccadilly High Speed station in the adjacent Manchester Piccadilly Station area (MA08) will lead to changes to traffic levels in the Davenport Green to Ardwick area due to passengers accessing the station, particularly by car or taxi.

14.5.10 The diversion of traffic associated with highway changes, including the new A635/A665 Pin Mill Brow Gyratory, and changes in traffic due to passengers and staff accessing Manchester High Speed station in the adjacent Manchester Piccadilly Station area (MA08) will lead to flow changes on the highway network. This will result in changes to congestion and delays at junctions. The junctions with changes in delay in 2038, which are significant, will be:

- A555/A555 Ringway Road/B166 Styal Road - minor adverse effect;
- Portway/Selstead Road - minor beneficial effect;
- Simonsway/Poundswick Lane - minor adverse effect;
- Barnacre Avenue/Newall Road/Whitecarr Lane - minor adverse effect;
- B5166 Styal Road/Hollyhedge Road - minor adverse effect;
- A665 Chancellor Lane/A665 Devonshire Street North/Higher Ardwick - major adverse effect;
- M60 junction 2/A560 Stockport Road/Heathside Park Road/Carrs Road/Cheadle Point - minor adverse effect;
- M56 junction 3a/A560 Altrincham Road - moderate adverse effect;
- A6 Wellington Road South/Wellington Street/Station Road - minor adverse effect;
- A5181 Barton Road/A5145 Kingsway/B5213 Urmston Lane - minor adverse effect;

- A57 Hyde Road/Lime Grove/Saxon Street - major adverse effect;
- A57 Hyde Road/Tan Yard Brow/Willow Grove - moderate adverse effect;
- A57 Hyde Road/Chapman Street - major adverse effect;
- A57 Hyde Road/B6178 Hyde Road/B6178 Mount Road - minor adverse effect;
- Chapman Street/Cross Lane - moderate adverse effect;
- A57 Hyde Road/Clowes Street - major adverse effect;
- A57 Hyde Road/Bennett Street - major adverse effect;
- Stamford Road/Corporation Road - minor adverse effect;
- A665 Devonshire Street North/A57 Hyde Road/A665 Devonshire Street - minor beneficial effect;
- Gorton Lane/Belle Vue Street - major adverse effect;
- A6010 Pottery Lane/Gorton Lane/Wenlock Way - minor adverse effect;
- A635 Ashton Old Road/Capital Road - minor beneficial effect;
- A635 Ashton Old Road/Ogden Lane/Fairfield Road - minor beneficial effect;
- A662 Manchester Road/A662 Ashton New Road/Edge Lane - minor beneficial effect;
- Culcheth Lane/Briscoe Lane - minor adverse effect;

14.5.11 The junctions with changes in delay in 2046, which are significant, will be:

- A665 Chancellor Lane diversion/A665 Devonshire Street North/Higher Ardwick - major adverse effect;
- A555/A555 Ringway Road/B166 Styal Road - minor adverse effect;
- A555 Ringway Road West/Enterprise Way - moderate adverse effect;
- Greenbrow Road/Newall Road/Foxfield Road - moderate adverse effect;
- Floats Road/Southmoor Road - minor adverse effect;
- Southmoor Road/Ledson Road - major adverse effect;
- Greenwood Road/Royalthorn Road - minor adverse effect;
- M56 junction 3a/A560 Altrincham Road - minor adverse effect;
- A560 Altrincham Road/B5165 Stockport Road/A560 Shaftesbury Avenue/Brooklands Road - minor adverse effect;
- B5167 Wythenshawe Road/Moor Road - minor adverse effect;
- A6144 Northenden Road/A6144 Old Hall Road - minor beneficial effect;
- A5103 Princess Road/Whitchurch Road - major adverse effect;
- A5103 Princess Road/A6010 Wilbraham Road - moderate adverse effect;
- A5103 Princess Road/Platt Lane/Parkway Access - minor adverse effect;
- Upper Lloyd Street/Claremont Road/Lloyd Street South - moderate adverse effect;
- B5219 Moss Lane East/Upper Lloyd Street/Lloyd Street North - minor adverse effect;
- A34 Upper Brook Street/Hathersage Road - minor adverse effect;
- A57 Hyde Road/Tan Yard Brow/Willow Grove - minor adverse effect;

- A57 Hyde Road/Chapman Street - moderate adverse effect;
- A57 Hyde Road/Wellington Street/Hengist Street - minor adverse effect;
- A57 Hyde Road/B6178 Hyde Road/B6178 Mount Road - minor adverse effect;
- Wellington Street/Cross Lane/Garratt Way - moderate adverse effect;
- Chapman Street/Cross Lane - moderate adverse effect;
- A57 Hyde Road/Clowes Street - major adverse effect;
- A57 Hyde Road/Bennett Street - major adverse effect;
- Stamford Road/Corporation Road - minor adverse effect;
- A665 Devonshire Street North/A57 Hyde Road/A665 Devonshire Street - minor adverse effect;
- Gorton Lane/Belle Vue Street - major adverse effect;
- A635 Ashton Old Road/Vine Street - minor adverse effect;
- A635 Ashton Old Road/Stainforth Street - minor beneficial effect;
- A635 Ashton Old Road/Gable Street - minor beneficial effect;
- A662 Manchester Road/A662 Ashton New Road/Edge Lane - minor beneficial effect;
- A662 Ashton New Road/Hillkirk Street - minor beneficial effect;
- Millstream Lane/Clayton Bridge/Berry Brow - minor adverse effect; and
- A663 Broadway/Long Lane/Costco access - minor beneficial effect.

14.5.12 A change in traffic levels can result in changes to traffic-related severance for non-motorised road users, particularly pedestrians using or seeking to cross a road. The permanent highway changes which are forecast to result in changes in peak hour traffic flow (more than 10% for all vehicles) and that will result in changes in traffic-related severance for non-motorised users, which are significant, are set out in Table 36. Where there is no significant effect on a road during a particular time period it is represented by a dash.

Table 36: Roads with changes in traffic flow resulting in significant effects on traffic-related severance for non-motorised users, 2038 and 2046

Road name	2038 AM peak hour	2038 PM peak hour	2046 AM peak hour	2046 PM peak hour
Shadowmoss Road (between Simonsway and Cornishway)	-	-	-	Minor adverse
Portway (between Cornish Way and Ruddpark Road)	-	-	Moderate adverse	-
Portway (between Simonsway and Selstead Road)	-	-	Major adverse	-
Brownley Road (between Crossacres Road and Simonsway)	-	Moderate adverse	-	-
Greenbrow Road (between Hucklow Avenue and Newall Road)	-	-	Moderate beneficial	-
Greenbrow Road (between Simonsway and Hucklow Avenue)	-	-	Moderate beneficial	-

Road name	2038 AM peak hour	2038 PM peak hour	2046 AM peak hour	2046 PM peak hour
Newall Road (between Greenbrow Road and Whitecarr Lane)	-	-	Moderate adverse	-
Rowlandsway (between Simonsway and Poundswick Lane)	-	-	-	Minor adverse
Whitecarr Lane (between Newall Road and Roaring Gate Lane)	-	Moderate adverse	Moderate adverse	-
Simonsway (between Greenbrow Road and Firbank Road)	Moderate adverse	-	Major adverse	-
Gladeside Road (between Greenwood Road and Poundswick Lane)	-	-	-	Moderate adverse
Tuffley Road (between Firbank Road and Greenbrow Road)	Major adverse	-	Major adverse	-
Greenwood Road (between Simonsway and Gladeside Road)	-	-	Major adverse	-
Floats Road/Clay Lane/Barnacre Avenue/Newall Road (between Dobbinetts Lane and Whitecarr Lane)	Moderate beneficial	Moderate beneficial	-	Moderate beneficial
Greenbrow Road (between Wastdale Road and Tuffley Road)	Moderate adverse	-	Major adverse	Moderate adverse
Greenwood Road (between Gladeside Road and Hollyhedge Road Road)	-	-	Major adverse	-
Greenbrow Road (between Wastdale Road and Firbank Road)	Moderate adverse	-	Major adverse	-
Southmoor Road (between Floats Road and Wythenshawe Hospital Visitor Car Park)	Moderate adverse	Major beneficial	Moderate adverse	-
Highdales Road (between Hollyhedge Road and Firbank Road)	-	-	Minor adverse	-
Firbank Road (between Highdales Road and Greenbrow Road)	Minor adverse	-	Moderate adverse	-
Southmoor Road (between Wythenshawe Hospital Car Parking and Hollyhedge Road)	-	Moderate beneficial	Moderate adverse	-
Floats Road (between Southmoor Road and Ledson Road)	-	Major adverse	Moderate beneficial	Moderate adverse
Greenbrow Road (between Firbank Road and Hollyhedge Road)	Moderate adverse	-	Major adverse	-
Hollyhedge Road (between Southmoor Road and Marden Road)	-	-	Moderate adverse	-
Greenwood Road (between Hollyhedge Road and Benchill Road)	-	-	Moderate adverse	-
Hollyhedge Road (between Marden Road and Greenbrow Road)	-	-	Moderate adverse	-
Southmoor Road (between Ledson Road and Hollyhedge Road)	-	Major adverse	Moderate adverse	Major adverse
Ledson Road (between Floats Road and Southmoor Road)	-	-	Moderate adverse	Major adverse

Road name	2038 AM peak hour	2038 PM peak hour	2046 AM peak hour	2046 PM peak hour
Southmoor Road (between Ledson Road and Floatshall Road)	-	Major adverse	-	Moderate adverse
Greenwood Road (between Benchill Road and Royalthorn Road)	-	-	Major adverse	-
Southmoor Road (between Floatshall Road and Royal Oak Road)	-	Major adverse	-	-
Greenwood Road (between Royalthorn Road and A560 Altrincham Road)	-	-	Moderate adverse	-
Longley Lane (between Moor End and Beech Avenue)	-	-	Moderate beneficial	-
Moor End (between Longley Lane and B5167 Palatine Road)	-	-	Moderate beneficial	-
Longley Lane (between Moor End and B5167 Palatine Road)	-	-	Moderate beneficial	-
B5166 Church Road (between Patterdale Road and B5167 Palatine Road)	-	-	Moderate adverse	-
Platt Lane (between Hart Road and Lloyd Street South)	-	-	Moderate adverse	-
Lloyd Street South (between Platt Lane and Hart Road)	-	-	Minor adverse	-
Lloyd Street South (between Garswood Road and Thornton Road)	-	-	Minor adverse	-
Birch Lane (between A6010 Dickenson Road and A6 Stockport Road)	Minor adverse	-	Minor adverse	-
A5184 Plymouth Grove (between A6 Stockport Road and Clarence Road)	-	-	-	Moderate adverse
A6010 Kirkmanshulme Lane (between New Bank Street and A6010 Pottery Lane)	-	-	-	Moderate adverse
Whitwell Way (between Garratt Way and A57 Hyde Road)	Major adverse	-	Major adverse	-
Thornbury Way/Garratt Way (between A57 Hyde Road and Whitwell Way)	-	-	Minor adverse	-
Garratt Way (between Whitewell Way and Wellington Street)	Major adverse	-	Major adverse	-
Chapman Street (between Cross Lane and Highmead Street)	-	-	Moderate adverse	-
High Bank (between Cross Lane and Highmead Street)	-	-	Moderate beneficial	Moderate adverse
Highmead Street (between Chapman Street and High Bank)	Moderate beneficial	-	-	-
Wellington Street/Gorton Lane (between Garratt Way and A6010 Pottery Lane)	-	Moderate adverse	-	Major adverse
Belle Vue Street (between A57 Hyde Road and Birch Street)	Major adverse	-	Major adverse	-

Road name	2038 AM peak hour	2038 PM peak hour	2046 AM peak hour	2046 PM peak hour
Birch Street (between A57 Hyde Road and Belle Vue Street)	Moderate adverse	-	Moderate adverse	-
Chapman Street (between Highmead Street and Railway Street)	Moderate adverse	-	Moderate adverse	-
A6010 Pottery Lane (between A57 Hyde Road and Wenlock Way)	-	-	-	Moderate adverse
Corporation Road (between Stamford Road and Maytree Crescent)	Moderate adverse	-	-	-
City Road (between A5014 Chester Road and A5067 Chorlton Road)	-	-	Moderate adverse	-
Clowes Street (between A57 Hyde Road and Wenlock Way)	-	-	Moderate beneficial	-
Belle Vue Street (between Birch Street and Gorton Lane)	Major adverse	-	Major adverse	-
Wenlock Way (between Kniveton Road and A6010 Pottery Lane)	-	-	Moderate beneficial	-
Vine Street (between Abbey Hey Lane and A635 Ashton Old Road)	-	Moderate adverse	-	Major adverse
Cornwall Street (between Railway Street and Ogden Lane)	Moderate adverse	-	-	-
Cornwall Street (between Ogden Lane and A635 Ashton Old Road)	-	Moderate adverse	-	-
A665 Devonshire Street North (between Higher Ardwick and A57 Hyde Road)	Moderate beneficial	Moderate beneficial	Moderate beneficial	Moderate beneficial
Press Street/Whitworth Street East (between Widnes Street and Lawton Street)	Major adverse	-	Major adverse	-
Higher Ardwick (between Union Street and A665 Chancellor Lane)	Major adverse	Major adverse	Major adverse	Major adverse
B6390 Audenshaw Road (between Kings Road and Stamford Road)	-	-	Moderate adverse	-
Gorton Road (between A635 Ashton Old Road and A6010 Pottery Lane)	-	Major adverse	-	Major adverse
B6390 Audenshaw Road (between Kershaw Lane and Kings Road)	-	-	Moderate adverse	-
A635 Ashton Old Road (between Greenside Street and Dakley Street)	Moderate adverse	-	Moderate adverse	-
B6390 Audenshaw Road (between Stamford Road and A6140 Moss Way)	Major adverse	-	Moderate adverse	-
Victoria Street/Parkhouse Street (between A635 Ashton Old Road and Greenside Street)	-	Minor adverse	-	Moderate adverse
A635 Ashton Old Road (between A6010 Pottery Lane and Greenside Street)	Moderate adverse	-	Moderate adverse	-
Gable Street (between Stainforth Street and A635 Ashton Old Road)	-	Major adverse	Moderate beneficial	Major adverse

Road name	2038 AM peak hour	2038 PM peak hour	2046 AM peak hour	2046 PM peak hour
Parkhouse Street (between Greenside Street and Cycle Street)	-	Moderate beneficial	-	-
Sunny Lowry Road (between A6010 Alan Turing Way and Grey Mare Lane)	Moderate adverse	-	Moderate adverse	-
Greenside Street (between Parkhouse Street and Clayton Lane)	-	Moderate adverse	-	Minor adverse
A6017 Stockport Road (between Howe Street and Birch Street)	Major adverse	-	Major adverse	-
Wilson Street (between Ridings Street and Clayton Lane)	Moderate adverse	-	Moderate adverse	-
A6140 Moss Way (between M60 junction 23 eastbound off-slip and M60 junction 23 westbound on-slip)	Moderate adverse	-	-	-
Grey Mare Lane (between Sunny Lowry Road and Albert Street)	Major adverse	-	Major adverse	-
Clayton Lane (between Cycle Street and Greenside Street)	Moderate adverse	-	Moderate adverse	-
A6017 Stockport Road (between Birch Street and Hamilton Street)	Major adverse	-	Major adverse	-
Albert Street (between Darley Street and Grey Mare Lane)	Major adverse	-	Major adverse	-
A6017 Stockport Road (between Cecil Walk and Hamilton Street)	Major adverse	-	Major adverse	-
Albert Street (between Councillor Street and Darley Street)	Moderate adverse	Moderate beneficial	Moderate adverse	Moderate beneficial
Palmerston Street (between Councillor Street and Gurney Street)	Major adverse	Moderate beneficial	Major adverse	Major beneficial
Grey Mare Lane (between Albert Street and A662 Ashton New Road)	Major adverse	Moderate adverse	Major adverse	Moderate adverse
Darley Street (between Albert Street and A662 Ashton New Road)	Minor adverse	Moderate adverse	Minor adverse	Moderate adverse
Clayton Lane (between Greenside Street and Oldfield Street)	Moderate adverse	-	Moderate adverse	-
Councillor Street (between Palmerston Street and A662 Ashton New Road)	Major adverse	-	Major adverse	Moderate beneficial
Clayton Lane (between Oldfield Street and A662 Ashton New Road)	Moderate adverse	-	Moderate adverse	-
Hallkirk Street/Cambrian Street (between A662 Ashton New Road and Phillips Park Road)	-	Moderate adverse	-	Moderate adverse
Clayton Street (between A662 Ashton New Road and North Road)	Moderate adverse	-	Moderate adverse	-
Bank Street (between A662 Ashton New Road and John Heywood Street)	-	-	Moderate adverse	-
Margaret Street (between A635 Manchester Road and Cotton Street West)	Moderate adverse	-	Moderate adverse	-

Road name	2038 AM peak hour	2038 PM peak hour	2046 AM peak hour	2046 PM peak hour
Bank Street (between John Heywood Street and Ravensbury Street)	-	-	Moderate adverse	-
Richmond Street/Cotton Street West (between Margaret Street and Katherine Street)	Moderate adverse	-	Moderate adverse	-
Bank Street (between Ravensbury Street and Tartan Street)	-	-	Moderate adverse	-
Katherine Street (between Margaret Street and Richmond Street)	Major adverse	-	Major adverse	-
Katherine Street (between Margaret Street and A627 Cavendish Street)	Moderate adverse	-	Moderate adverse	-
Katherine Street (between A627 Cavendish Street and A627 Oldham Road)	Moderate adverse	-	Moderate adverse	-
Bradford Road (between A6010 Alan Turing Way and Varley Street)	Moderate beneficial	Moderate beneficial	-	Moderate beneficial
Bank Street/Bank Bridge Road (between Tartan Street and Riverpark Road)	-	-	Moderate adverse	-
Ten Acres Lane (between Briscoe Lane and Riverpark Road)	-	-	Moderate adverse	-
Grimshaw Lane (between Lord North Street and Briscoe Lane)	-	-	-	Moderate adverse

Accidents and safety

14.5.13 There will be no significant effects on accidents and safety as there are no locations where there are both accident clusters and substantial changes in traffic due to the operation of the Proposed Scheme.

Parking and loading

14.5.14 There will be a permanent loss of car parking at locations along the route of the Proposed Scheme in this area, which is significant. This will include:

- Fallowfield Retail Park – major adverse effect due to the permanent loss of 123 off-street spaces. Six blue badge bays will be relocated; and
- The Christie Hospital (Car Park D) – major adverse effect due to the permanent loss of 135 off-street spaces. Thirty blue badge bays will be relocated.

14.5.15 HS2 Ltd will work with the businesses affected to identify opportunities where reasonably practicable to mitigate effects on parking.

Public transport network

14.5.16 The operation of the Proposed Scheme in the adjacent Manchester Piccadilly Station area (MA08) will result in the permanent re-routing of several bus routes. The effect of these bus route changes and diversions, as well as some additional bus delay on routes due to

changes in the traffic flows on the network, will result in the following effects, which are significant, in the Davenport Green to Ardwick area:

- bus routes 7, 7A, 7B, 171, 172, 219, 220, 221, 703, 704, 707, 719, 747 and 768 operating on the A635 Ashton Old Road between the A6010 Alan Turing Way and Manchester City Centre – moderate adverse effect in 2038 and 2046;
- bus routes 192, 733 and X92 operating on the A6 Stockport Road between the A6010 Alan Turing Way and Manchester City Centre – moderate adverse effect in 2038 and 2046; and
- bus routes 201, 202, 203 and 205 operating on the A57 Hyde Road between the A6010 Alan Turing Way and Manchester City Centre – moderate adverse effect in 2038 and 2046.

Non-motorised users

14.5.17 There will be permanent widening, realignment, diversion or extension of one road in the Davenport Green to Ardwick area that will have an impact on journey lengths or introduce hindrances such as substantial changes in levels for non-motorised users.

14.5.18 The only severance effect, which is significant, on non-motorised users in the Davenport Green to Ardwick area will arise from the closure of a section of the A665 Midland Street. This will increase journey length by up to 860m, resulting in a major adverse effect.

Other mitigation measures

14.5.19 No further appropriate traffic and transport mitigation measures have been identified. HS2 Ltd will, however, continue to work with the relevant highway authorities to identify whether further mitigation measures should be provided.

Summary of likely residual significant effects

14.5.20 The residual significant effects during operation remain as described above. The highest magnitude effects are summarised below. For traffic-related effects, where there are adverse and beneficial effects in different time periods in the same year, only the adverse effects are reported in this summary.

14.5.21 The Proposed Scheme will generate significant major beneficial effects for rail passengers as a result of the introduction of HS2 services at Manchester Airport High Speed station and Manchester Piccadilly High Speed station, including improved journey times between Manchester, the Midlands and the south of England and released capacity on the network easing pressure on other passenger rail services.

14.5.22 The operation of the Proposed Scheme will cause changes in traffic that will result in the following effects, which are significant, through changes to congestion and/or delays for road users in 2038:

- major adverse effects at six junctions;
- moderate adverse effects at three junctions;
- minor adverse effects at 11 junctions; and
- minor beneficial effects at five junctions.

14.5.23 The residual significant effects of changes in congestion and/or delays for road users in 2046 will be:

- major adverse effects at six junctions;
- moderate adverse effects at seven junctions;
- minor adverse effects at 16 junctions; and
- minor beneficial effects at six junctions.

14.5.24 Changes in traffic during operation of the Proposed Scheme will result in the following effects, which are significant, on traffic-related severance for non-motorised users in 2038:

- major adverse effects on 23 roads;
- moderate adverse effects on 31 roads;
- minor adverse effects on three roads; and
- moderate beneficial effects on six roads.

14.5.25 The residual significant effects on traffic-related severance for non-motorised users in 2046 will be:

- major adverse effects on 30 roads;
- moderate adverse effects on 48 roads;
- minor adverse effects on eight roads; and
- moderate beneficial effects on 10 roads.

14.5.26 Changes in bus journey times resulting in public transport delays during operation of the Proposed Scheme will result in moderate adverse effects, which are significant, on three bus corridors in 2038 and 2046.

14.5.27 The operation of the Proposed Scheme will result in permanent major adverse effects, which are significant, at two locations due to loss of parking spaces in 2038 and 2046.

14.5.28 Changes in journey lengths for non-motorised users during operation of the Proposed Scheme will result in a major adverse effect, which is significant, on users of one road in 2038 and 2046.

Cumulative effects

14.5.29 The assessment includes cumulative effects of planned and committed development during operation, by taking into account background traffic growth in the future baseline.

Monitoring

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

14.5.31 The travel plans for the Manchester Airport High Speed station in the Hulseheath to Manchester Airport area (MA06) and the Manchester Piccadilly High Speed station in the Manchester Piccadilly Station area (MA08) will detail how travel associated with the operation of the stations will be monitored.

14.5.32 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 Davenport Green to Ardwick area. The likely impacts and significant effects identified arising from the construction and operation of the Proposed Scheme on surface water and groundwater bodies and their associated water resources are reported. The likely impacts and significant effects of the Proposed Scheme on flood risk and land drainage are also reported.

15.1.2 Engagement has been undertaken with:

- the Environment Agency;
- Manchester City Council (MCC) which is the Lead Local Flood Authority (LLFA);
- Canal & River Trust; and
- United Utilities Group plc (the local water and sewerage undertaker).

15.1.3 The purpose of this engagement has been to obtain relevant baseline information and to discuss the Proposed Scheme and potential impacts and effects. The engagement has informed the assessments, including issues such as flood risk and associated mitigation relating to the Didsbury flood storage basin and the potential for saline upwelling or change in groundwater quality due to construction dewatering at the Manchester tunnel vent shafts.

15.1.4 Maps showing the location of the key environmental features (Map Series CT-10), and the key construction (Map Series CT-05) and key operational (Map Series CT-06) features of the Proposed Scheme can be found in the Volume 2: MA07 Map Book.

15.1.5 Map Series WR-01, WR-02, WR-03, WR-05 and WR-06, showing details of the water features referred to in this section, are contained in the Volume 5: Water resources and flood risk Map Book.

15.1.6 Detailed information on the water resources and flood risk issues specific to the Davenport Green to Ardwick area are contained in the Volume 5 appendices. These comprise:

- Appendix WR-003-0MA07, Water resources assessment;
- Appendix WR-005-0MA07, Flood risk assessment; and
- Appendix WR-006-00009, Hydraulic modelling report – River Mersey.

15.1.7 Volume 5 also includes a detailed route-wide, stand-alone Water Framework Directive (WFD) compliance assessment (Appendix WR-001-00001) and a draft route-wide water resources and flood risk operation and maintenance plan (Appendix WR-007-00000).

15.1.8 In addition, the following documents are provided as Background Information and Data (BID)[120]:

- BID WR-004-0MA07 – Water resources baseline; and
- BID WR-002-00001 – Water Framework Directive compliance assessment baseline data.

15.1.9 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 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)[121].

15.1.10 The Proposed Scheme is described in Section 2.

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

15.2 Scope, assumptions and limitations

15.2.1 The scope, assumptions and limitations for the water resources and flood risk assessment are set out in Volume 1, Section 8 and the EIA Scope and Methodology Report (SMR)[122].

15.2.2 Unless indicated otherwise, the spatial scope of the assessment (the study area) is based upon the identification of surface water and groundwater features within 1km of the route of the Proposed Scheme, as described in Section 2.2 of this report. In the Davenport Green to Ardwick area, the study area has been extended to include the zone of influence of tunnel construction on groundwater (up to 1.5km from the vent shaft sites).

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

15.2.4 A precautionary approach has been used in the assessment to identify impacts and effects where there is limited information. Where surveys have not been undertaken due to land access constraints, a precautionary approach has been adopted in the assessments of receptor value and impact magnitude. Where this precautionary approach indicates the requirement for mitigation, preliminary mitigation is described, which may include further data collection and/or assessment.

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

[121] Ministry of Housing, Communities and Local Government (2019), *National Planning Policy Framework*.

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

15.2.5 Hydraulic analysis has been undertaken of watercourses and key structures within flood risk areas. This includes modelling/analysis of flood risk impacts around the River Mersey and Didsbury flood storage basin. Interpretation of the hydraulic modelling and details of the analysis carried out can be found in Volume 5: Appendix WR-005-0MA07, Flood risk assessment.

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

15.2.7 The hydrological impacts on biological receptors such as aquatic fauna and flora are referred to in the Volume 5: Appendix WR-003-0MA07, Water resources assessment and Volume 5: Appendix WR-001-00000, WFD compliance assessment. Where these impacts have the potential to result in significant effects these are described in Section 7, Ecology and biodiversity, together with any other mitigation required.

15.2.8 Impacts from existing land contamination which lead to significant effects on groundwater quality are presented in Section 10, Land quality.

15.3 Environmental baseline

Existing baseline - Water resources

Surface water

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

15.3.2 The current river basin management plan[123] identifies the chemical and ecological status of surface water bodies, and the quantitative and chemical status of groundwater bodies within this RBD.

15.3.3 The statutory objective of the WFD[124] is to achieve 'good status' for all designated water bodies. The purpose of the WFD compliance assessment[125] is to demonstrate that the Proposed Scheme does not result in a deterioration in current water body status and that water bodies are not prevented from achieving status objectives.

15.3.4 Specialist field surveys have been undertaken, where access has been available. Receptor values have been adjusted to reflect the outputs from these surveys, in close consultation with the Environment Agency. In the absence of field surveys, surface water bodies, other

[123] Environment Agency (2015), *Water for life and livelihoods Part 1: North West river basin district: River basin management plan*. Available online at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/718335/North_West_RBD_Part_1_river_basin_management_plan.pdf.

[124] *The Water Environment (Water Framework Directive) (England and Wales) Regulations 2017 (SI 2017 No. 407).* London, Her Majesty's Stationery Office.

[125] Volume 5: Appendix WR-001-00000, Water Framework Directive compliance assessment.

than minor ditches or ponds, have been identified within this assessment as being of either moderate, high or very high value based on various criteria including watercourse flow and taking into account any habitat which the watercourse may support.

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 37. The receptor value attributed to each individual water body is based on the methodologies set out in the SMR. The feature locations are indicated by the grid coordinates on the relevant Volume 5, Water resources and flood risk Map Book: Map Series WR-01, at the point closest to the Proposed Scheme.

Table 37: Surface water body receptors

Water body name and location	Type (at closest point to the Proposed Scheme)[126]	Q95 value (m^3/s)[127]	Receptor value	Parent WFD water body name and identification number[128]	Current WFD status/ Objective[129]	Crossed by the Proposed Scheme?[130]
Fairywell Brook WR-01-309b - E5	Main river	0.004	Low	Sinderland Brook (Fairywell Bk and Baguley Bk) GB112069061270	Moderate/good by 2027	Yes
Baguley Brook WR-01-309b - G4	Main river	0.01	Moderate	Sinderland Brook (Fairywell Bk and Baguley Bk) GB112069061270	Moderate/good by 2027	Yes
Mill Brook WR-01-309b - F5	Ordinary watercourse	<0.002	Moderate	Sinderland Brook (Fairywell Bk and Baguley Bk) GB112069061270	Moderate/good by 2027	Yes
Tributary of Baguley Brook WR-01-309b - G5	Ordinary watercourse	<0.002	Low	Sinderland Brook (Fairywell Bk and Baguley Bk) GB112069061270	Moderate/good by 2027	Yes

[126] The term 'minor ditch' has been used to denote a small trench or drain that has been constructed for the purpose of draining water from the land or roads and is isolated from the wider river network.

[127] This is the flow within the watercourse that is exceeded for 95% of the time. The Q95 has been provided as an indication of watercourse size, but is only one of several criteria used to inform receptor value. Other criteria include the WFD watercourse classification which takes into account the value of any habitat which the watercourse supports. Details are provided in the Volume 5: Appendix CT-001-00001, Environmental Impact Assessment Scope and Methodology Report.

[128] The Environment Agency has attributed each surface water and groundwater body a unique water body identification (ID) number.

[129] Status and objectives are based on those set out in the 2015 River basin management plan. The 2015 RBMP is the most up to date and will be updated in 2021.

[130] In the Davenport Green to Ardwick area, the route of the Proposed Scheme passes beneath all these watercourses in tunnel.

Water body name and location	Type (at closest point to the Proposed Scheme)[126]	Q95 value (m^3/s)[127]	Receptor value	Parent WFD water body name and identification number[128]	Current WFD status/ Objective[129]	Crossed by the Proposed Scheme?[130]
Round Wood Drain WR-01-309b - H5	Minor ditch	n/a[131]	Low	Sinderland Brook (Fairywell Bk and Baguley Bk) GB112069061270	Moderate/good by 2027	Yes
River Mersey WR-01-309b - I8	Main river	1	Very high	Mersey (Upstream of Manchester Ship Canal) GB112069061030	Moderate/ moderate by 2015	Yes
Tributary of River Mersey 1 WR-01-309b - I6	Ordinary watercourse	<0.002	Moderate	Mersey (Upstream of Manchester Ship Canal) GB112069061030	Moderate/ moderate by 2015	No
M60 Drainage WR-01-309b - I5	Minor ditch	0.004	Moderate	Mersey (Upstream of Manchester Ship Canal) GB112069061030	Moderate/ moderate by 2015	No
Tributary of River Mersey 3 WR-01-310a - B4	Ordinary watercourse	<0.002	Moderate	Mersey (Upstream of Manchester Ship Canal) GB112069061030	Moderate/ moderate by 2015	No
Tributary of River Mersey 2 WR-01-310a - B4	Main river	<0.002	Moderate	Mersey (Upstream of Manchester Ship Canal) GB112069061030	Moderate/ moderate by 2015	Yes
Red Lion Brook WR-01-310a - C6	Ordinary watercourse	<0.002	Low	Chorlton Brook (Princess Parkway to Mersey) GB112069061040	Moderate/good by 2027	Yes
Shaw Brook WR-01-310a - D5	Minor ditch	<0.002	Low	Chorlton Brook (Princess Parkway to Mersey) GB112069061040	Moderate/good by 2027	Yes
Cringle Brook WR-01-310a - F8	Main river	0.007	Moderate	Fallowfield Brook GB112069061410	Moderate/good by 2027	Yes
Tributary of Cringle Brook 1 WR-01-310a - E8	Ordinary watercourse	<0.002	Moderate	Fallowfield Brook GB112069061410	Moderate/good by 2027	No
Fallowfield Brook WR-01-310a - F9	Ordinary watercourse	0.003	Moderate	Platt Brook (Source to Fallowfield Bk) GB112069061060	Moderate/good by 2027	Yes

[131] Offline drain with no baseflow.

Water body name and location	Type (at closest point to the Proposed Scheme)[126]	Q95 value (m^3/s)[127]	Receptor value	Parent WFD water body name and identification number[128]	Current WFD status/ Objective[129]	Crossed by the Proposed Scheme?[130]
Tributary of Platt Brook 1 WR-01-310a - F6	Ordinary watercourse	<0.002	Low	Platt Brook (Source to Fallowfield Bk) GB112069061060	Moderate/good by 2027	Yes
Gore Brook WR-01-310a - H8	Main river	0.01	Moderate	Platt Brook (Source to Fallowfield Bk) GB112069061060	Moderate/good by 2027	Yes
Corn Brook WR-01-310a - I7	Ordinary watercourse	0.006	Low	Irwell/Manchester Ship Canal (Irk to confluence with Upper Mersey) GB112069061452	Moderate/ moderate by 2015	Yes

Abstractions and permitted discharges (surface water)

15.3.6 Table 38 sets out the surface water abstractions and permitted discharges located within the Davenport Green to Ardwick study area.

Table 38: Surface water abstraction and permitted discharges in study area

Feature	Details	Value
Licensed surface water abstractions	None	None
Registered private unlicensed surface water abstractions	None	None
Consented discharges to surface water	Twenty two, of which one is within the land required for the construction of the Proposed Scheme	Low

15.3.7 Private unlicensed surface water abstractions comprise those for quantities of less than $20m^3$ per day. There is no obligation to register private water supplies, but available records have been obtained from the local authorities. Unregistered private surface water supplies may be present. Private water supplies are assumed to be high value receptors unless details obtained from supply owners indicated otherwise.

15.3.8 The number of abstractions and permitted discharges listed in Section 10, Land quality may be different to that stated here, due to different definitions of spatial scope. This is because the Water resources and flood risk study area comprises all land within 1km of the route of the Proposed Scheme, whereas the default Land quality study area comprises all land within 250m from the boundary of the Proposed Scheme. The default study areas may be extended where the potential for pathways to more remote receptors exists.

Groundwater

15.3.9 The location of abstractions, geological formations and indicative groundwater levels, where available, are shown in Volume 5, Water resources and flood risk Map Book: Map Series WR-02.

15.3.10 The geology of the study area, including distribution and formation description, is detailed in Section 10, Land quality. The aquifer classification, WFD status and receptor value of the superficial and bedrock hydrogeology is summarised in Table 39 (for superficial deposits) and Table 40 (for bedrock). Unless stated otherwise, the geological groups listed will all be crossed by the Proposed Scheme. The current overall status of, and objective for, the WFD groundwater body is as stated in the current river basin management plan. Where the Environment Agency has not assigned an individual water body identification (ID) to a unit, it has been assumed that it is connected to the underlying water body.

Table 39: Summary of geology and hydrogeology in the study area – superficial deposits

Geology	Aquifer classification	WFD body (ID) and current overall status	WFD status objective	Receptor value
Alluvium	Secondary A	Not assessed by the Environment Agency	Not assessed by the Environment Agency	Moderate
River terrace deposits	Secondary A	Not assessed by the Environment Agency	Not assessed by the Environment Agency	Moderate
Shirdley Hill Sand Formation Not crossed by the route of the Proposed Scheme	Secondary A	Not assessed by the Environment Agency	Not assessed by the Environment Agency	Moderate
Glaciofluvial deposits	Secondary A	Not assessed by the Environment Agency	Not assessed by the Environment Agency	Moderate
Glaciofluvial sheet deposits	Secondary A	Not assessed by the Environment Agency	Not assessed by the Environment Agency	Moderate
Glaciofluvial ice contact deposits Not crossed by the route of the Proposed Scheme	Secondary (Undifferentiated)	Not assessed by the Environment Agency	Not assessed by the Environment Agency	Moderate
Glacial till	Secondary (Undifferentiated)	Not assessed by the Environment Agency	Not assessed by the Environment Agency	Moderate

Table 40: Summary of geology and hydrogeology in the study area – bedrock

Geology	Aquifer classification	WFD body (ID) and current overall status	WFD status objective	Receptor value
Mercia Mudstone Group – Sidmouth Mudstone Formation – Bollin Mudstone Member	Secondary B	Not assessed by the Environment Agency	Not assessed by the Environment Agency	Moderate
Mercia Mudstone Group – Tarporley Siltstone Formation	Secondary B	Not assessed by the Environment Agency	Not assessed by the Environment Agency	Moderate
Sherwood Sandstone Group – Helsby Sandstone Formation	Principal	Manchester and East Cheshire Permo-Triassic Sandstone Aquifer (GB41201G101100) Poor	Good by 2021	High

Geology	Aquifer classification	WFD body (ID) and current overall status	WFD status objective	Receptor value
Sherwood Sandstone Group – Wilmslow Sandstone Formation	Principal	Manchester and East Cheshire Permo-Triassic Sandstone Aquifer (GB41201G101100) Poor	Good by 2021	High
Sherwood Sandstone Group – Chester Formation	Principal	Manchester and East Cheshire Permo-Triassic Sandstone Aquifer (GB41201G101100) Poor	Good by 2021	High
Cumbrian Coast Group – Manchester Marls Formation	Secondary B	Manchester and East Cheshire Permo-Triassic Sandstone Aquifer (GB41201G101100) Poor	Good by 2021	Moderate
Appleby Group – Collyhurst Sandstone Formation	Principal	Manchester and East Cheshire Permo-Triassic Sandstone Aquifer (GB41201G101100) Poor	Good by 2021	High
Warwickshire Group – Halesowen Formation	Secondary A	Manchester and East Cheshire Permo-Triassic Sandstone Aquifer (GB41201G101100) Poor	Good by 2021	Moderate
Warwickshire Group – Halesowen Formation – Holt Town Sandstone Bed Not crossed by the route of the Proposed Scheme	Secondary A	Manchester and East Cheshire Permo-Triassic Sandstone Aquifer (GB41201G101100) Poor	Good by 2021	Moderate
Warwickshire Group – Halesowen Formation – Great Mine Limestone. Not crossed by the route of the Proposed Scheme	Secondary A	Manchester and East Cheshire Permo-Triassic Sandstone Aquifer (GB41201G101100) Poor	Good by 2021	Moderate
Warwickshire Group – Etruria Formation	Secondary A	Manchester and East Cheshire Permo-Triassic Sandstone Aquifer (GB41201G101100) Poor	Good by 2021	Moderate
Pennine Coal Measures Group - Pennine Upper Coal Measures Formation Not crossed by the route of the Proposed Scheme	Secondary A	Manchester and East Cheshire Permo-Triassic Sandstone Aquifer (GB41201G101100) Poor	Good by 2021	Moderate

Superficial deposit aquifers

15.3.11 The basis of the receptor values attributed to the superficial deposit aquifers present within the study area, as shown in Table 39, is outlined briefly as follows:

- alluvium, river terrace deposits, Shirdley Hill Sand Formation, glaciofluvial deposits and glaciofluvial sheet deposits are classified as Secondary A aquifers. These aquifers may be capable of supporting water supplies at a local rather than regional scale and may also form an important source of baseflow to rivers. These aquifers have, therefore, been classified as moderate value receptors; and
- glacial till and glaciofluvial ice contact deposits are classified as Secondary (Undifferentiated) aquifers. These superficial deposits may supply baseflow to watercourses or store and yield limited amounts of groundwater. They have, therefore, been classified as moderate value receptors.

Bedrock aquifers

15.3.12 The basis of the receptor values attributed to the bedrock aquifers present within the study area, as shown in Table 40, is outlined briefly as follows:

- the Sherwood Sandstone Group (locally comprising the Helsby Sandstone Formation, the Wilmslow Formation and the Chester Formation) and the Appleby Group (comprising the Collyhurst Sandstone Formation) have been classified as Principal aquifers by the Environment Agency. Principal aquifers can provide water supplies that are of strategic importance and can also contribute an important component of baseflow to rivers. They have, therefore, been assessed as high value receptors;
- the Warwickshire Group (locally comprising the Halesowen Formation, including the Holt Town Sandstone Bed and the Great Mine Limestone, and the Etruria Formation) has been classified as a Secondary A aquifer by the Environment Agency. This aquifer can provide a component of baseflow to rivers and for water supply. Therefore, these aquifers have been classified as moderate value receptors; and
- the Mercia Mudstone Group (locally comprising the Bollin Mudstone Member of the Sidmouth Mudstone Formation, and the Tarporley Siltstone Formation) and the Cumbrian Coast Group (comprising the Manchester Marls Formation) have been classified as Secondary B aquifers by the Environment Agency. These bedrock deposits have traditionally been regarded as predominantly impermeable or, at best, poor aquifers. Limited quantities of groundwater suitable for domestic or agricultural use are, however, occasionally obtainable within these rock formations. They have, therefore, been classified as moderate value receptors.

WFD status of groundwater bodies

15.3.13 A summary of the locations, current overall WFD status, and future overall status objectives associated with the designated bedrock groundwater bodies within the study area is provided in Table 40. The value attributed to each of these receptors is also indicated.

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

Abstraction and permitted discharges (groundwater)

15.3.15 Table 41 sets out the groundwater abstraction and permitted discharges located within the Davenport Green to Ardwick study area.

Table 41: Groundwater abstraction and permitted discharges in Water resources and flood risk study area

Feature	Details	Value
Source Protection Zones (SPZ) associated with licensed public water supplies	SPZ3 near Rusholme lies within the study area. This SPZ is associated with an abstraction 3km north-west of the route of the Proposed Scheme.	Very high
Private licensed groundwater abstractions	One at Didsbury Golf Club, Northenden, used for spray irrigation purposes.	Moderate
Registered unlicensed private groundwater abstractions	None	None
Consented discharges to groundwater	None	None

Groundwater – surface water interactions

15.3.16 A desk-based assessment using Ordnance Survey maps and detailed river network data provided by the Environment Agency identified 12 features within the study area that had the potential to be springs or sinks. Access was possible to inspect nine of these features. The value of these features has been determined based on consideration of the feature's importance as a water resource as well as any ecological, heritage, cultural or community asset importance. Further details on these features can be found in BID WR-004-0MA07[132]. Of the nine features inspected:

- surveys were unable to verify the nature of one potential feature and it has, therefore, been assumed to be a high value receptor on a precautionary basis;
- four potential features were verified as land drainage features and are excluded from the groundwater surface water assessment; and
- four features were identified to be culverts and not groundwater features.

15.3.17 The remaining three potential spring features are assumed to be high value receptors on a precautionary basis, pending site inspection. None of these are within the land required for construction of the Proposed Scheme.

15.3.18 There are no ponds within the land required for the construction of the Proposed Scheme.

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

Water dependent habitats

15.3.19 Blackcarr Wood and Baguley Bottoms Site of Biological Importance (SBI) is a nature conservation site within the study area. The Proposed Scheme will pass beneath this site in tunnel. There are springs and a pond connected to Baguley Brook located within the habitat, which may be supported by groundwater flow from glaciofluvial deposits and glacial till. This site has, therefore, been included on a precautionary basis.

15.3.20 No designated nature conservation sites within the study area that are dependent on surface water flows have the potential to be affected by the Proposed Scheme.

15.3.21 A detailed description of the ecology of this site is provided in Volume 5 reports relating to Ecology and biodiversity.

Existing baseline – flood risk and land drainage

15.3.22 The Environment Agency's Flood map for planning (rivers and sea)[133] has been used to scope the baseline flood risk for fluvial flooding from main rivers and ordinary watercourses. These maps define Flood Zone 2 (land assessed as having between a 1 in 100 (1%) and 1 in 1,000 (0.1%) annual probability of river flooding) and Flood Zone 3 (land assessed as having a 1 in 100 (1%) or greater annual probability of river flooding). The Risk of Flooding from Surface Water map[134] has been used to scope surface water flood risks. All of these flood zones are shown in Volume 5, Water resources and flood risk Map Book: Map Series WR-01.

15.3.23 Infrastructure failure flood risks have been scoped using the Environment Agency Risks of flooding from reservoirs national dataset[134]. The British Geological Survey (BGS) Susceptibility to groundwater flooding dataset[135] has been used to assess the future risk of groundwater flooding.

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

- MCC Preliminary Flood Risk Assessment (PFRA) (2011)[136];
- MCC Strategic Flood Risk Assessment (SFRA) (2014)[137]; and

[133] Environment Agency (2019), *Long term flood risk assessment for locations in England*. Available online at: https://flood-warning-information.service.gov.uk/long-term-flood-risk/.

[134] Environment Agency (2021), *Long term flood risk information.* Available online at: https://flood-warning-information.service.gov.uk/long-term-flood-risk/.

[135] British Geological Survey (2021), *Susceptibility to groundwater flooding dataset*. Available online at: http://www.bgs.ac.uk/products/hydrogeology/groundwaterFlooding.html.

[136] JBA Consulting (2011), *Manchester City Council Preliminary Flood Risk Assessment.* Available online at: https://www.manchester.gov.uk/egov_downloads/MCC_PFRA.pdf.

[137] JBA Consulting (2010), *Manchester, Salford and Trafford Level 1 Strategic Flood Risk Assessment (SFRA)*. Available online at: https://www.trafford.gov.uk/planning/strategic-planning/docs/manchester-salford-and-trafford-councils-level-2-hybrid-sfra-level-1-sfra-march-2010.pdf.

- MCC Local Flood Risk Management Strategy (LFRMS) (2015)[138].

15.3.25 Historical flood investigation reports published by the LLFA, under Section 19 of the Flood and Water Management Act[139], relevant to this area have been reviewed (see Appendix WR-005-0MA07 - Flood risk assessment for further details). None of these reports include details of any historical flooding within the study area.

River flooding

15.3.26 The study area includes areas of floodplain (Flood Zone 2 and 3) associated with Baguley Brook and the River Mersey. The route of the Proposed Scheme will pass beneath the Baguley Brook floodplain in a bored tunnel. A review of the above ground Altrincham Road vent shaft and headhouse at this location has shown it to be outside of the Environment Agency's flood zones. The flood risk to this area will therefore be unaffected by the Proposed Scheme and will not be discussed further in this document. A review of the Environment Agency's Flood map for planning has shown that the Palatine Road vent shaft and headhouse are located in the floodplain of the River Mersey, partially within the Environment Agency Didsbury flood storage basin, which is designated a statutory reservoir[140]. This vent shaft therefore has the potential to affect floodplain conveyance causing a change in peak flood levels in neighbouring residential areas.

15.3.27 Table 42 shows all relevant watercourses within the study area with receptors that would potentially be affected by any changes in the level and extent of flooding. The value of these receptors, based on the definitions in Section 21 of the SMR, is also indicated. The location description and figure/coordinate is the location at which the source intersects the Proposed Scheme, as indicated by the grid coordinates on the relevant Volume 5, Water resources and flood risk Map Book: Map Series WR-01.

Table 42: River flood risk sources and receptors

Source	Location description and figure/coordinate	Receptor potentially affected	Receptor value/sensitivity to flooding
River Mersey/Tributary of River Mersey 2 (Fielden Park Brook)	River Mersey WR-01-310a - B4	Electricity substation (Palatine Road)	Very High
River Mersey/Tributary of River Mersey 2 (Fielden Park Brook)	River Mersey WR-01-310a - B4	Electricity substation (Palatine Road)	Very High
River Mersey/Tributary of River Mersey 2 (Fielden Park Brook)	River Mersey WR-01-310a - B4	Residential properties along Palatine Road	High

[138] Manchester City Council (2014), *Local Flood Risk Management Strategy*. Available online at: https://secure.manchester.gov.uk/info/500207/planning_and_regeneration/5905/manchesters_local_flood_risk_management_strategy_lfrms.

[139] *Flood and Water Management Act 2010.* Her Majesty's Stationary Office, London. Available online at: http://www.legislation.gov.uk/ukpga/2010/29/contents.

[140] A statutory reservoir is a reservoir which holds more than 25,000m^3 of water above ground level. These reservoirs must be registered with the Environment Agency and are subject to a number of conditions.

Source	Location description and figure/coordinate	Receptor potentially affected	Receptor value/sensitivity to flooding
River Mersey	River Mersey WR-01-310a - B4	Withington Golf course club house	Moderate
River Mersey/Tributary of River Mersey 2 (Fielden Park Brook)	River Mersey WR-01-310a - B4	Hotel	Moderate
River Mersey	River Mersey WR-01-310a - B4	Palatine Road	Moderate
River Mersey/Tributary of River Mersey 2 (Fielden Park Brook)	River Mersey WR-01-310a - B4	Car Parks	Low
River Mersey	River Mersey WR-01-310a - B4, B5	Didsbury flood storage basin	Low
River Mersey	River Mersey WR-01-310a - B4, B5	Withington golf club	Low
River Mersey	River Mersey WR-01-309b – I4	Residential property along Kenworthy Lane	High
River Mersey	River Mersey WR-01-309b – I4	Cycle track	Moderate
River Mersey	River Mersey WR-01-310a – B6	Four residential properties along Stenner Lane	High
River Mersey	River Mersey WR-01-310a – B6	Disused commercial building on Stenner Lane	Moderate
River Mersey	River Mersey WR-01-310a – B6	Stenner Lane	Moderate
River Mersey	River Mersey WR-01-310a – B5	Allotments	Low
River Mersey	River Mersey WR-01-310a – B5, B6	Didsbury Sports ground and buildings	Moderate
River Mersey	River Mersey WR-01-310a – A5, B5	Didsbury golf course	Low
River Mersey	River Mersey WR-01-310a – A4	Electricity substation (Mill Lane)	Very High
River Mersey	River Mersey WR-01-310a - A4	27 Residential properties around Mill Lane	High
River Mersey	River Mersey WR-01-310a - A4	Disused commercial building	Moderate
River Mersey	River Mersey WR-01-310a - A4	Mill Lane and Allanson Road	Moderate
River Mersey	River Mersey WR-01-310a - A4	Car Park	Low

Surface water flooding

15.3.28 There are areas that are susceptible to surface water flooding within the study area. The key sources and receptors with potential to be affected by the Proposed Scheme are shown in Table 43. The value of these receptors, based on Section 21 of the SMR, is also indicated. The location description and figure/coordinate is the location at which the source will be intersected by the Proposed Scheme, as indicated by the grid coordinates on the relevant Volume 5, Water resources and flood risk Map Book: Map Series WR-01.

Table 43: Surface water flood risk sources and receptors

Source	Location description and figure/coordinate	Receptor potentially affected	Receptor value
Surface water flow path at Rondin Road	Rondin Road WR-01-310a - I5	Two electricity substations	Very high
Surface water flow path at Rondin Road	Rondin Road WR-01-310a - I5	Railway assets (train care facility)	Moderate
Surface water flow path at Rondin Road	Rondin Road WR-01-310a - I5	Commercial property on Rondin Road	Moderate
Surface water flow path at Rondin Road	Rondin Road WR-01-310a - I5	Blind Lane	Moderate
Surface water flow path at Rondin Road	Rondin Road WR-01-310a - I5	Industrial wasteland	Low

Artificial water bodies

15.3.29 Flooding from artificial water bodies may occur due to failure of an impounding structure, such as a dam or canal embankment. Artificial water bodies with potential implications for flood risk within the study area include:

- Didsbury flood storage basin located in the vicinity of the Proposed Scheme on the north bank of the River Mersey. This is an existing offline flood storage area within the floodplain of the River Mersey, and although the Proposed Scheme will pass in tunnel, both temporary construction and permanent features (the Palatine Road vent shaft and headhouse) will be partially located in the flood storage basin; and
- Woodhead, Dovestone, Greenfield, Rhodeswood, Yeoman Hey, Fernilee, Errwood, Chew, and Torside reservoirs.

15.3.30 Woodhead, Dovestone, Greenfield, Rhodeswood, Yeoman Hey, Fernilee, Errwood, Chew, and Torside reservoirs are the artificial water bodies with the potential to affect flood risks of relevance to the Proposed Scheme. As these are large reservoirs and therefore, subject to the requirements of the Reservoirs Act 1975[141], the inundation risk posed by these water

[141] Department for Environment, Food and Rural Affairs (2016), *Reservoirs: owner and operator requirements*. Available online at: https://www.gov.uk/guidance/reservoirs-owner-and-operator-requirements.

bodies is considered to be low and the Proposed Scheme will not affect local flood characteristics in the event of a failure of these reservoirs.

15.3.31 The assessment does not identify any changes in flood risk posed by failure of artificial water sources.

Groundwater flooding

15.3.32 Information related to historical incidents of groundwater flooding in the Davenport Green to Ardwick area is provided within the MCC SFRA[137] and LFRMS[138]. The SFRA and LFRMS state that there is no history of groundwater flooding within the study area.

15.3.33 The BGS Susceptibility to groundwater flooding dataset indicates that there is potential for groundwater flooding to occur at surface around Manchester tunnel north portal due to the nature of the bedrock and superficial deposits, Baguley, Newall Green, Woodhouse Park and Moss Nook. This flooding could impact on residential properties (high value) and roads (moderate value), commercial properties (moderate value) and parks (low value).

Future baseline

Construction (2025)

15.3.34 Volume 5: Appendix CT-004-00000 provides details of the developments in the Davenport Green to Ardwick area that are assumed to have been implemented by 2025. The committed developments relevant to water resources and flood risk during construction in this area are set out in Table 44.

Table 44: Committed developments of relevance to water resources and flood risk during construction

Map book reference[142]	Planning reference	Description	How this is considered in the assessment
MA07/111	Manchester Core Strategy (2012)	Location: Corridor (Manchester) within the Central Manchester Regeneration Area. Proposed delivery of approximately 14ha of employment land for office, research and development, light industrial, general industrial, education and health uses.	Informing future baseline
MA07/110	Manchester Core Strategy (2012)	Location: Central Manchester. Proposed delivery of approximately 8,200 residential units. High density housing will be permitted within or adjacent to the Regional Centre (Hulme and the Higher Education Precinct) as well as within Hulme, Longsight and Rusholme district centres as part of mixed-use schemes.	Informing future baseline

[142] Volume 5, Planning Data/Committed Development Map Book: Maps CT-13-322b to CT-13-326a.

Map book reference[142]	Planning reference	Description	How this is considered in the assessment
MA07/299	Manchester Core Strategy (2012)	Location: South Manchester. Proposed delivery of approximately 3,240 residential units. High density development will generally only be appropriate within the district centres of Chorlton, Didsbury, Fallowfield, Levenshulme and Withington, part of mixed-use schemes.	Informing future baseline
MA08/038	Manchester Core Strategy (2012)	Location: Manchester City Centre and City Fringe (including Strangeways, Collyhurst, Ancoats, Chancellors Place, Manchester Science Park). Proposed 33ha in City Centre and 25ha in City Fringe of B1a high density offices or similar employment development.	Informing future baseline
MA08/129	Manchester Core Strategy (2012)	Location: Area to east and north of Manchester City Centre. Proposed delivery of approximately 16,580 residential units. 40-50 dwellings per ha but higher densities considered appropriate in locations close to the City Centre such as the Lower Irk Valley and Holt Town.	Informing future baseline

15.3.35 Implementation of committed developments set out in the Table 44 will result in the introduction of flood risk receptors within the water resources and flood risk study area. As such, these committed developments have been included as part of the future baseline and considered within this assessment.

Operation (2038)

15.3.36 Volume 5: Appendix CT-004-00000 also provides details of the developments in the Davenport Green to Ardwick area that are assumed to have been implemented by 2038. No additional committed developments have been identified in this study area that will materially alter the baseline conditions in 2038 for water resources and flood risk.

Climate change

15.3.37 Detailed analysis of the potential impacts of climate change on the Proposed Scheme has been undertaken and is reported in Volume 3, Route-wide effects (Section 4). In general, the design of the Proposed Scheme has adopted a precautionary approach to potential future increase in peak river flows and rainfall intensities.

15.3.38 Although no definitive guidance is available, climate change may also affect future surface water and groundwater resources. However, any such changes are unlikely to alter the significance of the effects identified in this assessment.

15.4 Effects arising during construction

Avoidance and mitigation measures

15.4.1 The principal strategy adopted to limit the temporary and permanent effects of the Proposed Scheme is through avoidance of sensitive receptors wherever reasonably practicable. Where receptors could not be avoided, mitigation measures have been incorporated where appropriate and reasonably practicable, to limit the potential effects. Section 16 of the draft Code of Construction Practice (CoCP)[143] includes a range of mitigation measures that reduce construction impacts as far as is reasonably practicable. The avoidance and mitigation measures that are of particular relevance to water resources and flood risk during construction are described in the following sections of this report.

Water resources

15.4.2 The avoidance of sensitive receptors has reduced the risks associated with the Proposed Scheme not complying with the requirements of the WFD. Examples of this strategy include:

- avoidance of channels and floodplain areas, where reasonably practicable – the alignment of the Proposed Scheme will avoid passing along river or stream valleys and their associated floodplains. Instead it will pass beneath these larger watercourses in tunnel;
- 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: MA07 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 Davenport Green to Ardwick area.

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

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

15.4.7 Infrastructure required within or in proximity to an existing channel (including outfalls) will be designed to reduce impacts on the natural hydromorphology of watercourse channels, as far as is reasonably practicable.

15.4.8 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.

15.4.9 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.

15.4.10 There are no permanent culverts proposed on the smaller watercourse crossings within the Davenport Green to Ardwick area.

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 remove potential pollution pathways. If boreholes are to be decommissioned and replaced with alternatives, the contractors will follow the latest industry standard. This principle will also be applicable to springs potentially affected by the Proposed Scheme, although additional measures may be required to mitigate temporary construction impacts. Wherever a spring is to be covered or displaced by design elements then additional mitigation measures may be applied to relocate the spring, where reasonably practicable.

15.4.12 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, tunnels, vent shafts and cuttings, insofar as reasonably practicable. The types of measure that could be adopted include:

- installation of cut-off structures (impermeable barriers preventing water flow) around excavations;
- ensuring cut-off structures are driven to sufficient depths to meet an underlying strata or zone of lower permeability;
- promoting groundwater recharge, such as discharging pumped water to recharge trenches around excavations to maintain baseline groundwater and surface water conditions;
- incorporating passive bypasses within the design, which could comprise a 'blanket' of permeable material, such as gravel, placed around temporary structures allowing groundwater to bypass the below-ground works, without a rise in groundwater levels on the upstream side;
- the tunnel boring machines (TBMs) will be operated in a closed face mode when tunnelling within water bearing strata and the tunnel linings will be designed to reduce leakage rates as far as is reasonably practicable, thereby reducing the requirements for dewatering and drainage; and
- vent shafts will be spray concrete lined following construction or diaphragm walled prior to construction to reduce leakage rates as far as reasonably practicable, thereby reducing the permanent dewatering effects.

15.4.13 The exact requirements will be refined and method of mitigation will be designed following ground investigation at foundations, tunnels, vent shafts and cutting locations where appropriate.

15.4.14 For major utilities, the following specific measures are considered in addition to the above points:

- trenchless crossing techniques will be used wherever reasonably practicable for main rivers/sensitive watercourses and key designations to reduce the impact on these features;
- where temporary watercourse diversions are required, during the reinstatement the watercourse will be returned to its natural course and condition where reasonably practicable after work is complete, with due consideration to its WFD status objectives; and
- at watercourse crossings, hard bank reinforcement will be avoided where reasonably practicable.

15.4.15 No borrow pits are proposed in the Davenport Green to Ardwick area.

Flood risk and land drainage

15.4.16 The design of the Proposed Scheme will mitigate permanent impacts on flood risk and land drainage, as far as reasonably practicable, as follows:

- as the Proposed Scheme will be in tunnel through the Davenport Green to Ardwick area, the impacts on flood flows within rivers and streams, and their floodplains, will be limited

to those associated with the vent shafts. The Proposed Scheme includes volume for volume replacement for the loss of flood storage in the Didsbury flood storage basin associated with Palatine Road vent shaft, up to the maximum operating level (28.65m AOD) of the statutory reservoir;

- the temporary works shown on Map Series CT-05 in the Volume 2: MA07 Map Book have been informed by a detailed consideration of the flood risk constraints and have sought to avoid flood zones wherever reasonably practicable;
- runoff from the footprint of the infrastructure could occur more rapidly post-construction due to steeper slope angles and the permeability (or compacted nature) of the newly-created surfaces. The drainage systems will be designed to ensure that there will be no significant increases in flood risk during storms up to and including the 1 in 100 (1%) annual probability design event, with an allowance for climate change;
- attenuation tanks for new sections of highway and railway drainage have been sized on a precautionary basis, pending more detailed information about the permeability and runoff characteristics of existing and proposed ground surfaces;
- where the Proposed Scheme will pass in cutting, drainage measures will be provided to limit overland flow into the cutting. This overland flow along with seepage and runoff from the cuttings will, where reasonably practicable, be drained to the catchments to which this water would naturally drain, avoiding transfer of water from one water body to another, which could increase flood risk or impact on land drainage systems; and
- measures will be introduced to reduce any potentially significant effects on groundwater flood risk as far as is reasonably practicable, including the incorporation of passive hydraulic bypasses at cuttings and other below ground structures. These could for example comprise a 'blanket' of permeable material such as gravel.

15.4.17 The nominated undertaker will, as far as reasonably practicable, ensure that flood risk is managed throughout the construction period, when planning sites and storing materials. If necessary, temporary provision will be made to reduce the potential for impacts on existing land drainage systems during construction. Some of the specific measures referred to in the draft CoCP, include:

- having regard to the requirement for construction activities to avoid any increases in flood risk to vulnerable receptors;
- preparation of flood risk assessments and method statements for temporary works, including construction compound drainage, watercourse crossings and realignments and temporary realignments in consultation with the Environment Agency, and where applicable, the LLFA and other relevant regulators;
- location of storage, machinery, equipment and temporary buildings outside flood risk areas where reasonably practicable;
- construction of outfalls during periods of low flow to reduce the risk of scour and erosion; and

- design of temporary watercourse realignments with equivalent hydraulic capacity to the existing channels, ensuring that field subsurface drainage systems can be adapted to discharge into the new channel.

15.4.18 In accordance with Section 16 of the draft CoCP, monitoring will also be undertaken in consultation with the Environment Agency, and where applicable, the LLFA, to ensure that temporary structures are installed, maintained and removed in accordance with the relevant environmental approvals and that any impacts on existing land drainage systems are managed appropriately.

15.4.19 For major utilities, the following specific measures are considered in addition to the above points:

- trenchless crossing techniques will be used wherever reasonably practicable for main rivers/sensitive watercourses to reduce the impact of temporary watercourse diversions on flood risk; and
- at watercourse crossings, hard bank reinforcement and piers in floodplains will be avoided where reasonably practicable.

Assessment of impacts and effects

15.4.20 This section describes the significant effects following the implementation of the avoidance and mitigation measures. The majority of the potential temporary impacts on the water environment during construction will be avoided or mitigated by the working methods outlined in the draft CoCP. The mitigation included in the design has focused on reducing permanent impacts resulting from the presence of the Proposed Scheme to as low a level as is reasonably practicable.

Temporary effects – Water resources

Surface water

15.4.21 Potential temporary impacts on surface water quality, due to site runoff and increased pollution risk, are a key concern during construction and have the potential to affect abstractions and the water environment more generally. However, the practices outlined in the draft CoCP are considered adequate to mitigate any impacts, such that there are unlikely to be any significant effects.

15.4.22 Construction compounds may have substantial water demands that may require approval through the protective provisions in the Bill for abstractions to augment other supply options. The assessment will include location-specific engagement with the Environment Agency and other water undertakers on the availability of water at that location. The Environment Agency will be able to impose conditions on any abstractions approved so that no significant effects are likely to arise. In this case, in the Davenport Green to Ardwick area,

the current Environment Agency Abstraction Licensing Strategy (ALS)[144,145,146] information suggests that there will not be restrictions on obtaining water supplies from surface water sources.

Groundwater

Aquifers

15.4.23 The proposed dewatering during construction of Manchester tunnel south portal and Manchester tunnel north portal may alter groundwater flow in the glacial till Secondary (Undifferentiated) aquifer, the Appleby Group Principal aquifer and the Mercia Mudstone Group Secondary B aquifer. Whilst there are likely to be minor localised impacts on groundwater flow, the implementation of the measures outlined in the draft CoCP and the extent of the superficial and bedrock aquifers will mean that any impacts on the overall status of the aquifers will not be significant.

15.4.24 The proposed dewatering during construction of the Wilmslow Road vent shaft may alter groundwater flow in the Sherwood Sandstone Group (Wilmslow Formation and Chester Formation) Principal aquifer. To reduce the impact on groundwater flow, a construction methodology will be adopted that will only permit internal dewatering at the vent shafts. The construction methodology may incorporate avoidance measures such as using diaphragm walls to seal the groundwater outside of the vent shaft or secant piled walls through the superficial deposits and injection grouting as the shaft is constructed. On completion, the vent shaft will be fully lined to prevent groundwater ingress. Dewatering of the shaft is expected to take three months although the temporary impact of dewatering on groundwater levels and flow in the bedrock is likely to occur over a period of three to five years. As a result, construction of the Wilmslow Road vent shaft is assessed to result in temporary negligible impacts leading to negligible effects, which are not significant.

15.4.25 The Birchfield Road vent shaft is located in a heavily faulted area and will penetrate into the Appleby Group (Collyhurst Sandstone Formation) Principal aquifer and Warwickshire Group (Halesowen Formation) Secondary A aquifer. The Environment Agency regional groundwater conceptual model report 2004[147] suggests that some of the faults in this area restrict groundwater flow. These no flow faults, along with the presence of the partially confining Manchester Marls, suggests that the temporary impact of dewatering at this shaft site is likely to be limited to the isolated block of the Collyhurst Sandstone Formation Principal

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[144] Environment Agency (2013). *Upper Mersey abstraction licensing strategy*. Available online at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/300491/LIT_7883_7c60f1.pdf.

[145] Environment Agency (2019), *Northern Manchester abstraction licensing strategy*. Available online at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/300488/LIT_7849_fa7980.pdf.

[146] Environment Agency (2013). *Lower Mersey and Alt abstraction licensing strategy*. Available online at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/300490/LIT_7881_35d3ed.pdf.

[147] ESI (April 2004), *Manchester and East Cheshire Water Resources Study: Final Report*. *6184a R3.* Appendix C.

aquifer, the Halesowen Formation Secondary A aquifer and the Etruria Formation Secondary A aquifer. The temporary impact of dewatering on groundwater levels and flow in the bedrock is assessed to be moderate on the limited area of sub-crop for the Collyhurst Sandstone Formation and underlying Halesowen Formation, leading to a moderate effect, which is significant for both aquifers. The impact on the Etruria Formation is assessed to be minor leading to minor effect, which is not significant.

15.4.26 The Palatine Road vent shaft will be constructed using fully penetrating diaphragm walls to seal the groundwater outside of the vent shaft and therefore dewatering will be minimal. As a result, construction of the Palatine Road vent shafts is assessed to result in temporary negligible impacts leading to negligible effects, which are not significant.

15.4.27 The Altrincham Road vent shaft will be constructed through the Tarporley Siltstone Formation (Secondary B aquifer). The construction methodology will be similar to that set out above for Wilmslow Road and Birchfield Road vent shaft. The construction of the Altrincham Road vent shaft is assessed to result in temporary negligible impacts leading to negligible effects, which are not significant.

15.4.28 The construction of the Proposed Scheme will require dewatering activities to take place, which will require approval under protective provisions in the Bill. The assessment covers the dewatering activities associated with Manchester tunnel, Manchester tunnel south and north portals, the vent shafts at Altrincham Road, Palatine Road, Wilmslow Road and Birchfields Road, Ardwick South cutting retaining wall, Ardwick box structure and Ardwick North cutting retaining wall. As well as assessing the specific impacts of these activities on potential water receptors, an evaluation of water resource policy in this area, using the Environment Agency's ALS[144,145,146], has been carried out. A review of the ALS covering the Davenport Green to Ardwick area suggests that there is 'restricted water available' from the Sherwood Sandstone Group at Palatine Road and Wilmslow Road due to 'over licensing'. This could lead to restrictions on obtaining approvals for these dewatering activities. Engagement with the Environment Agency will be undertaken in relation to each of the dewatering locations and the Environment Agency will be able to impose conditions on any abstractions approved so that no significant adverse effects are likely to arise.

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

Abstractions

15.4.30 There is one licensed private groundwater abstraction at Didsbury Golf Club, Northenden which has the potential to be temporarily affected by dewatering of Palatine Road vent shaft. This abstraction is used for spray irrigation at the golf course and has been assessed as a moderate value receptor. The borehole abstraction is from the Sherwood Sandstone Group (Wilmslow Sandstone Formation) Principal aquifer.

15.4.31 The Palatine Road vent shaft will be constructed using fully penetrating diaphragm walls to seal the vent shaft from groundwater inflow and therefore minimising the need for dewatering. However, some small localised change in groundwater level in the surrounding

area is possible, due to inflow into the base of the shaft during construction. There is currently insufficient data to understand how any potential water level reduction, resulting from dewatering at Palatine Road vent shaft, will be affected by the River Mersey, located between the vent shaft and the abstraction. The River Mersey is likely to form a recharge boundary for the aquifer when groundwater levels are reduced, leading to a smaller reduction in groundwater level at the abstraction location than indicated by preliminary calculations. On a precautionary basis, however, the assessment has not taken this into account and the water level reduction from dewatering is unaffected by the river. The impact on this abstraction is, therefore, assessed to be major. This will result in a temporary moderate adverse effect, which is significant.

Groundwater – surface water interactions

15.4.32 The assessment has not identified any temporary significant effects on groundwater - surface water interactions.

Water dependent habitats

15.4.33 The assessment has not identified any temporary hydrological impacts on water dependent habitats in the study area.

Temporary effects – Flood risk and land drainage

15.4.34 Construction of Palatine Road vent shaft, which is located within the River Mersey floodplain, will require temporary working within flood zones. On a precautionary basis this assessment assumes that material used to raise the land for the Palatine Road vent shaft satellite compound will not be removed at the end of the construction period and therefore form part of the permanent works at the vent shaft site. The size of the permanent raised site will be reviewed during design development with the aim of reducing the area of raised land as far as reasonably practicable.

Permanent effects – Water resources

15.4.35 Permanent effects are those initially caused by activity to construct the Proposed Scheme, but which will also remain after the Proposed Scheme has been constructed and is present in the area.

Surface water

15.4.36 Where highway drainage is discharged to local watercourses, assessments for determining whether routine runoff and spillage risk are likely to have a detrimental impact on water quality have been carried out using the Highways England Water Risk Assessment Tool

(HEWRAT)[148]. No HEWRAT assessments were required in this area, as there are no highway drainage discharges to watercourses in this area.

15.4.37 The assessment has not identified any permanent significant effects on surface water features.

Groundwater

Aquifers

15.4.38 A section of the Manchester tunnel will be constructed through the Appleby Group Principal Aquifer, the Warwickshire Group Secondary A Aquifer and the Cumbrian Coast Group Secondary B Aquifer. The construction of the tunnel will create an extended cylinder of no flow in these aquifers and may have minor localised impacts on groundwater flow. This may result in a permanent moderate adverse effect which is significant for the Appleby Group, and a permanent minor adverse effect which is not significant for the Warwickshire Group and the Cumbrian Coast Group.

15.4.39 The temporary dewatering during construction at the Wilmslow Road vent shaft has the potential to cause upwelling of saline water towards the base of the Sherwood Sandstone Group Principal aquifer. In addition, during dewatering, poorer quality groundwater might be drawn into the aquifer from the adjacent Collyhurst Sandstone Formation or underlying Pennine Upper Coal Measures Formation, potentially along faults or across fault boundaries. If poor quality water is drawn into the aquifer, it would take many years to remediate. To reduce the risk of movement of poor quality water into the Principal aquifer, the construction methodology will only permit internal dewatering. This methodology, along with the limited period of dewatering and use of avoidance measures such as grouting which will be implemented during construction, mean that the risk of drawing in poor quality water to the Principal aquifer is considered low. The impact of dewatering on water quality in the high value Sherwood Sandstone Group Principal aquifer is therefore assessed as negligible leading to a negligible effect, which is not significant.

15.4.40 Dewatering for Birchfields Road vent shaft, located in the Collyhurst Formation Principal aquifer and Halesowen Formation Secondary A aquifer, might cause an inflow of poorer quality groundwater from the adjacent Etruria Formation or underlying Pennine Upper Coal Measures. As with the Wilmslow Road vent shaft, the construction methodology only permits internal dewatering, the dewatering period is limited and avoidance measures such as grouting will be implemented during construction will reduce the risk of drawing in poor quality water. As such, the risk of changes in water quality in these aquifers is considered low. This is assessed as a negligible impact on groundwater water quality in the high value

[148] Highways England (2019), *Design Manual for Roads and Bridges (DMRB), Sustainability and Environment Appraisal, LA 113 Road drainage and the water environment* (formerly HD 45/09). Available online at: http://www.standardsforhighways.co.uk/ha/standards/dmrb/vol11/section3/LA%20113%20Road%20drainage%20and%20the%20water%20environment-web.pdf.

Appleby Group and moderate value Halesowen Formation, leading to a negligible effect which is not significant.

15.4.41 Palatine Road vent shaft will be constructed with full depth diaphragm walls. These will reduce dewatering requirements to a minimum. Temporary dewatering is assessed to have a negligible impact on the Sherwood Sandstone Group leading to a negligible effect, which is not significant.

15.4.42 The Altrincham Road vent shaft will be constructed through the Tarporley Siltstone Formation (Secondary B aquifer). There is little risk of any change in water quality as a result of the construction of the Altrincham Road vent shaft and this is assessed to have a negligible impact on water quality, leading to a negligible effect, which is not significant.

Abstractions

15.4.43 The assessment has not identified any permanent significant effects on groundwater abstractions.

Groundwater - surface water interactions

15.4.44 The assessment has not identified any permanent significant effects on groundwater - surface water interactions.

Water dependent habitats

15.4.45 The assessment has not identified any permanent hydrological impacts on water dependent habitats in the study area.

Permanent effects – Flood risk and land drainage

15.4.46 During a flooding event, the defended Didsbury flood storage basin fills first. Once full and the defences become drowned out, floodwaters then fill the River Mersey floodplain. The Palatine Road vent shaft and temporary construction satellite compound will be located on the north side of Didsbury flood storage basin. This would displace floodwater whilst the Didsbury flood storage basin fills, and once the defences are overwhelmed, it would displace floodwater in the River Mersey floodplain. Preliminary hydraulic modelling using the Environment Agency's 1D hydraulic model (2012) was undertaken to establish the potential loss of storage volume resulting from the encroachment of the Palatine Road vent shaft into the storage basin. Further modelling work was undertaken using the Environment Agency's updated 1D-2D hydraulic model (2018) following Storm Christoph in January 2021 to calibrate the hydraulic model and improve the representation of key structures including flood embankment crest levels and the operation of sluice gates controlling flows into and out of Didsbury flood storage basin. The additional modelling carried out is set out in the Flood Risk Assessment (Volume 5: Appendix WR-005-0MA07) and the hydraulic modelling report (Volume 5: Appendix WR-006-00009), which include impact maps showing all of the affected receptors.

15.4.47 The additional modelling includes a detailed assessment of the impacts of the Proposed Scheme on the floodplain beyond the loss and compensation of floodplain storage, particularly local conveyance impacts on receptors close to the vent shaft site.

15.4.48 The detailed modelling shows that the presence of Palatine Road vent shaft will lead to localised changes to peak flood levels at the following local receptors which are already at risk of flooding:

- area around Palatine Road (Didsbury);
  - a moderate increase in peak flood level at one electricity substation (very high value). This will be a moderate impact and result in a major adverse effect, which is significant;
  - a minor increase on peak flood level at another electricity substation (very high value). This will be a minor impact and result in a moderate adverse effect, which is significant ;
  - a major increase in peak flood level at four high value residential properties. This will be a major impact and result in major adverse effects to these properties, which are significant;
  - a moderate increase in peak flood level at two high value residential properties near Palatine Road. These moderate impacts result in moderate adverse effects, which are significant;
  - a major increase in peak flood level at one commercial property near Palatine Road. This major impact on a moderate value receptor results in a moderate adverse effect, which is significant;
  - a minor increase in peak flood level at three high value residential properties near Palatine Road. These minor impacts result in moderate adverse effects, which are significant;
  - a major increase in peak flood level along part of Palatine Road (to the northeast of the Proposed shaft site). This major impact result in moderate adverse effect on these roads, which are significant;
  - a moderate increase in peak flood level along Palatine Road (further to the north-east in the vicinity of Ringway Hotel). This moderate impact result in moderate adverse effects on these roads, which are significant;
  - a minor increase in peak flood level at a moderate value commercial property. This minor impact results in a minor adverse effect which is not significant;
  - a minor decrease in peak flood level to two car parks near Palatine Road, low value receptors. These minor impacts are assessed as minor impacts resulting in negligible effects, which are not significant;
  - a moderate decrease in peak flood level to one residential property near Palatine Road. This moderate impact on a high value receptor results in a moderate beneficial effect, which are significant;

  - a major decrease in flood risk along Palatine Road (directly adjacent to the Proposed shaft site) This moderate impact on a moderate value receptor results in a moderate beneficial effect, which is significant;
  - a minor increase in flood risk along Palatine Road (to the southwest of the Proposed shaft site). This minor impact is assessed to result in a minor adverse effect, which is not significant;
- area south of Junction 5 of the M60 (Northenden);
  - a minor increase in peak flood level at one high value residential property. This minor impact results in a moderate effect, which is significant;
  - a minor increase in flood risk along a cycle path which passes beneath J5 of the M60 (low value receptor). This minor impact on a low value receptor results in a minor adverse effect, which is not significant;
- east of Didsbury flood storage basin (Stenner Lane);
  - a moderate increase in peak flood level to four residential receptors (high value). These moderate impacts result in moderate adverse effects, which are significant;
  - a moderate increase in peak flood level to one commercial receptor (moderate value). This moderate impact results in a moderate adverse effect, which is significant; and
  - a moderate increase in peak flood level along part of Stenner Lane. This is assessed to result in a moderate adverse effect on this road, which is significant.

15.4.49 In addition, the detailed modelling shows that the presence of Palatine Road vent shaft will lead to a risk of flooding at the following local receptors in the Ford Lane and Mill Lane area (Northenden):

- a major impact on peak flood levels on a very high value electricity substation. This results in a major adverse effect, which are significant;
- major impacts on peak flood levels on 22 high value residential properties in Northenden. These result in major adverse effects, which are significant;
- a major impact on peak flood levels on a moderate value commercial property in Northenden. This results in a moderate adverse effect, which is significant;
- moderate impacts on four high value residential receptors in Northenden. These results in moderate adverse effects, which are significant;
- major impacts on peak flood levels along Mill Lane and Allanson Road (moderate value receptors). These results in moderate adverse effects on these roads, which are significant; and
- a major impact on peak flood levels on a low value car park in Northenden. This results in a minor adverse effect, which is not significant.

15.4.50 In the vicinity of the Proposed Scheme, the BGS groundwater flooding susceptibility dataset shows potential for groundwater flooding at surface and in basements, particularly in the Ardwick area. There is the potential for groundwater level rise north of the Proposed Scheme due to the Ardwick South cutting retaining wall, Ardwick box structure and Ardwick North cutting retaining wall, which could result in an increased risk of groundwater flooding

in this area. The industrial properties (moderate value receptors) located in these areas will be demolished as part of the Proposed Scheme but may be replaced with future residential and industrial properties (allocations MA07/110, MA07/111, MA08-038, MA07-299 and MA08-129). On a precautionary basis, pending further investigation, the potential impact is considered to be moderate on these high to moderate value receptors. This will result in a moderate adverse effect, which is significant.

Summary of significant effects

15.4.51 On a precautionary basis the Proposed Scheme is anticipated to result in the following significant effects which require other mitigation:

- a temporary moderate adverse effect on the licensed private groundwater abstraction at Didsbury Golf Club from the dewatering during construction of Palatine Road vent shaft;
- a permanent moderate adverse effect on groundwater flow in the Applyby Group related to the presence of the Manchester tunnel;
- a permanent moderate adverse effect related to the potential for increased risk of groundwater flooding at Ardwick due to a potential rise in groundwater level north of the Proposed Scheme due to the presence of the Ardwick South cutting retaining wall, Ardwick box structure and Ardwick North cutting retaining wall;
- a permanent major adverse effect on peak flood levels at 26 residential properties and three electrical substations, due to changes in the conveyance of flood flows around the Palatine Road vent shaft site;
- a permanent moderate adverse effect on peak flood levels at 16 residential properties, two commercial properties and four roads, due to changes in the conveyance of flood flows around the Palatine Road vent shaft site; and
- a permanent moderate beneficial effect on peak flood levels at one residential property and part of Palatine Road, due to changes in the conveyance of flood flows around the Palatine Road vent shaft site.

Other mitigation measures

15.4.52 Additional mitigation measures have been developed 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.

Surface water

15.4.53 No requirement for additional mitigation for surface water has been identified in this assessment.

Groundwater

15.4.54 The potential temporary effect of Palatine Road vent shaft on the borehole abstraction at Didsbury Golf Club golf course will be considered during design development. Following further investigations and monitoring by the nominated undertaker, if this assessment identifies a risk that there will be a temporary, significant effect on this abstraction, then suitable mitigation measures will be discussed with the licence holder, to avoid the temporary significant effect on this groundwater abstraction. These measures may include provision of a temporary alternative supply during construction, or possibly deepening of the existing borehole, to ensure no significant adverse effect on the licence holder.

Groundwater – surface water interactions

15.4.55 No requirement for additional mitigation for groundwater – surface water interactions has been identified in this assessment.

Flood risk

15.4.56 The Palatine Road vent shaft will be located partially within the Environment Agency Didsbury flood storage basin. Provision has therefore been made to provide volume for volume replacement for the flood storage lost due to Palatine Road vent shaft and Palatine Road vent shaft satellite compound, up to the maximum operating level of the basin (28.65mAOD).

15.4.57 The Palatine Road vent shaft will change the flood flow conveyance in the area for events in excess of the operating level, immediately surrounding the vent shaft site. Additional modelling is underway and will continue during the passage of the Bill, to identify avoidance and mitigation measures to reduce the impact on peak flood levels at receptors in the area of the Palatine Road vent shaft, as far as reasonably practicable. This will be undertaken in consultation with the Environment Agency and utility providers. These avoidance and mitigation measures could include:

- refinement of the design to reduce the flood risk effects, including review of the vent shaft compound size and elevation;
- measures to control conveyance of flood flows, such as the provision of flood walls or bunds;
- additional capacity in the outlet structures from the Didsbury flood storage basin into the River Mersey;
- measures to increase the conveyance of Fielden Park Brook (Tributary of River Mersey 2) beneath Palatine Road; and
- increasing the level of flood protection in the Northenden area, around Ford Lane.

15.4.58 The preliminary assessment work carried out to date, has identified mitigation measures to ensure no significant effects on receptors around Ford Lane and Mill Lane area (Northenden) and at the electricity substations near Palatine Road (Didsbury). However, until

such time as other avoidance and mitigation measures have been identified, residual significant effects will remain on some of the receptors in the area near Palatine Road (Didsbury) and all of the receptors in the areas South of Junction 5 of the M60 (Northenden) and East of Didsbury flood storage basin (Stenner Lane).

15.4.59 During design development, further topographical survey, other surveys as required, hydraulic modelling and refinement of the mitigation will be undertaken with the aim reducing the flood risk identified as far as reasonably practical.

15.4.60 There is potential for groundwater level rise north of Ardwick South cutting retaining wall, Ardwick box structure and Ardwick North cutting retaining wall, which could result in moderate impacts on groundwater flood risk and therefore affect committed developments (allocations MA07/110, MA07/111, MA08-038, MA07-299 and MA08-129) in the area. Additional mitigation measures for the management of groundwater flood risk may be required. These mitigation measures may include the requirement for land drainage around the retaining wall structures. If required, further investigations will be undertaken during design development and the mitigation measures designed in consultation with the Environment Agency and the LLFA, to ensure no significant adverse effects on groundwater flood risk.

15.4.61 The assessment has concluded that, as a result of the mitigation included in the design, there will be no permanent significant effects on committed developments related to flood risk. A series of additional modelling steps have been identified and agreed with the Environment Agency to refine the mitigation design, if appropriate.

Summary of likely residual significant effects

15.4.62 Implementation of the other mitigation measures described above will reduce a number of the identified effects to a level that is not significant. However, on a precautionary basis, it is anticipated that significant residual effects will remain on:

- a permanent major adverse effect on peak flood levels at four residential properties near Palatine Road (Didsbury), due to changes in the conveyance of flood flows around the Palatine Road vent shaft site;
- a permanent moderate adverse effect on peak flood levels at five residential properties and two sections of road near Palatine Road (Didsbury), due to changes in the conveyance of flood flows around the Palatine Road vent shaft site;
- a permanent moderate adverse effect on peak flood levels at a residential property in the area south of Junction 5 of the M60 (Northenden), due to changes in the conveyance of flood flows around the Palatine Road vent shaft site; and
- a permanent moderate adverse effect on peak flood levels at four residential properties, one commercial property and Stenner Lane in the area East of Didsbury flood storage basin (Stenner Lane), due to changes in the conveyance of flood flows around the Palatine Road vent shaft site.

15.4.63 There will be a permanent moderate residual significant beneficial effect on peak flood levels at one residential property and part of Palatine Road, due to changes in the conveyance of flood flows around the Palatine Road vent shaft site.

Cumulative effects

15.4.64 No significant cumulative temporary or permanent effects during construction related to water resources or flood risk are anticipated.

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 is provided in Volume 5: Appendix WR-007-00000.

15.5.2 The design takes into account the policies in the NPPF and will ensure that the Proposed Scheme is safe from flooding without increasing flood risk elsewhere, as outlined in the Flood risk assessment, Appendix WR-005-0MA07. 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 ensure that the quantity and quality of water draining from the Proposed Scheme during its operational phase will have a negligible impact on the water environment.

15.5.4 A route-wide WFD compliance assessment is provided in Volume 5: Appendix WR-001-00000. This describes how the Proposed Scheme complies with the requirements of the WFD.

Assessment of impacts and effects

15.5.5 There are considered to be no significant adverse effects related to water resources and flood risk arising from operation of the Proposed Scheme.

Other mitigation measures

15.5.6 There are considered to be no further measures required to mitigate adverse effects on surface water resources, groundwater resources or flood risk.

Summary of likely residual significant effects

15.5.7 The assessment indicates that there will be no residual significant effects on surface water, groundwater or flood risk during operation of the Proposed Scheme.

Cumulative effects

15.5.8 No significant cumulative effects during operation related to water resources or flood risk are anticipated.

Monitoring

15.5.9 Volume 1, Section 9 sets out the general approach to monitoring of water resources and flood risk during operation of the Proposed Scheme.

15.5.10 There are no area-specific requirements for monitoring water resources and flood risk during operation of the Proposed Scheme.

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