In Parliament – Session 2021 - 2022

HS2

High Speed Rail (Crewe – Manchester) Environmental Statement

Non-technical summary

M13

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Department for Transport

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

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1 Introduction

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About this document

This document is a summary, in non-technical language, of the Environmental Statement (ES) for the proposed High Speed Two (HS2) railway between Crewe and Manchester. The ES has been deposited to Parliament with the Bill seeking approval for the project. The purpose of the ES is to help Parliament to make decisions about the project based on a full understanding of any effects, positive or negative, that it may have on the environment. The ES also enables anyone with an interest in the project, including the general public, to understand how it will affect them and to express their views on the effects of the project.

This non-technical summary (NTS) describes:

- the proposed new railway, and associated works;
- the reasonable alternatives to the project that have been studied;
- how the public and other stakeholders have been consulted and engaged with in developing and assessing the project;
- the likely significant effects of the project on the environment;
- the proposed means of avoiding, preventing, reducing, and if possible, offsetting (e.g. through restoration or compensation) the adverse effects of the project; and
- how the effects of the project will be monitored.

The proposed HS2 network

HS2 is a new high speed rail network. It will:

- transform intercity and long-distance passenger rail travel in the UK;
- provide the first major increase in inter-city rail capacity for over a century; and
- free up substantial capacity for rail travel on the existing network.

High speed trains will serve London, Birmingham, Manchester and cities in the Midlands, the North and Scotland. Trains will run on HS2 lines and on the existing conventional rail network at speeds of up to 360 kilometres per hour (225 miles per hour).

HS2 is being built in phases. Phase One is the section between London and the West Midlands. It was the subject of an ES deposited with the High Speed Rail (London – West Midlands) Bill. The Bill was deposited in November 2013 and enacted as the High Speed Rail (London – West Midlands) Act 2017.

Phase Two will extend the route north from Phase One and is being taken forward in stages. Phase 2a comprises the section of the route between the West Midlands and Crewe. The High Speed Rail (West Midlands – Crewe) Bill, together with an ES, was prepared for the Phase 2a proposals. Both were deposited in Parliament in July 2017. The Bill was enacted as the High Speed Rail (West Midlands – Crewe) Act 2021.

The full Phase 2b scheme (as announced in July 2017) comprised the following two sections of route:

- Crewe to Manchester, with a connection onto the West Coast Main Line (WCML) – referred to as 'the Western Leg'; and
- the West Midlands to Leeds via the East Midlands and South Yorkshire (referred to as 'the Eastern Leg'). The Eastern Leg is not the subject of this Bill and ES.

The Proposed Scheme

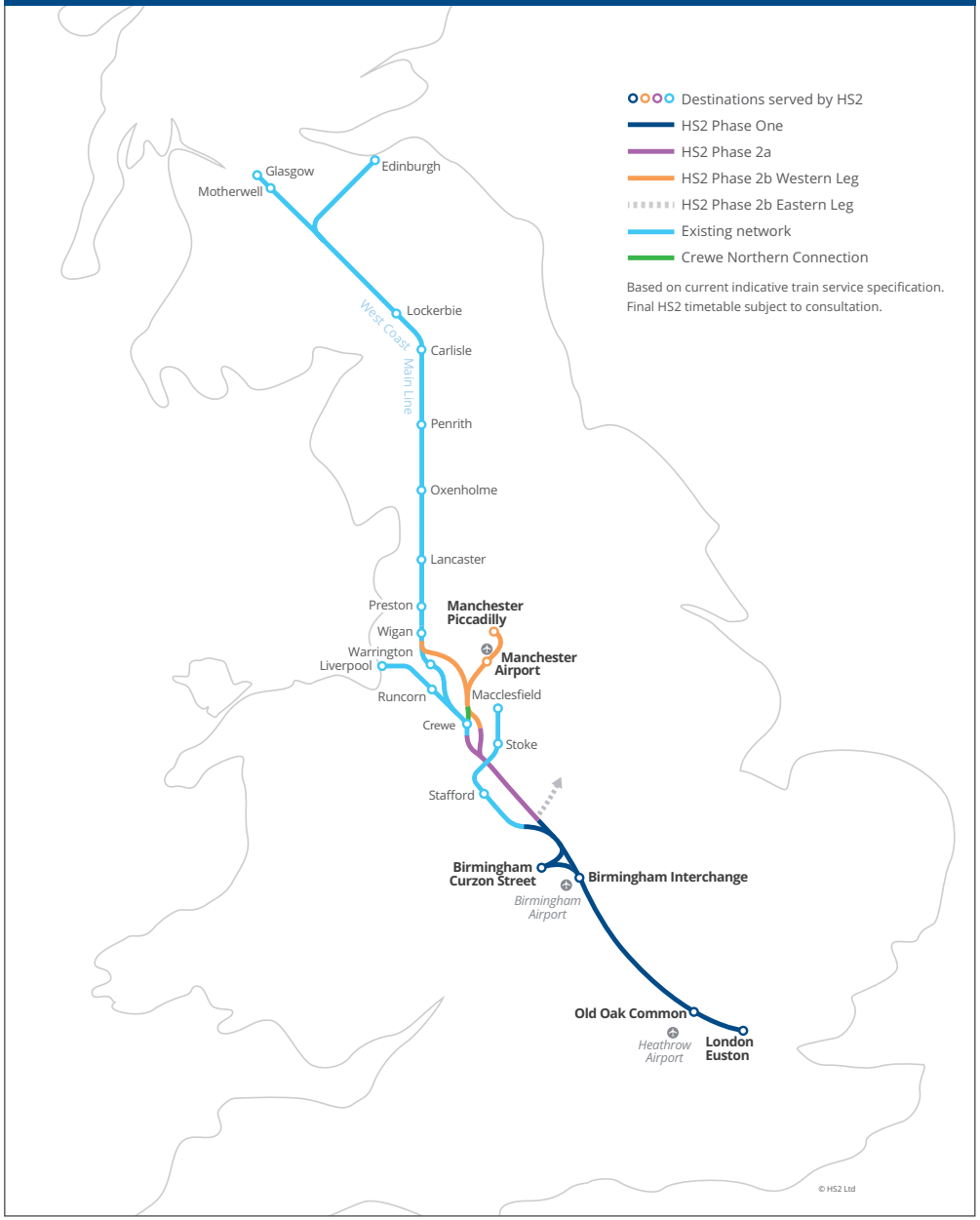
The ES, and therefore this NTS, is for the Western Leg which is referred to throughout the ES as the 'Proposed Scheme'. The Proposed Scheme comprises:

- 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 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.

Construction of the Proposed Scheme is assumed to begin in 2025. Operation is assumed to start in 2038.

The Proposed Scheme will connect with HS2 Phase 2a at Hough to the south of Crewe. Connections with the conventional rail network will enable HS2 trains to provide onward services beyond the HS2 network.

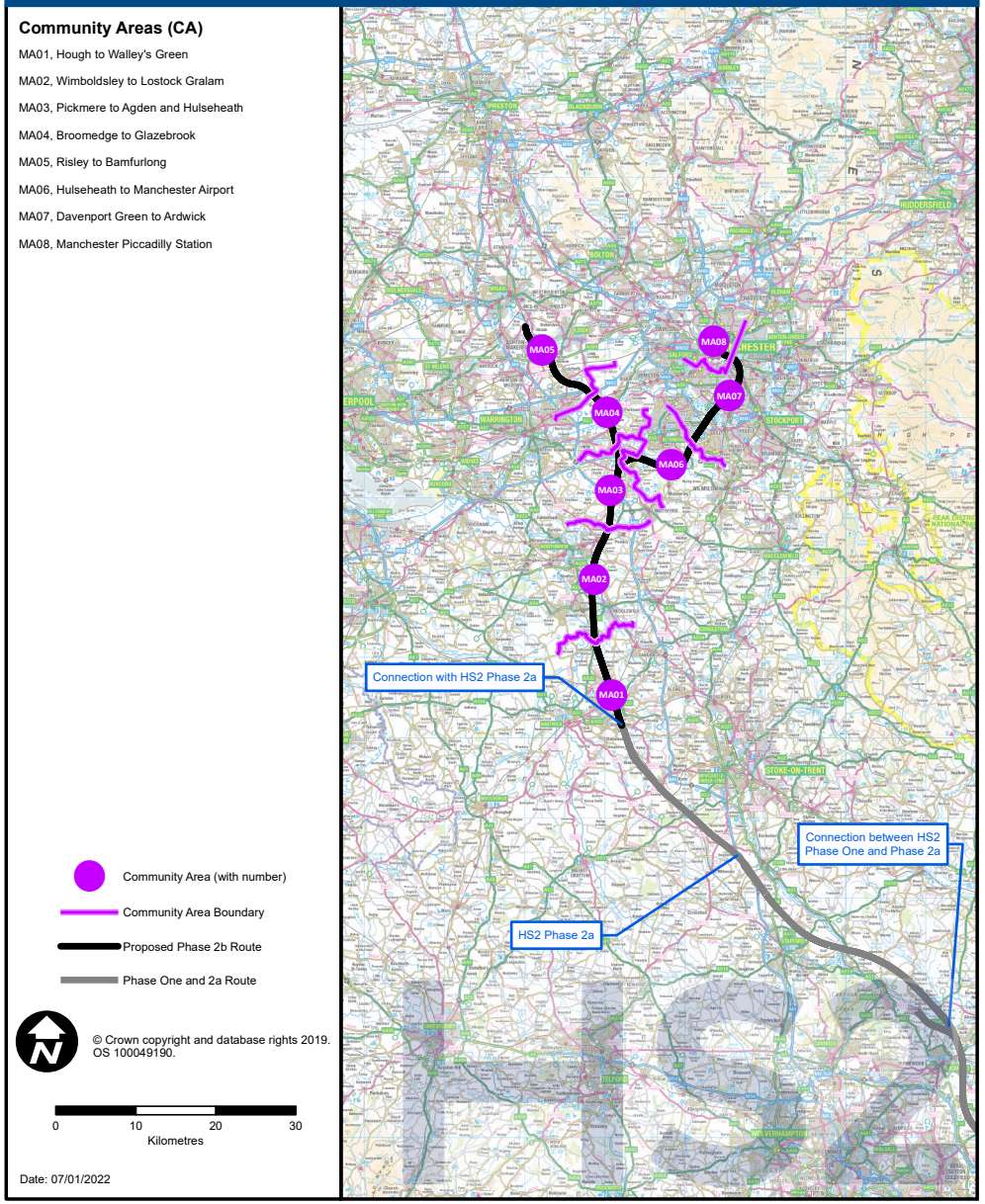
Figure 1: The HS2 network and Crewe Northern Connection



The environmental effects of the Proposed Scheme have been assessed. The ES presents the findings of the assessment. A 'working draft' ES was consulted on while the Phase 2b proposals were being developed. Responses to this consultation have informed how the Proposed Scheme has been designed and assessed.

For environmental assessment and community engagement purposes, the Proposed Scheme has been divided into eight community areas. These are shown in Figure 2.

Figure 2: Phase 2b Western Leg Community Areas



The hybrid Bill for HS2 Phase 2b Crewe to Manchester

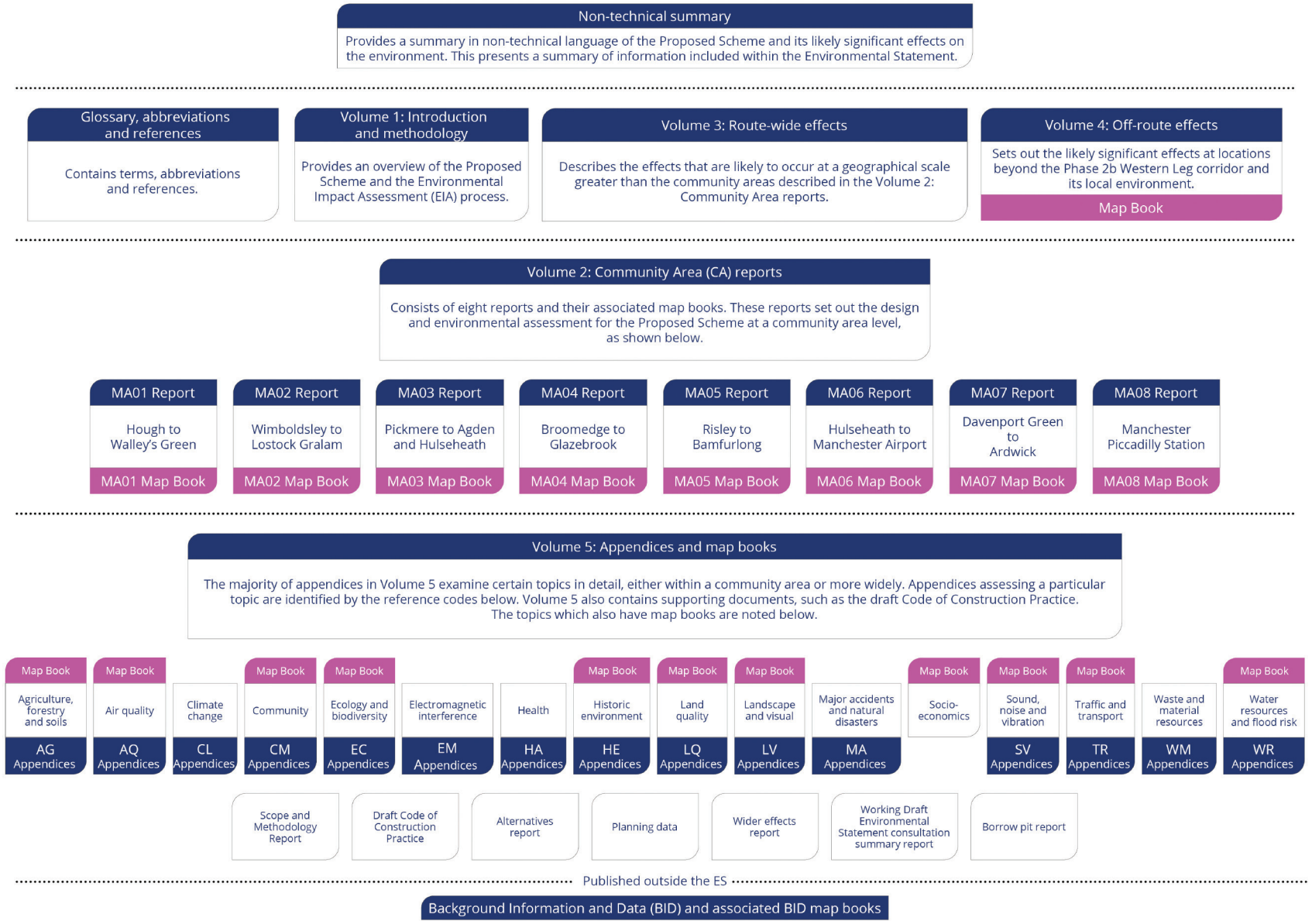
The Government is seeking approval for the Proposed Scheme through primary legislation (an Act of Parliament). Primary legislation allows the Government to seek the full range of statutory powers and authorisations that a project of this size and complexity requires. This includes any necessary revisions to the systems governing planning and rail regulations. It also enables subsequent orders and regulations to be made without Parliament having to pass a new Act. The Government followed the same approach for Phase One and Phase 2a of HS2, as well as for High Speed One (HS1) (formerly the Channel Tunnel Rail Link) and the Elizabeth Line (formerly Crossrail).

The Government will deposit a 'hybrid' Bill for the Proposed Scheme. In practice, this means that people whose property or interests are directly and specially affected will be able to petition Parliament. They will also be able to present their case to a Select Committee of Members of Parliament. This includes people whose properties are to be compulsorily purchased for the Proposed Scheme. Local authorities situated along the route of the Proposed Scheme will also be able to petition on behalf of their local communities as will Members of Parliament on behalf of their constituents. The Select Committee will then report to the House of Commons. A similar procedure applies in the House of Lords. In other respects, a hybrid Bill proceeds essentially in the same way as other Government Bills.

High Speed Rail (Crewe – Manchester) Environmental Statement

This report is part of the suite of documents that make up the ES for the Proposed Scheme. The ES is a detailed statement describing the likely significant effects of the Proposed Scheme on the environment. It is deposited in Parliament alongside the hybrid Bill, as required by Parliamentary rules. The structure of the ES is shown in Figure 3 and described in the text. All of the documents in Figure 3 will be published alongside the Bill deposited in Parliament.

Figure 3: Structure of the Environmental Statement



The ES has been prepared by people with sufficient expertise to ensure the completeness and technical quality of the statement.

The ES comprises the following documents (in addition to this NTS):

Glossary, abbreviations and references

This contains terms, abbreviations (including units of measurement), and references used throughout the ES.

Volume 1: Introduction and methodology

This provides:

- a description of HS2, the environmental impact assessment (EIA) process and the approach to consultation and engagement;
- details of the permanent features of the Proposed Scheme and general construction techniques;
- a summary of the scope and methodology used for the environmental topic assessments;
- an outline of the general approach to mitigation;
- an outline of the approach to monitoring the effects of constructing and operating the Proposed Scheme, and the effectiveness of mitigation after construction, as well as the approach to monitoring during the operational phase; and
- a summary of the reasonable alternatives studied (including local alternatives studied prior to the Government's announcement of the preferred route in July 2017). Local alternatives studied after July 2017 are reported in the Alternatives report.

Volume 2: Community Area reports and Map Books

These cover the following community areas: Hough to Walley's Green (MA01); Wimboldsley to Lostock Gralam (MA02); Pickmere to Agden and Hulseheath (MA03); Broomedge to Glazebrook (MA04); Risley to Bamfurlong (MA05); Hulseheath to Manchester Airport (MA06); Davenport Green to Ardwick (MA07); and Manchester Piccadilly Station (MA08).

The reports provide the following information for each area:

- an overview of the area;
- a description of the construction and operation of the Proposed Scheme within the area;
- a description of the environmental baseline;
- a description of the likely significant beneficial and adverse effects of the Proposed Scheme;
- the proposed means of avoiding, reducing or managing the likely significant adverse effects; and
- the proposals for monitoring during construction and operation.

The maps relevant to each Community Area are provided in separate Volume 2, Community Area map books. These maps should be read in conjunction with the relevant Community Area report. The maps show the existing environment (Map Series CT-10), proposed construction (Map Series CT-05) and operation stages (Map Series CT-06) of the Proposed Scheme.

There are specific maps showing viewpoint and photomontage (i.e. multiple photos stitched together to give one seamless image) locations (Map Series LV-03 and LV-04, respectively). These should be read in conjunction with Section 11, Landscape and visual of the Volume 2, Community Area reports. There are also maps showing the operational noise and vibration impacts

and likely significant effects (Map Series SV-05). These should be read in conjunction with Section 13, Sound, noise and vibration of the Volume 2, Community Area reports.

Volume 3: Route-wide effects

This describes the likely significant environmental effects at a geographical scale greater than the community areas described in Volume 2, Community Area reports.

Volume 4: Off-route effects

This provides an assessment of the likely significant environmental effects of the Proposed Scheme at locations beyond the Phase 2b Western Leg route corridor and its associated local environment. The maps relevant to the assessment of off-route effects are provided in a separate Volume 4, Off-route effects map book.

Volume 5: Appendices and map books

This contains supporting technical information and associated map books to be read in conjunction with the other volumes of the ES.

Background information and data (BID)

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 website (www.hs2.org.uk). The BID reports and maps present relevant survey information, collated from published and unpublished sources, and other relevant background material and are referenced at various places within the ES.

1.1 Approach to the environment

The environment has been central to selecting the route and developing the design. It has also been a key consideration in how the Proposed Scheme will be constructed and operated. HS2 Ltd aims to enable the nation to take full advantage of the opportunities and benefits offered by the Proposed Scheme. It also aims to mitigate the adverse environmental effects of the Proposed Scheme as effectively as reasonably practicable.

HS2 Ltd has continued to develop and refine the design to:

- reduce its effects on the environment and on communities;
- resolve engineering issues; and
- improve value for money.

The Government recognises that the Proposed Scheme will have significant effects on those who live close to the route and upon the local environment through which it will pass. Engagement on Phase Two started in 2013 with the announcement of the initial preferred route. Since then HS2 Ltd has engaged with local communities and landowners along the route of the Proposed Scheme and with other stakeholders to identify and seek to resolve issues of concern, as described in Section 1.3 of this NTS.

Community engagement has continued to evolve and mature. Early lessons learnt from Phase One led to changes in the approach on Phase Two. For example, this included a coherent and organised programme of engagement with individual stakeholders throughout the design and assessment process. These changes were adopted to help identify and resolve, where reasonably practicable, issues of concern for local communities and stakeholders at the earliest possible opportunity.

The ES includes a description of the measures proposed in order to avoid, reduce, mitigate or where possible, offset (e.g. through restoration or compensation), likely significant adverse environmental effects. It also describes measures to manage and monitor the adverse effects of the Proposed Scheme on the environment. HS2 Ltd's approach to mitigating adverse effects and monitoring the effects of the Proposed Scheme on the environment is described in Section 7 of this NTS. HS2 Ltd's aim is to ensure that the significant adverse effects of constructing and operating the Proposed Scheme are avoided, reduced or mitigated, as far as reasonably practicable. Compensation for effects is also included where necessary.

The Secretary of State will establish a set of controls known as Environmental Minimum Requirements (EMR). The purpose of the EMR is to ensure that the environmental effects of the Proposed Scheme generally do not exceed those reported in the ES. The EMR are described in Section 5.3 of this NTS. Similar controls have been put in place for Phase One and Phase 2a of HS2.

1.2 Engagement and consultation

HS2 Ltd has consulted and engaged with stakeholders during the development of the design and impact assessment of the full Phase 2b scheme and latterly the Proposed Scheme.

The HS2 Community Engagement Strategy published in 2017 (revised 2018) provides the overall framework for HS2 Ltd's engagement activities for both its staff and contractors. This includes a Residents' Charter which lists the 10 commitments used to measure how successfully HS2 Ltd is delivering engagement. The Strategy will continue to evolve as the HS2 project progresses to meet the changing needs of the communities and stakeholders affected by the Proposed Scheme.

Communities

Communities that had the potential to be affected by the Proposed Scheme were identified in the development of the Phase 2b scheme proposals. These communities were a key focus of engagement and formal consultation. Communities were engaged with during the design and assessment process, in line with best practice and Government guidance. Consultation was undertaken in a timely and appropriate manner to ensure communities had the opportunity to provide input to and influence the development of the Proposed Scheme. The role of community engagement was to consider local issues and discuss potential ways to avoid, reduce or mitigate impacts of the Proposed Scheme. The issues and measures discussed included screening views of the railway, managing noise, reinstating highways and identifying possible community benefits. Community engagement informed the assessment of community and health in the ES as well as in the separate Equality Impact Assessment (EQIA) Report.

Local authorities

Engagement was undertaken with local authorities throughout the design and assessment process. The purpose was to maximise the opportunities for local authorities to positively inform the development of the Proposed Scheme. The engagement covered both technical input to the assessment and local knowledge and issues.

Expert, technical and specialist groups

This group comprised stakeholders with specific expert, technical or specialist knowledge or particular interest in the Proposed Scheme. Engagement with this group of stakeholders informed the design and environmental assessment process. It covered technical feasibility and likely environmental and community impacts in particular. This stakeholder

group included environmental statutory authorities and government departments. It also included non-statutory technical/specialist organisations at national, regional and local levels. These stakeholders inputted to baseline information and helped inform project-wide mitigation strategies and principles.

Directly affected individuals, major asset owners and businesses

These are stakeholders whose land or property will be directly affected by the Proposed Scheme. Direct engagement with these stakeholders was ongoing throughout the design and assessment process.

Utility companies

Engagement has been undertaken and will continue with utility companies and statutory stakeholders (e.g. National Grid) to establish how the Proposed Scheme will affect their infrastructure.

Approach to engagement and consultation

A variety of open and inclusive methods of engagement and consultation have been used. These reflect the differing needs and expectations of stakeholders. The methods included formal and informal engagement with organisations such as Natural England, the Environment Agency and local authorities and information events for the public. Stakeholders have been informed about how the Proposed Scheme has been designed and assessed.

HS2 Ltd published a draft EIA Scope and Methodology Report (SMR) and EQIA SMR for consultation in July 2017. These documents presented the proposed scope and methodology for undertaking the EIA and EQIA of the Proposed Scheme. The reports were issued to statutory bodies, non-government organisations, local authorities and parish councils and the public to comment. The consultation period ended in September 2017. The EIA SMR and EQIA SMR, and a consultation summary report (reflecting feedback on the draft), were published alongside the working draft ES in October 2018. The draft EIA SMR and EQIA SMR were amended in response to the consultation. The amended reports provided the framework within which the ES and EQIA have been prepared. The EIA SMR and EQIA SMR have been published alongside the ES.

Consultation on the working draft ES

The public were consulted on the working draft ES from 11 October to 21 December 2018. This consultation sought feedback on the emerging design and assessment of the full Phase 2b scheme (both Eastern and Western Legs). A parallel consultation on the working draft EQIA also took place during this period.

Information events were held in communities along the full Phase 2b scheme as part of the consultation. Directly affected stakeholders were invited to participate.

Feedback from consultation was considered in the further development of the Proposed Scheme and in preparing this ES. A summary of these changes is provided in the High Speed Rail (Crewe – Manchester) Environmental Statement Volume 5: working draft Environmental Statement Consultation Summary Report.

Consultations on design refinement 2019 Design Refinement Consultation

Consultation on 11 proposed design refinements to the full Phase 2b scheme took place from June to September 2019. Details of the proposed refinements were made available in public locations and online at the gov.

uk website. Supporting information was also made available, including visualisations and plan and profile maps.

Stakeholders were invited to comment, as part of this process, on the design refinements made since the working draft ES consultation. Information events were held in communities where the design refinements would be implemented. Directly affected stakeholders were also invited to participate and offered a one-to-one appointment at the events through written communication.

Feedback from the 2019 Design Refinement Consultation was considered and feedback relevant to the Proposed Scheme was taken into account in preparing this ES. The Secretary of State produced a formal response to the consultation in October 2020, which is available on the gov.uk website.

2020 Western Leg Design Refinement Consultation

The 2020 Western Leg Design Refinement Consultation took place between October and December 2020. This consultation sought feedback on further proposed design refinements to the Proposed Scheme in four locations. Details of the proposed design refinements were made available online. Supporting information was also made available, including visualisations and comparative construction and operational plans. An interactive map and a virtual exhibition room provided alternative ways for people to access the information. Printed copies of the materials were sent free of charge following requests to the HS2 Helpdesk.

A series of 13 live webinars was held for people to view and ask questions about the proposals. Those directly affected by the proposals were written to and offered virtual one-to-one meetings.

Feedback from the 2020 Western Leg Design Refinement Consultation was considered in the further development of the Proposed Scheme and in preparing this ES. A summary report of the 2020 Western Leg Design Refinement Consultation outcome was produced by Ipsos Mori. The summary report is available at the gov.uk website.

Further engagement and consultation

The Phase 2b Planning Forum is the main mechanism for discussing planning matters. It is attended by HS2 Ltd and the local authorities affected by the Proposed Scheme. It focuses on matters associated with powers contained in the Bill and issues of route-wide interest. The Planning Forum and its sub-groups will continue to meet during and after the passage of the Bill through Parliament and beyond.

Parliamentary rules require the Secretary of State as Promoter of the Bill scheme to consult the public on the ES. Consultees will have at least 56 days (eight weeks) after deposit of the Bill documents in Parliament and the first publication of the necessary newspaper notices, to respond to the consultation. The Secretary of State will publish all comments received on the ES and submit them to an independent assessor to be appointed by Parliament. The independent assessor will prepare a report summarising the issues raised by the comments made on the ES. The ES (including this NTS), all comments received by the Secretary of State on the ES and the independent assessor's report will be available to Members of Parliament for the Second Reading debate on the Bill in the House of Commons.

There will also be a 'petitioning period'. This petitioning period will provide an opportunity for persons whose property or interests are specially and directly affected by the Proposed Scheme to petition against the Bill. More information on who may petition against the Bill, and how to do so, is available on Parliament's website (www.gov.uk/hs2).

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2 The case for HS2

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2.1 The need for high speed rail

The Government is committed to building a stronger, more balanced economy capable of delivering lasting growth and widely shared prosperity. For rail transport, the Government's key objectives are to:

- provide sufficient capacity to meet long-term demand and to improve resilience and reliability across the network;
- improve connectivity by delivering better journey times and making travel easier;
- boost economic growth across the UK; and
- deliver a vital contribution to the UK's environmental targets.

A new high speed rail network will ensure that the inter-city rail network supports the economic development of the country by providing sufficient capacity and improved connectivity between urban centres. This will help to build a stronger, more balanced economy, capable of delivering growth and economic benefits.

The Government's view is that further incremental upgrades to the existing rail network would be insufficient to meet these objectives and would result in prolonged and unacceptable disruption to the existing network.

A new railway could operate at conventional speeds or at high speed. The Government has concluded that building a new conventional speed railway would not be significantly cheaper than building a new high speed line. Similarly, the effects on the environment and communities of a new conventional speed railway would not be significantly less than those of high speed rail. A conventional railway line would deliver far fewer benefits in terms of enhanced connectivity, capacity and support for long-term economic growth. The Government also considers that high speed rail would have greater potential to reduce carbon emissions than other transport modes.

2.2 Enhancing capacity and connectivity

Railways in Britain have seen significant growth since the mid-1990s and it is predicted that in the medium to long term additional capacity will be needed to cater for inter-city journeys between London and the major cities in the Midlands and the North. While the response to COVID-19 caused a short-term reduction in rail travel during the period of the pandemic, forecasts are for rail demand to recover and continue to grow in the longer term.

The Government has concluded that a new line is needed. This will provide new, fast, long-distance services. It will also release significant capacity on existing conventional rail network routes. The released capacity could be used to benefit both passenger and freight services.

As well as the gain in capacity, enhanced connectivity is one of the key objectives of HS2. This will help to deliver an additional low-carbon transport choice, reduced journey times and more reliable rail services, which will result in long-term economic benefits.

Once completed, the Proposed Scheme will realise many of the Government's key objectives for the HS2 network. It will reduce journey times between the Midlands, the North West and Scotland, as well as to and from London. It will deliver a step-change in capacity on Britain's rail network. It will also relieve pressure on the existing conventional rail networks like the West Coast Main Line (WCML), helping to improve its reliability and performance.

2.3 Generating growth

The movement of people and freight efficiently and reliably is essential for economic growth. Enhanced capacity and good connectivity strengthen the links between businesses, workers and customers and reduce geographical barriers to markets, skills and knowledge. The ability of rail to provide direct connections into urban centres makes it a particularly effective way of moving large numbers of people into and between towns and cities. Extending the high speed rail network to North West England reflects the Government's intention that the regional benefits of high speed rail travel are distributed as widely as possible.

2.4 The case for the Proposed Scheme

The Proposed Scheme will increase capacity and deliver faster and more reliable journeys between the Midlands, the North West, London and Scotland (see Table 1). It will do this by:

- running high speed services entirely on dedicated high speed track to Manchester Airport and city centre; and
- enabling services to Preston, Glasgow and Edinburgh to bypass the WCML around Crewe and Warrington.

The Proposed Scheme will, therefore, reduce journey times and improve connectivity. Combined with the previous phases, it will:

- allow passengers travelling to or from a wide range of places to connect onto HS2 services via local, regional and long distance connections at Manchester;
- bring economic benefits to the Midlands, the North West and Scotland, to help rebalance the UK economy. It would also support major regeneration opportunities through Manchester Airport High Speed station and Manchester Piccadilly High Speed station;
- relieve pressure and release capacity on the WCML and key routes into and out of Manchester. This will allow additional local and regional passenger services and freight services to run on those lines; and
- provide elements of the proposed Northern Powerhouse Rail scheme for the Crewe Northern Connection, London to Manchester and Manchester to Leeds corridors, enabling future connectivity across the North to Manchester Airport and Greater Manchester.

Table 1: Fastest standard journey times between key destinations 'without' and 'with' HS2 in operation.

Train origin/ destination	Train destination/ origin	Current fastest standard hour journey time by conventional rail (hours: minutes)	Fastest standard hour journey time with the Proposed Scheme (including Phase One and Phase 2a) (hours: minutes)
London Euston	Carlisle	3:16	2:23
	Crewe	1:30	0:56 (requires Phase One and Phase 2a only)
	Manchester Airport	2:24 (to conventional rail station)	1:03 (to high speed station)
	Manchester Piccadilly	2:07	1:11
	Preston	2:08	1:18
	Liverpool Lime Street	2:14	1:34
	Glasgow (Central)	4:30	3:46
	Edinburgh (Waverley)	4:22	3:42
Birmingham Curzon Street	Manchester (Piccadilly)	1:28	0:41
	Glasgow (Central)	4:02	3:23
	Edinburgh (Waverley)	4:07	3:20

For journeys to destinations that are not on the core HS2 network, a change on to the conventional rail network will be required.

2.5 HS2 and sustainability

Development of the Proposed Scheme has been influenced by the Government's commitment to sustainable development. In January 2018, the Government's 25-year Environment Plan set out the goals for improving the environment within a generation and leaving it in a better state than it is at present. The Plan includes commitments to biodiversity net gain, woodland creation and the creation of a nature recovery network.

In June 2021 the Government announced an aim for the Proposed Scheme to deliver net gains in biodiversity. Plans are being developed to support this key policy area.

The Proposed Scheme has been developed to help mitigate climate change through reductions in greenhouse gas emissions and the need for critical infrastructure and environments to be resilient to future climate change impacts and risks.

Since 2008, the Government has had in place legally binding targets to reduce greenhouse gas emissions. In June 2019 the Government committed to bring all greenhouse gas emissions to net zero by 2050, as mandated by the updated Climate Change Act 2008 (2050 Target Amendment). The Government's approach to achieving this focuses on decarbonising key aspects of the economy including electricity generation and transport. Transport emissions accounted for 33% of Britain's greenhouse gas emissions in 2019 and the Government acknowledges that decarbonising transport will be essential to achieving the ambitious target.

HS2 will be vital to decarbonising the transport network and the wider Government commitment to bring all greenhouse gas emissions to net zero by 2050. Electric rail remains the most efficient means of mass transportation.

In terms of enhancing inter-city connectivity, high speed rail is one of the most carbon efficient means of transporting large numbers of people, measured in terms of emissions per passenger kilometre. Furthermore, the carbon emissions of high speed rail are likely to reduce in the future as the energy supply is decarbonised, as Britain continues to move towards renewable and low carbon sources of energy. There is a large carbon benefit associated with the operation of Phase One of HS2. The operation of Phase 2a and the Proposed Scheme is expected to provide some additional carbon benefits through transport changes of passengers (such as shifting from road vehicles to trains) and potentially freight, including through released capacity on conventional rail lines. The rail sector is further delivering its strategy to decarbonise through the deployment of various traction technologies (battery, electrification and hydrogen) on the unelectrified sections of the UK's conventional rail network.

The use of electricity for operating rolling stock, stations, and rail systems is a prominent carbon source within the lifetime impacts of the Proposed Scheme. The procurement of zero carbon electricity for the operation of the Proposed Scheme offers a considerable opportunity to reduce these impacts. HS2 Ltd's Net Zero Carbon Plan seeks to accelerate the ambition of the construction industry to realise net zero during the construction phase of the Proposed Scheme and to procure zero carbon electricity from day one of operation. These aspirations have not driven the main results of this assessment but have been considered as part of the sensitivity analysis.

HS2 will play an important role in climate change resilience as extreme weather events become more frequent. Existing transport networks are less resilient to events such as high winds, intense rainfall and major storms, but HS2 has been designed with these events in mind and can be expected to maintain performance under more extreme weather conditions.

3 Description of the Proposed Scheme

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3.1 Stations

Two new stations are proposed as part of the Proposed Scheme:

- **Manchester Airport High Speed station** – a new intermediate station near Manchester Airport; and
- **Manchester Piccadilly High Speed station** – a new terminus station alongside the existing Network Rail Manchester Piccadilly Station.

In addition to the new high speed stations, works will be required to the existing Preston and Carlisle stations on the conventional rail network to enable the operation of HS2 services.

3.2 The route

The following section provides a summary description of the route of the Proposed Scheme. Maps illustrating the route of the Proposed Scheme through each community area are included in Section 8 of this NTS.

HS2 West Coast Main Line connection and HS2 Manchester spur

The route of the Proposed Scheme will run from Crewe to Manchester and to the West Coast Main Line (WCML) near Bamfurlong. Its total length will be 85km (52 miles). The route will begin to the south of the existing Crewe Station, south of the A500 Shavington Bypass where it will connect to the HS2 Phase 2a route. The Proposed Scheme will pass beneath Crewe in a tunnel. The route will re-surface to the north of the B5076 Bradfield Road.

The Proposed Scheme will connect with the WCML to the north of Crewe tunnel. This connection will enable future Northern Powerhouse Rail (NPR) services to connect with HS2. A rolling stock (i.e. trains) depot and maintenance facility will be located between the route of the Proposed Scheme and the WCML where they separate to the east of Walley's Green. The rolling stock depot will serve as an operational and maintenance hub for HS2 trains on Phase One, Phase 2a and the Proposed Scheme. Reception tracks will connect the rolling stock depot with the WCML, the route of the Proposed Scheme and the maintenance facility.

Continuing north, the route will pass between the towns of Winsford and Middlewich on a series of embankments and viaducts to the west of Lostock Green and east of Higher Shurlach, Rudheath, Lostock Gralam and Higher Wincham. The route will then cross over the M6 on a viaduct. The HS2 WCML connection will then diverge from the HS2 spur to Manchester. The Proposed Scheme also includes a junction at this location. This junction, the NPR London to Liverpool junction, will enable a future NPR route between London and Liverpool to connect to HS2.

The HS2 Manchester spur will continue towards Manchester. Bearing east, the spur will pass to the north-west of Rostherne Mere and will run broadly parallel to the M56. The Proposed Scheme includes a junction at this location to enable future NPR services between Manchester and Liverpool to connect to HS2. A maintenance base near Ashley will also be located adjacent to the route of the Proposed Scheme. This facility will be used to support railway maintenance.

Continuing in an easterly direction, the HS2 Manchester spur will cross the Mid-Cheshire Line on a viaduct. It will then head northwards before passing beneath the M56 to the east of Warburton Green. The spur will then continue to Manchester Airport High Speed station. The station will be located adjacent to the M56 and to the north-west of Manchester Airport.

Just beyond the proposed station, the route of the Proposed Scheme will enter a tunnel passing beneath south Manchester. The route will re-emerge in the Ardwick area. A junction will be provided at this location to enable a future NPR route between Manchester and Leeds to connect to HS2.

The HS2 Manchester spur will rise onto an embankment before transitioning onto a viaduct terminating at the proposed Manchester Piccadilly High Speed station. The station will be a new six-platform terminus for HS2 and future NPR services. It will be located next to the existing Manchester Piccadilly Station, and will include works to the Metrolink tram network. The Proposed Scheme in this area will include:

- relocation of the existing Piccadilly Metrolink stop to beneath the Manchester Piccadilly High Speed station;
- realignment of existing Metrolink tracks;
- provision for a new Metrolink stop, called Piccadilly Central; and
- provision of a new Metrolink turnback facility immediately east of the existing New Islington Metrolink stop, to replace the existing turnback facility on Sheffield Street. A turnback is a section of track allowing trams to reverse.

Continuing north from Hoo Green, the HS2 WCML connection will pass beneath the M56. It will rise onto a viaduct over the Manchester Ship Canal to the east of Hollins Green. The route will cross over the M62 on a viaduct, passing to the west of Culcheth. It will then continue through Lowton, connecting to the WCML south of Bamfurlong.

A summary of the route of the Proposed Scheme and its significant environmental effects is provided in Section 8 of this NTS for each community area. Further details can be found in Volume 2, Community area reports.

Off-route works

A number of works are required beyond the route corridor, including in Scotland, to enable the operation of the Proposed Scheme.

These 'off-route works' include:

- works to enable HS2 services to call at existing stations at Preston and Carlisle;
- construction of a depot at Annandale (between Gretna Green and Kirkpatrick Fleming in southern Scotland) for HS2 trains serving the North of England and Scotland; and
- minor enhancement to the existing facilities at Polmadie Depot (Glasgow) to provide overnight stabling for HS2 trains serving the North of England and Scotland.

A summary of the off-route works and their significant environmental effects is provided in Section 10 of this NTS. Further details can be found in Volume 4, Off-route effects.

Land required

Land required for the Proposed Scheme will include:

- the operational rail corridor;
- new stations, maintenance facilities and depots;
- railway and power supply infrastructure;
- drainage features such as balancing ponds;
- environmental mitigation and compensation areas including for earthworks, landscape planting and new ecological habitats;

- temporary diversions or permanent realignment of roads, public rights of way, private accesses, utilities and watercourses; and
- sites to support construction activity, including the temporary storage of excavated materials and soils and space for site compounds and worker accommodation.

Land used only for construction will be restored once the works in that area are complete.

Rail corridor

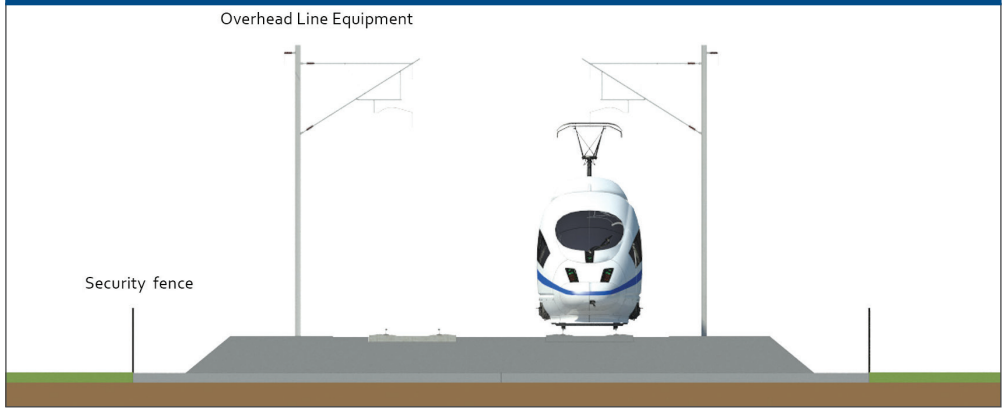
The route of the Proposed Scheme will generally comprise two railway tracks: one for northbound and one for southbound services. More than two tracks will be provided where different railway lines connect and on the approaches to stations, maintenance facilities and depots. The rail corridor will also include other features including: overhead line equipment; electricity cables; railway drainage; access tracks; line-side walkways; and noise fence barriers, where required. Power supply, train control and telecommunications infrastructure will also be required at certain locations along the route.

The width of the rail corridor will vary depending, for example, on the existing and proposed ground levels and the need to accommodate more than two tracks.

The railway will be continuously fenced along the length of the rail corridor. The type of fencing used at each location will depend on the functional requirements and its setting, for example, whether it is in a rural or urban area.

An indicative cross-section through a two-track rail corridor at ground level is shown in Figure 4.

Figure 4: Indicative two-track rail corridor



3.3 Other components of the Proposed Scheme

Bridges and viaducts

Bridges or viaducts will be used where the route of the Proposed Scheme will cross a feature such as a public right of way, road, river, canal, floodplain or existing railway (examples of a bridge and a viaduct are shown in Figure 5 and Figure 6 respectively). Viaducts are constructed where embankments are not practicable. The heights of the bridges and viaducts have been determined by the route alignment, surrounding ground levels and the feature being crossed.

Figure 5: Illustration of a generic single span bridge

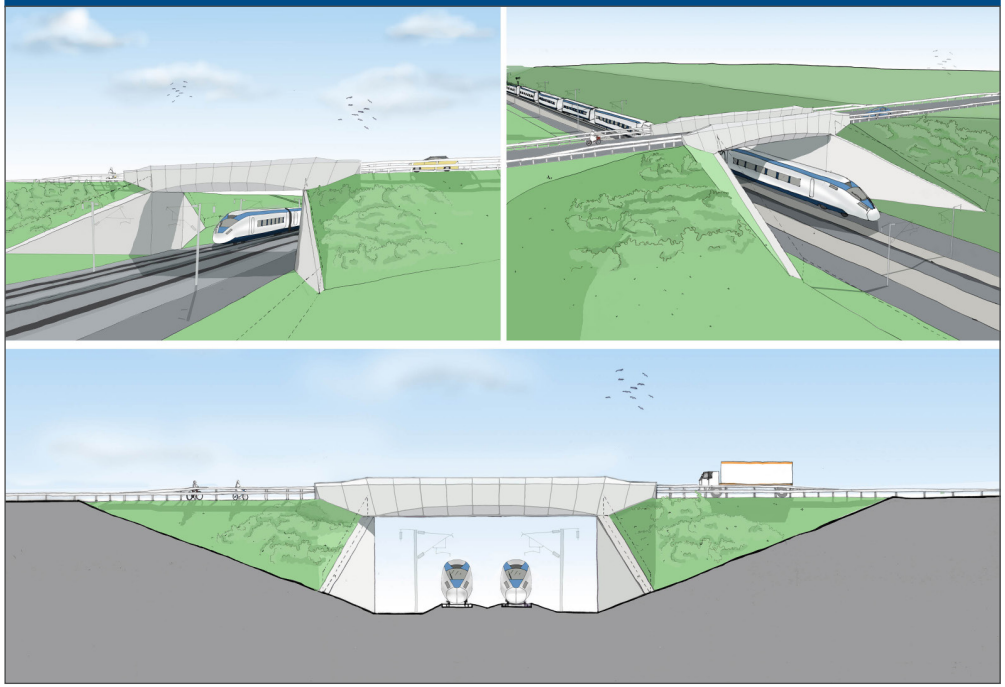
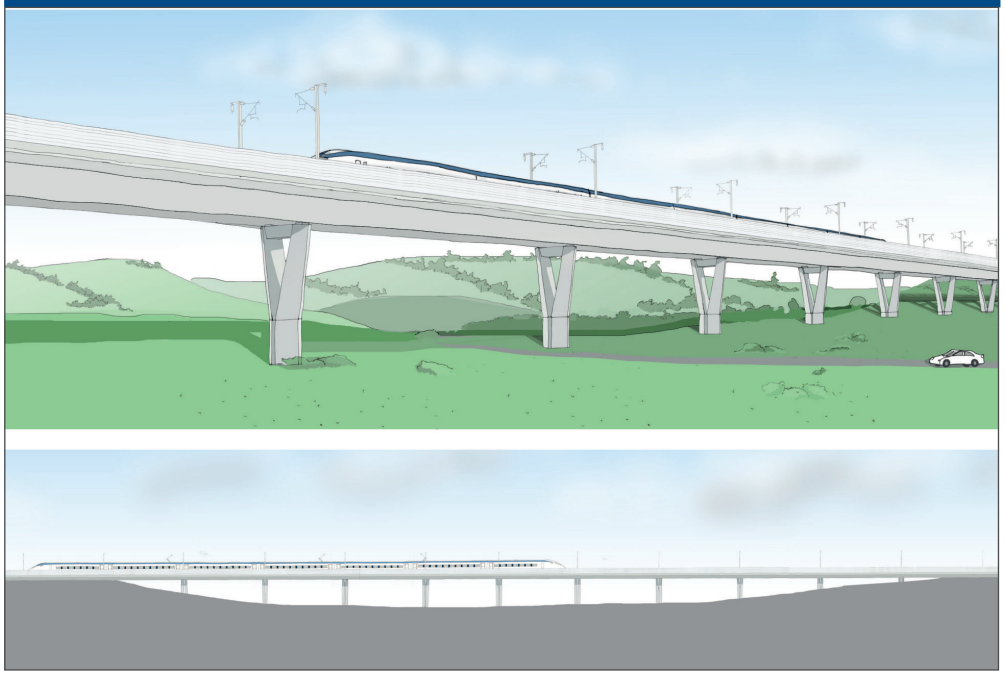


Figure 6: Illustration of a generic high viaduct



Some underbridges (i.e. bridges under the route) have been designed to provide ecological connectivity across the route.

Tunnels

Tunnels will be constructed at four locations along the route of the Proposed Scheme: under Crewe; in the Hoo Green area; to the east of Hale Barns; and from Davenport Green to Ardwick. The Crewe (MA01) and tunnels under south Manchester (MA06 and MA07) will be constructed using tunnel boring machines and will comprise two parallel tunnel bores each containing a single rail track. The Hoo Green tunnel (MA03) will be constructed in conjunction with the Hoo Green box structure, using typical cut and cover construction methods.

Cut-and-cover tunnel construction requires temporary disruption at the surface while the tunnel is constructed by excavating downwards, building a structural box and then restoring the land over the top.

All tunnels will have portals at each entry/exit. Portal design depends on ground conditions, local topography, train speeds and whether they need to accommodate a tunnel boring machine during construction. Where necessary, tunnel portals are designed to reduce noise and air pressure effects as trains enter/exit the tunnels. These are called porous portals. An example of a cut and cover tunnel porous portal is shown in Figure 7.

For safety reasons, longer tunnels are required to have cross passages for evacuation escape between individual tunnel bores and to the surface. Cross passages must be provided at intervals of no more than 500m and located approximately 350m from a ventilation shaft. Shafts for tunnel ventilation (and for emergency services access and exit) will be required approximately every 2-3km (1.2-1.9 miles) and will incorporate both lifts and stairs, which surface at ground level in headhouses. These headhouses will accommodate ventilation fans, lift machinery and emergency access doors.

The design and external appearance of headhouses will be approved by relevant local authorities and designed to fit into the local surroundings. An example of a cross-section of a ventilation shaft and headhouse in an urban location is shown in Figure 8 and an illustration of a ventilation shaft and headhouse in a greenfield location in Figure 9.

Figure 8: Illustration of a generic ventilation shaft and headhouse in an urban location

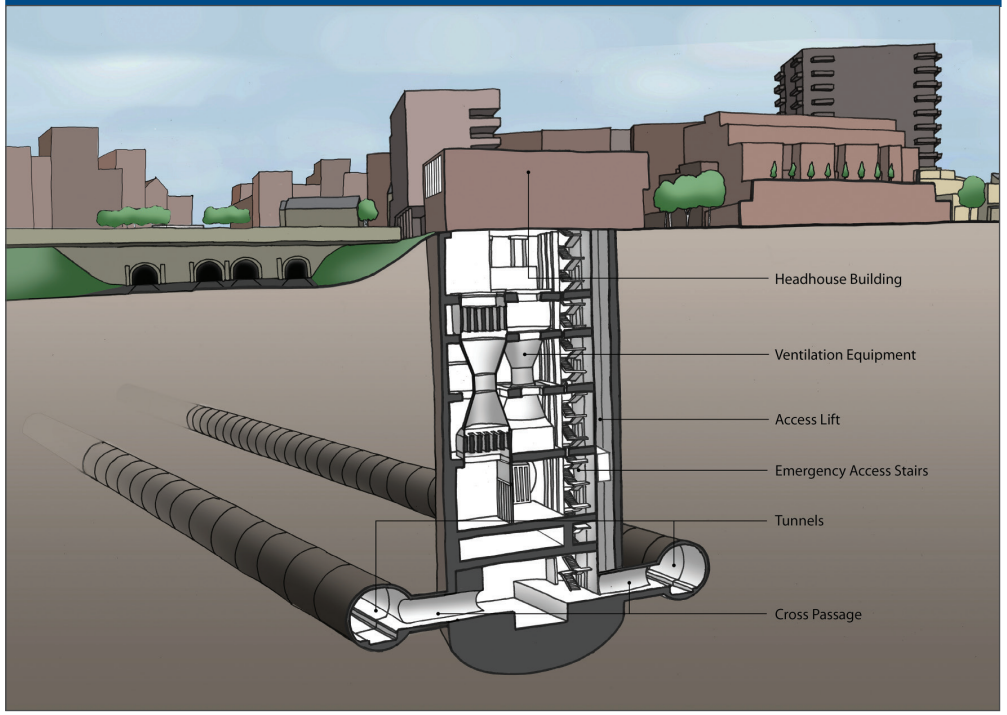


Figure 7: Illustration of a generic cut-and-cover tunnel or box structure

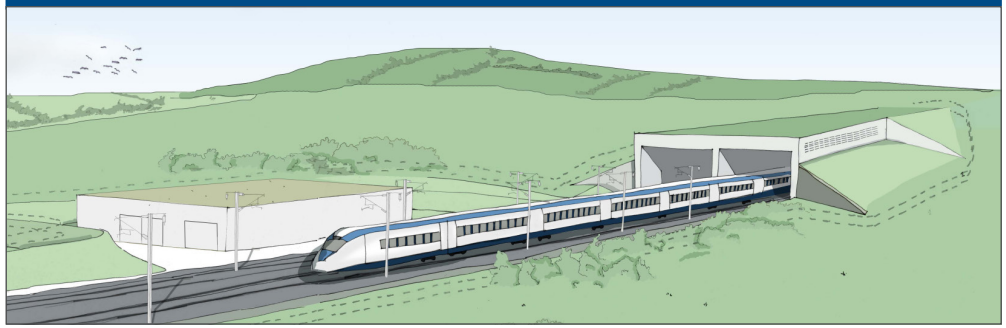
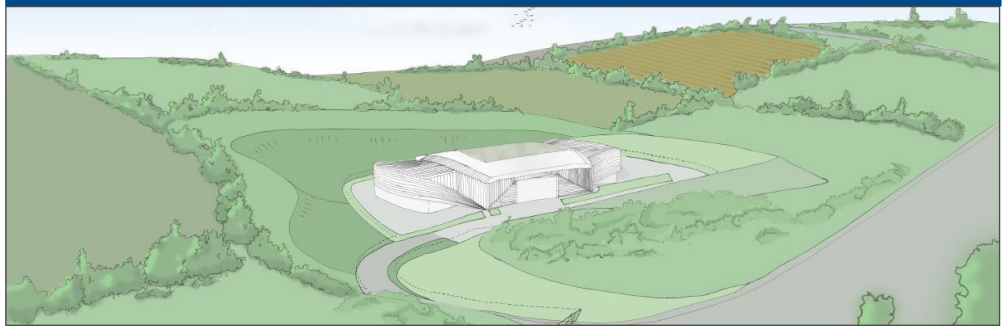


Figure 9: Illustration of a generic ventilation shaft and headhouse in a greenfield location



Cuttings and embankments

The route of the Proposed Scheme has been designed without tight curves or steep gradients so that the high train speeds required can be achieved. To facilitate this, sections of the route will be in cutting or on embankment.

Cuttings are sections of the route where material has been excavated to make way for the railway. An example of a cutting is shown in Figure 10. In some locations, retaining walls are proposed on one or both sides of a cutting to reduce the amount of land required for the railway, as shown in Figure 11.

Figure 10: Illustration of a generic cutting and cross-section of cutting

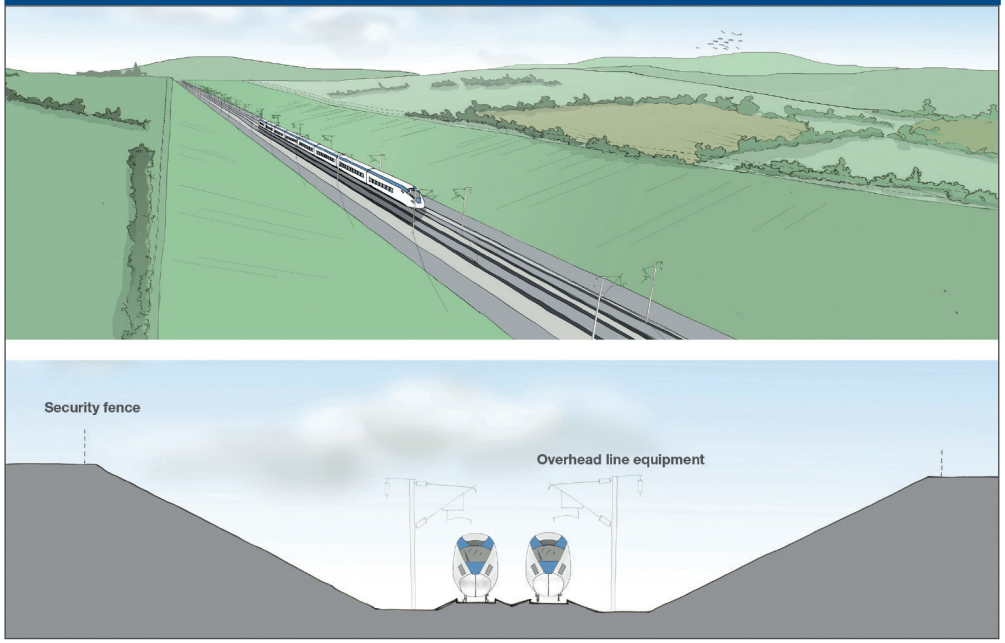
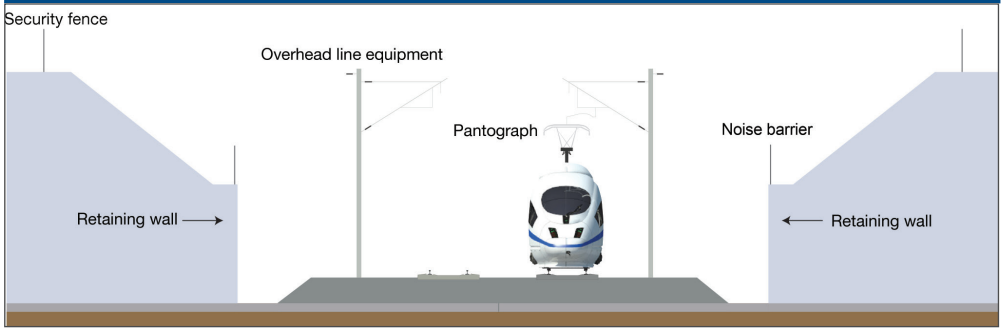
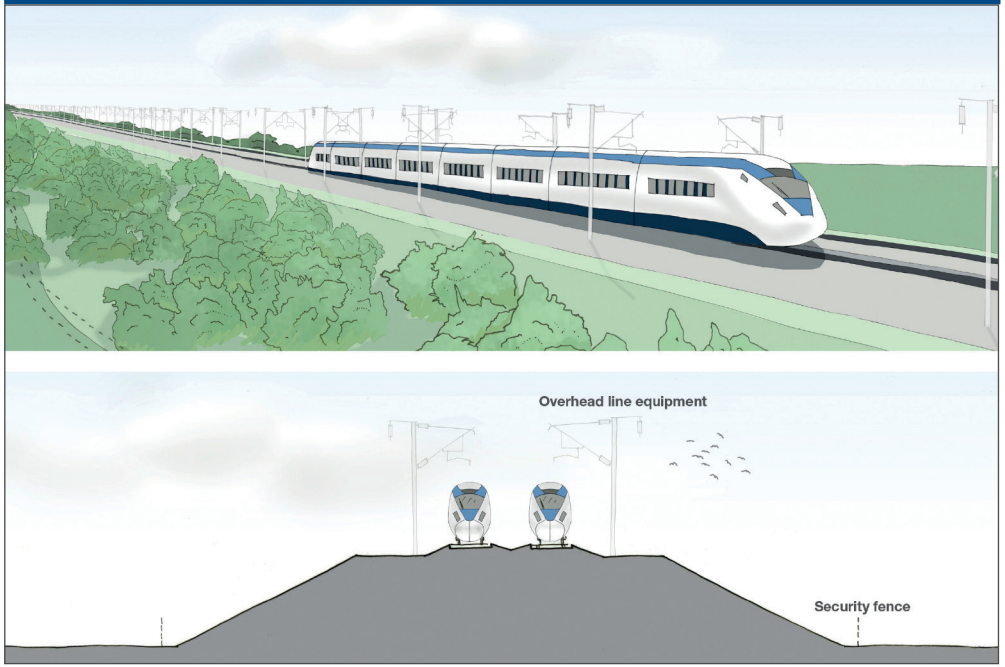


Figure 11: Illustration of generic retaining walls



Embankments are where the rail level is maintained above the existing ground level using compacted soils or rock material, known as 'fill' on which the rail track is laid. An example of an embankment is shown in Figure 12.

Figure 12: Illustration of a generic embankment and environmental mitigation earthworks and cross-section of an embankment



Mitigation earthworks will also be used at some locations along the route of the Proposed Scheme. These involve forming raised earth bunds on one or both sides of the route of the Proposed Scheme to help screen and integrate it into the landscape. The earthworks may also help to reduce noise effects in many locations.

Priority will be given to using suitable engineering material excavated locally from cuttings and tunnels constructed as part of the Proposed Scheme, to form rail or road embankments and mitigation earthworks for noise and visual mitigation. A number of options were considered for how to locally source the additional material needed to construct embankments. 'Borrow pits' have been included within the Proposed Scheme for this purpose. Section 4 of this NTS describes the process of selecting borrow pits, and their location, operation, restoration and aftercare.

Maintenance and stabling facilities

Separate facilities will be provided for maintaining the railway and the trains. Maintenance of the railway will be managed and resourced from a series of infrastructure maintenance facilities.

An infrastructure maintenance depot is included in the Phase One Scheme at Calvert. A centralised infrastructure maintenance base is included in the Phase 2a Scheme at Stone.

Two further maintenance bases are included in the Proposed Scheme to support the work of the centralised facility at Stone. These will be located to the north of Crewe and at Ashley.

A rolling stock depot, for the maintenance of trains, will be located to the north of Crewe and at Washwood Heath.

Stabling facilities will also be provided at the proposed Annandale depot. Stabling at existing facilities will also occur at Longsight (Manchester), Polmadie (Glasgow) and Washwood Heath (Birmingham), provision for which was included in the Phase One Act. More information on stabling facilities at Annandale can be found in Section 10 of this NTS.

Track

The track for the Proposed Scheme will either be ballasted or slab track. Ballasted tracks are fastened to concrete sleepers supported by stone ballast (a form of crushed rock). Slab track comprises pre-cast concrete slabs supported on a continuous structural layer. A final decision on the track form will be made during the detailed design of the Proposed Scheme.

The Environmental Impact Assessment (EIA) has been undertaken on the assumption of a reasonable worst case scenario for each relevant environmental topic assessment. For example, the assessments that include construction vehicle movements (e.g. traffic and transport and related environmental topics such as air quality) have included the number of heavy goods vehicle movements associated with the construction of ballasted track. The sound, noise and vibration operational assessment has been undertaken on the assumption that slab track will be used for the Proposed Scheme. The track and track-bed has been designed to avoid significant ground-borne noise or vibration effects from the Proposed Scheme.

Train control and telecommunications

The train control and telecommunications system will be operated from a route-wide HS2 network interface control centre at the Washwood Heath depot in Birmingham, which forms part of the Phase One scheme. The purpose of the network integrated control centre will be to supervise and control activities on the railway.

The Proposed Scheme will use radio communications for its railway operations and train control systems. This will require masts and associated radio transmission equipment to be installed at fixed locations, at intervals of approximately every 2-3km, along the route of the Proposed Scheme to provide coverage. The heights of the masts will depend on what is required to achieve reliable and adequate radio coverage. They will typically be 15-20m high (from track level) but may, in limited circumstances be up to

30m high. The use of these masts could also, in the future, be shared with mobile network operators or other third party service providers.

Power supply

Electrical power for the Proposed Scheme will be provided from National Grid supply points to auto-transformer feeder stations located adjacent to the route of the Proposed Scheme. The grid supply points will be connected to the auto-transformer feeder stations by underground or overhead power lines. Each auto-transformer feeder station will occupy an area of approximately 2.75ha and will require road access for maintenance purposes.

Auto-transformer stations, mid-point auto-transformer stations and express feeder auto-transformer stations will also be required at regular intervals along the route of the Proposed Scheme. These are needed to distribute and manage the power supply from the auto-transformer feeder stations to trains. Power will be transmitted to the trains through overhead line equipment.

Each auto-transformer station and mid-point auto-transformer station will require an area of approximately 0.3ha and road access for maintenance purposes. Express feeder auto-transformer stations will require an area of approximately 0.5ha and road access for maintenance purposes.

Road, public right of way, utility and watercourse diversions

The nature and timing of any road diversions will be planned in consultation with the relevant highway authority. Roads, public rights of way and utilities that need to be diverted or realigned will normally follow the shortest route that is reasonably practicable, taking into account safety, pedestrian, cyclist and horse rider flows, motorised traffic flows, construction duration and local environmental effects.

New roads, bridges and public rights of way across the route of the Proposed Scheme will be required. These will be constructed in advance and offline, where reasonably practicable. This will allow existing routes to be used until their replacements are ready.

Where watercourses require diversion, channel flow will be designed and maintained in consultation with the relevant regulatory authority.

Site haul routes

Where reasonably practicable, movement of construction material, construction machinery and construction workers between the construction compounds and work sites will be on designated temporary roads within the area of land required for construction (known as site haul routes). Site haul routes will either follow the line of the route of the Proposed Scheme or run parallel to it. Using site haul routes will reduce the need for construction vehicles to use the existing public highway network. This will reduce impacts on the road network and on local communities.

Site haul routes will generally be no wider than 10m (including land for any associated infrastructure, such as signalling). Where a site haul route crosses a public highway or public right of way, the crossing points will be safely managed by either temporary traffic lights, roundabouts or manned control points.

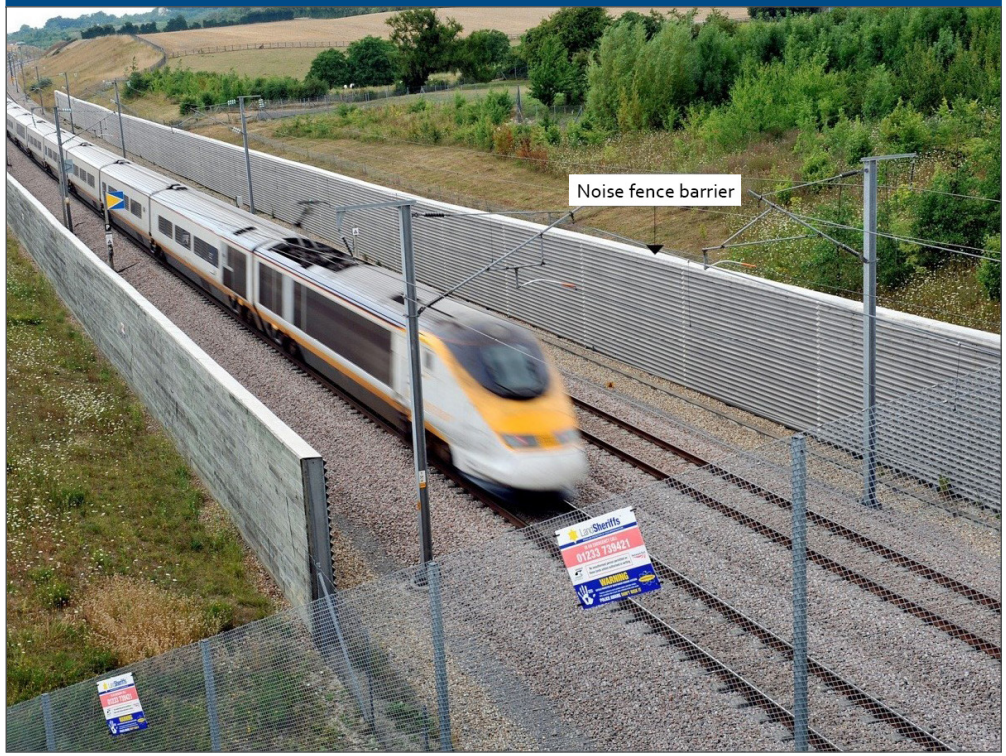
Site haul routes will be surfaced at their point of connection with the public highway. This will help to maintain the cleanliness of the public highway.

Following construction, land used for site haul routes will be appropriately restored.

Noise barriers

The Proposed Scheme will incorporate noise barriers, where needed, to avoid significant noise effects. These will generally take the form of landscape earthworks, noise fence barriers or parapet barriers on viaducts. An example of a noise fence barrier is shown in Figure 13.

Figure 13: An example of a noise fence barrier



Design development since the working draft Environmental Statement

This section lists the main changes made to the design of the Proposed Scheme since publication of the working draft ES. More detail on specific design changes is included in Section 8 of this NTS. The main changes involved are:

- introducing features to enable future NPR services to connect with HS2;
- minor re-aligning of the route of the Proposed Scheme, and changes to existing rail lines;
- refining the lengths, design and method of constructing the tunnels;
- refining the size of some of the cuttings, embankments and viaducts, and providing additional viaducts;
- developing mitigation, including noise fence barriers, landscape earthworks, compensatory planting and replacement ponds;
- revising works to roads and public rights of way, including realigning some roads and providing additional overbridges and underbridges;
- revising the size and locations of balancing ponds, providing additional balancing ponds, where required, and refining rail and highway drainage;
- relocating, or including, auto-transformer stations, and including telecommunications sites and works to utilities;
- refining the design of the proposed new stations, including works to Metrolink;

- introducing infrastructure maintenance bases, and revising the design of the rolling stock depot; and
- re-locating or removing construction compounds and site haul routes and introducing a temporary railhead and sidings to enable rail access to the construction works.

The Proposed Scheme now also includes four borrow pits. These will be located in the Wimboldsley to Lostock Gralam (MA02) area. The borrow pits are required to provide sufficient material of an appropriate suitability to construct railway embankments. Further details on the borrow pits are included in Section 4 of this NTS.

HS2 Ltd recognises the importance of good design. It has produced guidance for the appointed designers to achieve a high quality design that is functional, works well and responds sensitively in terms of scale to the local context along the route of the Proposed Scheme. It is also intended that the architectural and landscape design delivers a strong identity for the Proposed Scheme. This will include the creation of new landscapes, structures and transformational public spaces and places. Good design provides the opportunity to:

- create new ecological habitats and green infrastructure;
- improve water quality; and
- build in resilience to the effects of climate change.

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4 Construction and operation of the Proposed Scheme

4 Construction and operation of the Proposed Scheme

4.1 Construction programme

The Proposed Scheme is expected to be constructed between 2025 and 2038 (including a period of system testing and commissioning). The duration, intensity and scale of construction along the route of the Proposed Scheme will vary over this period. An indicative construction programme for each community area is included in Section 2 of the Volume 2, Community Area reports. An indicative construction programme for the off-route works is included in Volume 4, Off-route effects.

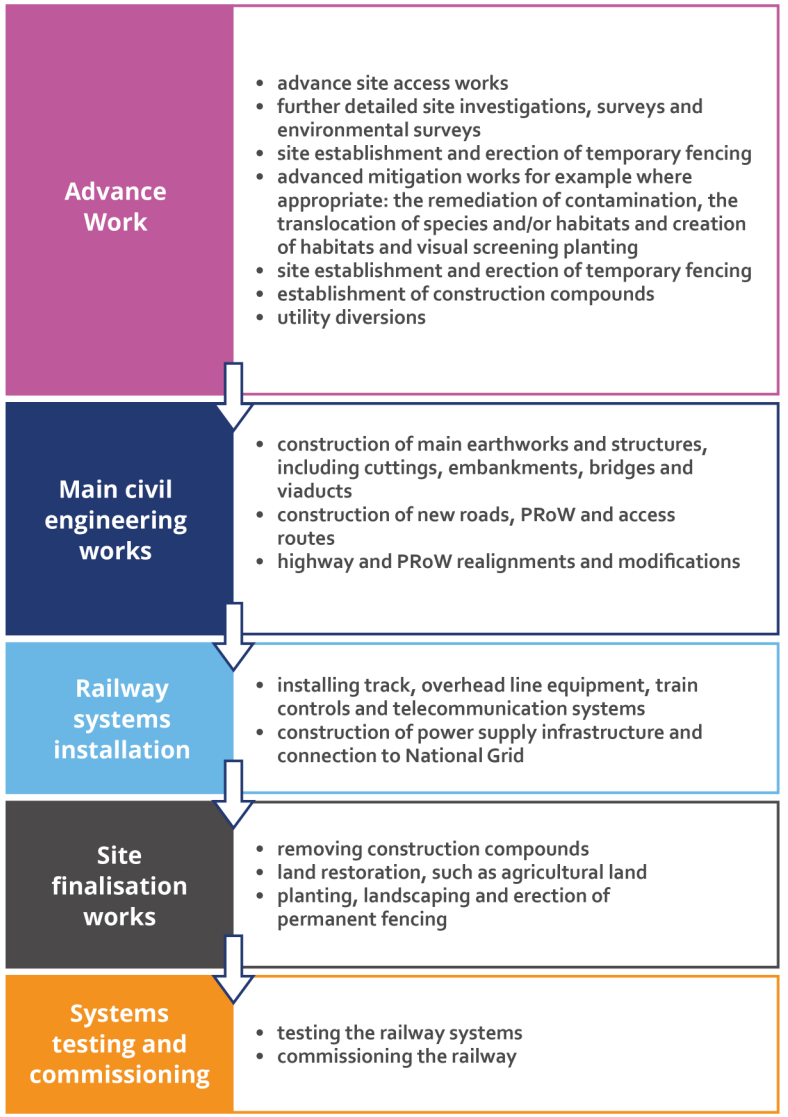
The stages of construction are shown in Figure 14. Advance works will include:

- establishing the site;
- erecting temporary fencing;
- establishing the construction compounds; and
- undertaking preliminary activities, such as utility diversions.

Landscape planting will also be started as early as is reasonably practicable before the main construction activities. Preparatory mitigation works will also take place at this time.

Advance works will be followed by the main period of construction activity and civil engineering works. This will involve constructing the main earthworks and structures of the Proposed Scheme, including cuttings, embankments, bridges and viaducts. Once these major components have been built, activity will focus on installing track, overhead line equipment and train control and telecommunications systems. Finalisation works will include removing construction compounds and restoring land. There will be a period for systems to be tested and commissioned before the railway starts operating.

Figure 14: Stages of main construction activities



4.2 Construction management

Code of Construction Practice and local environmental management plans

The construction of the Proposed Scheme will be required to comply with the Code of Construction Practice (CoCP), a draft of which has been included in this Environmental Statement. The draft CoCP will be finalised when the hybrid Bill is enacted. The 'nominated undertaker' will be required to comply with the CoCP throughout the construction period. The nominated undertaker is the body or bodies appointed to implement the powers of the hybrid Bill to construct and maintain the Proposed Scheme.

Construction works will be undertaken by appropriately experienced construction contractors. The draft CoCP sets out the proposed measures to manage and control the effects of construction.

The draft CoCP also includes arrangements for monitoring of environmental effects during construction, where appropriate. At a local level, site-specific control measures will be included within local environmental management plans.

The local environmental management plans will build on the project-wide environmental requirements contained within the CoCP. The plans will be developed during the Parliamentary process and detailed design stage in consultation with the relevant stakeholders. The plans will set out how the Proposed Scheme will adapt and deliver the required environmental and community protection measures within each relevant local authority area. They will do this by identifying a series of topic-specific measures (including, for example, air quality and noise monitoring) that reflect the general requirements of the CoCP.

The nominated undertaker and its contractors will engage with the community. This engagement will focus on those who may be affected by construction, such as local residents, businesses and community facilities.

The nominated undertaker or its contractors will notify local communities before realigning, diverting or closing roads or public rights of way.

Construction compounds

There will be two types of construction compound along the route of the Proposed Scheme: main and satellite construction compounds.

Main construction compounds will act as strategic hubs for core project staff, such as engineering, planning and construction delivery staff. They will include: areas for storing construction equipment and materials; maintenance and parking facilities; and the main welfare and office facilities for construction staff and overnight accommodation where necessary.

The main construction compounds will be located:

- north of Crewe, east of Coppenhall Moss in the Hough to Walley's Green area (MA01);
- south-west of Hoo Green in the Pickmere to Agden and Hulseheath area (MA03);
- north of Hollins Green, south of Glazebrook in the Broomedge to Glazebrook area (MA04);
- north of Kenyon, south of Lowton in the Risley to Bamfurlong area (MA05);
- east of Hale Barns in the Hulseheath to Manchester Airport area (MA06);
- east of Davenport Green in the Hulseheath to Manchester Airport area (MA06);
- east of Ardwick Station in the Davenport Green to Ardwick area (MA07); and
- north of Ardwick in the Manchester Piccadilly Station area (MA08).

There will also be main construction compounds for off-route works at Preston and Carlisle stations and at the Annandale depot.

Satellite construction compounds will generally be smaller than main construction compounds. They will be used as the base to manage specific works along a section of the route of the Proposed Scheme. Satellite compounds could include some or all of the following: local storage for plant and materials; car parking for staff and site operatives; and welfare and office facilities for staff and overnight accommodation where necessary.

Some of these compounds will continue to be used for facilitating railway systems works following the completion of civil engineering works from these locations. The railway system works involve installing, testing and commissioning the systems and infrastructure needed to operate the railway, including: track, overhead line equipment, communication and signalling equipment, and power supply. A small number of additional satellite compounds will only be used for railway systems work.

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. Other excavated materials may also be stored at material stockpiles.

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 via 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.

Buildings within compounds will generally be temporary modular units that will be positioned to maximise construction space and limit the area of land required. In urban areas, or where there is limited space, it may be necessary to stack these units.

Security fencing or hoarding will be provided around the perimeter of each construction compound.

Overnight accommodation for construction staff will be provided at a limited number of compounds. This will help to reduce daily travel for those not normally based locally. Temporary worker accommodation will be provided at certain main and satellite compounds in the following areas:

- Hough to Walley's Green (MA01);
- Wimboldsley to Lostock Gralam (MA02);
- Pickmere to Agden and Hulseheath (MA03); and
- Broomedge to Glazebrook (MA04).

Temporary worker accommodation will also be provided at the Annandale depot in southern Scotland.

The total number of compounds per community area is set out in Section 8 of this non-technical summary (NTS). The siting of construction compounds has been influenced by a number of factors including:

- size of the site required;
- proximity to locations of major construction activities;
- proximity to main roads and rail/bus routes;
- proximity to existing utility services;
- accessibility for local workforce and the presence of existing local facilities (e.g. shops);
- existing land use and proximity to sensitive features of the environment and communities;
- location of floodplains; and
- ease of establishing and maintaining security.

Further details for construction compounds are provided for each area in Section 2 of the relevant Volume 2, Community Area reports, and in Volume 4, Off-route effects.

Construction worksites

Construction compounds, both main and satellite, will act as the main points of entry to the construction worksites. Access to the construction worksites will be by road, site haul routes or rail to deliver construction material or machinery.

Railhead and construction sidings

A temporary 'railhead' will be located at Ashley in the Hulseheath to Manchester Airport area (MA06). The railhead will include temporary rail sidings connected to the existing railway network. This will enable material and equipment to be moved by rail. Facilities at the railhead will include offices, welfare facilities, storage areas, workshops, a rail marshalling yard, a pre-assembly area and car parking areas. The railhead will operate 24 hours a day, seven days a week during the construction period.

Temporary sidings will be required in other locations to handle construction materials. The sidings will be connected to the existing railway network. This will allow excavated materials to be transferred between construction areas and the rail network. Construction sidings will be located in Crewe in the Wimboldsley to Lostock Gralam area (MA02) and Ardwick in the Davenport Green to Ardwick area (MA07).

Borrow pits

Suitable high quality construction material (sand and gravel) will be required to construct embankments for the Proposed Scheme. Much of this material will be provided from the excavation of cuttings and other works (for example, tunnels) along the route of the Proposed Scheme.

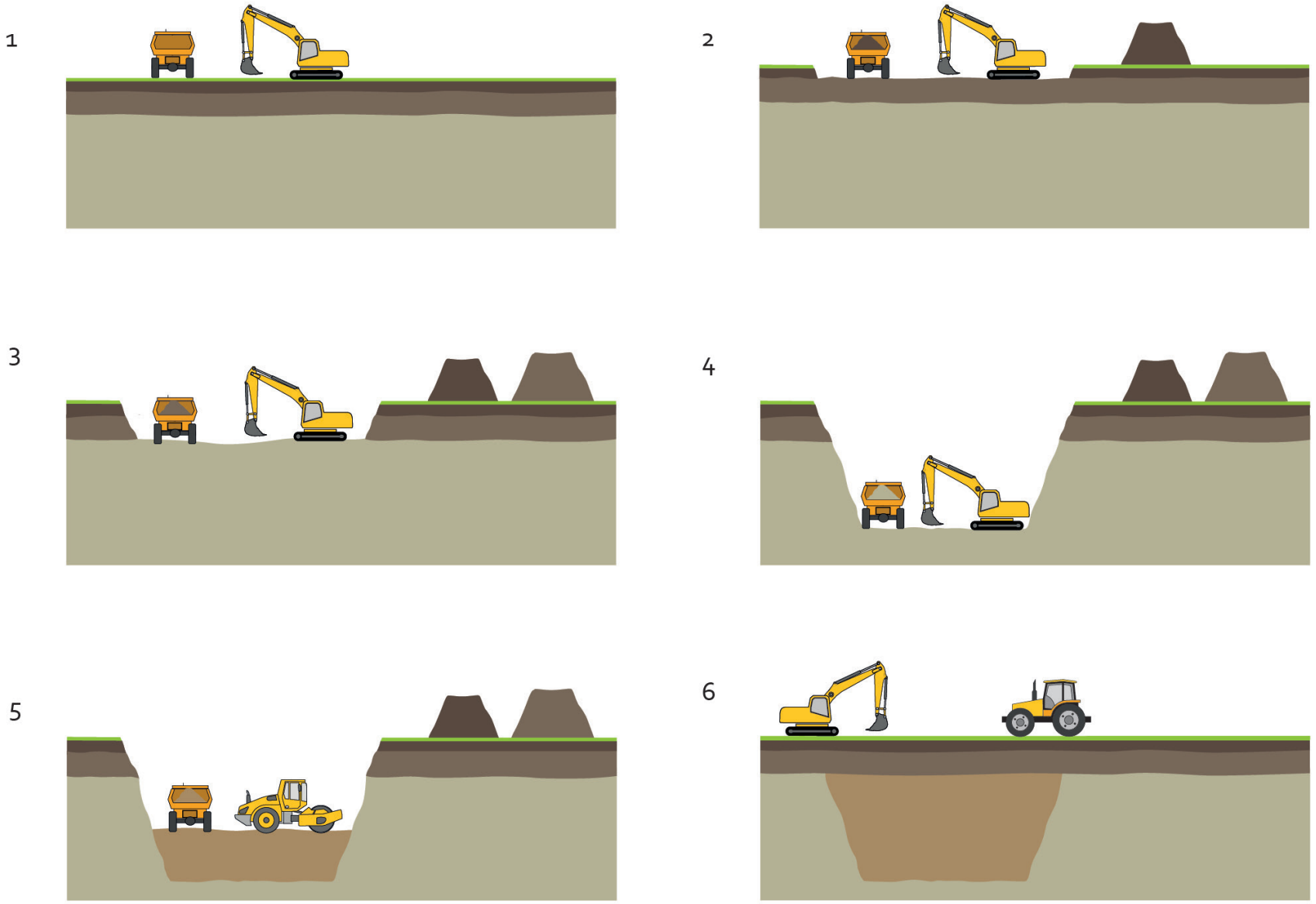
However, in the Wimboldsley to Lostock Gralam area (MA02), there is anticipated to be a shortfall of acceptable engineering material (typically sands, gravels, crushed rock and clays) from the excavation of cuttings and other works for use in embankment construction.

As part of the development of the Proposed Scheme design, three options were considered to overcome this shortfall. The first option would be to use materials extracted during the construction of the Proposed Scheme for engineering fill. This would maximise direct reuse of excavated materials. However, excavations would not provide enough material. The second option was to use suitable granular material imported from commercial quarries. However, there was no certainty of supply and the quarries are far from the areas where the additional construction material would be needed. This would result in increased traffic impacts on local highways and communities. It was therefore concluded that using quarries to meet the entire shortfall of suitable construction material is not reasonably practicable. The third option was to excavate acceptable engineering material from 'borrow pits' located close to the route of the Proposed Scheme. This option will provide a certainty of supply, reduce reliance on external sources and reduce the impacts of vehicle movement associated with importing materials.

The Proposed Scheme will use four borrow pits located in the Wimboldsley to Gralam area (MA02) to meet the demand for material for construction.

Borrow pits will be restored with other excavated material, such as clay, which is considered unsuitable for use in embankments. This material will be then overlain by topsoil and subsoil, including that initially stripped from the borrow pit area. The borrow pit sites will be restored to their former use unless otherwise approved by the relevant local planning authority and landowner (see Figure 15). An aftercare plan will be set out in the site-specific restoration plan for each borrow pit and agreed with relevant statutory bodies.

Figure 15: Illustration of a generic borrow pit and excavation and backfilling process



Working hours

The draft CoCP outlines the proposed working hours for construction. Core working hours will be from 08:00-18:00 on weekdays (excluding bank holidays) and from 08:00-13:00 on Saturdays. The nominated undertaker will require its contractors to adhere to these core working hours, subject to the activities during additional hours described in the following paragraphs.

Tunnelling and directly associated activities (such as removing excavated material, supplying materials and maintaining tunnelling equipment) will be carried out on a 24 hours a day, seven days a week basis. Where reasonably practicable, excavated material will be stored within the compound boundary for removal during core working hours.

Certain activities, such as earthworks, are season- and weather-dependent. Contractors may seek to extend the core working hours and/or days for such operations to take advantage of daylight hours and weather conditions, subject to the approval of the relevant local authority. Some other construction activities will require extended working hours for reasons of engineering practicability. Abnormal loads, or those requiring a police escort, may be delivered outside core working hours subject to the requirements and approval of the relevant authorities.

Works will be required within existing railway lines and at stations and railheads during construction. These will include track laying and work requiring the closure, or limiting the use of, the existing conventional rail network. Such works will be managed through possessions and blockades. Possessions limit the use of the railway for existing trains, or access to stations for passengers. Blockades are used where works require the total closure of a line or station. These activities are normally undertaken during night-time, Saturday afternoons, Sundays and/or bank holidays. This is for reasons of safety or operational necessity so there is less disruption to services and passenger access/movements. Such activities will often involve consecutive nights of work over weekend possessions. On occasion the possessions will be of longer duration. Activities outside core working hours that could give rise to disturbance will be kept to a reasonably practicable minimum.

Where HS2 works affect highways, these will be planned to minimise where practicable the impact on users. Where there is a requirement for partial or full closures, the timing of closures, scope of traffic management and diversion routes will be discussed with the relevant highway authorities prior to submission, as appropriate. The project will aim to avoid conflicting requirements in any one area through early planning of highway works, depending on the scale and scope of the likely disruption.

Guidance on site-specific variations to core working hours and/or additional hours likely to be required will be included within the local environmental management plans following consultation with the relevant local authority. Contractors will require a period of up to one hour before and up to one hour after core working hours for start-up and closedown of activities. Activities within these periods will include deliveries, movement to place of work, unloading, maintenance and general preparation works. Activities within these periods will not include operation of plant or machinery likely to cause a disturbance to local residents or businesses.

Site restoration

All temporary plant, materials, equipment, buildings, access roads and vehicles will be removed from site when construction is complete. This will allow the land used temporarily for construction purposes to be restored.

Where agricultural and forestry land is required only for construction purposes, it will be restored to enable its former use or as agreed with the landowner and the relevant local planning authority.

System testing and commissioning

The railway will be fully tested to ensure it can operate safely and reliably. Commissioning will allow operational procedures to be tested and refined alongside the training of staff. The period of testing, commissioning and trial operation is expected to take place between 2035 and 2038.

4.3 Services and operating characteristics

HS2 trains

HS2 could be used by two types of service. Services running on both the HS2 line and existing rail infrastructure will use specially designed high speed trains (referred to as 'conventional compatible' trains). Services only operating on the HS2 line will use standard European-sized high speed trains (referred to as 'captive' trains) or conventional compatible trains.

Depending on demand and the time of day, services will operate as:

- 200m-long trains, carrying up to approximately 550 passengers; or
- two trains coupled together to form 400m-long trains, carrying up to approximately 1,100 passengers.

High speed trains will generally operate at up to 360kph (225mph), where the alignment allows. However, where possible, the alignment of the route of the Proposed Scheme has been designed to allow for train speeds of up to 400kph (approximately 250mph) in the future where it is commercially justified. It would need to be demonstrated that improved train design would enable services to operate at up to 400kph without giving rise to further significant environmental effects.

The maximum operating speeds over each section of the route of the Proposed Scheme are anticipated to be as follows:

- up to 360kph (225mph) between the interface with Phase 2a and the connection to the West Coast Main Line south of Bamfurlong, near Golborne; and
- up to 230kph (145mph) on the HS2 Manchester spur.

HS2 services

Services will operate from 05:00 until midnight from Monday to Saturday and from 08:00 until midnight on Sunday. Maintenance and engineering works will normally take place outside of these operational hours, unless the works can be safely undertaken with trains operating at the same time.

The expected fastest standard journey times with the Proposed Scheme are set out in Table 1 of this NTS.

4.4 Maintenance and stabling of trains

Maintenance

HS2 trains will be maintained at a rolling stock depot north of Crewe and at Washwood Heath. Activities at the depot will include cleaning and servicing. Lighter maintenance of trains, such as cleaning, will also take place in sidings and at stations.

Inspections of the railway will take place on a regular basis, at night when the railway is not operating. Routine preventative maintenance will keep the track and other equipment (e.g. electrical and mechanical equipment) in good condition. There will also be periodic heavy maintenance, as necessary.

The infrastructure maintenance bases included in the Proposed Scheme will only be used during maintenance, as required. Facilities will work together to provide system-wide maintenance and these bases may be operational 24 hours a day, seven days a week during these periods. Daytime activities will include the maintenance and stabling of infrastructure maintenance trains. This will help optimise the works and reduce movements to and from the centralised maintenance base at Stone. Maintenance of infrastructure will generally be undertaken at night.

Stabling and use of off-route depots

Trains will be stabled overnight and prepared for service for the following day. Stabling at the off-route locations is required to help reduce the movement of empty trains at the beginning and end of service. The assessment of the environmental effects at these existing facilities is summarised in Section 10 of this NTS.

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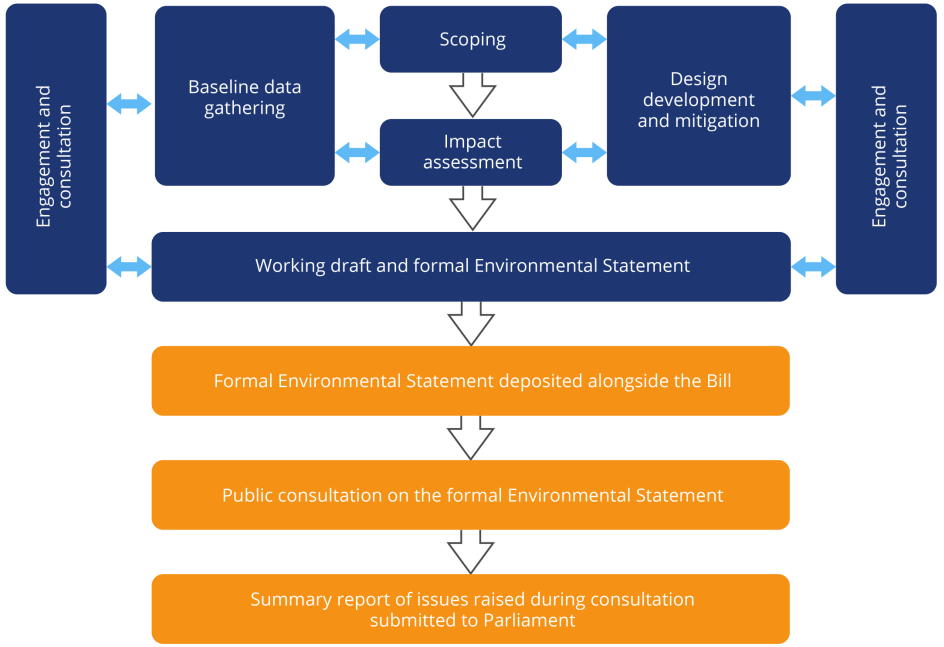
5 Preparation of the Environmental Statement

5 Preparation of the Environmental Statement

5.1 Introduction

The main steps in the preparation of the Environmental Statement (ES) for the Proposed Scheme are shown in Figure 16 and are outlined in this section. The ES was prepared in accordance with all relevant legislation on environmental impact assessment, and relevant guidance.

Figure 16: Environmental assessment process for the Proposed Scheme



5.2 The Environmental Impact Assessment process

Introduction

An Environmental Impact Assessment (EIA) is a legal process and includes the identification of the significant environmental impacts that are likely to arise from a project. The findings of the assessment of the Proposed Scheme are reported in this ES.

The ES describes the Proposed Scheme, its likely significant environmental effects (both beneficial and adverse) and the measures envisaged to avoid, prevent, reduce or offset and monitor those adverse effects.

The EIA process for the Proposed Scheme comprises the following activities.

Scoping

This part of the process involves determining the scope of the assessment, including the range of environmental topics to be addressed, and the assessment methods. This is included within the EIA Scope and Methodology Report which is published in support of the ES.

Establishing the baseline

This involves collecting information about current environmental conditions ('the baseline') in the vicinity of the Proposed Scheme, including off-route works. Where information is not currently available, professional judgement and reasonable assumptions are used. This is informed by

consultation and engagement with stakeholders on the Proposed Scheme. The future environmental conditions without the Proposed Scheme (referred to as 'the future baseline') are predicted as part of this stage of the process.

Environmental input to the design

The environment has been a key consideration as the design of the Proposed Scheme has been developed. Environmental input to design development has included the consideration of reasonable alternatives, at both a local and route-wide level, to the Proposed Scheme. These are discussed in Section 6 of this non-technical summary (NTS).

Identifying and mitigating the effects

The purpose of EIA is to identify the likely significant effects of a proposed development on people and the environment. It does this by:

- anticipating how the future baseline may change when the development is assumed to begin construction; and
- predicting the potential impacts of constructing and operating the development across a range of environmental topics.

The likely significant environmental effects of the Proposed Scheme have been assessed in accordance with the EIA Scope and Methodology Report. These effects are either beneficial or adverse. Measures to mitigate significant adverse effects are identified as part of the assessment. Any significant adverse effects that remain after mitigation (referred to as 'residual effects') are also identified.

Engagement and consultation

Stakeholder engagement has been an integral and ongoing part of the process of designing and assessing the Proposed Scheme from its inception. A key stage in this process was the engagement and consultation with stakeholders on a working draft ES. Refinements to the design were also consulted upon. Comments received during this process help to inform the design and assessment of the Proposed Scheme.

Finalising and submitting the ES

The completed ES accompanies the Bill that is deposited in Parliament, in accordance with House of Commons Standing Order 27A. Copies of the ES are made available for inspection.

Further engagement and consultation

There is then a public consultation on the ES, during the Parliamentary process. Standing Order 224A allows for a consultation period of at least 56 days (eight weeks). During this period, members of the public and other stakeholders may comment on the ES. The Secretary of State is required to publish any comments made in response to the consultation. An independent assessor will then prepare a report summarising the issues raised through comments received, during that period. This report will then be submitted to Parliament.

5.3 Meeting environmental requirements

The Secretary of State will establish a set of Environmental Minimum Requirements (EMR) for the Proposed Scheme. The purpose of the EMR is to ensure that the environmental effects of the Proposed Scheme do not generally exceed those reported in the ES. The EMR will sit alongside the statutory environmental controls included in the hybrid Bill. The nominated undertaker will be required to comply with both the EMR and those statutory environmental controls throughout construction and operation of the Proposed Scheme.

The EMR, together with the controls in the hybrid Bill, will ensure that the impacts identified in the ES will not be exceeded, unless:

- this results from a change in circumstances that was not foreseeable at the time the ES was prepared;
- any such changes will be unlikely to have significant adverse environmental effects;
- the relevant works will be subject to a separate consent process and further EIA; or
- any such change results from a change or extension to the project, where that change or extension does not itself require an EIA.

The EMR will also require the nominated undertaker to use reasonable endeavours to adopt measures to further reduce the adverse environmental effects, provided that such measures are reasonably practicable and do not add unreasonable cost or delay to the construction or operation of the Proposed Scheme. The EMR will also detail any specific requirements on the nominated undertaker to monitor the impacts of construction; and the post-construction performance of mitigation measures implemented.

The EMR will include:

- general principles, which will establish the Secretary of State's intention to carry out the Proposed Scheme so that the impacts generally do not exceed those reported in the ES;
- a Code of Construction Practice (CoCP), which will set out measures and standards to which a developer or contractor must adhere in order to provide effective planning, management and control of potential impacts on individuals, communities and the environment during construction;
- an Environmental Memorandum, which provides a framework for the nominated undertaker, its contractors and stakeholders, to work together to ensure that the design and construction of the Proposed Scheme is carried out with due regard for environmental considerations. Stakeholders will include the Environment Agency, Natural England and the Scottish Environment Protection Agency;
- a Planning Memorandum, which will set out the agreements between the Department for Transport, the nominated undertaker and the local planning authorities relating to the consideration and processing of detailed planning approvals under the provisions of the hybrid Bill, including attendance at a Planning Forum to discuss technical planning and environmental matters. The detailed planning approvals will relate, for example, to the design and appearance of stations, depots, bridges, viaducts, tunnel portals, noise barriers and earthworks;
- a Heritage Memorandum, which will provide a framework for the nominated undertaker, Historic England, local authorities and other stakeholders to work together to ensure that the Proposed Scheme is designed and constructed with proper regard to the historic environment; and
- undertakings and assurances given during the passage of the Bill through Parliament as recorded on the Register of undertakings and assurances.

5.4 Monitoring

The ES sets out monitoring requirements for environmental topics during construction and operation of the railway, where appropriate.

The draft CoCP sets out indicative procedures for inspection and monitoring. The purpose of these procedures is to assess the effectiveness of mitigation measures during construction. Relevant local authorities and regulatory authorities will be consulted, prior to construction, on the monitoring procedures to be implemented. The regulatory authorities consulted will include the Environment Agency, Natural England, Historic Environment Scotland and Scottish Environment Protection Agency.

Monitoring during operation will, where appropriate, be agreed between the nominated undertaker and the relevant planning authorities or other relevant regulatory authorities.

Further information on monitoring is set out in Section 7 of this NTS.

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6 Strategic, route-wide and local alternatives

6 Strategic, route-wide and local alternatives

6.1 Strategic alternatives to high speed rail previously studied

The Government has concluded that action is needed to meet the future travel needs of Britain and 'doing nothing' is not an option.

Before deciding to proceed with HS2, a wide range of options to address Britain's inter-city transport challenges was reviewed. These included domestic aviation, new motorways, a new conventional speed rail line and upgrades to the existing conventional rail network and roads.

The potential for capacity upgrades to the existing conventional rail network was explored. The Government rejected capacity upgrades to the existing conventional rail network, as these alone would not provide the scale of capacity increase and connectivity improvements needed to fulfil the Government's objectives. They would also not meet Government objectives for future performance of the conventional rail network and would cause considerable disruption to existing train services during construction.

High speed rail has some of the lowest carbon emissions of any inter-city transport option. The capacity of London's airports is limited and providing for future growth in international travel will be a significant challenge on its own without factoring in the need to serve additional demand for domestic air services. HS2 will provide a low carbon alternative for passengers and spread capacity demand for domestic journeys.

The Government decided not to give further consideration to major new motorways as an alternative to HS2, as high speed rail is preferable in terms of both capacity and journey times and has lower carbon emissions and environmental effects.

The cost of a new conventional speed railway would be almost as high as that of high speed rail without delivering the reduced journey times and would have only marginal environmental benefits. For these reasons, a new conventional rail line option was rejected.

Prior to the introduction of the Phase One Bill into Parliament in November 2013, the Government considered and reported on alternative configurations of the proposed high speed rail network. The Government's conclusions and its reasons for promoting the Y network were reported both in the Command Paper *High Speed Rail: Investing in Britain's Future* (2012) and in the ES deposited in Parliament alongside the Phase One Bill.

6.2 Alternatives to the Proposed Scheme

The Government and HS2 Ltd considered four categories of alternatives for the Proposed Scheme:

- strategic alternatives: including doing nothing, alternative modes (air or road) and alternative high speed configurations to the Y network;
- route-wide rail alternatives: alternatives to Phase Two, including rail alternatives to the full Phase 2b scheme;
- route corridor alternatives: variations of the full Phase 2b scheme route, or sections of it; and

- local alternatives: different design, construction and mitigation arrangements for the route at or around a community area level.

For each of the categories, alternatives were evaluated on a comparative basis against benefits, cost, engineering design and environmental impact.

Strategic alternatives

Do nothing

For the Phase 2b Western Leg, the 'do nothing' scenario would involve not delivering the Proposed Scheme between Crewe and Manchester nor connections to the West Coast Main Line (WCML). The Government concluded that action is required to support economic growth, meet the rising demand for inter-city rail travel, reduce crowding and congestion on the existing conventional rail network, and make a vital contribution to the UK's environmental targets 'Do nothing' is therefore not considered an option.

Alternative modes (air or road)

The Government considers that a continuing increase in demand will create a need for additional capacity to cater for inter-city journeys between London, the major cities in the Midlands and the North of England and Scotland. It does not, however, believe transferring rail demand to road or aviation to be an appropriate solution. Rather than building additional roads or airports, the Government considers that the rail network needs to deliver new capacity in the form of a new high speed rail network. HS2 will be capable of operating carbon-free services as a significant part of a zero-carbon, multimodal transport network.

Route-wide rail alternatives

The Phase 2b strategic alternatives report (2016), was commissioned by the Department for Transport to assess the route-wide rail alternatives to the full Phase 2b scheme. The report identified upgrades to existing rail infrastructure as alternatives and analysed how these would perform compared to HS2 Phase 2b infrastructure and train services.

Following an announcement by Government in February 2020 that it would proceed with a Phase 2b Western Leg Bill, the DfT commissioned the *Strategic Alternatives to High Speed 2 Phase 2b: West Coast Main Line* report (2021). This report builds on and updates the work completed on the Phase 2b Western Leg route-wide rail alternatives in 2016. Additionally, it includes consideration of early stage engineering feasibility, indicative journey times and track capacity and indicative infrastructure costs. Two Phase 2b Western Leg alternatives were considered: alternatives to the Proposed Scheme between Knutsford and Golborne; and alternatives to the route of the Proposed Scheme between Crewe and Manchester Piccadilly Station.

The appraisal of alternatives found that:

- the Proposed Scheme would offer the fastest journey times between London and Manchester and serve a new station near to Manchester Airport;
- the route-wide rail alternatives would not create significant additional network capacity nor support Northern Powerhouse Rail (NPR) aspirations without further substantial investment;
- the route-wide rail alternatives would deliver the same number of seats to Scotland and to Manchester Piccadilly as per the Proposed Scheme, but would not serve Manchester Airport and its wider catchment;

- network resilience would be less for all the route-wide rail alternatives compared to the Proposed Scheme because the route-wide rail alternatives would require greater use of and dependence on the existing rail network;
- construction of the route-wide rail alternatives and the Proposed Scheme would both cause significant disruption to rail passengers; and
- route-wide rail alternatives would have fewer environmental impacts than the Proposed Scheme largely because they could be delivered through upgrades and alterations to sections of the existing conventional rail network within the existing rail corridor.

Route corridor alternatives

The Proposed Scheme has evolved through a refinement process which looked at environmental effects, cost and operational and engineering considerations.

Various route alignments were considered for the route of the Proposed Scheme, including:

- the examination of different routes across the Cheshire plains;
- different approaches into Manchester;
- different terminus stations in Manchester city centre;
- onward connectivity to the WCML; and
- proposed depot locations.

The route corridor alternatives considered were discounted as none performed better overall than the Proposed Scheme.

Local alternatives

HS2 Ltd published the *High Speed Rail: Consultation on the route from the West Midlands to Manchester, Leeds and beyond - Sustainability Statement* in July 2013. Following public consultation on the initial preferred route from July 2013 to January 2014, HS2 Ltd investigated a number of local alternatives. For example, for the Phase 2b Western Leg, alternatives considered included: the route through and around Crewe and possible integration for a Crewe Hub station; the opportunity for a WCML connection north of Crewe and clearance; and navigational visibility when crossing the Bridgewater Canal and Agden Brook.

HS2 Ltd considered a number of further refinements in 2015/2016 in response to updated design principles and to address comments arising from consultation and ongoing engagement. These alternatives were considered against the scheme as amended, following the 2013-2014 consultation. Local alternatives considered included: the length of the Crewe tunnel; the size of footprint of the rolling stock depot at Crewe north; and the operational requirements and layout of the Manchester Airport High Speed station.

Between November 2016 and March 2017, a public consultation was held on areas of the route where substantial changes had been made from the 2013 proposed scheme. HS2 Ltd considered further refinements which sought to address specific consultee concerns raised during the consultation period. Local alternatives considered included: relocating the rolling stock depot from near Golborne to north of Crewe; changing the route between Middlewich and Pickmere; and changing the approach to the high speed station at Manchester Piccadilly Station.

Following the period of public consultation, there was further work to consider potential route refinements. For the post-consultation (2016/2017) refinements, a baseline option was presented as part of each refinement option. This was the 2016 preferred route to Manchester and Leeds. A summary is provided below for each of the route refinement areas,

together with the recommendations adopted. Further detail can be found in the *Phase 2b route refinements report* (2017).

The revised scheme formed the basis of the route that was the subject of the Government's route announcement in July 2017.

Since July 2017, as part of the design development, a process of considering potentially feasible local alternatives by engineering, planning and environmental specialists has been undertaken. Alternatives have been developed for individual areas of the route, which can be broadly categorised as follows:

- route alignment: for example, moving the route further away from residential areas and other sensitive areas, or raising or lowering the route in places to reduce the area of land required for construction, or to mitigate landscape and visual impacts;
- how the route passes through an area: for example, having the route run on embankment instead of viaduct;
- location and/or design of Proposed Scheme features: including viaducts, embankments, tunnels, tunnel portals, depots; and
- design and/or location of diversions for utilities, watercourses, public rights of way and roads.

A number of alternatives were taken forward, with amendments made to the July 2017 scheme. These were as follows:

- the location of the Crewe tunnel vent shafts following the decision to extend the Crewe tunnel and therefore move the entrance, and subsequently the interface between HS2 Phase 2a and the Proposed Scheme;
- relocation of the Crewe tunnel north portal which will avoid the loss of broadleaved woodland and have fewer visual impacts on the residents of properties on Bradfield Road and along Broughton Road;
- reduction in the height of embankment through the Cheshire salt plain resulting in fewer landscape and visual impacts, less impact on the historic environment (listed buildings and a scheduled monument) as well as requiring less time and costing less to construct;
- reduction in the height of embankments and viaduct between Lostock Green and Lostock Gralam, to reduce the volume of earthworks, associated construction traffic, shorten the duration of construction impacts such as traffic, noise and air quality impacts, and resulting in fewer landscape and visual impacts;
- the location of borrow pits in the Wimboldsley to Lostock Gralam area that will provide sufficient material to construct the Proposed Scheme and which will require less agricultural land and have fewer air quality, noise and visual impacts;
- realignment of the B5391 Pickmere Lane, the diversion of Flittogate Lane and also the re-connection of these highways to Budworth Road due to the HS2 WCML connection crossing through this area, resulting in fewer impacts on ecology and smaller volumes of materials to construct, requiring fewer vehicle trips, with fewer impacts on air quality and traffic and transport;
- relocation of the proposed Hoo Green auto-transformer feeder station leading to fewer environmental impacts, fewer operational complexities with less operational maintenance requirements and a more efficient design;
- highway realignment at Peacock Lane resulting in fewer landscape and visual impacts along with less impacts on the historic environment as the works will be located further from and avoid residential properties and heritage assets;
- provision for a connection to future NPR services, in order to avoid disruption to HS2 services due to both the construction and operation of potential future NPR routes and services;

- realignment of the route of the Proposed Scheme where it will pass the Manchester Ship Canal east of Hollins Green resulting in fewer landscape, visual and noise impacts during both construction and operation for the residential properties at Hollins Green, Hollinfare Cemetery and the Black Swan public house;
- replacing an embankment with a viaduct adjacent to Manchester Mosses Special Area of Conservation and Holcroft Moss Site of Special Scientific Interest as the foundation works will have less impact on groundwater flows, and therefore, less potential to impact Holcroft Moss Site of Special Scientific Interest/Manchester Mosses Special Area of Conservation as well as maintaining greater ecological connectivity from east to west across the Site of Special Scientific Interest;
- realignment of the A574 Warrington Road to the south of Culcheth which will avoid the partial loss of playing fields associated with Culcheth Athletic Junior Football Club and will avoid the demolition of a residential property;
- realignment of Wigshaw Lane instead of permanent closure which will have less impact on traffic during operation at the junction of the A574 Warrington Road and Common Lane in Culcheth;
- changes to the realignment of the A573 Wigan Road resulting in fewer environmental impacts and would be less complex to construct;
- changes to the connection of the route of the Proposed Scheme to the WCML at Lily Lane Junction which will require less temporary and permanent agricultural land, will be less complex to construct and cost less;
- relocation of the railhead at Ashley resulting in fewer noise impacts and impacts on historic environment as well as fewer air quality impacts during construction due to fewer construction vehicle movements;
- relocation of the Ashley Infrastructure Maintenance Base - rail (IMB-R) resulting in fewer ecological, surface water and flood risk impacts by avoiding Birkin Brook, Blackburn's Brook and surrounding habitat as well as requiring less time and costing less to construct;
- changes to the highway arrangements for the A538 Hale Road where it will cross the HS2 Manchester spur and connect to the M56 junction 6 resulting in fewer traffic and transport impacts;
- changes to the vertical alignment of Manchester Airport High Speed station resulting in less complex construction and less cost;
- location of the Altrincham Road vent shaft and headhouse which will avoid the demolition of the existing multi-storey car park;
- relocation of the Palatine Road vent shaft and auto-transformer station which will require less land from, and therefore have less impact on, the capacity of the Didsbury Flood Storage Basin and the flood zone;
- location of the Wilmslow Road vent shaft which will avoid the demolition of the telephone exchange, the electricity substation, the diversion of associated utilities, the demolition of a car wash;
- relocation of the Birchfields Road vent shaft (formerly known as the Lytham Road vent shaft) which will avoid a school, the Manchester Enterprise Academy Central, and will require less land from Fallowfield Retail Park;
- reconfiguration of the Manchester Piccadilly High Speed station and Ardwick approach which will increase station capacity to provide sufficient platforms to accommodate potential future NPR services, will enable more of Manchester City Council's HS2 Strategic Regeneration Framework aspirations to be realised and will avoid the demolition of Chapeltown Apartments;

- re-routing of high pressure gas main diversions to facilitate construction of the HS2 WCML connection;
- the locating of a stabling facility at Annandale which will cost less to construct than other options for stabling facilities and will have fewer ecological and landscape and visual impacts; and
- relocation of the splitting and joining location in the North to Carlisle Station which will cost less to construct and allow passengers and crew to join services at Carlisle Station.

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7 Approach to environmental mitigation and monitoring

7 Approach to environmental mitigation and monitoring

7.1 Mitigation

An ES is required to include "a description of any features of the proposed development, or measures envisaged in order to avoid, prevent or reduce and, if possible, offset likely significant adverse effects on the environment". Such measures in the Environmental Statement (ES) are referred to as 'mitigation measures'.

HS2 Ltd's aim is to avoid or prevent adverse environmental effects, where reasonably practicable (for example, through changes in route alignment). Where this was not achievable, HS2 Ltd has considered mitigation measures to reduce or avoid such effects (for example, by lowering the alignment to reduce visual impact). Where, despite efforts to avoid or reduce them, significant adverse environmental effects are predicted to occur, HS2 Ltd seeks to offset them through restoration and compensation measures.

This approach is driven by the HS2 Sustainability Policy and the HS2 Environmental Policy. HS2 Ltd is committed to developing an exemplar project through seeking environmental enhancements and benefits whilst limiting negative impacts through design, construction and operation of the railway.

Mitigation measures were identified by regularly reviewing the likely adverse effects identified during the assessment process. These effects were considered at design workshops attended by different parts of the HS2 project team. One of the aims of these workshops was to modify the design to avoid or reduce significant adverse effects. Factors considered in identifying mitigation measures included:

- the nature and severity of the adverse environmental effect; and
- the effectiveness and value for money of the measures.

Mitigation incorporated into the design of the Proposed Scheme as a result of this process includes:

- selecting the Proposed Scheme from a range of alternatives, taking account of environmental issues;
- developing the route of the Proposed Scheme to avoid, where possible, significant adverse effects, including on residential properties, community facilities, public open space, businesses, farm buildings, sites of ecological and/or heritage importance and the wider landscape;
- using mitigation earthworks and/or planting to:
  - screen views; and
  - integrate the Proposed Scheme into the local landscape;
- providing noise barriers (fence barriers or earthworks);
- providing links under or over the Proposed Scheme to:
  - maintain access for roads, public rights of way and properties; and
  - allow safe passage of wildlife;
- creating new habitats and other features of ecological value to compensate for unavoidable losses;
- limiting, as far as reasonably practicable, the amount of land required to construct and operate the Proposed Scheme;
- using excavated materials produced within the Proposed Scheme, where suitable, for construction, primarily of embankments and environmental mitigation earthworks, so as to reduce the number of heavy goods vehicles on local roads;

- avoiding or reducing impacts on floodplains and providing replacement floodplain storage areas; and
- providing balancing ponds to control surface water run-off from the Proposed Scheme in rural areas.

In addition, the draft Code of Construction Practice (CoCP) has been produced in conjunction with the ES. This has enabled mitigation measures for construction to be considered during the EIA process. These and other measures are supported by the Environmental Minimum Requirements, which are described in Section 5 of this non-technical summary (NTS).

7.2 Monitoring

An ES must also include a description, where appropriate, of any proposed arrangements for monitoring the significant adverse effects of constructing and operating a scheme.

Monitoring during construction

The draft CoCP includes commitments to monitor significant effects during construction, as described in Section 4 of this NTS. The CoCP will specify:

- monitoring requirements that the nominated undertaker must employ to manage the effects of construction; and
- the monitoring of mitigation post-construction.

Relevant local authorities will be consulted on the monitoring procedures to be implemented. Reports of the monitoring will be provided to the local authorities.

Monitoring during operation

The following types of post-construction monitoring will be undertaken during operation of the Proposed Scheme:

- 'general' monitoring – for example, monitoring of:
  - the progress of habitat creation works;
  - the condition of restored agricultural land; and
  - the establishment of landscape planting; and
- 'specific' monitoring settled in consultation with relevant statutory bodies for particular significant adverse effects where appropriate – for example, monitoring of a public water supply borehole.

The next section describes the range of measures and policies that have either already been adopted or have been considered at an environmental topic level.

7.3 Agriculture, forestry and soils

Mitigation

In rural areas, agriculture is the most common land use. In developing the Proposed Scheme, HS2 Ltd has worked to limit the adverse impacts on agricultural land and farm holdings as far as is reasonably practicable. A guide for farmers and growers affected by the Proposed Scheme, the Phase 2b Farmers and Growers Guide, will be published following deposit of the Bill.

HS2 Ltd has aimed to design the Proposed Scheme to avoid or limit direct effects on the highest quality agricultural land. However, this aim has had to be balanced with other important environmental and engineering

considerations, such as landscaping to screen the Proposed Scheme and provide noise mitigation, balancing ponds to control surface water runoff from the Proposed Scheme or planting of woodland, grassland and wetland to mitigate the loss of ecological habitats.

Where the Proposed Scheme will affect agricultural land, a range of measures will be put in place to help reduce impacts, including appropriate handling of topsoil and subsoil to enable agricultural land to be restored and maintaining or mitigating land drainage.

Work has been undertaken to assist in mitigating the effects of the Proposed Scheme on land-based businesses, where reasonably practicable. Measures will be put in place to maintain access for land management. Where appropriate access arrangements cannot be provided during construction, consideration has been given to the acquisition of severed land. Owners and operators of affected agricultural holdings are entitled to receive compensation under existing statutory compensation arrangements.

Monitoring

Construction

Appropriately qualified environmental management staff will be appointed to secure compliance with the CoCP in relation to soils. Their responsibilities will include monitoring the striEFFECTIVE PPIng, handling, storage and replacement of topsoil and subsoil, as appropriate. The nominated undertaker will inspect works on site to monitor progress and standards of restoration, and provide agricultural liaison officers.

Soils restored to agricultural, forestry or landscape uses will be monitored on completion of construction, for up to five years. The purpose of this monitoring is to identify any unsatisfactory growing conditions.

Operation

No other significant agriculture, forestry and soils effects are anticipated during operation of the Proposed Scheme. Therefore, no further operational monitoring is required.

7.4 Air quality

Mitigation

The proposed mitigation measures to control and manage the construction effects of the Proposed Scheme in relation to air quality are stated within the draft CoCP. Best practice engine emission standards have been set for on- and off-road construction vehicles.

The use of borrow pits will reduce the need for longer distance transport and import of materials.

The high speed railway will operate efficient, non-polluting electrically powered passenger trains.

Monitoring

Construction

Contractors will implement inspection and monitoring procedures to assess the effectiveness of measures to prevent dust and air pollutant emissions. Monitoring (and monthly reporting) will comply with the measures set out in the CoCP.

Monitoring of dust and particulate matter during construction of the Proposed Scheme will be undertaken following the current best practice guidance.

Monitoring of significant air quality effects adjacent to highways will be undertaken following current best practice guidance.

Operation

Given that no significant air quality effects are anticipated during operation of the Proposed Scheme, no operational monitoring is required.

7.5 Climate change

Mitigation

The HS2 Environmental Policy seeks to minimise the carbon footprint (of the Proposed Scheme) and deliver low carbon, long-distance journeys that are supported by low-carbon energy. The potential to reduce carbon emissions across the design, construction and operation phases, as a best practice framework, has been pursued. As part of the commitment to minimising the carbon footprint of the Proposed Scheme, HS2 Ltd is implementing a carbon management process.

The use of electricity for operating rolling stock, stations, and rail systems is a prominent carbon source within the lifetime impacts of the Proposed Scheme. The procurement of zero carbon electricity for the operation of the Proposed Scheme offers a considerable opportunity to reduce these impacts and will be pursued by HS2 Ltd as a key mitigation action.

The in-combination climate change impacts assessment considers how climate change impacts, in combination with the effects of the Proposed Scheme, may affect the receiving environment. This enables appropriate mitigation to be identified. Potential in-combination climate change effects during operation will be mitigated by embedded topic-specific measures and measures set out in the draft CoCP.

The HS2 Sustainability Policy seeks to build a network which is resilient to climate change in the long term and adaptable to future trends and demands. To address this objective, the climate change resilience assessment considers how climate change risks may affect the resilience of infrastructure and assets associated with the Proposed Scheme. Measures have been incorporated into the Proposed Scheme to ensure it is resilient to climate change risks. For example, it has been designed to accommodate rainfall and flooding levels that include an allowance for climate change.

Monitoring

Construction

The draft CoCP requires contractors to produce carbon management plans detailing 'the approach to energy and carbon dioxide monitoring and reporting from relevant site activities'. Contractors will also monitor extreme weather events during construction.

Operation

Carbon dioxide emissions will be calculated and monitored during operation. Monitoring of any significant adverse in-combination climate change effects during operation will form part of the operational monitoring strategies for the relevant environmental topics. Requirements for weather and climate change resilience monitoring will be integrated into the asset management of the Proposed Scheme.

7.6 Community

Mitigation

HS2 Ltd has developed the design of the Proposed Scheme with the aim of avoiding demolitions of residential properties and loss of community facilities so far as reasonably practicable. The Government has developed a

package of HS2 property compensation measures over and above statutory requirements. Where it has not been proved possible to avoid adverse impacts resulting from the temporary or permanent loss of public open space, HS2 Ltd has engaged with the local authorities in order to identify and put in place appropriate further mitigation measures. Such measures may include improving or altering existing open spaces or community facilities partially lost, or providing new open space or community facilities to replace those lost to the Proposed Scheme.

The draft CoCP includes measures to reduce noise, air quality, visual and construction traffic effects on local communities during construction. Proposed measures include:

- the appointment of community relations personnel;
- a community helpline to handle enquiries from the public;
- the sensitive laying out of construction sites to reduce nuisance; and
- maintaining public roads and rights of way around construction sites wherever reasonably practicable, to avoid deterioration due to construction traffic.

Where there are community effects that cannot currently be mitigated, HS2 Ltd will continue to engage with owners and operators of these facilities to identify reasonably practicable measures to help mitigate the residual significant effects identified in the assessment.

Monitoring

Any construction and operational monitoring requirements in relation to in-combination effects arising from air quality, visual, noise and construction traffic effects are described in the relevant topic sections of the ES.

7.7 Ecology and biodiversity

Mitigation

HS2 Ltd has designed the Proposed Scheme to avoid or reduce adverse impacts on habitats, species and other features of ecological value, where reasonably practicable.

Where adverse impacts cannot be avoided, HS2 Ltd has considered mitigation and compensation measures to reduce effects on species and habitats. Measures will include, where appropriate:

- translocating or relocating protected species;
- providing replacement habitat; and
- providing ecological features such as ecological underpasses, to enable species to cross the route.

Such measures will be used to limit the effects of loss and/or fragmentation of habitat to a level where the loss will not result in a significant adverse effect.

Monitoring

Construction

Detailed surveys will be undertaken prior to and during construction. These surveys will help refine the mitigation and control measures required during construction.

The nominated undertaker will undertake appropriate monitoring of the consequences of construction works on ecological resources. It will also monitor the effectiveness of management measures designed to control ecological effects on protected or notable species, and statutory designated or non-statutory sites of ecological interest. Monitoring will

be put in place throughout the habitat establishment period to measure its success and to determine whether any changes in management are required. This may need to continue beyond the establishment period.

HS2 Ltd is committed to monitoring the effectiveness of ecological mitigation and compensation measures for a sufficient period to ensure the objectives of the proposals for nature conservation are achieved, as set out in the Environmental Memorandum. An Ecology Review Group will review the outputs of monitoring for habitat creation sites and make recommendations for remedial action where appropriate.

Operation

The effectiveness of ecological mitigation and compensation measures will be monitored.

7.8 Electromagnetic interference

Mitigation

High voltage electrical equipment creates electromagnetic fields which, when at high levels, can potentially have implications for human health and may cause electromagnetic interference to other electrical/electronic equipment (e.g. communications) or infrastructure (e.g. power lines). The generation of electromagnetic fields will be managed during construction and operation of the Proposed Scheme to ensure that electrical equipment and human health are not adversely affected. Electromagnetic interference will be managed during construction in line with British and European standards and industry best practice. The main source of electromagnetic fields from operation of the Proposed Scheme will be the power supply system along the railway. The voltage and current generated by the power supply system will not be high enough to cause significant electromagnetic fields outside the railway boundary.

HS2 Ltd is undertaking on-going engagement with the owners and operators of facilities that may be affected to establish the electromagnetic sensitivity levels and risk of electromagnetic interference. Any appropriate mitigation measures will be identified during on-going engagement.

Monitoring

Construction

Features such as tower cranes can cause temporary interference to TV reception. Tower cranes will be used in some locations during the construction phase. If complaints about interference are received (e.g. in relation to TV reception), appropriate remedial action where reasonably practicable will be taken to restore signal integrity at affected properties (e.g. by replacing aerials or boosting signal strength).

7.9 Health

Mitigation

The route of the Proposed Scheme has been selected to avoid residential properties and other sensitive receptors, where reasonably practicable. Noise mitigation, landscape earthworks and other measures have been incorporated to reduce effects on people along the route. Air quality impacts and mitigation measures are reported in the relevant sections of the ES. Mitigation measures will be implemented during construction and through ongoing management and delivery of the Proposed Scheme. These are incorporated into the draft CoCP and other HS2 strategies and policies as appropriate.

Monitoring

Any construction and operational monitoring requirements in relation to impacts generated from air quality, noise and vibration, traffic and transport, and visual effects that have the potential to influence health have been described in the relevant topic sections of the ES.

7.10 Historic environment

Mitigation

In designing the Proposed Scheme, HS2 Ltd's aim has been to avoid direct impacts on all heritage assets as far as reasonably practicable. Where this has not been possible, a range of measures will be implemented to mitigate the impact on such assets.

A Heritage Memorandum has been prepared. This sets out the commitments of the Secretary of State in relation to the historic environment and heritage assets. The memorandum provides a framework for the nominated undertaker, Historic England, Historic Environment Scotland, local authorities and other stakeholders to work together to ensure that the Proposed Scheme is designed and constructed with proper regard to the historic environment. The memorandum will form part of the EMR.

Mitigation of the effects of the Proposed Scheme will include a programme of historic environment investigation, recording, analysing, reporting and archiving affected assets guided by an historic environment research and delivery strategy.

Mitigation measures have been developed in consultation with other disciplines to ensure that heritage assets have been considered when designing mitigation works. For example, landscape planting and noise mitigation measures can be used to help preserve a heritage asset's setting and character.

Monitoring

Construction

Contractors will be required to implement appropriate monitoring of the consequences of construction work, as required, on all heritage assets (designated and non-designated). This will help ensure that:

- management measures are effective; and
- agreed approaches to construction activities and heritage assets are complied with.

Risk assessments identifying appropriate surveys will be undertaken at locations of archaeological or built heritage interest adjacent to the construction site prior to, during and following construction works. Surveys may include structural or condition surveys, and monitoring of settlement and vibration.

Operation

No specific monitoring requirements are proposed in relation to heritage assets during operation of the Proposed Scheme. However, monitoring specified during the construction phase may continue during the operational phase. It is assumed that any heritage assets within the land required for construction will have been removed unless excluded as a result of the mitigation process.

7.11 Land quality

Mitigation

The draft CoCP contains measures to mitigate the temporary effects of any land contamination. This will help ensure that no significant adverse effects arise. Pre-existing contaminated soils or groundwater may be treated. If remediation of contaminated soils or groundwater is required, there could be a beneficial effect for the environment in the long term with respect to contamination.

The Proposed Scheme will cross a number of mineral safeguarding areas for sand and gravel or salt and brine extraction. Where construction occurs within a mineral safeguarding area, pre-extraction will be discussed with the owner of the mineral/land, the Mineral Planning Authority and other relevant stakeholders to assist in achieving effective management of minerals.

Mitigation measures for geoconservation sites, such as geological SSSIs, may include preservation of any new exposures created during the construction works. A plan will be discussed with relevant stakeholders.

Monitoring

Construction

The nominated undertaker will require monitoring procedures to be implemented, as appropriate, in areas of contaminated land.

Groundwater and surface water monitoring plans will be prepared. Monitoring will take place in the vicinity of contamination remediation works, or where a piling risk assessment has indicated a potential effect on below-ground contamination.

Works that have the potential to impact identified geological resources will be monitored. Appropriate health, safety and environmental monitoring will be set out. This will help ensure that procedures relating to working on or adjacent to land affected by contamination will be adhered to.

Operation

During the operational phase, monitoring works (such as for groundwater and landfill or mine gas) will continue, where required.

7.12 Landscape and visual

Mitigation

Measures to mitigate landscape and visual impacts are part of an integrated design approach. This includes consideration of engineering requirements, environmental considerations and best practice design. The landscape design proposals for the Proposed Scheme incorporate mitigation measures for a range of environmental topics including agriculture, community, ecology and biodiversity, historic environment, landscape and visual and noise.

Mitigation measures have been developed to: avoid or reduce effects on the character of the landscape; seek to enhance such resources where appropriate and to achieve wider landscape and ecological connectivity; and avoid or reduce effects on the visual amenity of residential communities, receptors and users of the landscape.

A wider landscape approach to ecological compensation and mitigation is being adopted for the Proposed Scheme (see Figure 17). The form and location of trees and grassland is being planned to reconnect existing and fragmented habitats. This will help create a joined-up ecological network and contribute to HS2 Ltd's policy aspiration for a Green Corridor. Distributing the planting over a wider area will better help to maintain

landscape character, as planting is not concentrated in large blocks of woodland, which has the effect of changing the appearance of the local landscape and reducing the amount of land available for agriculture and other land uses. The provision of new planting and landscape earthworks will help to integrate the Proposed Scheme into the character of the surrounding landscape and can also provide visual screening for residents and other sensitive receptors (such as users of recreational sites and public rights of way). Landscape design and mitigation will:

- create new ecological habitats and features; and
- help reduce noise and effects on the setting of heritage assets.

Compensatory green space will be provided where this is affected by the Proposed Scheme and will link up with wider green infrastructure where possible.

Space accessible to the public (referred to as 'public realm') is included in the design of the Proposed Scheme in urban areas. It will include tree planting and green space, to help integrate the new railway stations and associated operational features into their local context.

Earthworks and planting will be designed to help integrate new structures, such as bridges, viaducts and depots into the landscape. Detailed design, materials and finishes will be subject to approval by the local authority under the provisions of the Bill.

Mitigation will also reduce the effects of construction through, for example, advance planting and temporary screening. Temporary or permanent mitigation will be installed at the earliest opportunity, where appropriate and reasonably practicable. Planting away from the route will also be established to reduce adverse landscape and visual effects, where this is appropriate to landscape character and context.

The draft CoCP includes measures to limit landscape and visual impacts during construction including the design of lighting to limit intrusion on any adjacent residential properties.

Figure 17: Landscape design solutions

Support local economies

Woodland planting to integrate railway could also be locally managed as coppice woodland, which respects historic landscape character and traditional woodland management.

Positive use of excavated materials

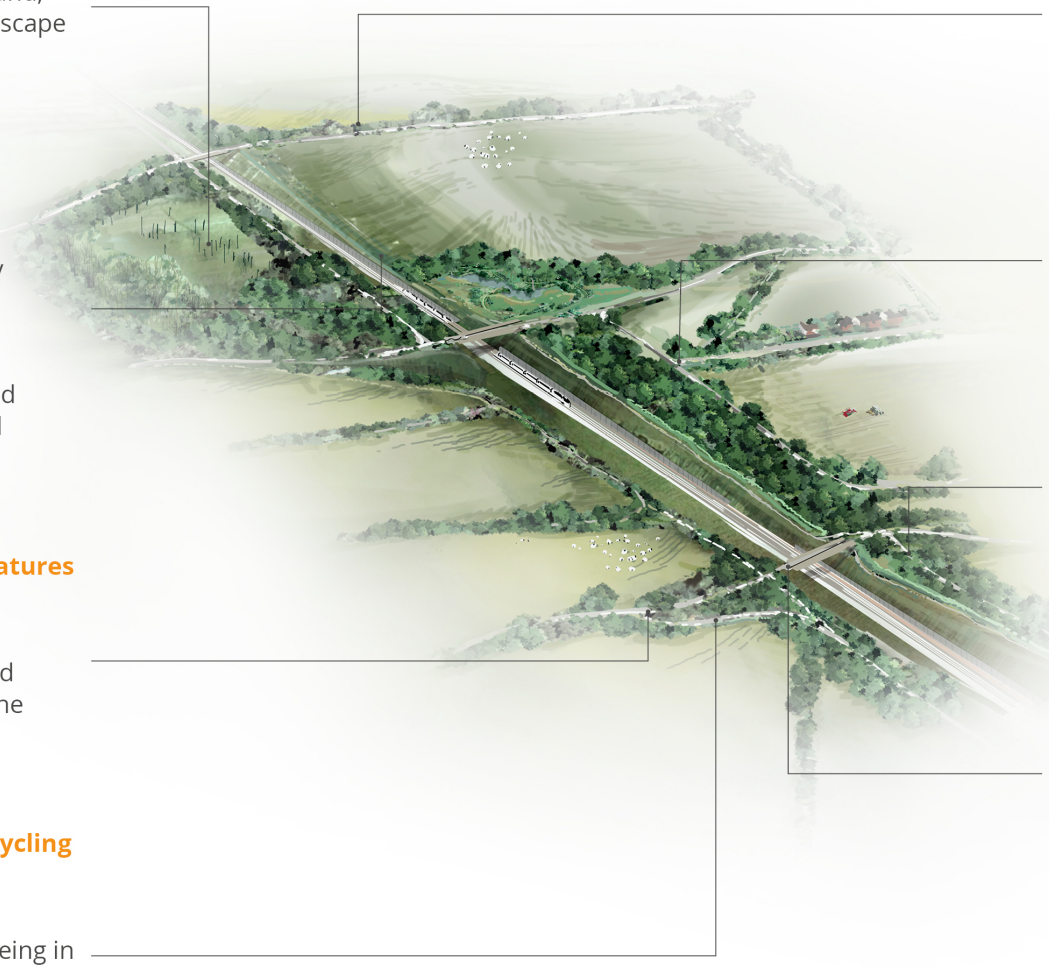
Excavated material carefully designed to screen views of HS2 from local receptors, and returned to agriculture. Contouring to be natural and reflect the character of local topography.

Community and visitor features

Earthwork and planting features that can provide landscape enhancement and HS2 observation areas for the community and visitors.

Promote local walking & cycling network

Provide opportunities for enhancing health and wellbeing in publicly accessible areas. Look to recreate local landscape features.



Conserve or enhance local landscape character

Hedgerows with tree species reinstated and enhanced to reflect landscape character and reconnect locally fragmented planting areas.

Access

Severed routes will be reconnected and integrated into wider access networks.

Planting character

Planting area to be shaped to respond to the scale and character of local planting and earthwork patterns.

Positive integration of structures

Earthworks and large scale planting used to integrate realigned bridge structure with the local landscape.

Monitoring

Construction

The nominated undertaker will implement appropriate monitoring of any new advance permanent or temporary planting. This will help ensure the planting becomes established and is properly maintained throughout the construction period.

Operation

The nominated undertaker and its contractors will maintain and monitor newly planted and landscaped areas. This will ensure that the planting (woodlands, grasslands, wetlands and hedgerows) successfully establishes and develops. This will help ensure that it achieves its mitigation objective and remains effective.

7.13 Major accidents and disasters

Mitigation

Management and mitigation of safety risks is a fundamental concept of the Proposed Scheme, embedded in HS2 Ltd's legal and contractual obligations as well as its management frameworks. The guiding principle is to manage all risks to be as low as reasonably practicable. A number of legislative and regulatory requirements must be complied with, to demonstrate the management of safety risks throughout the design, construction, management, operation and maintenance of the Proposed Scheme.

Measures to mitigate health, safety and environmental risks related to the potential for major accidents and disasters during construction and operation of the Proposed Scheme will be embedded through the detailed design, technical standards and specifications for the Proposed Scheme.

In addition, the CoCP will include the requirement for construction contractors and suppliers to prepare plans and protocols that address accident and disaster risk issues. This includes the preparation of community emergency plans (where relevant), traffic management plans, measures to control pollution risks, and plans to prevent fires and deal with the impacts of extreme weather events.

Monitoring

Construction

The draft CoCP describes the control measures and standards to be implemented to protect communities and the environment during construction works, including monitoring weather events. Consideration will be given to the potential impacts of extreme weather events and related conditions.

Specific monitoring solutions, for example during tunnelling activities, will be developed as part of detailed design.

Operation

A rigorous safety management system will be established and adhered to as part of the Proposed Scheme. This system will be used to record and monitor adverse incidents and to take appropriate action in response.

7.14 Socio-economics

Mitigation

The construction of the Proposed Scheme offers considerable opportunities to businesses and residents along the line of the route in terms of supplying goods and services and accessing employment opportunities. HS2 Ltd will adopt a policy to work with its suppliers to build

a skilled workforce that promotes further economic growth across the UK as it has done on Phase One and Phase 2a.

Some businesses will be required to move to alternative premises to enable the Proposed Scheme to be constructed. Displaced businesses will be entitled to receive compensation where required to relocate to alternative premises, under existing statutory compensation arrangements. HS2 Ltd will also provide, where appropriate, additional support to help businesses relocate to alternative premises.

A Communities and Environment Fund and a Business and Local Economy Fund have been made available for Phase One and Phase 2a. These funds help offset the impacts of the HS2 on local communities and their economies. The extension of the funds and funding allocation for the Proposed Scheme is currently subject to Ministerial decision. The objective of the Business and Local Economy Fund is to add benefit over and above committed mitigation and statutory compensation to support local economies that are demonstrably disrupted by the construction of HS2.

All reasonably practicable steps are and will be undertaken to limit the impact of the Proposed Scheme on existing businesses.

The measures set out in the draft CoCP and Local Environmental Management Plans will provide further mitigation for individual significant effects (relating, for example, to air quality, noise, vibration, visual, construction traffic) on a case-by-case basis.

Monitoring

Specific monitoring requirements in relation to noise, vibration, construction traffic, air quality and visual effects on existing businesses are described in the relevant topic sections of the ES.

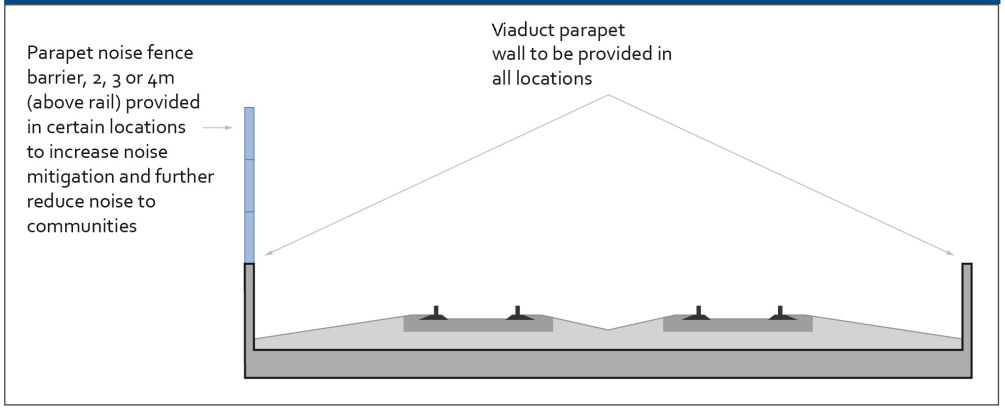
7.15 Sound, noise and vibration

Mitigation

HS2 Ltd has designed the Proposed Scheme with the aim of avoiding or limiting noise and vibration effects along the route.

The development of the Proposed Scheme alignment has sought to reduce noise and vibration effects as far as reasonably practicable. Operational noise will be further reduced at source through the effective design and specification of the trains and track, as well as by noise barriers. Noise barriers will take the form of landscape earthworks, noise fence barriers and/or parapet barriers on viaducts (see Figure 11, Figure 13 and Figure 18). Tunnel portals will also be designed to avoid adverse noise effects caused by trains exiting the tunnel. Noise insulation will be offered with the aim of avoiding residual significant adverse effects inside qualifying dwellings close to the Proposed Scheme.

Figure 18: Cross-section of a generic viaduct including parapet noise fence barrier



The draft CoCP sets out measures to control noise and vibration during construction. The primary measure is the use of the best practicable means to reduce noise (including vibration) at neighbouring properties. The draft CoCP also sets out the order in which mitigation measures should be applied based on the best practicable means. Firstly, mitigation to control noise at source should be applied, for example, the use of quiet and/or low-vibration equipment and restricted working hours. Secondly screening will be provided, for example local screening of equipment, as well as screening along the edge of the construction worksites. HS2 Ltd will offer noise insulation and/or temporary rehousing to dwellings which satisfy the applicable qualifying criteria.

Monitoring

Construction

The nominated undertaker will require its contractors to undertake monitoring and report the results. This will include real-time noise and vibration monitoring, as appropriate, and will help ensure compliance with the CoCP.

Operation

Noise and vibration will be monitored at different times during the lifetime of the Proposed Scheme at appropriate monitoring locations. Reasonable remedial measures will be identified and implemented where measurements indicate worse than expected performance.

7.16 Traffic and transport

Mitigation

The draft CoCP includes measures to reduce and manage traffic and transport impacts on local communities during construction of the Proposed Scheme. Construction will lead to increased vehicular traffic and has the potential to cause increased congestion and journey times at a number of locations. HS2 Ltd will, where reasonably practicable, limit the use of local roads by HS2 heavy goods vehicles during construction. It will do this by using the strategic road network, site haul routes and rail transport. In order to control disruption and congestion resulting from construction traffic, HS2 Ltd will put in place measures to reduce the impact of construction vehicles using the public road network, especially local roads.

An overarching framework travel plan will be developed for the Proposed Scheme covering construction, operation and maintenance. For construction, workforce travel plans will be implemented to help mitigate transport-related effects during construction (such as through the promotion of public transport, car sharing and, where appropriate, works buses).

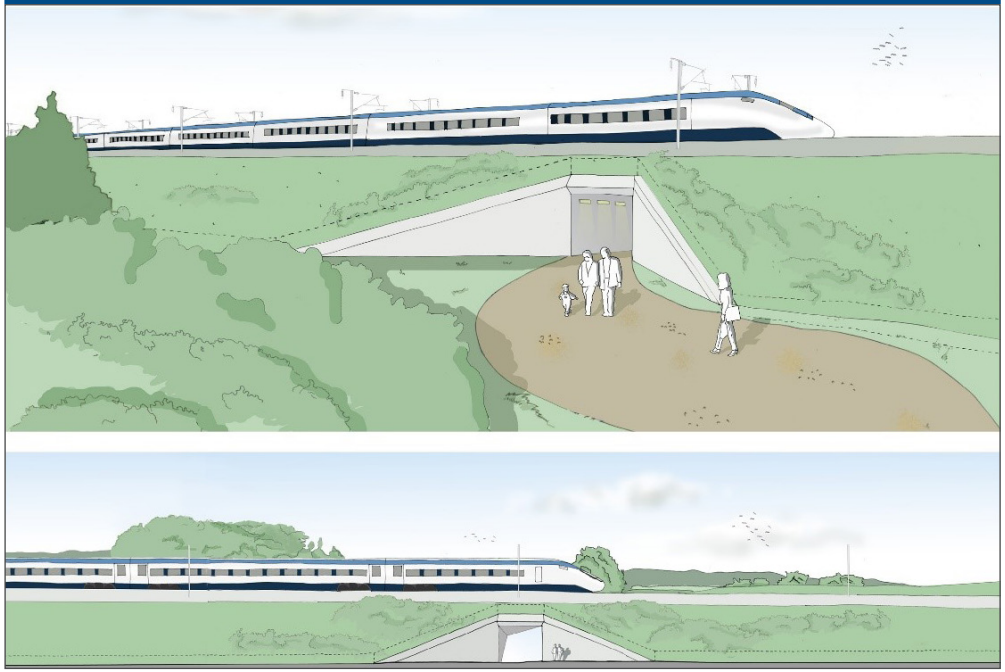
Where reasonably practicable, movement of construction material, machinery and/or construction workers between construction compounds and work sites will be via site haul routes. These will reduce the need for construction vehicles to use the public highway network, therefore helping to reduce traffic related impacts. Excavating borrow pits will enable high quality material for use in construction of the Proposed Scheme to be extracted locally and transported largely within the construction area of the Proposed Scheme. This will generate lower construction traffic movements than importing the material from commercial quarries, reducing impacts.

Using borrow pits will reduce the number of construction vehicle movements on the highway network.

It will be necessary to close, realign or divert certain local roads and public rights of way along the Proposed Scheme, both during construction, and in some cases, permanently. In most cases, alternative routes will be available either through the use of temporary alternative routes or the existing wider network. There may, however, be some limited effects on road users, including non-motorised users (i.e. pedestrians, cyclists and horse riders), due to increased journey distances and times.

Where new roads, public rights of way or bridges are required to cross the route, they will, where reasonably practicable, be constructed in advance and offline so as to enable the existing route to continue in use until its replacement is ready. Existing roads and public rights of way will be reinstated on or as close to their existing alignment as is reasonably practicable. An example of a public right of way crossing beneath the Proposed Scheme is shown in Figure 19.

Figure 19: Illustration of a generic pedestrian underbridge



A number of measures have been included as part of the design of the Proposed Scheme and will avoid or reduce impacts on transport users. For HS2 stations these include provision for access by public transport, walking and cycling. There will be areas for dedicated taxis, private hire vehicles including drop-off and pick-up zones. Access to the stations by cycle will be provided together with cycle parking.

Monitoring

Construction

The nominated undertaker and its contractors will undertake the necessary monitoring to ensure compliance with the requirements of the CoCP, associated Local Traffic Management Plans and construction travel plans.

Operation

Travel plans will detail monitoring associated with the operation of the proposed high speed stations and depots.

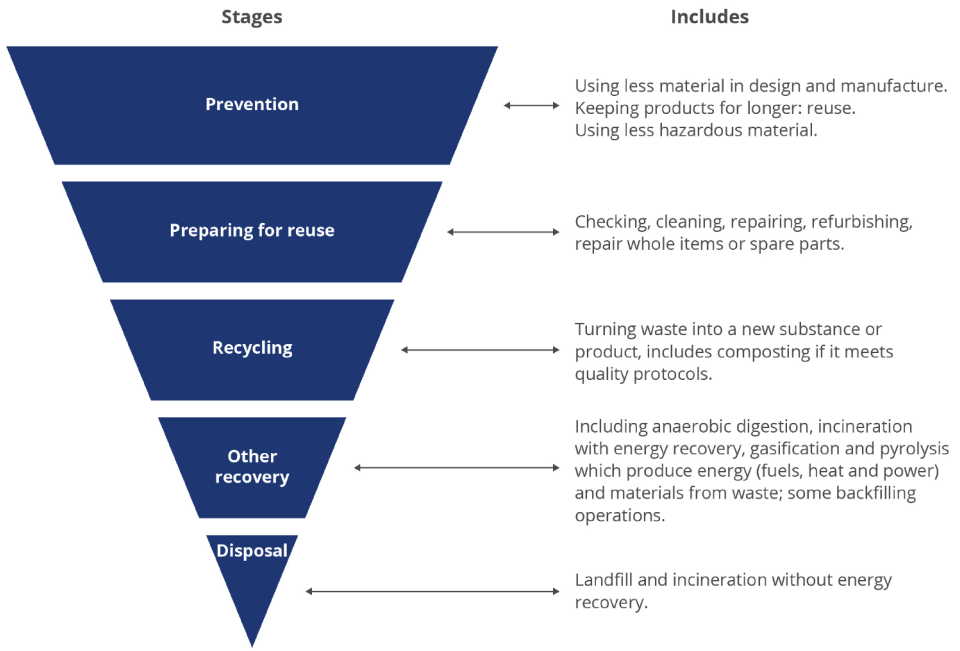
7.17 Waste and material resources

Mitigation

HS2 Ltd's objective is to limit the use of materials and minimise the generation of waste during the construction and operation of the Proposed Scheme. Sustainable materials will be sourced and used efficiently to construct the Proposed Scheme.

The principles of the waste hierarchy (see Figure 20) will be followed. Priority will be given to the prevention of waste generation, followed (where this is not possible) by reuse, recycling and recovery of waste respectively, with disposal to landfill adopted only as a last resort.

Figure 20: Waste management hierarchy



The principles of the circular economy will be applied throughout the lifecycle of the Proposed Scheme. The circular economy is an alternative approach to the typical 'linear' way of using resources. By finding opportunities of remanufacturing, reusing or recycling materials and keeping them in use for longer, both resource use and waste generation can be reduced.

An integrated design approach will be followed that uses excavated material to satisfy the engineering and environmental mitigation earthworks requirements of the Proposed Scheme. This will reduce both the need for imported materials and the amount of excavated material requiring disposal. Excavated material will only be considered for off-site reuse, treatment, recycling or disposal if it:

- is not required on-site;
- is unsuitable for use; or
- cannot be economically treated to make it suitable for use.

Monitoring

Construction

Monitoring and recording of waste management activities will be undertaken by contractors in accordance with the CoCP.

Operation

Monitoring of waste management activities will be undertaken by train operating companies and other operators of the Proposed Scheme in accordance with statutory requirements.

7.18 Water resources and flood risk

Mitigation

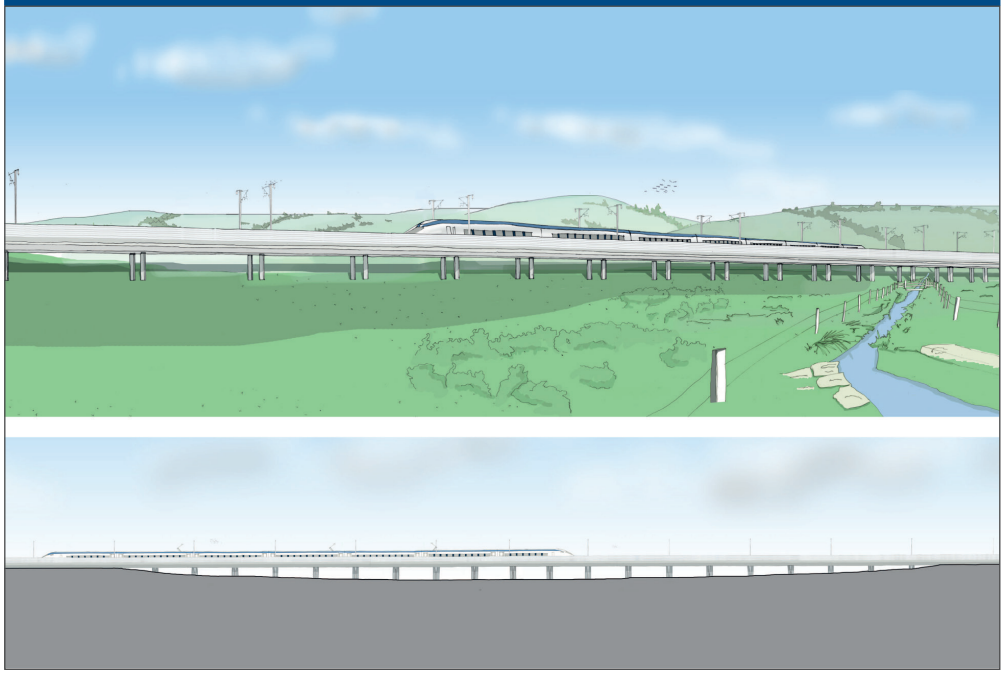
HS2 Ltd has designed the Proposed Scheme to avoid or reduce adverse impacts on surface water and groundwater resources and flood risk. Where adverse impacts on receptors cannot be avoided, mitigation measures have been incorporated, where necessary.

The Proposed Scheme will cross watercourses either by viaduct (see Figure 21), bridge or culvert. These structures, together with cuttings and embankments, are being designed to take into account the potential impact on surface waters and groundwater. Minor realignments or short diversions of watercourses are proposed in some locations to reduce the number of crossings. Mitigation measures have been embedded within the construction methodology and design of the scheme to:

- reduce effects on the water environment; and
- ensure the scheme complies with the objectives of the Water Framework Directive.

These measures have been identified in liaison with the Environment Agency and will be developed further during detailed design.

Figure 21: Illustration of a generic low viaduct



Measures set out in the draft CoCP will reduce effects during construction, as far as is reasonably practicable, including effects on local groundwater levels during excavation works.

Where reasonably practicable, the Proposed Scheme will be designed to avoid an increase in the risk of flooding from all sources in line with relevant guidance, taking into account the projected impact of climate change. Replacement flood storage areas will be created where the unavoidable loss of areas of floodplain could lead to a significant effect on flood risk. Sustainable drainage is also being incorporated into the design, where reasonably practicable, to control the rate, volume and quality of runoff.

The design of the Proposed Scheme will seek to ensure that controlled waters - rivers, streams, canals, lakes, ponds, ditches and groundwater – are protected from pollution and that appropriate water quality standards are met.

Existing groundwater abstraction boreholes or monitoring points will be protected from physical damage, insofar as reasonably practicable. This will include the appropriate decommissioning of abandoned boreholes to remove potential pollution pathways.

Engagement has been, and will continue to be, undertaken with the following organisations to ensure that likely residual significant adverse effects are managed and mitigated appropriately: Environment Agency, Scottish Environment Protection Agency, Lead Local Flood Authorities, water companies and the Canal & River Trust.

Monitoring

Construction

Contractors will implement appropriate procedures for monitoring and inspecting surface water and groundwater. This will include procedures to monitor the effectiveness of the mitigation measures associated with potentially significant effects.

Where potentially significant effects on Water Framework Directive water bodies have been identified, appropriate monitoring will be undertaken to determine whether such effects may occur or are occurring. Relevant statutory undertakers will be consulted regarding water quality, flow and level monitoring. This will be undertaken for surface and groundwater water bodies potentially affected by construction of the Proposed Scheme.

The nominated undertaker will require its contractors to undertake monitoring to identify, for example:

- pollution risks that are unacceptably high;
- spillages;
- non-compliance with the CoCP; and
- leakages and suspected pollution incidences.

Appropriate action will be taken where pollution risks are unacceptably high (as confirmed by the relevant regulatory body), where there is non-compliance with the CoCP, where spillages and leakages are unacceptable or where there are any suspected pollution incidents.

Operation

Monitoring will be undertaken in agreement with the relevant statutory undertaker. The purpose of the monitoring will be to confirm the effectiveness of implemented mitigation.

The duration of this monitoring will be agreed in consultation with the Environment Agency or Scottish Environment Protection Agency and will depend on the nature of the potential impact concerned.

8 Summary of environmental effects by Community Area

8 Summary of environmental effects by Community Area

8.1 Introduction

This section provides the following for each of the eight Community Areas as shown in Figure 22:

- a summary of the existing environment within the area;
- a brief description of the Proposed Scheme in the area;
- a description of how the design has evolved since the working draft Environmental Statement (ES) and the avoidance and mitigation measures proposed to reduce environmental impacts; and
- a description of any likely significant residual environmental effects, in the area for the following topics:
  - agriculture, forestry and soils;
  - air quality;
  - community;
  - ecology and biodiversity (impacts on barn owls during operation are considered to be a route-wide effect and therefore reported in Section 9 of this non-technical summary (NTS);
  - health (see following paragraph regarding health effects);
  - historic environment;
  - land quality;
  - landscape and visual;
  - socio-economics;
  - sound, noise and vibration;
  - traffic and transport; and
  - water resources and flood risk.

The Proposed Scheme will impact a range of environmental and social factors that have the potential to affect health. Since there are no accepted criteria for defining 'significant' health effects, professional judgements have been made as to the level and type of impact that could potentially affect health.

Those topics not listed above (climate change, major accidents and disasters, waste and material resources and electromagnetic interference) are not considered to give rise to local level impacts. The route-wide impacts for these topics are described in Section 9, Summary of route-wide effects, of this NTS, and in more detail in Volume 3, Route-wide effects. Section 9 also considers the overall changes to employment levels arising from the construction and operation of the Proposed Scheme.

For each community area, the summary of likely significant environmental effects is generally confined to 'residual effects', i.e. those significant adverse and beneficial environmental effects of the Proposed Scheme that are likely to remain after the range of mitigation measures already incorporated into the design of the Proposed Scheme and the Code of Construction Practice (CoCP) are in place.

The likely significant effects reported in this section are adverse unless otherwise stated.

All measurements of lengths and areas reported are approximate, except in relation to Traffic and transport.

8.2 Hough to Walley's Green area (MA01)

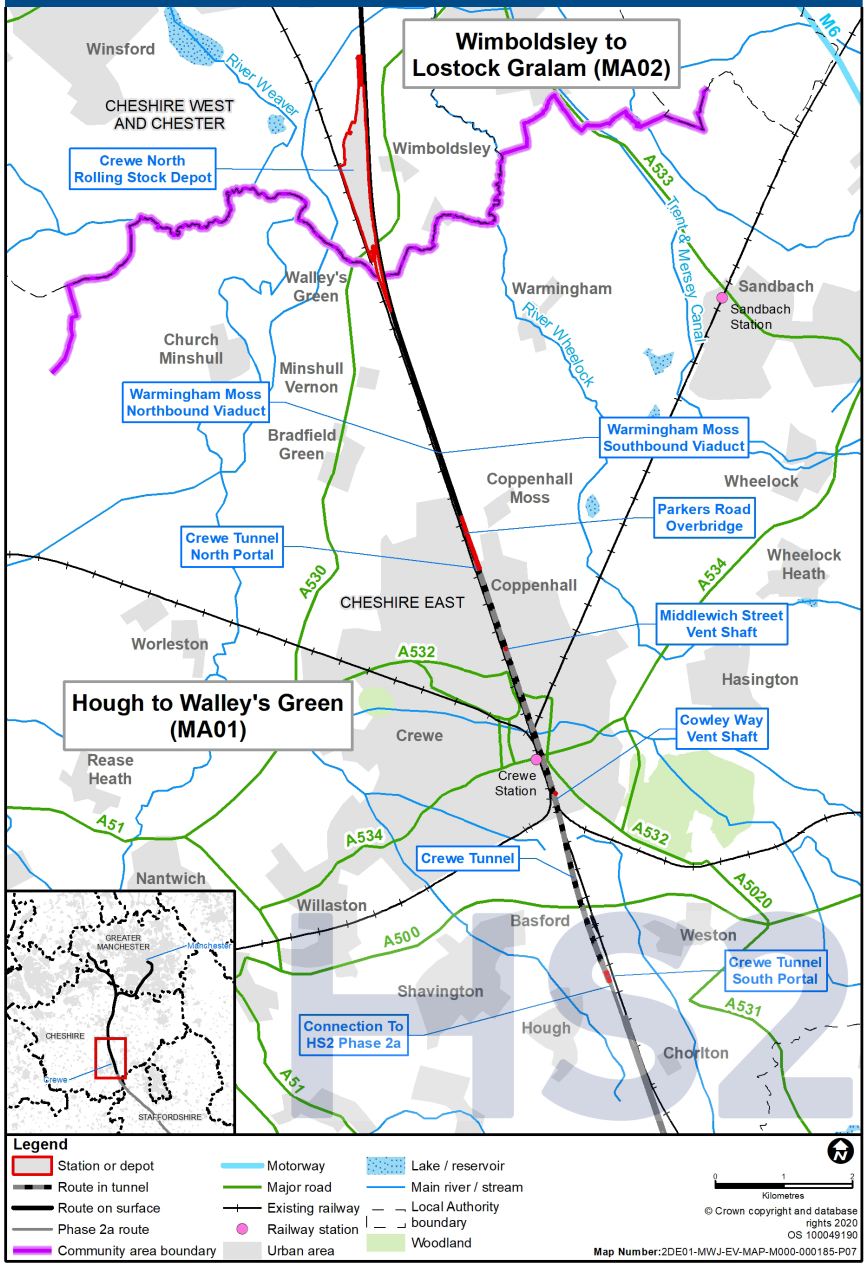
Overview

The route of the Proposed Scheme in the Hough to Walley's Green area will be 10.8km (6.7 miles) in length, extending north-west from the east of Hough to the east of Walley's Green. The area falls within the local authority area of Cheshire East Council (see Figure 22).

The southern section of the area through Crewe is predominantly urban in character with industrial, commercial, railway and residential land uses. North of Crewe, the area is rural in character, with agriculture being the main land use.

The main settlement is Crewe, with the key residential areas of Wistaston and Wistaston Green to the south, and Coppenhall, Maw Green and Barrows Green to the north. Crewe Gates Farm Industrial Estate dominates the south-east part of Crewe.

Figure 22: Hough to Walley's Green area (MA01) context map



The Proposed Scheme

The route of the Proposed Scheme will begin to the south of the existing Crewe Station, south of the A500 Shavington Bypass, where it will connect to the HS2 Phase 2a scheme at Hough. It will then enter the Crewe tunnel and pass under Crewe before transitioning into cutting north of Crewe. The route will continue on embankment north-west towards Wimboldsley, passing to the east of Bradfield Green and Walley's Green, continuing into the Wimboldsley to Lostock Gralam area (MA02).

In this area, the Proposed Scheme also includes the Crewe Northern Connection which will connect the route of the Proposed Scheme to the West Coast Main Line (WCML). Crewe Northern Connection will allow high speed services to call at an enhanced Crewe Hub Station, and future Northern Powerhouse Rail (NPR) services to connect with HS2. Crewe Northern Connection northbound will provide connections towards Manchester and Liverpool and Crewe Northern Connection southbound will provide connections towards Crewe and London. This will provide more journey opportunities for passengers and capitalise on the journey time and performance improvements made by the Proposed Scheme.

The Crewe North rolling stock depot (RSD) will be located in the Wimboldsley to Lostock Gralam area (MA02). WCML reception tracks will connect the WCML to the Crewe North RSD. These reception tracks will mainly be located within the Hough to Walley's Green area. The WCML will need to be realigned and modified in the area. This is to enable it to accommodate, and connect with, the reception tracks and the Crewe Northern Connection.

In this area, the Proposed Scheme will require the demolition of two residential properties, three commercial properties (including farm outbuildings), two other structures (a footbridge over the WCML and an overbridge for access to agricultural land) and a solar farm. There will be permanent realignment or diversion of one road, six public rights of way and one watercourse. One main construction compound and five civil engineering satellite construction compounds will be required. All of these compounds will continue to be used for railway systems works following the completion of the civil engineering works. The main construction compound in this area will provide temporary accommodation for up to 70 workers.

Changes in the design of the Proposed Scheme in this area since the working draft ES

Key design changes include:

- the introduction of the Crewe Northern Connection to connect the WCML to the route of the Proposed Scheme;
- introduction of reception tracks from the WCML to Crewe North RSD;
- changes to the WCML as a result of the introduction of Crewe Northern Connection and WCML reception tracks; and
- Crewe tunnel south portal and tunnel portal building and rescue area, which were provided for in the HS2 Phase 2a scheme, will now be constructed as part of the Proposed Scheme.

Avoidance and mitigation measures

During the development of the design, measures have been incorporated to avoid or mitigate adverse impacts in this area including:

- amendments to the Crewe tunnel to avoid direct effects on Mere Gutter with Basford Brook Local Wildlife Site, deciduous woodlands at Crewe Station sidings and the watercourses of Basford Brook, Gresty Brook and Valley Brook;
- landscape mitigation planting to provide visual screening for residents in Coppenhall Moss, Warmingham Moss, at Moss Farm and Moss Fields Farm;

- provision of continued access to the Crewe and Nantwich Circular Walk during construction; and
- noise fence barriers to provide acoustic screening for residents along Parkers Road and Broughton Road, and for Spring Farm, White House, Springfield Cottage and Barrows Green.

Residual effects

No likely adverse residual effects have been identified as arising during operation for agriculture, forestry and soils, air quality, historic environment, land quality and water resources and flood risk.

The following sections provide a summary of the likely significant residual environmental effects identified for the Hough to Walley's Green area.

Agriculture, forestry and soils

Construction

During construction, 133ha of agricultural land will be required, of which 6ha is high quality agricultural land. Some of this land will be restored following construction, with 81ha permanently required, 1ha of which is high quality agricultural land.

Construction of the Proposed Scheme will result in temporary significant effects at 12 farm holdings in this area due to the proportion of land required during construction. Of these 12, eight holdings will be permanently significantly affected due to the proportion of land required and loss of assets. Land required temporarily will, in accordance with a restoration scheme agreed with the landowner and the relevant planning authority, be returned to the farm holding following the completion of construction. Three holdings will be significantly affected by property demolitions: Bridge Farm and Moss Bridge Farm (Winton Equestrian Centre) due to the loss of residential property and buildings; and Moss Farm due to the loss of a solar farm.

The compensation code provides for compensation for the loss of agricultural land and for losses resulting from disturbance to agricultural activities.

Air quality

Construction

Eight residential properties located on the B5076 North Street/Bradfield Road and on Broughton Road will temporarily experience a worsening of the air quality (NO2 concentrations) because of the additional construction traffic generated on these roads. These concentrations are similar to those currently experienced at other properties along these roads.

Community

Construction

Construction of the Proposed Scheme will result in the permanent loss of the Winton Equestrian Centre.

During construction, 0.66ha (55% of the park's area) of land will be required from Yellow Park, an informal open space, of which 0.22ha of land will be permanently required at the western end of Ridgway Street, Audley Street West and Mellor Street for the Middlewich Street vent shaft. The loss of parkland will have an adverse effect on recreational users of the open space.

Residents will experience a combination of noise and Heavy Goods Vehicle (HGV) traffic effects associated with construction of the Proposed Scheme resulting in a temporary significant effect for: 25 residential properties along Sydney Road in Crewe; and 30 residential properties along the A530 Middlewich Road, Crewe.

Staff and pupils at Oakfield Lodge School will also experience a combination of noise and HGV traffic effects associated with the construction of the Proposed Scheme resulting in a temporary significant effect.

Residents are likely to experience a combination of HGV traffic and air quality effects associated with construction of the Proposed Scheme resulting in a temporary significant effect for: approximately 20 residential properties along the B5076 Bradfield Road in Crewe; and five residential properties along the B5076 North Street, Crewe.

Residents are likely to experience a combination of noise and visual effects associated with construction of the Proposed Scheme resulting in a temporary significant effect for: 45 residential properties in the vicinity of Wareham Drive in Crewe; and 20 residential properties in the vicinity of Perry Fields in Leighton.

Approximately 250 residential properties in the vicinity of Broughton Road, Crewe will experience a combination of noise, vibration, visual and air quality effects associated with construction of the Proposed Scheme resulting in a temporary significant effect.

Operation

Ground-borne noise from trains passing through the Crewe tunnel will be noticeable for residents of the Bentley Manor Care Home. In addition, some residents of the care home may experience changes to their visual environment due to views of the Proposed Scheme at the surface.

Fifteen residential properties on the B5067 Middlewich Street will experience a combination of visual effects due to views of an adjacent vent shaft headhouse and ground-borne noise effects from trains travelling in the tunnel under the properties.

Ecology and biodiversity

Construction

The assumed loss of veteran trees from Moss Bridge Marsh Local Wildlife Site and Spring Plantation Grassland Local Wildlife Site will result in a permanent adverse residual effect that is significant at the national level. Where reasonably practicable, measures will be taken to protect veteran trees that are currently assumed to be lost.

On a precautionary basis, it is assumed that there will be a net loss of 17.9km (9.3 miles) of hedgerow, resulting in a permanent adverse residual effect. However, restoration of land required only for the construction of the Proposed Scheme to its current use offers the potential for additional retention and replacement of hedgerow.

Health

Construction

Construction works will be visible at street level around Broughton Street, around Wareham Drive, Crewe and along Perry Fields, Leighton. Construction noise generated by these works will also be noticeable. In addition:

- residential properties along Sydney Road and approximately 30 residential properties on the A530 Middlewich Road will experience significant HGV traffic effects and noise effects;
- residential properties along the B5076 North Street and the B5076 Bradfield Road will experience significant HGV traffic effects and air quality effects; and
- some properties along Broughton Road are expected to experience significant noise effects from traffic and significant air quality effects.

People in this community are likely to experience these effects as changing the quality of their neighbourhood and diminishing the amenity of the settlement.

Construction of the Proposed Scheme will require the demolition of the Winton Equestrian Centre, and hence the loss of opportunities for physical activity.

Staff and pupils of Oakfield Lodge School will experience significant noise effects and an increase in HGV movements due to construction of the Proposed Scheme, which may reduce the beneficial wellbeing effects associated with educational attainment. HS2 Ltd is continuing to engage with Oakfield Lodge School and Cheshire East Council to identify reasonably practicable measures to help mitigate the potential effects identified.

The temporary construction workforce is likely to comprise a mixture of local people and workers from further afield. This could mean that local communities see temporary changes to their population size and demographics.

Operation

Ground-borne noise from trains passing through the Crewe tunnel will be noticeable for residents of the Bentley Manor Care Home and the Sherborne Court Neurological Centre. In addition, some residents of the care home may experience changes to their visual environment due to the presence of the Proposed Scheme above ground. Therefore, permanent changes to the care home and neurological centre's environments are expected, which may be noticeable for some residents. For those residents affected, this may lead to a reduction in the wellbeing benefits associated with the care home environment. HS2 Ltd will continue to engage with the operators of Bentley Manor Care Home and Sherborne Court Neurological Centre to identify reasonably practicable measures to mitigate adverse health effects.

HS2 Ltd continues to review design and mitigation in relation to ground-borne noise effects, and any changes will be brought forward during the passage of the Bill in Parliament.

Historic environment

Construction

Construction of the Proposed Scheme will result in a permanent effect due to physical impact (either permanent loss or partial removal) on three non-designated heritage assets: archaeological features at Warmingham Moss; Bridge Farm and former farmstead, Parkers Road; and Moss Bridge Farm, Parkers Road.

Construction of the Proposed Scheme will result in permanent impacts to Crewe Mossland Historic Landscape Character Area. Introduction of the Proposed Scheme into this Historic Landscape Character Area will remove characteristic features such as field boundaries, and affect the character and heritage value, which will result in an adverse significant effect.

Construction of the HS2 Phase 2a scheme and the Proposed Scheme will temporarily affect the setting of Basford Bridge Cottage and permanently affect the setting of the 1867 buildings at Crewe Station which is a cumulative effect.

Land quality

Construction

On a precautionary basis, construction of the Proposed Scheme will result in residual adverse effects with respect to sterilisation of the salt resources associated with Parkfield Farm extension to Warmingham Brinefield. The Parkfield Farm extension to Warmingham Brinefield has planning permission for seven salt caverns. The Proposed Scheme will impact on the viability of four of these caverns and therefore result in a loss of this resource.

Landscape and visual

Construction

Temporary residual effects will arise from the presence of construction works including night-time lighting and changes to the existing landform and vegetation patterns that will affect the character of the local landscape. Where reasonably practicable, effects will be reduced by early planting to reduce the visibility of the Proposed Scheme. A set of mitigation measures, including those in the draft CoCP, will be implemented to reduce landscape and visual effects further throughout the construction works.

Construction of the Proposed Scheme will result in adverse effects on two landscape character areas (LCA), Wimboldsley Plain LCA and Crewe Fringe Mossland LCA, due to changes in landforms and impacts on the tranquillity of this predominantly agricultural landscape.

Construction of the Proposed Scheme will result in significant visual effects at 17 representative viewpoints, including on views from locations on Casey Lane, the B5076 Middlewich Street, Bradfield Road and Broughton Road. Of these, residents at nine representative residential viewpoint locations will also experience adverse night-time visual effects due to additional lighting associated with construction compounds.

The combination of HS2 Phase 2a and the Proposed Scheme during construction will result in an adverse cumulative effect on the Shavington/Crewe Outer Fringe Lower Farms and Woods LCA and Blakenhall Lower Farms and Woods LCA, which is significant.

The combination of HS2 Phase 2a and the Proposed Scheme during construction will result in an adverse cumulative effect on views from five representative viewpoint locations on Newcastle Road (two viewpoints), Hough, Casey Lane and Weston Lane, which is significant. At night, the combination of HS2 Phase 2a and the Proposed Scheme during construction will result in an adverse cumulative effect at one representative viewpoint location on Casey Lane, which is significant.

Operation

During operation, the effects of the Proposed Scheme on the character and appearance of the local landscape will substantially reduce over time as mitigation planting grows and matures. However, effects may remain significant.

The Proposed Scheme will have a residual adverse effect on Wimboldsley Plain LCA due to uncharacteristic built structures in the area.

Operation of the Proposed Scheme will result in significant visual effects at six representative viewpoints within the area including views: south-east from public open space bordering the B5076 Middlewich Street; looking east from Moss Lane, Crewe and Nantwich Circular Walk; and looking east from Footpath Minshull Vernon 2/1, east of Moss Lane.

View from Footpath Minshull Vernon 2/1 looking towards the proposed Warmingham Moss Northbound viaduct and Warmingham Moss Southbound viaduct (year 1 of operation)

Socio-economics

Construction

The Proposed Scheme will result in the loss of land at Crewe Truck Stop and Cafe on Cowley Way. It will also prevent construction of a development for Bentley Motors Ltd.

During construction of the Proposed Scheme, The White Lion public house will experience temporary adverse residual significant isolation effects as a result of a road closure.

Operation

Residents of the Bentley Manor Care Home will experience in-combination ground-borne noise and visual effects during operation of the Proposed Scheme. HS2 Ltd continues to review design and mitigation in relation to ground-borne noise effects, and any changes will be brought forward during the passage of the Bill in Parliament.

Sound, noise and vibration

Construction

The proposed avoidance and mitigation measures will reduce noise and vibration from the construction activities inside all individual dwellings such that residents will not be significantly affected.

Noise from construction will result in significant effects on residential communities closest to the construction works in Crewe (north) and Leighton. Construction vibration effects will be experienced in the residential community areas of Coppenhall and Crewe (north).

Construction traffic is likely to cause significant noise effects on adjacent residential properties on Sydney Road, Landsdowne Road, Limetree Avenue, Broughton Road and the A530 Middlewich Road.

Noise from construction will result in significant effects on the following non-residential buildings: Car Parts Retail, Gist Engineering, and Bentley Car Scheme on Cowley Way; Scope House Business Centre on Weston Road; Cemetery Lodge, Orbitas Bereavement Services and Crewe Cemetery and Crematorium on Market Close; Oakfield Lodge School on Warmingham Road; and Spring Farm Business Centre on Moss Lane.

Vibration from construction will be experienced at the Bentley Manor Care Home.

A comprehensive set of mitigation measures, including those in the draft CoCP, will be implemented to control noise and vibration throughout the construction works.

HS2 Ltd will continue to seek reasonably practicable measures to reduce or avoid these residual significant noise and vibration effects. In doing so HS2 Ltd will continue to engage with stakeholders to fully understand the receptor, its use and the benefit of the measures.

Operation

At the community level, the envisaged mitigation, including landscape earthworks and noise mitigation, such as noise fence barriers, will substantially reduce the potential airborne noise impacts and noise effects that would otherwise arise from the Proposed Scheme. Significant residual adverse effects are likely to remain due to increased ground-borne noise levels for occupants of 265 residential properties in the vicinity of the following locations in Crewe: Earle Street, Brierley Street, Broughton Road, North Street, North Stafford Street, Thomas Street, Wallis Street, Henry Street, Middlewich Street, Ridgeway Street, Audley Street, Sheppard Close, Sherbourne Road, Broad Street, Cranbourne Road, Greenacres, Crossway, Lime Street, Hazelmere Way, Basford Road, Broad Street, Hazel Grove, Churchmere Drive and Chapelmere Court.

At the majority of individual residences, the proposed mitigation measures will reduce noise inside all dwellings such that it does not reach a level where it will significantly affect residents. However, significant residual adverse effects are likely to remain for 35 individual residential properties in Crewe, due to ground-borne noise from Crewe tunnel.

The assessment has identified a likely significant ground-borne noise effect from Crewe tunnel at the following non-residential receptors: Best Western Crewe Arms Hotel, Nantwich Road; Eurosales and Eurocard Centre (offices), Herald Park, Herald Drive; ChuffChuff (dance studio), Middlewich Street; Sherborne Court Neurological Centre, Sherborne Road; Bentley Manor Care Home, Sherborne Road; and Cooperative Funeral Services (offices), Middlewich Street.

HS2 Ltd continues to review design and mitigation in relation to ground-borne noise effects, and any changes will be brought forward during the passage of the Bill in Parliament.

Significant beneficial effects are likely to occur due to decreased noise levels for occupants of residential properties at the following locations in Leighton, Crewe: Bowland Croft, Wharfdale Avenue, Hawswater Avenue, Buttermere Drive, Bleasdale Road, Aysgarth Avenue and Perry Fields. This is due to more noise barriers being erected in this area to mitigate noise from an increase in train services.

HS2 Ltd will continue to seek reasonably practicable measures to reduce or avoid these likely residual significant noise and vibration effects. In doing so HS2 Ltd will continue to engage with stakeholders to fully understand the potentially affected receptors, their use and the benefit of the measures.

Traffic and transport

Construction

Temporary diversions or realignments will result in increases in journey length for vehicle users of Parkers Road.

The most intensive periods of construction of the Proposed Scheme will cause changes in traffic that will result in additional congestion and/or delays for road users at 33 junctions. However, road users of one junction will experience improvements to congestion and/or delays.

Increases in traffic during construction will make it more difficult for non-motorised users to cross roads throughout this area on 77 roads. However, users of two roads will find it easier to cross due to road improvements.

The loss of parking spaces during the construction period will impact both McColl's convenience store and Crewe Truck Stop and Café.

Changes in bus journey times will lead to public transport delays on one bus corridor.

Temporary closure or diversion/realignment of public rights of way and roads will increase travel distances for non-motorised users of six public rights of way.

Operation

The operation of the Proposed Scheme will result in the permanent loss of parking spaces at Crewe Truck Stop and Café.

Closure or diversion/realignment of public rights of way and roads due to the operation of the Proposed Scheme will increase journey length for non-motorised users of four public rights of way. The permanent widening, realignment, diversion or extension of six public rights of way and one road will have an impact on journey lengths or introduce difficulties for non-motorised users wishing to cross the road.

Water resources and flood risk

Construction

On a precautionary basis it is anticipated that a temporary significant adverse residual effect will remain on water quality in Basford Brook relating to highways discharges from David Whitby Way.

The design of mitigation in this area will be refined in consultation with the Environment Agency and other stakeholders to reduce the impact on water quality and ensure that as far as reasonably practicable there are no significant effects on Basford Brook.

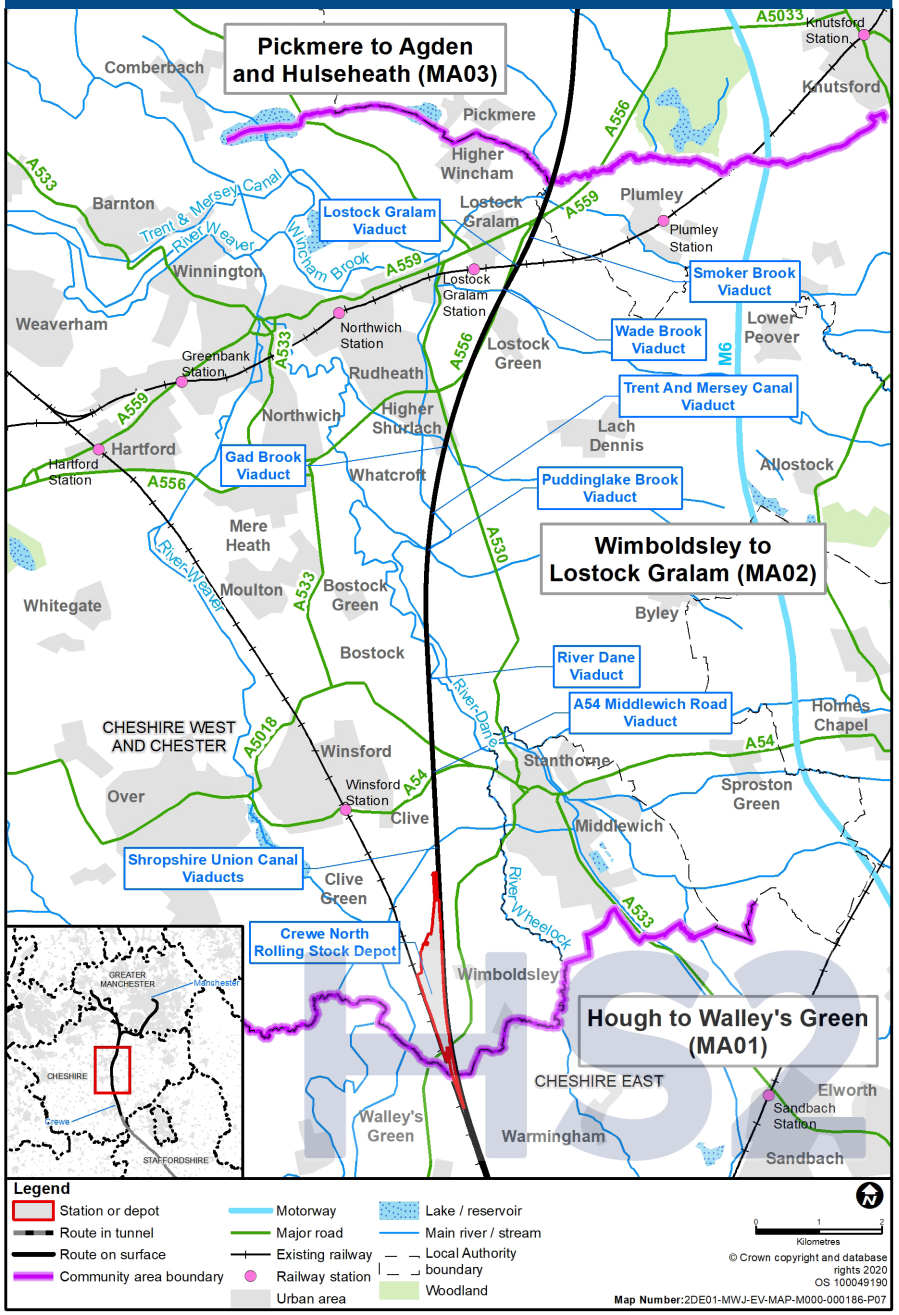
8.3 Wimboldsley to Lostock Gralam area (MA02)

Overview

The route of the Proposed Scheme in the Wimboldsley to Lostock Gralam area will be 14.6km (9.1 miles) in length, extending north from Wimboldsley to the east of Higher Wincham. The area falls within the local authority areas of Cheshire West and Chester Council and Cheshire East Council (see Figure 23).

The area is a mix of rural and urban areas, with agriculture being the main land use. The main settlements are Middlewich and Winsford, located in the south of the area, and Northwich, Lostock Green and Lostock Gralam, located in the north of the area. The low-lying agricultural land is interspersed with occasional woodland including ancient woodland, the smaller settlements of Wimboldsley, Stanthorne, Bostock Green and Lach Dennis and isolated dwellings and farmsteads.

Figure 23: Wimboldsley to Lostock Gralam area (MA02) context map



The Proposed Scheme

The route of the Proposed Scheme will continue north from the Hough to Walley's Green area on embankment, passing Middlewich to the east, before crossing the Middlewich branch of the Shropshire Union Canal on viaduct. The Proposed Scheme will continue on embankment, passing Winsford to the west and crossing the River Dane on viaduct. The route will continue north towards Lostock Gralam, alternating between embankment and viaduct to cross over Puddlinglake Brook, the Trent and Mersey Canal, Gad Brook, Wade Brook, Peover Eye and Smoker Brook before continuing into the Pickmere to Agden and Hulseheath area.

In this area, the Proposed Scheme also includes the Crewe North RSD, which will be provided on land between the route of the Proposed Scheme and the WCML, north-east of Walley's Green. The Crewe North RSD will serve as an operational and maintenance hub for HS2 rolling stock. Reception tracks will connect the RSD to both the WCML and the route.

The Proposed Scheme also includes the Crewe North infrastructure maintenance base – rail (IMB-R). This will be located on 4ha of land between the route of the Proposed Scheme and the WCML, north-east of Walley's Green. It will span the Hough to Walley's Green (MA01) and the Wimboldsley to Lostock Gralam (MA02) areas. The Crewe North IMB-R will be a maintenance facility and storage area for the Proposed Scheme. It will support the main maintenance base at Stone, which is part of the Phase 2a scheme. Crewe North RSD will be located just to the north of the IMB-R, in the Wimboldsley to Lostock Gralam area. It will serve as an operational and maintenance hub for HS2 rolling stock.

Additionally, the Crewe Northern Connection will connect the route to the WCML. Crewe Northern Connection will allow high speed services to call at an enhanced Crewe Hub Station, and future NPR services to connect with HS2.

In this area, the Proposed Scheme will require the demolition of 24 residential properties, four commercial properties (including farm outbuildings) and three other structures comprising two bridges and a public convenience. There will be permanent closure, realignment or diversion of nine roads and four public rights of way. The Proposed Scheme will require excavation of engineering material from four borrow pits in this area.

There will be 23 civil engineering satellite construction compounds required in this area (including four borrow pit compounds) which will be managed from two main compounds located in the Hough to Walley's Green area and the Pickmere to Agden and Hulseheath area. Seven of these satellite compounds will continue to be used as satellite compounds for railway systems following the completion of civil engineering works at those compounds. There will be one further satellite compound used for railway systems works only. Three satellite construction compounds in this area will provide temporary accommodation for up 90, 125, and 100 workers respectively.

Changes in the design of the Proposed Scheme in this area since the working draft ES

Key design changes include:

- the introduction of four borrow pits for the extraction of acceptable engineering material for construction;
- introduction of the Crewe Northern Connection to connect the route of the Proposed Scheme to the WCML and facilitate the delivery of train services envisaged by Crewe Hub;
- a change in the horizontal alignment of the route east by up to 60m, to accommodate the Crewe Northern Connection and WCML reception tracks to the Crewe North RSD;
- changes to the Crewe North RSD;

- introduction of temporary construction sidings on the same site as the Crewe North RSD, which will provide a facility to handle material during the construction of Proposed Scheme; and
- the introduction of the Crewe North IMB-R to support the maintenance of railway infrastructure.

Avoidance and mitigation measures

During the development of the design, measures have been incorporated to avoid or mitigate adverse impacts in this area including:

- the use of viaducts to avoid direct effects on the Shropshire Union Canal (Middlewich Branch), the River Dane, the Trent and Mersey Canal and other watercourses and allow free passage for wildlife beneath them;
- the design of drainage associated with the Crewe North RSD to avoid impacts on the saline spring habitat at Wimboldsley Wood SSSI;
- compensatory woodland habitat creation such as at Long Wood near Lostock Gralam and Stove Room Wood near Wimboldsley, providing habitat connectivity and enhanced landscape/green infrastructure connectivity;
- noise fence barriers to provide acoustic screening for the communities of Wimboldsley, Clive, Stanthorne, Whatcroft, Pear Tree Farm Cottages, Rudheath, Lostock Green, Lostock Gralam and Ascol Drive, Plumley; and
- the use of borrow pits to reduce the need for longer distance transport and import of engineering materials, thereby reducing the volume and impact of road traffic on local roads and communities.

Residual effects

The construction phase of the Proposed Scheme is not likely to result in any adverse residual effects on air quality in this area.

No likely adverse residual effects have been identified as arising during operation for agriculture, forestry and soils, land quality, socio-economics and water resources and flood risk.

The following sections provide a summary of the likely significant residual environmental effects identified for the Wimboldsley to Lostock Gralam area.

Agriculture, forestry and soils

Construction

During construction, 639ha of agricultural land will be required, 243ha of which is high quality agricultural land. Some of this land will be restored following construction, with 296ha permanently required, 77ha of which is high quality agricultural land.

Construction of the Proposed Scheme will result in temporary significant effects at 24 farm holdings in this area due to the proportion of land required and, in some cases, severance (i.e. where areas of agricultural holdings are cut off from the surrounding area) during construction. Of the 24 holdings, 14 holdings will be permanently significantly affected due to the proportion of land required and/or farm severance and disruption. Land required temporarily will, in accordance with a restoration scheme agreed with the landowner and the relevant planning authority, be returned to the farm holding following the completion of construction. Four holdings will have property demolitions, at Yew Tree Farm, Greenheyes Farm, Higgins Lane Farm and High House Farm.

The compensation code provides for compensation for the loss of agricultural land and for losses resulting from disturbance to agricultural activities.

Air quality

Operation

There will be a residual significant beneficial effect at one residential property located on the A530 Nantwich Road, Occleston because of a realignment of the road further from properties and therefore a reduction in annual mean NO2 concentrations that will be experienced at this property.

Community

Construction

Construction of the Proposed Scheme will result in the permanent loss of: five residential properties on the A530 Nantwich Road in Wimboldsley; nine residential properties on Cookes Lane in Rudheath; and five residential properties on Birches Lane in Lostock Green. Construction will also require the demolition of Greenheyes Farm community resource in Stanthorne.

Effects associated with noise, vibration, HGV traffic and views of construction activities will result in temporary adverse effects at 20 residential properties in Clive Green. Construction of the Proposed Scheme will also result in residual adverse effects on approximately 40 residential properties along the B5309 Centurion Way, Middlewich and approximately 30 residential properties along the B5081 Byley Road in Byley due to the combination of noise and HGV traffic effects.

The construction of the Proposed Scheme will result in the temporary use of 1.2ha of the 12ha of land at Winnington and Peas Wood Local Wildlife Site. Of the 1.2ha of land required temporarily, 0.4ha will be required permanently. The construction of the Proposed Scheme will permanently prevent access to the woodland from the A559 Manchester Road, which will mean that the majority of the walking track and woodland will be inaccessible. HS2 Ltd proposes to re-instate the permissive path through Winnington and Peas Wood Local Wildlife Site during operation. Construction of the Proposed Scheme will also permanently require all 2.2ha of land at the Lostock Green picnic area.

Operation

The combination of noise from, and views of the operation of the Proposed Scheme will permanently affect approximately 15 residential properties in Clive Green, 10 residential properties at Clive, 25 residential properties at Stanthorne, 25 residential properties at Whatcroft and 10 residential properties at Davenham Road.

Ecology and biodiversity

Construction

Construction of the Proposed Scheme will lead to the loss of 1.3ha of ancient woodland from the following Ancient Woodland Inventory sites: Stanthorne Hall Farm; Bull's Wood; Winnington Wood; and Leonard's and Smoker Wood. Ancient woodland is irreplaceable and its loss will result in a significant permanent adverse residual effect. The loss of ancient woodland will be partly compensated through a range of measures, including planting of 11.8ha of native broadleaved woodland, the translocation of ancient woodland soil with its associated seed bank where appropriate and planting native trees and shrubs.

Within the land required for construction it is assumed that all but one veteran tree will be lost. Where reasonably practicable, measures will be taken to protect veteran trees that are currently assumed to be lost.

Construction on the Proposed Scheme will result in the loss of orchard habitat from Bostock Road Orchards Local Wildlife Site and Pear Tree Farm. Measures will be taken to protect as much of the orchard habitat at these locations as far as is reasonably practicable.

On a precautionary basis, it is assumed that there will be a net loss of 56.9km (35.4 miles) of hedgerow, which will result in a permanent adverse residual effect. However, restoration of land required for the construction of the Proposed Scheme to its current use, offers potential for additional retention and replacement of hedgerow.

Cumulative effects with committed development

The operation of the proposed development 'Middlewich Eastern Bypass', expected from 2021 onwards, is anticipated to result in an adverse impact on barn owl as a result of collision risk during operation. Operation of the Proposed Scheme, expected from 2038, is also anticipated to result in a negative impact on barn owl in these locations due to the risk of train collision. The consecutive nature of these impacts is likely to result in an increase in mortality of barn owl over time, leading to an overall reduction in breeding success for these pairs until mitigation for both schemes is established. The cumulative effect of the Proposed Scheme and committed development will therefore result in a significant adverse effect on barn owl at Wimboldsley and north-west of Middlewich.

Health

Construction

The Proposed Scheme will result in the demolition of five properties in the village of Wimboldsley, which are considered non-designated heritage assets. This represents a large proportion of the local community. The erosion of social networks resulting from these demolitions will have the potential to reduce the levels of social contact and support and the health benefits they generate.

HS2 Ltd will continue to engage with the parties affected. Owners and occupiers of properties acquired for the construction of the Proposed Scheme are eligible for compensation in accordance with the compensation code.

Construction of the Proposed Scheme will result in the demolition of Greenheyes Farm on Northwich Road in Stanthorne. The loss of the facilities provided by the farm will result in a reduction in the beneficial wellbeing effects associated with educational activities.

The combination of construction noise, visual and traffic impacts will change the character of neighbourhoods and may impact on residents' quality of life. The community of Clive Green will experience a combination of noise, visual and traffic effects from construction of the Proposed Scheme. They are likely to experience this as changing the quality of their neighbourhood and to regard that change as adverse, both in diminishing the amenity of the village and in reducing the sense of its rural character.

Significant HGV traffic effects are expected to combine with significant traffic noise effects on residential properties on the B5309 Centurion Way and the B5081 Byley Road. The presence of construction traffic is also likely to give rise to concerns about road safety, which may contribute to perceptions of reduced neighbourhood quality.

Construction of the Proposed Scheme will temporarily require 1.2ha and permanently 0.4ha of Winnington and Peas Local Wildlife Site. This will permanently sever access to the woodland from the A559 Manchester Road. The reduction in opportunities for physical activity and access to green space is considered to result in an adverse health effect.

The temporary construction workforce is likely to comprise a mixture of local people and workers from further afield. This could mean that local communities see temporary changes to the local population size and demographics.

In Wimboldsley, the construction of the Proposed Scheme will affect neighbourhood quality as well as the levels of social contact and support

and the health benefits they generate. It is expected that the majority of the population at Wimboldsley will experience impacts on two or more environmental or social factors that influence health during the construction of the Proposed Scheme, and this may therefore result in a cumulative effect on health.

Operation

Noise and visual impacts from passing trains will result in permanent operational impacts on neighbourhood quality in the communities near the Proposed Scheme, including Clive Green, Clive, Stanthorne, Whatcroft and parts of Davenham Road. The presence of railway infrastructure within the local landscape will change the character of surrounding neighbourhoods.

It is considered likely that the effects on wellbeing will lessen over time, as mitigation planting becomes established.

Historic environment

Construction

Construction of the Proposed Scheme will result in significant effects due to permanent changes to the setting of five designated heritage assets: Lea Hall Grade II* listed building; Park Farmhouse, Clive Green Lane Grade II listed building; Bank Farmhouse Grade II listed building; Whatcroft Hall Grade II* listed building; and the Bridge Cottage and Canal Cottage Grade II listed buildings.

Construction of the Proposed Scheme will result in significant effects due to permanent changes to the setting of Dairy House Farm, now known as Stanthorne Park Mews, a non-designated asset.

There will also be an adverse effect on the Trent and Mersey Canal Conservation Area, Middlewich to Preston Brook, as the introduction of modern infrastructure will change the rural character of the conservation area that surrounds the canal.

Construction will result in permanent significant effects due to physical impact (either permanent loss or partial removal) on 22 non-designated heritage assets, including: numbers 1-4 Railway Cottages; Greenheys Farm; brick-making site by King Street; Roman roadside settlement, located in Rudheath; numbers 5, 7, 9, 11 Birches Lane; number 3 Birches Lane; RAF Cranage Airfield; Boundary Bank south of Bostock Hall; row of pits at Park Hall Farm; the Roman Salt Works near Bostock; and archaeological feature at Whatcroft Hall.

Construction will also result in a permanent significant effect due to physical impact on one designated heritage asset, the milepost on the A533 Bostock Road, a Grade II listed asset. The milepost will be removed during construction but will be safely stored for the duration of construction activities and will be returned, insofar as it is reasonably practicable, to its original location, or an alternative location agreed with the relevant stakeholders, before operation.

Operation

An additional significant permanent effect is predicted at Bridge Cottage and Canal Cottage, a Grade II listed building, during operation of the Proposed Scheme. The intermittent noise and presence of passing of trains on the nearby viaduct will alter the rural agricultural setting of the former farmhouse.

Land quality

Construction

There will a beneficial effect associated with the remediation of the former RAF airfield site.

Construction of the Proposed Scheme will result in likely significant residual effects with respect to sterilisation of the salt resources associated with the Springbank Farm extension to Holford Brinefield. The Springbank farm extension to Holford Brinefield has planning permission for 12 salt caverns.

On a precautionary bases the Proposed Scheme will impact on the viability of five of these caverns, resulting in the loss of these resources.

Landscape and visual

Construction

Temporary residual effects will arise from the presence of construction works including night-time lighting and changes to the existing landform and vegetation patterns that will affect the character of the local landscape. Where reasonably practicable, effects will be reduced by early planting to reduce the visibility of the Proposed Scheme. A set of mitigation measures, including those in the draft CoCP, will be implemented to reduce landscape and visual effects further throughout the construction works.

Construction of the Proposed Scheme will result in adverse effects on five LCA: Winsford and Middlewich Fringe Farmland LCA; Dane Valley LCA; Whatcroft and Billinge Green Flashes LCA; Lostock Plain LCA; and Wincham Brook and Holford Lower Wooded Farmland LCA. The loss of vegetation, noise from construction equipment, construction compounds and changes in landforms will impact the tranquillity of this predominantly agricultural landscape.

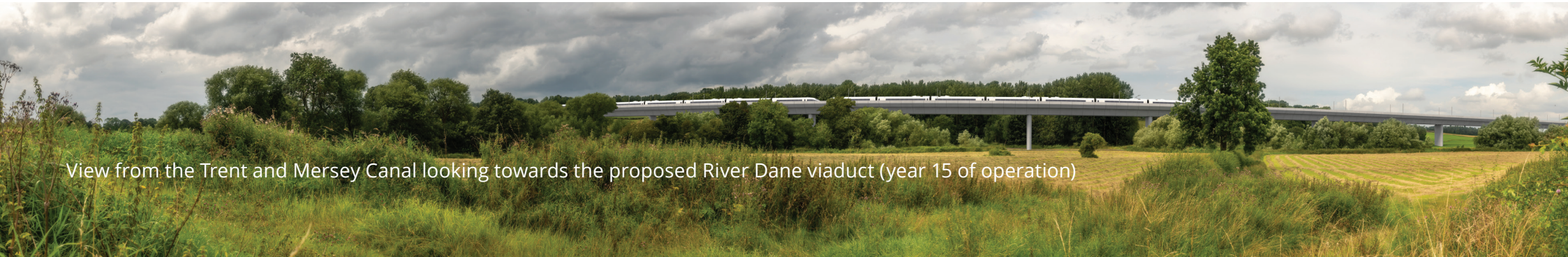
Construction of the Proposed Scheme will result in significant visual effects at 55 representative viewpoint locations within the area, including from: Footpath Wimboldsley 5, Verdin Arms public house, Walley's Green; Bellsmithy, A530 Nantwich Road; the Shropshire Union Canal (Middlewich Branch); Coalpit Lane, Wallange Paddocks Farm; Coalpit Lane, Stanthorne; Birch Lane, Stanthorne; Oldhall Farm, A533 Bostock Road; the Trent and Mersey Canal, Dane Valley; Bridge Farm, Whatcroft Hall Lane; Pear Tree Farm Cottages, Davenham Road; King's Lane Farm, Kings Lane; Broken Cross, the A556 Chester Road and the A530 King Street junction; Birch Grove, Lostock Green; Springbank Farm, Birches Lane; and Footpath Lostock Gralam 8, Plumley Lime Beds Site of Special Scientific Interest. Of these, residents at 17 representative residential viewpoint locations will also experience adverse night-time visual effects due to additional lighting associated with construction compounds.

Operation

During operation, the significant effects of the Proposed Scheme on the character and appearance of the local landscape will substantially reduce over time as mitigation planting grows and matures. However, effects may remain significant.

The Proposed Scheme will have a residual adverse effect on Winsford and Middlewich Fringe Farmland LCA, Dane Valley LCA and Whatcroft and Billinge Green Flashes LCA due to uncharacteristic built structures in the area.

Operation of the Proposed Scheme will result in significant visual effects at 35 representative viewpoints within the area, including on views from: Footpath Wimboldsley 5, Verdin Arms public house, Walley's Green; Bellsmithy, A530 Nantwich Road; the Shropshire Union Canal; Coalpit Lane,



View from the Trent and Mersey Canal looking towards the proposed River Dane viaduct (year 15 of operation)

Stanthorne; Birch Lane, Stanthorne; Oldhall Farm, A533 Bostock Road; the Trent and Mersey Canal; Bridge Farm, Whatcroft Hall Lane; Pear Tree Farm Cottages, Davenham Road; Broken Cross, the A556 Chester Road and the A530 King Street junction; Springbank Farm, Birches Lane; and Footpath Lostock Gralam 4, east of Fieldhouse Farm. Of these, residents at five representative residential viewpoint locations will also experience adverse night-time visual effects due to the proximity of lighting associated with realigned roads and elements of the Proposed Scheme.

Socio-economics

Construction

The Proposed Scheme will require land currently used for staff car parking at the Gadbrook Distribution Centre in Northwich. The operations of the business at this location could be affected by this loss. As a result of the construction, The Verdin Arms public house in Walley's Green will experience isolation effects as it will cease to have access to the main road (the A530 Nantwich Road) and is therefore likely to experience less exposure to and trade from passing travellers.

During construction, Holford Hall Estate Wedding Venue east of Lostock Gralam will experience significant noise effects which may discourage customers from using the venue, resulting in a significant adverse effect on the business.

Sound, noise and vibration

Construction

Noise from construction will result in significant effects on the acoustic character of residential communities closest to the construction works at Pear Tree Farm Cottages and Lostock Green. Noise and vibration effects from construction will affect the acoustic character of Clive Green.

Construction traffic is likely to cause significant noise effects on adjacent residential properties on: Darnhall School Lane, Glebe Green Drive and Mount Pleasant Drive between the B5074 Swanlow Lane and Woodford Lane West; the B5309 Centurion Way between the B5081 Byley Lane and the B5309 King Street; and the B5081 Byley Road between Lily Lane and the B5082 Northwich Road.

Noise from construction of the Proposed Scheme will result in temporary effects on the non-residential buildings at Holford Hall on the A556 Chester Road, Plumley.

Construction traffic is likely to cause significant noise effects on the non-residential properties of Lorien House on Darnhall School Lane and on Darnhall Primary School (Early Years Department) on Darnhall School Lane.

HS2 Ltd will continue to seek reasonably practicable measures to reduce or avoid these residual significant noise and vibration 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.

Operation

At the majority of 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.

Operation of the railway will result in noise effects on occupants of residential properties, due to potential noise increases above recognised thresholds, and hence change in the existing acoustic character around those properties closest to the Proposed Scheme at Clive Green, Clive, Stanthorne, Whatcroft and Pear Tree Farm Cottages.

There will also be beneficial airborne noise effects around the communities Lostock Green, including occupants of residential properties on Village Close, Cinder Lane and Birches Lane, due to decreases in sound from road traffic as a result of road realignment.

Operation of the Proposed Scheme will result in a residual significant operational airborne noise effect at Oakwood Marina (office), Davenham Road, Rudheath.

HS2 Ltd will continue to seek reasonably practicable measures to reduce or avoid these likely residual significant noise effects. In doing so HS2 Ltd will continue to engage with stakeholders to fully understand the potentially affected receptors, their use and the benefit of the measures.

Traffic and transport

Construction

Temporary diversions or realignments will result in increases in journey length for vehicle users of Davenham Road and Linnards Lane.

The most intensive periods of construction of the Proposed Scheme will cause changes in traffic that will result in additional congestion and/or delays for road users of 43 junctions. However, road users of four junctions will experience improvements in congestion and/or delays.

Increases in traffic during construction will make it more difficult for non-motorised users to cross roads throughout this area on 57 roads. However, users of six roads will find it easier to cross due to road improvements.

The loss of parking spaces during the construction period will impact the Gadbrook Distribution Centre.

Temporary closure or diversion/realignment of public rights of way and roads will increase travel distances for non-motorised users of five public rights of way and two roads.

Operation

The operation of the Proposed Scheme in 2038 will cause changes in traffic that will result in additional congestion and/or delays for road users of eight junctions.

There will also be increases in congestion and/or delays for road users in 2046 at 13 junctions. However, road users of one junction will experience improvements to congestion and/or delays.

Changes to the highway network will change travel patterns resulting in increases in traffic will make it more difficult for non-motorised users to cross 28 roads in 2038. However, there will also be seven roads where road users will find it easier to cross due to road improvements.

Increases in traffic in 2046 will make it more difficult for non-motorised users to cross 34 roads in this area, However, 19 roads will be easier to cross due to road improvements.

The loss of parking spaces during the operation of the Proposed Scheme will result in a significant adverse effect at the Gadbrook Distribution Centre.

Closure or diversion/realignment of public rights of way and roads due to the operation of the Proposed Scheme will increase journey length for non-motorised users of three public rights of way and six roads.

Water resources and flood risk

Construction

On a precautionary basis it is assumed that significant residual effects will remain on the water quality in the glacial till Secondary (Undifferentiated) aquifer relating to highway discharges to Broken Cross Drains.

There will also be significant residual effects on the groundwater baseflow to Puddinglake Brook due to the excavation and potential dewatering of a borrow pit in the area.

The design of mitigation in this area will be refined in consultation with the Environment Agency and other stakeholders to reduce impacts on water quality or groundwater and ensure no significant effects as far as reasonably practicable.

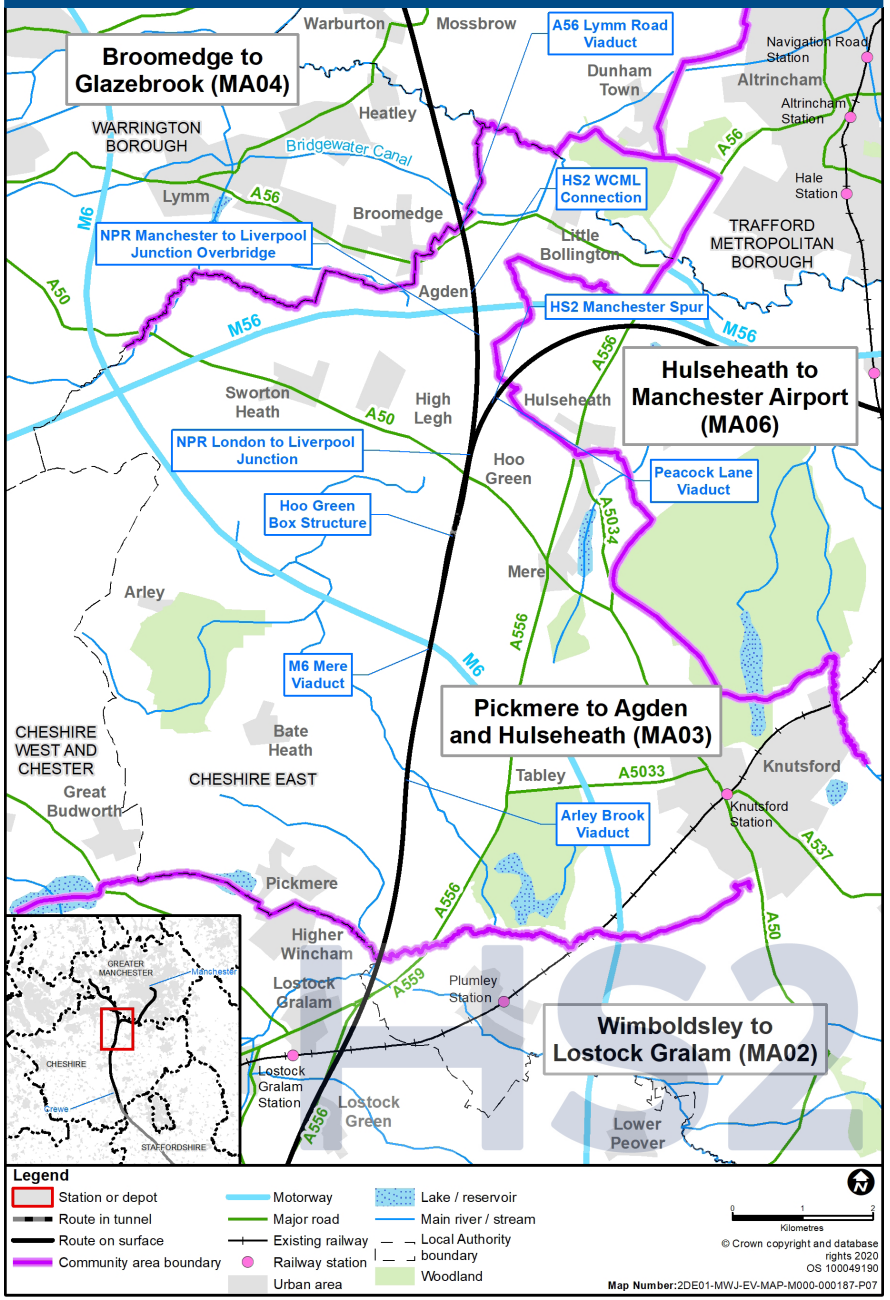
8.4 Pickmere to Agden and Hulseheath area (MA03)

Overview

The Proposed Scheme in the Pickmere to Agden and Hulseheath area is comprised of the route of the Proposed Scheme and the WCML connection, 10.6km (6.6 miles) in length, and a section of the HS2 Manchester spur, 3.3.km (2.1 miles) in length. The route of the Proposed Scheme divides west of Hoo Green into the HS2 WCML connection and the HS2 Manchester spur. The HS2 WCML connection will extend north to the east of Agden and Broomedge. This area will also include provision for a connection between HS2 and a future NPR route between London and Liverpool. The HS2 Manchester spur and the NPR London to Liverpool junction will extend north-east towards Hulseheath. The area falls within the local authority area of Cheshire East Council (see Figure 24).

The area is predominantly rural in character with agriculture being the main land use. The main settlements are Knutsford, Pickmere and High Legh. There are a number of villages in the area including Tabley, Mere and Little Bollington and several isolated farms throughout the area. Leonard's and Smoker Wood, an ancient woodland, is located in the southern part of the area.

Figure 24: Pickmere to Agden and Hulseheath area (MA03) context map



The Proposed Scheme

The route will continue north from the Wimboldsley to Lostock Gralam area on viaduct, transitioning onto embankment before crossing Arley Brook on viaduct. The route will continue on embankment and cross the M6 on viaduct, reverting to embankment before splitting into the HS2 WCML connection and the HS2 Manchester spur west of Hoo Green.

The HS2 WCML connection will continue into a box structure. The route will continue north-west on embankment, transitioning to cutting and passing under the M56. The route will continue on embankment, crossing the A56 on viaduct, before reverting to embankment to enter the Broomedge to Glazebrook area.

The HS2 Manchester spur will continue on embankment, transitioning into cutting before passing in tunnel under the box structure carrying the HS2 WCML connection. The HS2 Manchester spur will then continue north-east in cutting before running onto embankment towards the Hulseheath to Manchester Airport area.

The London to Liverpool junction will run alongside the HS2 WCML connection, continuing on embankment before transitioning to cutting. In addition, a box structure with supporting earthworks will be constructed over the route of the HS2 WCML connection near High Legh to enable connections for future NPR services between Manchester and Liverpool.

In this area, the Proposed Scheme will require the demolition of 10 residential properties, seven commercial properties (including farm outbuildings) and three other structures (comprising barns/outbuildings). There will be permanent closure, realignment or diversion of 11 roads and nine public rights of way. Seven watercourses will be permanently diverted or realigned. One main construction compound and 14 civil engineering satellite construction compounds will be required. Three of these satellite compounds will continue to be used as satellite compounds for railway systems following the completion of civil engineering works at those compounds. The main construction compound in this area will provide temporary accommodation for up to 155 workers.

Changes in the design of the Proposed Scheme in this area since the working draft ES

Key design changes include:

- changes in the NPR London to Liverpool junction area such as the introduction of earthworks and associated infrastructure to allow future connections for NPR;
- the replacement of High Legh box structure with Hoo Green tunnel, to accommodate the HS2 Manchester spur (southbound and northbound);
- changes to the HS2 Manchester spur; and
- the introduction of the NPR Manchester to Liverpool junction overbridge to enable provision for future NPR connection between Manchester and Liverpool.

Avoidance and mitigation measures

During the development of the design, measures have been incorporated to avoid or mitigate adverse impacts in this area including:

- woodland habitat creation to replace woodland lost from Leonard's and Smoker Wood, Belt Wood, Bongs Wood and along Waterless/Arley Brook to provide connectivity between habitats;
- a retaining wall near Mere to reduce the area of land required for the construction of the Proposed Scheme, and landscape planting to reduce the impact to Ovenback Cottage heritage asset north east of High Legh;
- provision to maintain vehicular and pedestrian access to the Cheshire Showground during construction of the Proposed Scheme, to enable the showground to continue to function and hold events; and
- noise barriers to reduce adverse effects due to airborne noise at the community in the vicinity of the A56 Lymm Road.

Residual effects

The construction and operation phases of the Proposed Scheme are not likely to result in any adverse residual effects on air quality, land quality and water resources in this area.

No likely adverse residual effects have been identified as arising during operation for agriculture, forestry and soils.

The following sections provide a summary of the likely significant residual environmental effects identified for the Pickmere to Agden and Hulseheath area.

Agriculture, forestry and soils

Construction

During construction, 402ha of agricultural land will be required, 273ha of which is high quality agricultural land. Some of this land will be restored following construction, with 156ha permanently required, 101ha of which is high quality agricultural land.

Construction of the Proposed Scheme will result in temporary significant effects at 33 farm holdings in this area due to the proportion of land required and, in some cases, severance during construction. Of the 33 holdings temporarily affected, 18 farm holdings will also be permanently significantly affected due to the proportion of land required, severance and/or demolition of farm buildings. Land required temporarily will, in accordance with a restoration scheme agreed with the landowner and the relevant planning authority, be returned to the farm holding following the completion of construction. Six holdings will have property demolitions, at Flittogate Farm (which forms part of the Roses Farm), Windmill Nurseries, Heyrose Farm, Bowden View Farm, Wrenshot House and Scandia House Farm.

The compensation code provides for compensation for the loss of agricultural land and for losses resulting from disturbance to agricultural activities.

Community

Construction

Effects associated with noise from, and views of construction activities, will result in temporary effects at five residential properties in Tabley Superior. Residents of approximately 50 properties in Mere will experience a combination of increased HGV traffic and noise effects. Additionally, 20 residential properties in Hulseheath will experience a combination of noise, visual and HGV traffic effects.

Construction of the Proposed Scheme will require temporary use of 25ha of land at the Cheshire Showground, of which 5ha will be required permanently. This is likely to mean that the showground will not be able to continue to operate. HS2 Ltd will continue to engage with owners and operators of Cheshire Showground to identify reasonably practicable measures to help mitigate the likely significant effects.

Operation

The combination of noise from, and views of, the operation of the Proposed Scheme will permanently affect approximately 10 residential properties in Over Tabley, five residential properties in Tabley Superior, five residential properties in Winterbottom and 15 residential properties in Hulseheath.

Ecology and biodiversity

Construction

Ancient woodland is irreplaceable and the loss of 0.3ha of this habitat from Ancient Woodland Inventory sites at Leonard's and Smoker Wood, Daisybank Wood and Belt Wood will result in a permanent significant adverse effect upon ancient woodland at each location where this habitat is lost. The loss of ancient woodland will be partly compensated through a range of measures, including planting of 3.7ha of native broadleaved woodland, translocation of ancient woodland soil with its associated seed bank where appropriate and planting native trees and shrubs.

The assumed loss of at least two veteran trees from Leonard's and Smoker Wood Local Wildlife Site and Arley and Waterless Brook Corridor Local Wildlife Site will result in a permanent adverse residual effect. Where reasonably practicable, measures will be taken to protect veteran trees that are assumed to be lost.

There will also be a net loss of 46.8km (29.1 miles) of hedgerow, which will result in a permanent adverse residual effect. However, the restoration of land required only for the construction of the Proposed Scheme to its current use offers potential for the additional retention and replacement of hedgerow.

Health

Construction

The combination of construction noise, visual and traffic impacts will change the character of neighbourhoods and may impact on residents' quality of life. The residents of Budworth Road in Tabley Superior, residents of Chester Road between the A50 Chester Road and the A5034 Mereside Road, residents at Bucklow Hill (Chapel Lane) and the community of Hulseheath, particularly around Chapel Lane, Peacock Lane, and Thowler Lane will experience a combination of effects from construction of the Proposed Scheme. People from these communities are likely to experience construction activities as changing the quality of their neighbourhood and to regard these change as adverse, both in diminishing the amenity of the community and in reducing the sense of its rural character. The presence of construction traffic is also likely to give rise to concerns about road safety, which may contribute to perceptions of reduced neighbourhood quality.

The temporary construction workforce is likely to be noticeable, with construction vehicles using local roads to access compounds, and workers using facilities within local settlements, particularly Hoo Green. This could mean that local communities see temporary changes to their population size and demographics. During the day, the workforce will be present on construction sites and compounds throughout the area, including work sites and satellite compounds.

Operation

The presence of rail infrastructure and noise from passing trains will change the character of surrounding neighbourhoods and may reduce the quality of life for residents, particularly for the communities of: Over Tabley, along Old Hall Lane; Tabley Superior, along Budworth Road; Winterbottom, along Winterbottom Lane; and Hulseheath, along Peacock Lane, Back Lane and Thowler Lane.

It is considered likely that the effects on wellbeing will lessen over time, as mitigation planting becomes established.

Historic environment

Construction

Construction of the Proposed Scheme will result in significant effects due to temporary and permanent changes to the setting of the Grade II listed Winterbottom Farmhouse, Grade II listed Mere Court Hotel and Grade II listed Ovenback Cottage.

Construction of the Proposed Scheme will result in permanent effects due to physical impact (either permanent loss or partial removal) on nine non-designated heritage assets, including: Flittogate Farm; the site of anti-aircraft batteries and defence features south of Budworth Road; a possible kiln or sawpit at Hoo Green; and a group of linear archaeological features south of Gorse Cottage.

Construction of the Proposed Scheme will result in permanent physical impacts on the Tabley Historic Landscape Character Area due to changes in landform and the removal of historic features in the landscape.

Operation

The intermittent noise of passing trains will alter the setting of the Grade II listed Mere Court Hotel formed by the surviving elements of the peaceful garden.

Landscape and visual

Construction

Temporary residual effects will arise from the presence of construction works including night-time lighting and changes to the existing landform and vegetation patterns that will affect the character of the local landscape. Where reasonably practicable, effects will be reduced by early planting to reduce the visibility of the Proposed Scheme. A set of mitigation measures, including those in the draft CoCP, will be implemented to reduce landscape and visual effects further throughout the construction works.

Construction of the Proposed Scheme will result in adverse effects on the Arley Lower Wooded Farmland LCA due to changes in landforms and impacts on the tranquillity of this predominantly agricultural landscape.

Construction of the Proposed Scheme will result in significant visual effects at 34 representative viewpoints in this area, including on views from: Flittogate Lane; Pickmere Lane; Old Hall Lane; Winterbottom Lane; Hoo Green Lane; Bowden View Lane; the A50 Cliff Road/Warrington Road/ Knutsford Road; Hulseheath Lane; Thowler Lane; Moss Lane; Agden Lane; Agden Bridge; and Spring Lane. Of these, residents at 18 representative residential viewpoint locations will also experience adverse night-time visual effects due to additional lighting associated with construction compounds.

Operation

During operation, the significant effects of the Proposed Scheme on the character and appearance of the local landscape will substantially reduce over time as mitigation planting grows and matures. However, effects may remain significant.

The Proposed Scheme will have a residual adverse effect on Arley Lower Wooded Farmland LCA due to uncharacteristic built structures in the area.

Operation of the Proposed Scheme will result in significant visual effects at 34 representative viewpoints in this area, including on views from: Flittogate Lane; Pickmere Lane; Old Hall Lane; Winterbottom Lane; Hoo Green Lane; Bowden View Lane; the A50 Cliff Road/Warrington Road/

View from Footpath Agden 9/2 looking towards the proposed Bridgewater Canal viaduct and Lymm North embankment (year 1 of operation)

Knutsford Road; Hulseheath Lane; Thowler Lane; Moss Lane; Agden Lane; Agden Bridge; and Spring Lane.

Socio-economics

Construction

The Proposed Scheme will require the acquisition of land from Mere Court Hotel and Cheshire Showground, potentially affecting the viability of the businesses resulting in a significant effect on both resources. Customers may be discouraged from using the Heyrose Golf Club due to highways changes and visual and noise effects associated with construction of the Proposed Scheme. This may impair the resource's ability to attract customers.

Operation

The Proposed Scheme will result in an in-combination noise and visual effect on Heyrose Golf Club. Customers are considered to be susceptible to changes in the local environment and setting and may, therefore, be discouraged from using the Heyrose Golf Club.

Sound, noise and vibration

Construction

The proposed avoidance and mitigation measures will reduce noise inside all individual dwellings from the construction activities such that residents will not be significantly affected.

Noise from construction will result in significant effects on residential communities closest to the construction works at properties in Tabley and Hulseheath.

Construction traffic will cause significant noise effects at adjacent residential properties on the B5569 Chester Road between the A50 Chester Road and the A5034 Mereside Road; and Chapel Lane and Peacock Lane between Hulseheath Lane and Back Lane.

Noise from construction will result in significant effects on the following non-residential properties: Heyrose Golf Club, Budworth Road, Knutsford; and Chain & Conveyor (offices), Winterbottom Lane, Winterbottom. Noise and vibration from construction will result in significant effects on Mere Court Hotel, Warrington Road, Mere, Knutsford.

A comprehensive set of mitigation measures, including those in the draft CoCP, will be implemented to control noise and vibration throughout the construction works.

HS2 Ltd will continue to seek reasonably practicable measures to reduce or avoid these residual significant noise and vibration effects. In doing so HS2 Ltd will continue to engage with stakeholders to fully understand the receptor, its use and the benefit of the measures.

Operation

At the majority of individual residences, the proposed mitigation measures will reduce 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.

Operational noise will be reduced at source through the effective design and specification of the trains and track. A number of measures have also been incorporated into the design of the Proposed Scheme to mitigate noise effects during operation. These include noise barriers in the form of landscape earthworks and/or noise fence barriers.

Operation of the Proposed Scheme will result in operational airborne noise effects for occupants of residential properties on: Old Hall Lane and Heyrose Lane in Over Tabley; Budworth Road in Tabley Superior; Winterbottom Lane in Winterbottom; and Thowler Lane, Back Lane and Peacock Lane in Hulseheath.

Operation of the Proposed Scheme will result in operational airborne noise effects at the following non-residential receptors: Tabley Brook Kennels and Cattery (office), Budworth Road, Tabley; Heyrose Golf Club, Budworth Road, Knutsford; and Mere Court Hotel, Warrington Road, Knutsford.

HS2 Ltd will continue to seek reasonably practicable measures to reduce or avoid these likely residual significant noise effects. In doing so HS2 Ltd will continue to engage with stakeholders to fully understand the potentially affected receptors, their use and the benefit of the measures.

Traffic and transport

Construction

Temporary diversions or realignments will result in increases in journey length for vehicle users of four roads.

The most intensive periods of construction of the Proposed Scheme will cause changes in traffic that will result in additional congestion and/or delays for road users of 10 junctions. However, road users of one junction will experience improvements in congestion and/or delays.

Increases in traffic during construction will make it more difficult for non-motorised users to cross roads throughout this area on 44 roads.

The loss of parking spaces during the construction period will impact the Mere Court Hotel and Cheshire Showground.

Temporary closure or diversion/realignment of public rights of way and roads will increase travel distances for non-motorised users of six public rights of way and six roads.

Operation

The operation of the Proposed Scheme in 2038 and 2046 will result in two significant adverse effects due to changes in journey lengths for vehicle users of Budworth Road and Agden Lane, both of which will be permanently closed.

The operation of the Proposed Scheme in 2038 will cause changes in traffic that will result in additional congestion and/or delays for road users of seven junctions. There will also be increases in congestion and/or delays for road users in 2046 at six junctions.

Changes to the highway network will change travel patterns resulting in increases in traffic and could also result in increased traffic severance for non-motorised users of 16 roads in 2038. There will also be seven roads where road users will experience improvements to traffic-related severance.

Increases in traffic in 2046 will make it more difficult for non-motorised users to cross 15 roads throughout this area. However, non-motorised users will find it easier to cross 15 roads due to road improvements.

The loss of parking spaces during the operation period of the Proposed Scheme will impact the Mere Court Hotel and Cheshire Showground.

Closure or diversion/realignment of public rights of way and roads due to the operation of the Proposed Scheme will increase journey length for non-motorised users of five public rights of way and five roads.

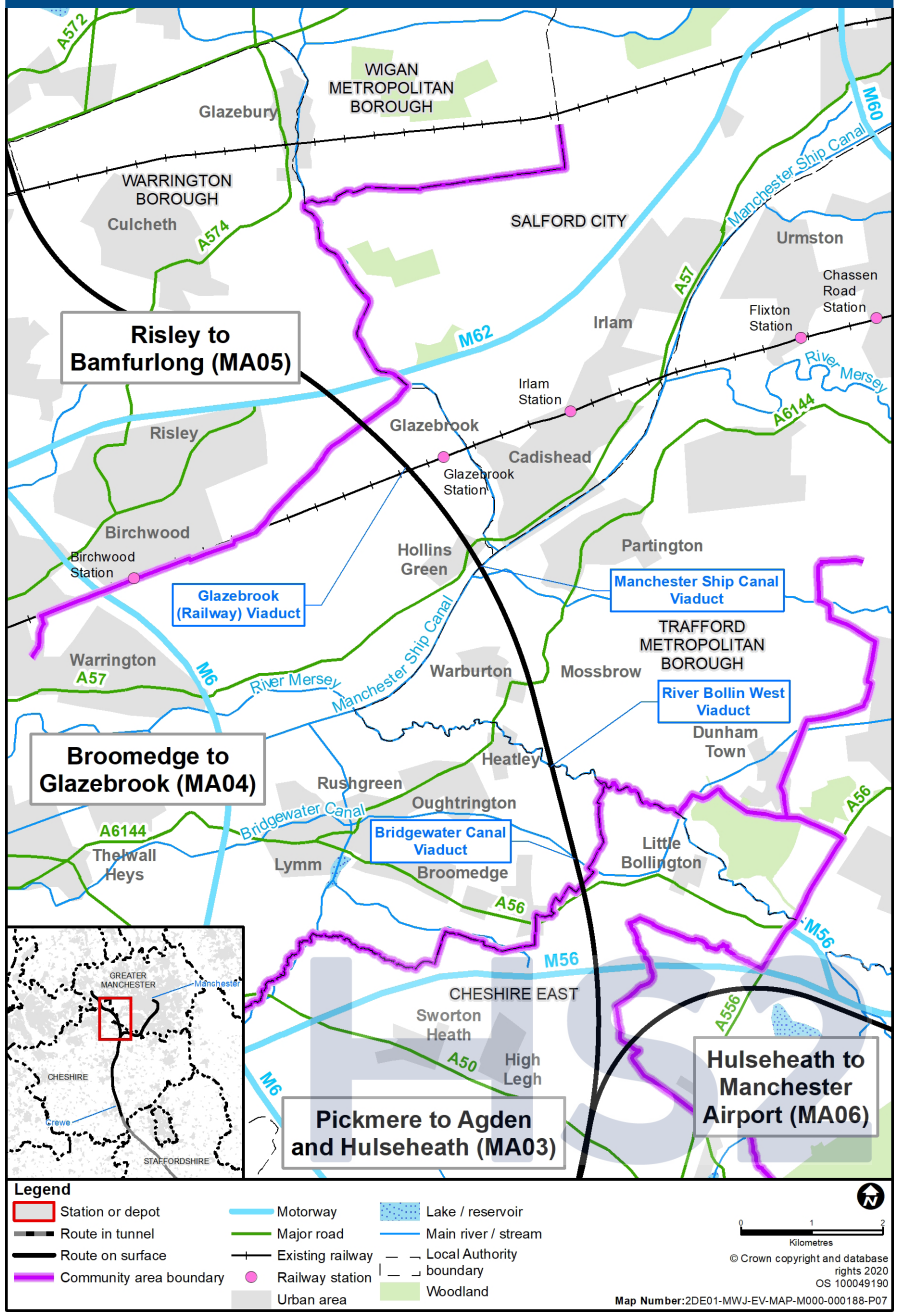
8.5 Broomedge to Glazebrook (MA04)

Overview

The route of the Proposed Scheme in the Broomedge to Glazebrook area will be 7.3km (4.5 miles) in length extending north-west from the east of Broomedge to the west of Glazebrook and east of Risley. The area falls within the local authority areas of Trafford Metropolitan Borough Council, Warrington Borough Council and Salford City Council (see Figure 25).

The area is predominantly rural in character with agriculture being the main land use. The main settlements are Lymm, Partington, Cadishead, Irlam and Hollins Green. There are also a number of hamlets and villages in the area including Broomedge, Little Heatley, Heatley, Mossbrow, Warburton and Glazebrook. These settlements are interspersed with areas of woodland, isolated dwellings and farmsteads.

Figure 25: Broomedge to Glazebrook area (MA04) context map



The Proposed Scheme

The route of the Proposed Scheme will continue north from the Pickmere to Agden and Hulseheath area on embankment, crossing the Bridgewater Canal and River Bollin on viaduct. The route will continue on embankment transitioning into cutting before reverting to embankment on the approach to Manchester Ship Canal. The route will cross the canal on viaduct, passing onto embankment south of Glazebrook before continuing on viaduct into the Risley to Bamfurlong area.

In this area, the Proposed Scheme will require the demolition of four residential properties. There will be permanent closure, realignment or diversion of five roads and of four public rights of way. One main construction compound and nine civil engineering satellite compounds will be required. Two of these satellite compounds will continue to be used as a satellite compound for railway systems following the completion of civil engineering work at this compound. The main construction compound in this area will provide temporary accommodation for up to 115 workers.

Changes in the design of the Proposed Scheme in this area since the working draft ES

Key design changes include:

- the realignment of the route east of Hollins Green to reduce impacts on local residents and Hollinfare Cemetery;
- the introduction of a viaduct in the Glazebrook area to reduce potential groundwater flow impacts to Holcroft Moss Site of Special Scientific Interest; and
- the introduction of retaining walls to define the extent of the Manchester Ship Canal and protect the Manchester Ship Canal viaduct against ship impact.

Avoidance and mitigation measures

During the development of the design, measures have been incorporated to avoid or mitigate adverse impacts in this area including:

- habitat creation, such as the provision of grassland and woodland adjacent to the River Bollin just east of Heatley, wetland habitat creation adjacent to Holcroft Moss Site of Special Scientific Interest;
- landscape mitigation planting within the Warburton area to reduce the effect of changes to the setting of Warburton Conservation Area and The Church of St Werburgh, Warburton;
- realignment of Footpath Warburton 3, which will carry part of the Bollin Valley Way across the route, to avoid severance of this promoted public right of way; and
- noise fence barriers and landscape earthworks to provide acoustic screening for residents of properties in Broomedge, Agden, Little Heatley, Mossbrow, Warburton, Hollins Green, Glazebrook and users of the Bridgewater Canal.

Residual effects

The construction and operation phases of the Proposed Scheme are not likely to result in any adverse residual effects on land quality in this area.

No likely adverse residual effects have been identified as arising during operation for agriculture, forestry and soils, air quality, socio-economics and water resources and flood risk.

The following sections provide a summary of the likely significant residual environmental effects identified for the Broomedge to Glazebrook area.

Agriculture, forestry and soils

Construction

During construction, 229ha of agricultural land will be required, 193ha of which is high quality agricultural land. Some of this land will be restored following construction, with 71ha permanently required, 56ha of which is high quality agricultural land.

Construction of the Proposed Scheme will result in temporary significant effects at 18 farm holdings in this area due to the proportion of land required and, in some cases, severance during construction. Of the 18 holdings temporarily affected, nine farm holdings will also be permanently significantly affected due to the proportion of land required and demolition of farm buildings. Following the completion of construction, land required temporarily will, in accordance with a restoration scheme agreed with the landowner and the relevant planning authority, be returned to the farm holding. Of the nine holdings, one will have a property demolition at Heatley Heath Farm.

The compensation code provides for compensation for the loss of agricultural land and for losses resulting from disturbance to agricultural activities.

Air quality

Construction

One residential property adjacent to the M6 and Nicol Avenue will temporarily experience a worsening of air quality (NO_2 concentrations) as a result of an increase in traffic using these roads during construction of the Proposed Scheme.

Community

Construction

Construction of the Proposed Scheme will result in the permanent loss of four residential properties in Little Heatley and may introduce an isolation effect for some residents in Warburton and Mossbrow due to the reduced access and visual barrier to community facilities.

Effects associated with noise from, and views of, construction activities will result in temporary effects at approximately 15 residential properties in Agden, 15 residential properties in Little Heatley and 15 residential properties in Hollins Green. The 15 residential properties in Hollins Green will also experience HGV traffic effects.

There will be a temporary loss of approximately half of the mooring facilities in Agden owned by Lymm Cruising Club resulting in an adverse effect of users of the facilities.

Operation

The combination of noise from, and views of, the operation of the Proposed Scheme will permanently affect approximately 15 residential properties in Agden and 10 residential properties in Little Heatley.

Ecology and biodiversity

Construction

Ancient woodland is irreplaceable and the loss of 0.5ha of this habitat will result in a permanent adverse residual effect upon ancient woodland at Coroners Wood. The loss of ancient woodland will be partly compensated through a range of measures, including planting of 3.4ha of native broadleaved woodland, translocation of ancient woodland soil with its associated seed bank where appropriate and planting native trees and shrubs.

The assumed loss of two veteran trees at Hollins Green will result in a permanent adverse residual effect. Where reasonably practicable, measures will be taken to protect veteran trees that are assumed to be lost.

On a precautionary approach, it is assumed that there will be a net loss of 22.1km (13.7 miles) of hedgerow resulting in a permanent adverse residual effect. However, restoration of land required only for the construction of the Proposed Scheme to its current use offers potential for additional retention and replacement of hedgerow.

Health

Construction

The combination of construction noise, visual and traffic impacts will change the character of neighbourhoods and may impact on residents' quality of life. The residents of Agden Lane, Agden Brow, Warrington Lane and Spring Lane, in Agden, residents of Spring Lane and Wet Gate Lane in Little Heatley and residents in the vicinity of St Helen's Close and Manchester Road in Hollins Green will experience a combination of effects from construction activities. People from these communities are likely to experience construction activities as changing the quality of their neighbourhood and to regard that change as adverse, both in diminishing the amenity of the community and in reducing the sense of its rural character. The presence of construction traffic is also likely to give rise to concerns about road safety, which may contribute to perceptions of reduced neighbourhood quality.

Construction of the Proposed Scheme will result in the demolition of four properties at Little Heatley. The erosion of social networks resulting from these demolitions will have the potential to reduce the levels of social contact and support and the health benefits they generate.

HS2 Ltd will continue to engage with the parties affected. Owners and occupiers of properties acquired for the construction of the Proposed Scheme are eligible for compensation in accordance with the compensation code.

Construction of the Proposed Scheme will require the permanent realignment of the A6144 Paddock Lane, which provides a link between the village of Warburton and hamlet of Mossbrow. The two settlements share community facilities. The reduced access, introduction of a visual barrier and feelings of separation from their fellow residents and community facilities will result in a loss of social contact and support and the health benefits they generate as well as increased social isolation resulting from journey delays and increased travel time.

In Little Heatley, the construction of the Proposed Scheme will affect the neighbourhood quality as well as the levels of social contact and support and the health benefits they generate. It is expected that the whole population at Little Heatley will experience impacts on two or more environmental or social factors that influence health during the construction of the Proposed Scheme, and this may therefore result in a cumulative effect on health.

Operation

The presence of rail infrastructure and noise from passing trains will change the character of surrounding neighbourhoods and may reduce the quality of life for residents, particularly for the communities of Agden and Little Heatley.

It is considered likely that the effects on wellbeing will lessen over time, as mitigation planting becomes established.

Historic environment

Construction

Construction of the Proposed Scheme will result in significant effects due to permanent changes to the setting of two Grade II listed buildings: The School and Post Office House at Warburton village.

Construction of the Proposed Scheme will result in permanent effects due to physical impact (either permanent loss or partial removal) on 12 non-designated heritage assets, including: the site of a pillow mound, east of Warburton Park Farm; the site of irregular linear cropmarks north-west of Warburton Park; the training area, firing range and military camp associated with the former Second World War HMS Gosling military camp 5; and the site of a post-medieval brick yard, east of Millbank Hall.

Construction of the Proposed Scheme will also result in significant effects on the Warburton Village and reclaimed mosslands Historic Landscape Character Area by altering the overall character of the area and disconnecting the village of Warburton from the rest of the historic landscape.

Operation

The peaceful character of Hollinfare Cemetery, a locally listed non-designated heritage asset, will be altered by the noise and movement of trains associated with the operation of the Proposed Scheme. This will reduce the experience of quiet contemplation within the cemetery and adversely impact its heritage value.

Landscape and visual

Construction

Temporary residual effects will arise from the presence of construction works including night-time lighting and changes to the existing landform and vegetation that patterns will affect the character of the local landscape.

Where reasonably practicable, effects will be reduced by early planting to reduce the visibility of the Proposed Scheme. A set of mitigation measures, including those in the draft CoCP, will be implemented to reduce landscape and visual effects further throughout the construction works.

Construction of the Proposed Scheme will result in significant adverse effects on three LCAs: River Bollin Meadowlands; Warburton Settled Sandlands; and Rixton Undulating Enclosed Farmland due to changes in landforms and impacts on the tranquillity of this predominantly agricultural landscape.

Construction of the Proposed Scheme will result in significant visual effects from 30 representative viewpoints within the area including on views from: Agden Lane; Spring Lane; Warrington Lane; the Trans Pennine Trail; Bent Lane; the A6144 Warburton Lane; the A6144 Paddock Lane; Moss Lane; the Bollin Valley Way; and Dam Lane. Of these, residents at 15 representative residential viewpoint locations will experience adverse night-time visual effects due to additional lighting associated with construction compounds.

Operation

During operation, the significant effects of the Proposed Scheme on the character and appearance of the local landscape will substantially reduce over time as mitigation planting grows and matures, however, effects may remain significant.

The Proposed Scheme will have a residual adverse effect on three LCAs: River Bollin Meadow Lands; Warburton Settled Sandlands; and Rixton Undulating Enclosed Farmland due to uncharacteristic built structures in the area.

Operation of the Proposed Scheme will result in significant visual effects from 19 representative viewpoints within the area, including views from: Agden Lane; Spring Lane; Warrington Lane; the Trans Pennine Trail; Bent Lane; the A6144 Warburton Lane; the A6144 Paddock Lane; Moss Lane; the Bollin Valley Way; Dam Lane; Dam Head Lane; Vetch Close and Bank Street; and the B5212 Glazebrook Lane.

Socio-economics

Construction

During construction, businesses on Warrington Lane, including The Barn Owl Inn public house, may experience isolation effects as customers may be discouraged by an increased journey length and diversion associated with the construction of the Proposed Scheme. Customers may also be permanently discouraged from using the Saracens Head public house and a farm shop at Moss Brow Farm on the A6144 Paddock Lane as both are expected to be affected by highway changes associated with the Proposed Scheme. In addition, customers will experience a combination of temporary visual effects and effects from HGV construction traffic flows. This will affect the ability of these businesses to generate income, due to a loss of trade.

Sound, noise and vibration

Construction

The proposed avoidance and mitigation measures will reduce noise inside all individual dwellings from the construction activities such that residents will not be significantly affected.

Noise and vibration from construction will result in significant effects on residential communities closest to the construction works in: Agden, on Agden Lane, Agden Brow, Warrington Lane and Spring Lane; and Little Heatly, on Spring Lane and Wet Gate Lane. Noise from construction will also result in significant effects on residential communities closest to the construction works in Rixton, on St Helen's Close and Manchester Road.

Noise from construction will result in significant effects on the following non-residential properties: Rixton-with-Glazebrook Community Hall, Manchester Road, Rixton; The Church of St Helen, Dam Lane, Hollins Green; EEF Ltd (office), Glazebrook Lane, Warrington; and Glazebrook Methodist Church, Glazebrook Lane, Warrington.

A comprehensive set of mitigation measures, including those in the draft CoCP, will be implemented to control noise and vibration throughout the construction works.

HS2 Ltd will continue to seek reasonably practicable measures to reduce or avoid these residual significant noise and vibration effects. In doing so HS2 Ltd will continue to engage with stakeholders to fully understand the receptor, its use and the benefit of the measures.

Operation

At the majority of individual residences, the proposed mitigation measures will reduce 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.

Operational noise will be reduced at source through the effective design and specification of the trains and track. A number of measures have also

View from the Trans Pennine Trail (National Cycle Route 62) looking towards the proposed River Bollin West viaduct (year 1 of operation)

been incorporated into the design of the Proposed Scheme to mitigate noise effects during operation. These include noise barriers in the form of landscape earthworks and/or noise fence barriers.

Operation of the Proposed Scheme will result in operational airborne noise effects for occupants of residential properties on Agden Lane, Warrington Lane and Spring Lane in Agden and Wet Gate Lane in Little Heatley.

Operation of the Proposed Scheme will result in beneficial operational airborne noise effects for occupants of residential properties on Warburton Lane and Paddock Lane in Mossbrow and on Dam Lane, due to decreases in sound from road traffic as a result of road realignment.

HS2 Ltd will continue to seek reasonably practicable measures to reduce or avoid these likely residual significant noise effects. In doing so HS2 Ltd will continue to engage with stakeholders to fully understand the potentially affected receptors, their use and the benefit of the measures.

Traffic and transport

Construction

The most intensive periods of construction of the Proposed Scheme will cause changes in traffic that will result in additional congestion and/or delays for road users of 13 junctions.

Increases in traffic during construction will make it more difficult for non-motorised users to cross roads throughout this area on 27 roads. However, users of one road will find it easier to cross due to road improvements.

Temporary closure or diversion/realignment of public rights of way and roads will increase travel distances for non-motorised users of 12 public rights of way and two roads.

Operation

The operation of the Proposed Scheme in 2038 and 2046 will result in changes in journey lengths for vehicle occupants on one road. Additionally, operation of the Proposed Scheme in 2046 will cause changes in traffic that will result in additional congestion and/or delays for road users of one junction.

Changes to the highway network will change travel patterns resulting in increases in traffic and could also make it more difficult for non-motorised users to cross four roads in 2038. There will also be three roads where road users will experience improvements to crossing these roads.

Non-motorised users will find it more difficult in 2046 to cross four roads. However, four roads will be easier to cross due to road improvements.

Closure or diversion/realignment of public rights of way and roads due to the operation of the Proposed Scheme will increase journey length for non-motorised users of three public rights of way and three roads.

Water resources and flood risk

Construction

On a precautionary basis, it is anticipated that significant residual effects will remain on flood risk at properties along Glazebrook Lane, Mythholme Avenue, Rosebank Road, Haig Avenue, Victory Road and Essex Gardens and part of a wastewater treatment works in Cadishead (permanent major adverse effect). This is due to the construction of Manchester Ship Canal retaining walls which will constrict the flow in the canal, causing the backing-up of flow in Glaze Brook.

The design of mitigation in this area will be refined in consultation with the Environment Agency and other stakeholders to reduce the flood risk impact and ensure no significant effects on flood risk to nearby receptors as far as reasonably practicable.

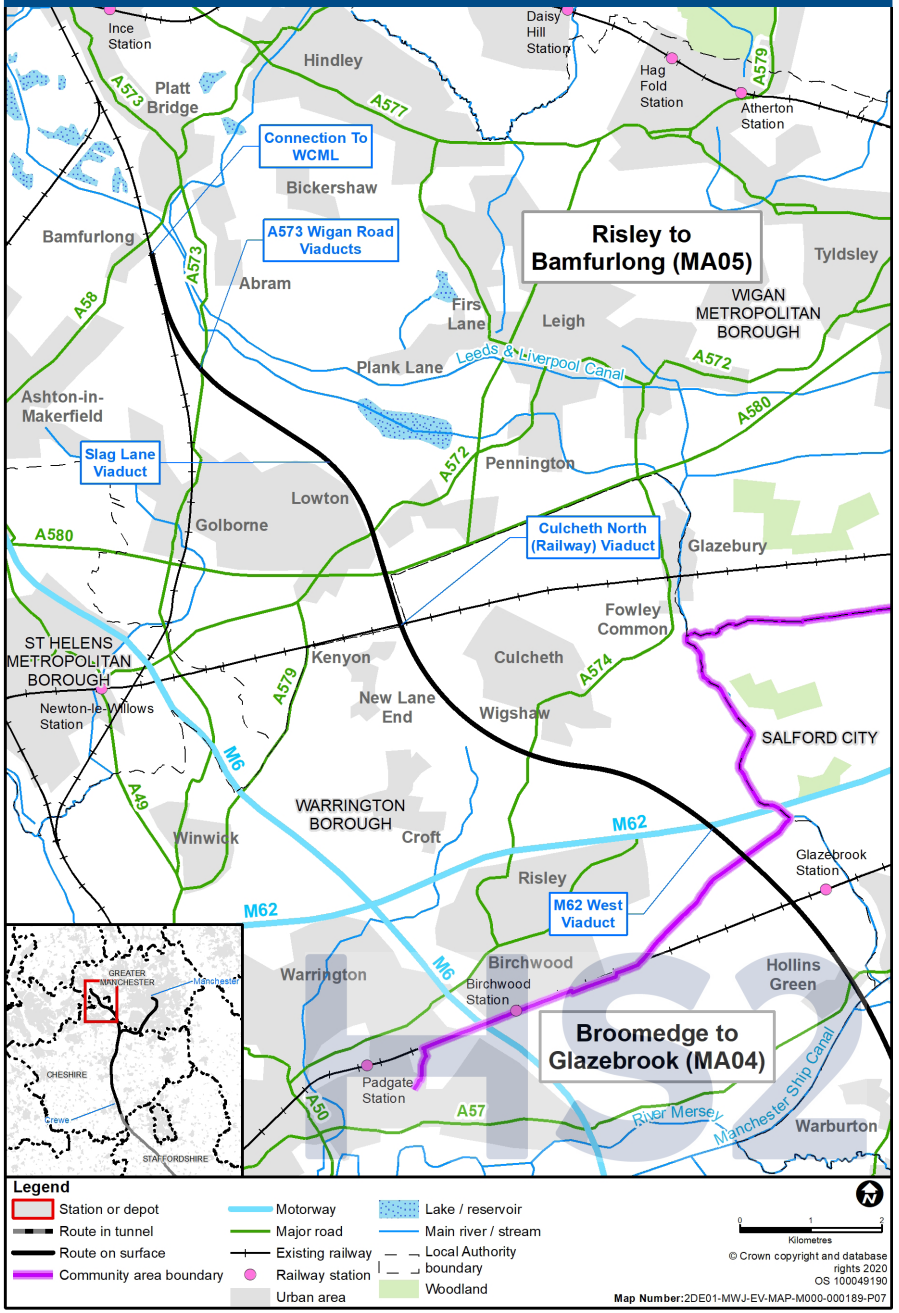
8.6 Risley to Bamfurlong (MA05)

Overview

The route of the Proposed Scheme in the Risley to Bamfurlong area will be 12.7km (7.9 miles) in length extending north-west from the east of Risley to the south of Bamfurlong where it will connect to the WCML. The area falls within the local authority areas of Warrington Borough Council and Wigan Metropolitan Borough Council (see Figure 26).

The area is predominantly rural in character with agriculture being the main land use. The main settlements are Warrington (including the suburbs of Birchwood), Risley, Lowton, Golborne, Pennington (a suburb of Leigh), Ashton-in-Makerfield, Ince-in-Makerfield and Wigan. There are also a number of villages in the area including Culcheth, Wigshaw and the villages of Bamfurlong, Abram, and Platt Bridge, which are suburbs of the larger town of Wigan. These settlements are interspersed with woodland, isolated dwellings and farmsteads throughout the area.

Figure 26: Risley to Bamfurlong area (MA05) context map



The Proposed Scheme

The route of the Proposed Scheme will continue north-west from the Broomedge to Glazebrook area on a viaduct crossing over the M62. The route will continue on embankment, passing into a cutting to the south of Culcheth before passing under the A574 Warrington Road. The route will continue in cutting west of Culcheth before transitioning onto embankment and crossing the Liverpool to Manchester (Chat Moss) railway line on a viaduct. Continuing north in cutting towards Lowton, the route will revert to embankment passing to the north of Golborne and connect with the WCML south of Bamfurlong. A section of the existing WCML, south and west of Wigan, will be modified where it will connect with the route of the Proposed Scheme.

In this area, the Proposed Scheme will require the demolition of 19 residential properties, 12 commercial properties (some which provide multiple business premises) and one other structure (a telecommunications mast). There will be permanent closure, realignment or diversion of 10 roads. There will be permanent closure, realignment or diversion of 28 public rights of way. Seventeen watercourses will be permanently diverted or realigned. One main construction compound and 11 civil engineering satellite construction compounds will be required. Three of these satellite compounds will continue to be used as satellite compounds for railway systems following the completion of civil engineering works at those compounds. There will be two further satellite compounds used for railway systems works only.

Changes in the design of the Proposed Scheme in this area since the working draft ES

Key design changes include:

- the extension of the M62 West viaduct by 70m to 830m to help avoid impacts on the local groundwater at Holcroft Moss Site of Special Scientific Interest;
- changes to the WCML connection;
- the removal of Glazebrook embankment to accommodate the lengthening of the M62 West viaduct;
- the realignment of the A573 Wigan Road to the west of its existing alignment to avoid the demolition of farm buildings and reduce the severance of agricultural land; and
- the realignment of the A574 Warrington Road to the east of its existing alignment to avoid demolition of property and direct impacts to Culcheth Athletic Junior Football Club.

Avoidance and mitigation measures

During the development of the design, measures have been incorporated to avoid or mitigate adverse impacts in this area including:

- realignment of public footpaths and accommodation access that will maintain public access for pedestrian routes through Byrom Wood;
- landscape earthworks, and planting to integrate the Proposed Scheme into the surrounding landscape at Culcheth, Wigshaw and Lowton;
- compensatory woodland planting in areas of loss at Viridor Wood and Byrom Wood to maintain connectivity between existing habitats; and
- the introduction of noise fence barriers to provide acoustic screening for residents of properties in Lowton.

Residual effects

The construction and operation phases of the Proposed Scheme are not likely to result in any adverse residual effects on land quality in this area.

The operation phase of the Proposed Scheme is not likely to result in any adverse residual effects on agriculture, forestry and soils, air quality,

health, land quality, socio-economics, and water resources and flood risk in this area.

The following sections provide a summary of the likely significant residual environmental effects identified for the Risley to Bamfurlong area.

Agriculture, forestry and soils

Construction

During construction, 254ha of agricultural land will be required, 86ha of which is high quality agricultural land. Some of this land will be restored following construction, with 165ha permanently required, 48ha of which is high quality agricultural land.

Construction of the Proposed Scheme will result in temporary significant effects at 27 farm holdings in this area due to the proportion of land required and/or severance or disruption during construction. Of the 27 holdings temporarily significantly affected, 22 farm holdings will also be permanently significantly affected due to the proportion of land required, through farm severance and/or property demolitions.

Land required temporarily will, in accordance with a restoration scheme agreed with the landowner and the relevant planning authority, be returned to the farm holding following the completion of construction. Six holdings will have property demolitions, at Glaziers Lane, Philips Farm, White's Farm, Birchalls Farm, Bancroft Kennels and Laburnum Farm. One holding, Cheetham Fold Stables, will experience significant effects due to the proportion of land required and it is likely that the owners or operators of the holding will have to reorganise their facilities to continue to operate. Part of the land permanently required at Cheetham Fold Stables is intended to be used for community sports pitches to offset a community impact.

The compensation code provides for compensation for the loss of agricultural land and for losses resulting from disturbance to agricultural activities.

Air quality

Construction

Thirteen residential properties adjacent to the M6 and B5207 Downall Green Road in Ashton-in-Makerfield will experience a temporary worsening of air quality (NO_2 concentrations) as a result of an increase in traffic using these roads during construction of the Proposed Scheme.

Community

Construction

Construction of the Proposed Scheme will result in significant residual effects from the permanent loss of: four residential properties on Glaziers Lane and Wigshaw Lane in Wigshaw; the English Karate Academy in Warehouse Studios on Glaziers Lane; eight residential properties on Newton Road, Lowton; and land at Byrom Wood near Golborne.

Effects associated with the combination of noise from, and views of construction activities, will result in temporary effects on approximately: 10 residential properties in Wigshaw; and 90 residential properties in Lowton. A combination of noise, visual and HGV traffic effects will result in temporary residual effects on approximately 10 residential properties on Warrington Road, Risley; and 10 residential properties in Little Byrom. A combination of noise and HGV traffic effects will result in temporary residual effects on approximately 120 residential properties in Golborne.

The combination effects of noise from, and views of, the construction of the Proposed Scheme will have a significant temporary effect on users of Lowton Junior and Infant School.

Operation

The operation of the Proposed Scheme will result in residual significant effects on approximately 10 residential properties in Wigshaw due to a combination of noise and visual effects.

Ecology and biodiversity

Construction

There will be a net loss of 24.8km (15.4 miles) of hedgerow, which will result in a permanent adverse residual effect. However, the restoration of land required only for the construction of the Proposed Scheme to its current use, offers potential for the additional retention and replacement of hedgerow.

Health

Construction

The combination of construction noise, visual and traffic impacts will change the character of neighbourhoods, and may impact on residents' quality of life. The residents of the communities of Wigshaw and Lowton, and residential roads of the A574 Warrington Road in Risley, Saddle Tree Fold and Slag Lane in Little Byrom, and Church Street in Lowton will experience a combination of effects from construction of the Proposed Scheme. People from these communities are likely to experience construction activities as changing the quality of their neighbourhood and to regard that change as adverse, both in diminishing the amenity of the community and in reducing the sense of its rural character. The presence of construction traffic is also likely to give rise to concerns about road safety, which may contribute to perceptions of reduced neighbourhood quality.

Construction activity will result in Byrom Wood being permanently bisected and 4ha of the wood will be permanently lost. The temporary presence of construction works and the permanent railway infrastructure may deter some visitors, reducing opportunities for health benefits associated with physical activity, and therefore resulting in an adverse health effect.

Construction of the Proposed Scheme will require the demolition of English Karate Academy in Warehouse Studios on Glaziers Lane. The permanent loss of this facility in this location will reduce the opportunity for beneficial health outcomes achieved through physical exercise and is therefore considered to result in an adverse health effect.

Users of Lowton Junior and Infant School will be affected by noise and visual effects. Additionally, works to the A572 Newton Road could affect journeys to school and raise child road safety concerns. These factors will result in a potential reduction in the beneficial wellbeing effects associated with education.

Construction of the Proposed Scheme will result in the demolition of four properties in Wigshaw. The loss of these residential properties represents a sizeable proportion of the community and has the potential to reduce beneficial health effects that are gained through social contact and support.

HS2 Ltd will continue to engage with the parties affected. Owners and occupiers of properties acquired for the construction of the Proposed Scheme are eligible for compensation in accordance with the compensation code.

The temporary construction workforce is likely to comprise a mixture of local people and workers from further afield. This could mean that local communities see temporary changes to their population size and demographics.

Historic environment

Construction

Construction of the Proposed Scheme will result in temporary changes to the settings of: views to the east from the Grade II listed Newchurch Old Refectory (also known as Newchurch Old Rectory); the southern boundary of the garden of the Grade II listed Wigshaw House; the Grade II listed Byrom Hall; and the Grade II* listed Lightshaw Hall.

Construction of the Proposed Scheme will result in a permanent effect due to physical impact (either permanent loss or partial removal) of 10 non-designated heritage assets, including: an undated cropmark enclosure; Glaziers Lane Farm and Swallow Barn in Culcheth; Willowpool, Birchalls Farm and White's Farm; the site of 17th century Lowton Hall; number 188 Newton Road, Lowton; and Laburnum Cottage.

Operation

Operation of the Proposed Scheme will result in permanent changes to the settings of: views to the east from the Grade II listed Newchurch Old Refectory (also known as Newchurch Old Rectory); the southern boundary of the garden of the Grade II listed Wigshaw House; the Grade II listed Byrom Hall; and the Grade II* listed Lightshaw Hall.

Landscape and visual

Construction

Temporary residual effects will arise from the presence of construction works including night-time lighting and changes to the existing landform and vegetation patterns that will affect the character of the local landscape. Where reasonably practicable, effects will be reduced by early planting to reduce the visibility of the Proposed Scheme. A set of mitigation measures, including those in the draft CoCP, will be implemented to reduce landscape and visual effects further throughout the construction works.

Construction of the Proposed Scheme will result in a residual adverse effect on the Hey Brook to Aspull Common Farmlands and Flashes LCA due to the severance of public rights of way and the introduction of construction works.

Construction of the Proposed Scheme will result in significant visual effects from 34 representative viewpoints within the area resulting in significant effects, including views from: Robins Lane; Newton Gardens and Cheetham Fold Farm Stables and residential properties at Hesketh Meadow Lane and Cabbala Gardens; Brancaster Drive; Saddletree Fold Farm; the A573 Wigan Road; St John's Church, Abram; and public rights of way. Of these, residents at seven representative residential viewpoint locations will also experience adverse night-time visual effects due to additional lighting associated with construction compounds.

Operation

During operation, the significant effects of the Proposed Scheme on the character and appearance of the local landscape will substantially reduce over time as mitigation planting grows and matures. However, effects may remain significant.

The Proposed Scheme will have a residual adverse effect on the Hey Brook to Aspull Common Farmlands and Flashes LCA due to the introduction of large-scale infrastructure and landform modifications in the area.

Operation of the Proposed Scheme will result in significant visual effects from 16 representative viewpoints within the area resulting in significant effects, including views from: Robins Lane, Wigshaw; residential properties at Hesketh Meadow Lane and Newton Gardens; and from the A573 Wigan Road.

Socio-economics

Construction

Construction of the Proposed Scheme will result in likely significant effects including the demolition of two commercial properties which provide premises for over 30 businesses at Warehouse Studios, Lowton Business Park and Pocket Nook Lane, and on Slag Lane.

Businesses displaced by the Proposed Scheme will be compensated in accordance with the compensation code.

During construction of the Proposed Scheme customers may also be discouraged from using Spa Beautiful, located in Yew Tree Court to the south of Culcheth, and Yew Tree Farm Caravan Club, as they are expected to be affected by construction works associated with the Proposed Scheme. This will result in adverse effects on the businesses.

Sound, noise and vibration

Construction

The proposed avoidance and mitigation measures will reduce noise inside all individual dwellings from the construction activities such that residents will not be significantly affected.

Noise and vibration from construction will result in significant effects on residential communities closest to the construction works at Risley, Wigshaw, Culcheth and Lowton Noise from construction will also result in a significant effect on the residential community at Bamfurlong.

Construction traffic on the A573 Church Street between B5207 Ashton Road and the Heath Street in this area is likely to cause significant noise effects on adjacent residential properties.

Noise from construction will result in significant effects on the following non-residential properties: Yew Tree Court (office), Taylor Business Park, Risley; Estate Office, Taylor Business Park, Risley; Newchurch Community Primary School, Culcheth; Lowton Junior and Infant School, Newton Road, Lowton; Lowton Youth and Community Centre, Newton Road, Lowton; and Gymetc. (office), Newton Road, Lowton.

A comprehensive set of mitigation measures, including those in the draft CoCP, will be implemented to control noise and vibration throughout the construction works.

HS2 Ltd will continue to seek reasonably practicable measures to reduce or avoid these residual significant noise and vibration effects. In doing so HS2 Ltd will continue to engage with stakeholders to fully understand the receptor, its use and the benefit of the measures.

View from the A573 Wigan Road looking towards the proposed A573 Wigan Road viaducts (year 1 of operation)

Operation

At the majority of individual residences, the proposed mitigation measures will reduce 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.

Operational noise will be reduced at source through the effective design and specification of the trains and track. A number of measures have also been incorporated into the design of the Proposed Scheme to mitigate noise effects during operation. These include noise barriers in the form of landscape earthworks and/or noise fence barriers.

Likely residual significant adverse effects due to increased airborne noise levels during operation have been identified at Wigshaw for occupants of residential properties on Wigshaw Lane and Robins Lane.

HS2 Ltd will continue to seek reasonably practicable measures to reduce or avoid these likely residual significant noise effects. In doing so HS2 Ltd will continue to engage with stakeholders to fully understand the potentially affected receptors, their use and the benefit of the measures.

Traffic and transport

Construction

The most intensive periods of construction of the Proposed Scheme will cause changes in traffic that will result in additional congestion and/or delays for road users at 28 junctions.

Increases in traffic during construction will make it more difficult for non-motorised users to cross roads in this area on 13 roads. However, users of one road will find it easier to cross due to road improvements.

The loss of parking spaces during the construction period will impact the Taylor Business Park.

Temporary closure or diversion/realignment of public rights of way and roads will increase travel distances for non-motorised users of 11 public rights of way and one road.

Operation

The operation of the Proposed Scheme in 2038 and 2046 will result in an increase in journey length for vehicle occupants on Glaziers Lane. Closure or the diversion or realignment of public rights of way and roads due to the operation of the Proposed Scheme will increase journey length for non-motorised users of 15 public rights of way and six roads.

Water resources and flood risk

Construction

On a precautionary basis it is anticipated that construction of the Proposed Scheme will have a temporary adverse effect associated with a source protection zone for the licensed public water supply south of Wash End.

A management strategy will be agreed with the Environment Agency and United Utilities. Until this strategy is in place the residual effect remains.

There will also be a permanent beneficial effect on flood risk to local receptors due to the realignment of Carr Brook.

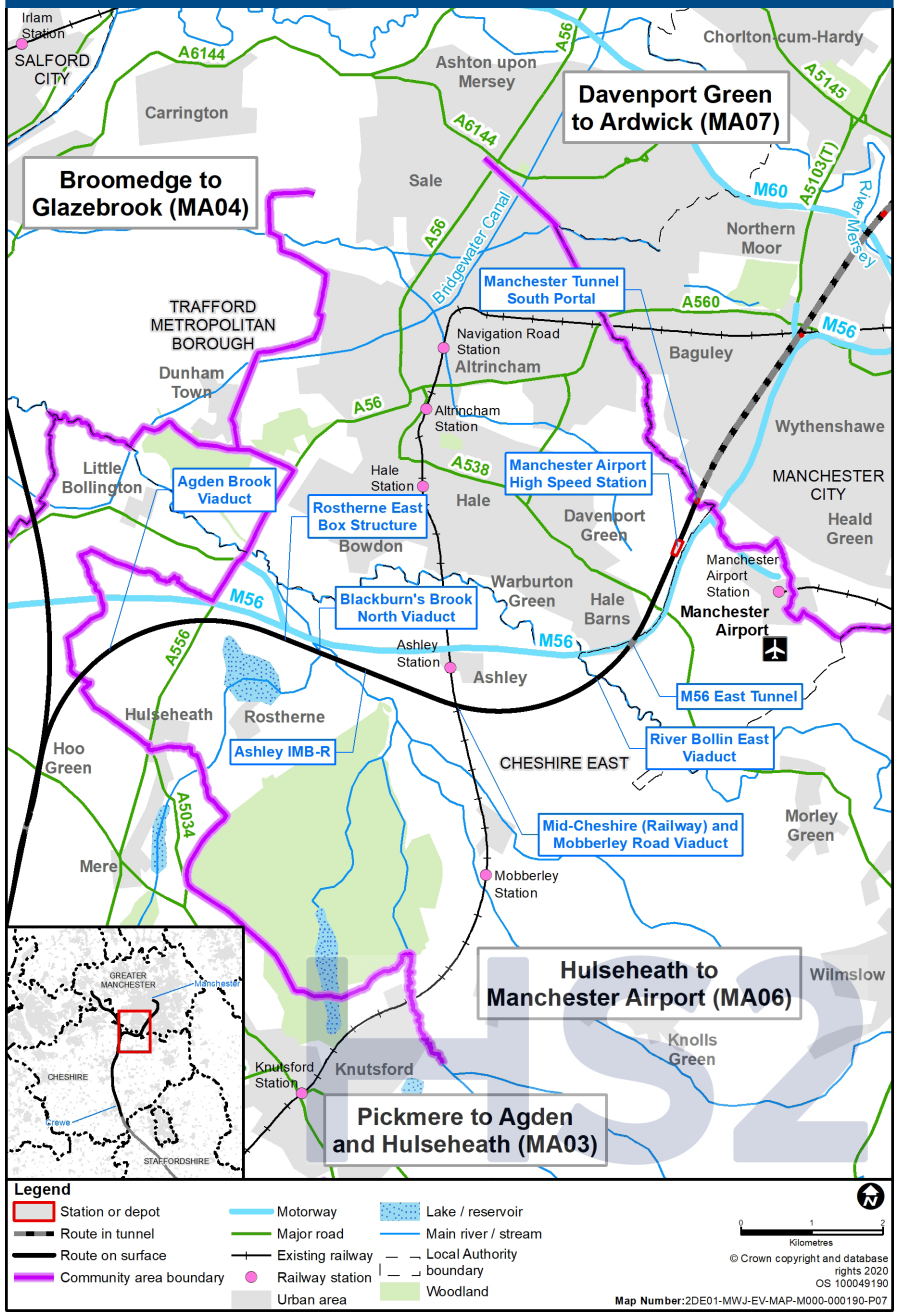
8.7 Hulseheath to Manchester Airport area (MA06)

Overview

The route of the Proposed Scheme in the Hulseheath to Manchester Airport area will be 10.7km (6.8 miles) in length extending north-east from the north of Hulseheath to the north-east of Davenport Green. In this area, the Proposed Scheme will also provide a connection between HS2 and a future NPR route between Manchester and Liverpool, a railway infrastructure maintenance facility, and the Manchester Airport High Speed station. The area falls within the local authority areas of Chester East Council, Trafford Metropolitan Borough Council, Manchester City Council and the Greater Manchester Combined Authority (see Figure 27).

In the south the area is predominantly semi-rural in character with agriculture and recreation being the main land uses. Urban land use dominates the north-west of the area. The main settlements are Altrincham, Hale, Hale Barns and Bowdon. There are also a number of villages in the area including Hulseheath, Ashley, Rostherne, Mobberley, Thorns Green and Halebank. These settlements are interspersed with isolated dwellings and farmsteads. Manchester Airport is located to the south-east of the route of the Proposed Scheme.

Figure 27: Hulseheath to Manchester Airport area (MA06) context map



The Proposed Scheme

The HS2 Manchester spur will continue east from the Pickmere to Agden and Hulseheath area (MA03) on embankment before crossing over Agden Brook on viaduct. The route will continue in cutting, transitioning to embankment and crossing the A556 Chester Road, before passing under the connection between HS2 and a future NPR route between Manchester and Liverpool in a box structure. The route will continue from the box structure on embankment, crossing Blackburn's Brook on viaduct, and returning to embankment. The route will cross the Mid-Cheshire Railway on viaduct, continuing on a series of embankments and in cuttings before crossing the River Bollin on viaduct. The route will continue northwards from the River Bollin on embankment and viaduct before entering cutting. The Manchester Airport High Speed station will be in this area.

Manchester Airport High Speed station will be located west of the M56, between junctions 5 and 6. The route will pass through the station in cutting before entering the Manchester tunnel south portal in the Davenport Green to Ardwick area. The station will have up to four platforms and be an interchange providing connections to Manchester Airport and to other transport services, including buses, coaches, private cars, taxis and to provide for future connections to Metrolink as well as including facilities for walking and cycling. The station will also include two multi-storey car parks, drop-off and pick-up bays and bus and coach parking bays (see Figure 28).

In this area, the Proposed Scheme also includes connections between HS2 and a future NPR route between Manchester and Liverpool, known as the NPR Manchester to Liverpool junction. The Proposed Scheme also includes a railway infrastructure maintenance facility, known as the Ashley IMB-R, located adjacent to the route of the Proposed Scheme, to the south of the M56 and west of the Mid-Cheshire Line.

In this area, the Proposed Scheme will require the demolition of 24 residential properties, eight commercial properties (including farm outbuildings) and five other structures (including an electricity sub-station, stable buildings and barns). There will be permanent closure, realignment or diversion of 13 roads. There will be a permanent closure, realignment or diversion of 20 public rights of way. Four watercourses will be permanently diverted or realigned. Two main construction compounds and 16 civil engineering satellite construction compounds will be required. Two of these satellite compounds will continue to be used as satellite compounds for railway systems following the completion of civil engineering works at those compounds. There will be two further satellite compounds used for railway systems works only.

There will also be a temporary railhead, used to receive and stockpile materials, by rail, required for the construction of the railway tracks, signals, and electrification systems for the Proposed Scheme. The railhead will be constructed and operational over a period of five years, and will be removed and the site reinstated over a period of one year.

Changes in the design of the Proposed Scheme in this area since the working draft ES

Key design changes include:

- the introduction of new features to enable connections of the future NPR Manchester to Liverpool junction;
- changes to Manchester Airport High Speed station to accommodate NPR and Metrolink services;
- changes to the highways/local roads near the station and introduction of a gyratory system to access the station;
- relocation of the Manchester tunnel south portal to the Davenport Green to Ardwick area to enable Manchester Airport High Speed station cutting to be lengthened by 100m;

- the introduction of the Ashley IMB-R for the maintenance of the HS2 infrastructure; and
- the introduction of a temporary railhead at Ashley, which will provide a facility for the construction of track, signals and electrifications systems.

Avoidance and mitigation measures

During the development of the design, measures have been incorporated to avoid or mitigate adverse impacts in this area including:

- habitat creation such as native broadleaved woodland planting to compensate for the partial loss of woodland at Millington Clough, Blackburn's Brook, along the River Bollin, and at Davenport Green and the creation of species-rich grassland east of Birkin House;
- landscape planting to reduce the effect of changes to setting at Mere Covert Cottage; landscape earthworks, and planting to integrate the Proposed Scheme into the surrounding landscape and to provide visual screening for the communities of Hulseheath North, Millington, Ashley, Thorns Green, Hale Bank, Warburton Green and Davenport Green; and
- changes to the highway and public transport network at Manchester Airport High Speed station to accommodate users of the HS2 services.

Residual effects

The construction and operation phases of the Proposed Scheme are not likely to result in any adverse residual effects on air quality and land quality in this area.

No likely adverse residual effects have been identified as arising during operation for agriculture, forestry and soils, community, historic environment and water resources and flood risk.

This section provides a summary of the likely significant residual environmental effects identified for the Hulseheath to Manchester Airport area.

Agriculture, forestry and soils

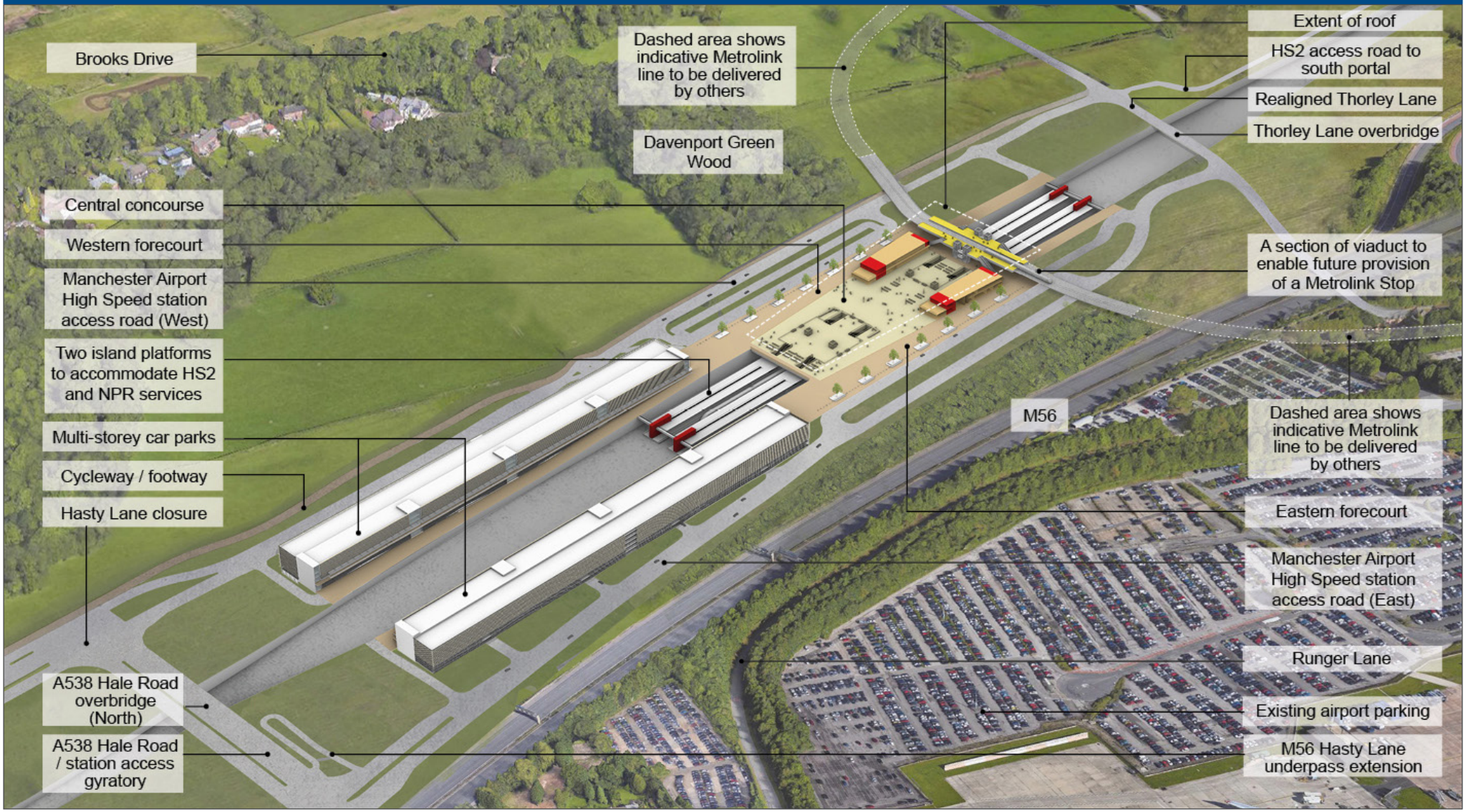
Construction

During construction, 339ha of agricultural land will be required, 56ha of which is high quality agricultural land. Some of this land will be restored following construction, with 158ha permanently required, 28ha of which is high quality agricultural land.

Construction of the Proposed Scheme will result in temporary significant effects at 26 farm holdings in this area due to the proportion of land required and severance during construction. Of the 26 holdings temporarily affected, 18 farm holdings will also be permanently significantly affected due to the proportion of land required, farm severance and property demolition in some cases. Land required temporarily will, in accordance with a restoration scheme agreed with the landowner and the relevant planning authority, be returned to the farm holding following the completion of construction. Of the 18 holdings, four will have property demolitions, at Cherry Tree Farm, Bowden View Farm, Higher Thorns Green Farm and Hale Bank Farm.

The compensation code provides for compensation for the loss of agricultural land and for losses resulting from disturbance to agricultural activities.

Figure 28: Manchester Airport High Speed station visualisation looking north



Community

Construction

Effects associated with noise from, and views of, construction activities will result in temporary effects at approximately 10 residential properties in Ringway, 40 residential properties on the eastern side of Warburton Green and 30 properties in Hale Barns. Approximately 20 residential properties in Bucklow Hill will experience noise and HGV traffic effects during construction.

Construction of the Proposed Scheme will result in significant effects from the permanent loss of: five residential properties in Thorns Green; five residential properties in Ringway; nine residential properties in Hale Barns; and Fairfield Farm Project at Higher Thorns Green Farm in Thorns Green.

Ecology and biodiversity

Construction

Ancient woodland is irreplaceable and the combined loss of 3.3ha of this habitat from Millington Clough, Hancock's Bank, Ryecroft Covert, Birkin Bridge Lodge, Arden House Wood, Sugar Brook, East Arden House Wood, Hennersley Bank, Bollin Bank and Davenport Green Wood will result in a permanent adverse residual effect at the national level. The loss of ancient woodland will be partly compensated through a range of measures, including planting of 26.5ha of native broadleaved woodland, the translocation of ancient woodland soil with its associated seed bank where appropriate and planting native trees and shrubs.

The assumed loss of at least six veteran trees from Sugar Brook Local Wildlife Site and Mill Wood, Castle Mill Local Wildlife Site will result in a permanent adverse residual effect. Where reasonably practicable, measures will be taken to protect veteran trees that are assumed to be lost.

There will be a net loss of 46.1km (28.6 miles) of hedgerow resulting in a permanent adverse residual effect. However, restoration of land required only for the construction of the Proposed Scheme to its current use, offers potential for additional retention and replacement of hedgerow.

Health

Construction

Construction of the Proposed Scheme will result in the demolition of five properties in the village of Thorns Green and five properties in the village of Halebank, Ringway. These demolitions represent a relatively sizable proportion of the two local communities. The erosion of social networks resulting from these demolitions will have the potential to reduce the levels of social contact and support and health the benefits they generate.

Construction of the Proposed Scheme will require property demolition at Higher Thorns Green Farm which hosts the Fairfield Farm Project. This may lead to a permanent loss of opportunities for vulnerable groups to engage in activities that are beneficial for their education, health and wellbeing resulting in an adverse health effect.

HS2 Ltd will continue to engage with those parties affected. Owners and occupiers of properties acquired for the construction of the Proposed Scheme are eligible for compensation in accordance with the compensation code.

The combination of construction noise, visual and traffic impacts will change the character of neighbourhoods, and may impact on residents' quality of life. The residents of Chapel Lane in Bucklow Hill, Hulseheath, Sunbank Lane in Ringway, the east of Warburton Green and the east of Hale Barns will experience a combination of effects from construction of the Proposed Scheme. People from these communities are likely to experience construction activities as changing the quality of their neighbourhood and to regard that change as adverse, both in diminishing the amenity of the community and in reducing the sense of its rural character. The presence of construction traffic is also likely to give rise to concerns about road safety, which may contribute to perceptions of reduced neighbourhood quality.

The temporary construction workforce is likely to be noticeable in more rural areas, with construction vehicles using local roads to access compounds, and workers using facilities within local settlements. Local communities could see temporary changes to their population size and demographics.

In Halebank, Ringway, the construction of the Proposed Scheme will affect neighbourhood quality as well as the levels of social contact and support and the health benefits they generate. It is expected that the majority of the population at Halebank, Ringway will experience impacts on two or more environmental or social factors that influence health during the construction of the Proposed Scheme, and this may therefore result in a cumulative effect on health.

In Hale Barns, the construction of the Proposed Scheme will affect neighbourhood quality, access to services and social contact and support and the health benefits they generate. It is expected that the majority of the population at Hale Barns will experience impacts on two or more environmental or social factors that influence health during the construction of the Proposed Scheme, and this may therefore result in a cumulative effect on health.

Operation

The presence of rail infrastructure and noise from passing trains will change the character of surrounding neighbourhoods and may reduce the quality of life for residents, particularly for the community of Hulseheath.

It is considered likely that the effects and wellbeing will lessen over time, as mitigation planting (located in MA07) becomes established.

Historic environment

Construction

Construction of the Proposed Scheme will result in a permanent effect due to the physical impact of the demolition of the former farmhouse of Buckhall, now The Four Seasons Hotel (also known as the Manchester Airport Marriott Hotel), a Grade II listed building.

Construction of the Proposed Scheme will result in a permanent effect due to physical impact (either permanent loss or partial removal) on 14 non-designated heritage assets, including: group of Four Cottages, Castle Mill Lane; Higher Thorns Green Farm, Castle Mill Lane; site of post-medieval brickyard, Cherry Tree Lane; site of two post-medieval buildings, east of Cherry Tree Farm; and linear archaeological features at M56 Junction 6, Warburton Green.

Construction of the Proposed Scheme will result in permanent effects due to changes to the setting of three Grade II listed assets: Mere Covert Cottage; Hough Green Farmhouse; and Yewtree House.

Construction of the Proposed Scheme will result in permanent physical impacts on Ringway Historic Landscape Character Area due to the demolition of a number of properties within Ringway and removal of field boundaries and woodland.

Landscape and visual

Construction

Temporary residual effects will arise from the presence of construction works including night-time lighting and changes to the existing landform and vegetation patterns that will affect the character of the local landscape. Where reasonably practicable, effects will be reduced by early planting to reduce the visibility of the Proposed Scheme. A set of mitigation measures,

including those in the draft CoCP, will be implemented to reduce landscape and visual effects further throughout the construction works.

Construction of the Proposed Scheme will result in adverse effects on the Ringway Lower Wooded Farmland LCA and the Altrincham and Hale Urban Fringe Farmland LCA due to the introduction of large-scale construction works.

Construction of the Proposed Scheme will result in significant visual effects at 31 representative viewpoints within the area, including on views from: Footpath Millington 2/1; Millington Hall; Millington Lane; Cherry Tree Lane; Footpath Rostherne 5/1; Ashley Road; Ashley Road bridge over Mid-Cheshire Line and from Mobberley Road; Lower House Farm; Tanyard Lane; Back Lane; Brickhill Lane; Thorns Green; Castle Mill Lane; Breach House Lane; Sunbank Lane; Burnside, Warburton Green; the A538 Hale Road; and Brooks Drive. Of these, residents at 19 representative residential viewpoints and at one recreational viewpoint location will also experience adverse night-time visual effects due to additional lighting associated with construction compounds.

Operation

During operation, the significant effects of the Proposed Scheme on the character and appearance of the local landscape will substantially reduce over time as mitigation planting grows and matures, however, effects may remain significant.

The Proposed Scheme will have a residual adverse effect on the Ringway Lower Wooded Farmland LCA and the Altrincham and Hale Urban Fringe Farmland LCA due to uncharacteristic built structures in the area.

Operation of the Proposed Scheme will result in significant visual effects at 20 representative viewpoints within the area resulting in significant effects, including on views from: Footpath Millington 2/1; Millington Hall; Millington Lane; Ashley Road; Ashley Road bridge over Mid-Cheshire Line; Mobberley Road; and the A538 Hale Road. Of these, residents at one representative residential viewpoint will also experience adverse night-time effects, namely in respect of the view south-east from Brooks Drive.

Socio-economics

Construction

The Proposed Scheme will require the demolition of farm buildings at Higher Thorns Green Farm and the demolition of the Manchester Airport Marriott Hotel. Additionally, the Proposed Scheme will result in the permanent loss of 80 of the 160 car parking spaces associated with the Holiday Inn Express at Manchester Airport. This will result in significant adverse effects on the operation of the hotel.

During construction of the Proposed Scheme, customers may also be discouraged from using Birkin Farm, South Arden and Little Lodge Holiday Lets, and the bed and breakfast at Sugar Brook Farm. The staff of a management company on Cherry Tree Lane are expected to be affected by construction works associated with the Proposed Scheme.

During construction and continuing into operation of the Proposed Scheme, Fentons Farm Shop will experience permanent adverse residual significant isolation effects as a result of road closure.

Operation

Customers may be discouraged from using Tatton Stays Holiday Lets (Birkin Farm and Stock Farm) as a result of a combination of visual and noise effects during the operation of the Proposed Scheme.

Sound, noise and vibration

Construction

The proposed avoidance and mitigation measures will reduce noise inside all individual dwellings from the construction activities such that residents will not be significantly affected.

Noise from construction will result in significant effects on residents closest to the construction works in the vicinity of Ringway, Warburton Green and Hale Barns.

Construction traffic in this area is likely to cause significant noise effects on adjacent residential properties on Chapel Lane between the B5569 Chester Road and Hulseheath Lane and on Rostherne Lane between Marsh Lane and Chester Road.

Noise from construction will result in significant effects on the following non-residential properties: Tatton Stays Holiday Lets (Birkin Farm, Stock Farm); and Sugar Brook Farm Bed & Breakfast, Mobberley Road.

Noise from specific construction activities has been identified as resulting in significant residual temporary effects on the non-residential buildings at Tatton Stays Holiday Lets (Little Lodge and South Arden Lodge).

Construction traffic in this area is likely to cause significant noise effects on the adjacent non-residential properties: Bucklow Manor Care Home on Chester Road; and Egerton Hall and Tatton Stays Holiday Lets (Virginia Cottage and Rose Cottage) on Rostherne Lane.

Noise from specific construction activities and from construction traffic has also been identified as causing a significant effect on Cherry Tree House (office) on Cherry Tree Lane.

A comprehensive set of mitigation measures, including those in the draft CoCP, will be implemented to control noise and vibration throughout the construction works.

HS2 Ltd will continue to seek reasonably practicable measures to reduce or avoid these residual significant noise effects. In doing so HS2 Ltd will continue to engage with stakeholders to fully understand the receptor, its use and the benefit of the measures.

Operation

At most individual residences, the proposed mitigation measures will reduce 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.

Operational noise will be reduced at source through the effective design and specification of the trains and track. A number of measures have also been incorporated into the design of the Proposed Scheme to mitigate noise effects during operation. These include noise barriers in the form of landscape earthworks and/or noise fence barriers.

Likely residual significant beneficial airborne noise effects due to decreased noise levels have been identified at Ashley including occupants of residential properties on Ashley Road, due to decreases in sound from road traffic as a result of road realignment.

Operation of the Proposed Scheme will result in operation airborne noise effects at the following non-residential receptors: Cherry Tree House (office), Cherry Tree Lane, Rostherne and Tatton Stays Holiday Lets (Birkin Farm and Stock Farm).

HS2 Ltd will continue to seek reasonably practicable measures to reduce or avoid these likely residual significant noise effects. In doing so HS2 Ltd will

View from Footpath Millington 6/2 looking towards the construction of the Millington cutting and Newhall Farm Accommodation Access (construction phase)

continue to engage with stakeholders to fully understand the potentially affected receptors, their use and the benefit of the measures.

Traffic and transport

Construction

Temporary diversions or realignments will result in increases in journey length for vehicle occupants on two roads.

The most intensive periods of construction of the Proposed Scheme will cause changes in traffic that will result in additional congestion and/or delays for road users of 27 junctions. However, road users of two junctions will experience improvements in congestion and/or delays.

Increases in traffic during construction will make it more difficult for non-motorised users to cross roads in this area on 34 roads.

The loss of parking during the construction period will impact both the Holiday Inn Express Manchester Airport and Manchester Airport (Building 319 World Cargo Centre).

Changes in bus journey times will lead to public transport delays on one road.

Rail possessions will cause disruption to users of the Mid-Cheshire Line and will be managed through a combination of measures that could include rail service diversions or replacement bus services.

Temporary closure or diversion/realignment of public rights of way and roads will increase travel distances for non-motorised users of 14 public rights of way and four roads.

Operation

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, including improved journey times between Manchester Airport, the Midlands and the south of England and released capacity on the network, easing pressure on other passenger rail services.

Permanent diversions or realignments will result in increased journey lengths for vehicle users of Ashley Road.

The operation of the Proposed Scheme in 2038 will cause changes in traffic that will result in congestion and/or delays for road users of 19 junctions. However, three junctions will experience improvements to congestion and/or delays.

Increases congestion and/or delays for road users in 2046 will be experienced at 21 junctions. However, at two junctions there will be improvements to congestion and/or delays.

Changes to the highway network will change travel patterns resulting in increases in traffic and could also result in increased traffic severance for non-motorised users of 33 roads in 2038. There will also be 13 roads where there will be improvements to traffic-related severance.

Increased traffic-related severance for non-motorised users in 2046 will occur on 37 roads. However, 14 roads will show improvements to traffic-related severance.

Changes in bus journey times resulting in public transport delays during operation of the Proposed Scheme will result in adverse effects on two routes in 2038 and 2046.

Closure or diversion/realignment of public rights of way and roads will increase travel distances for non-motorised users of 13 public rights of way and three roads.

Water resources and flood risk

Construction

On a precautionary basis, it is anticipated that significant residual effects will remain on potential spring in Bucklow Hill and an adverse effect on the spring and potential spring at Keepers Cottage, Sunbank Lane, due to the Proposed Scheme forming a barrier to groundwater flow.

The design of mitigation in this area will be refined in consultation with the Environment Agency and other stakeholders to reduce the impact on these springs and ensure no significant effects on water quality as far as reasonably practicable.

Construction of the Proposed Scheme will result in a permanent adverse effect on the water quality in Timperley Brook relating to highways discharges in the vicinity of Manchester Airport area. There will also be an adverse flooding effect on the agricultural land and the Mid-Cheshire Line railway due to the diversion of Tributary of Birkin Brook 1.

The design of mitigation in this area will be refined in consultation with the Environment Agency and other stakeholders to reduce the flood risk impact and ensure no significant effects on flood risk to nearby receptors as far as reasonably practicable.

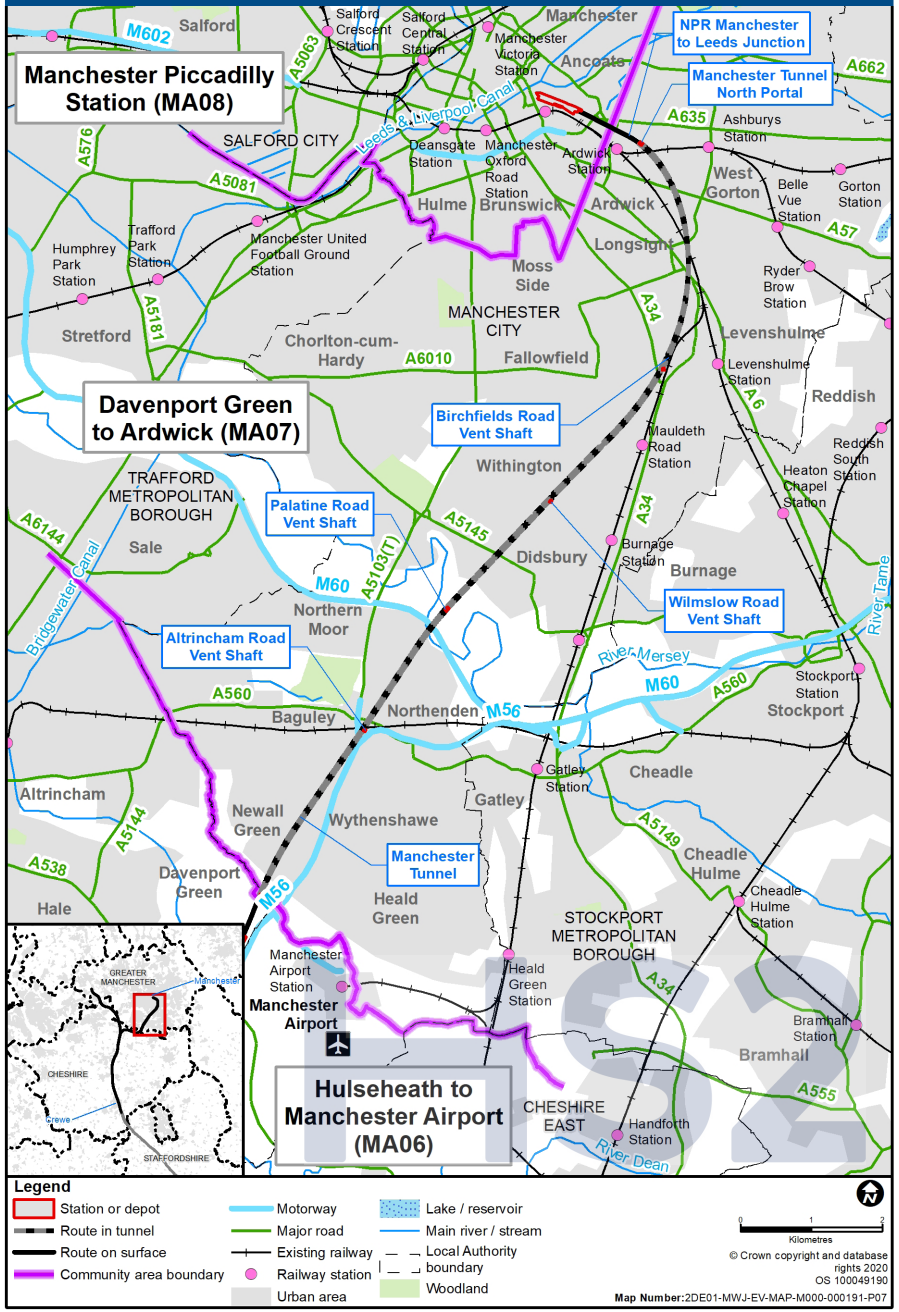
8.8 Davenport Green to Ardwick area (MA07)

Overview

The route of the Proposed Scheme in the Davenport Green to Ardwick area will be 13.4km (8.3 miles) in length extending north-east from Davenport Green to the north of Ardwick Station. The area falls within the local authority areas of Trafford Metropolitan Borough Council, Manchester City Council and the Greater Manchester Combined Authority (see Figure 29).

The area is predominantly suburban in character becoming more urban towards the north, with land use comprising dense residential development alongside recreational grounds. The area is interspersed with parkland and woodland, and includes a section of the River Mersey. The main settlements are Newall Green, Wythenshawe, Northenden, and Didsbury, Withington, Rusholme, Longsight, Roundthorn, West Gorton and Ardwick within Manchester City.

Figure 29: Davenport to Ardwick area (MA07) context map



The Proposed Scheme

The route of the Proposed Scheme will continue from the Hulseheath to Manchester Airport area (MA06) and enter Manchester tunnel south portal. Four vent shafts and headhouses will be required along the route of the tunnel. The route will emerge from the tunnel in Ardwick, continuing north-west in cutting towards central Manchester into the Manchester Piccadilly Station area.

The Proposed Scheme in this area will also provide for future connection to NPR, comprising features to enable a connection between a future NPR route between Manchester and Leeds and the route of the Proposed Scheme. This future connection is known as the NPR Manchester to Leeds junction.

In this area, the Proposed Scheme will require the demolition of four residential properties, 31 commercial properties and nine other structures (including a wheelchair shelter, electricity sub-stations, lighting tower, advertising hoardings, and a steel fuel tank). There will be permanent closure, realignment or diversion of four roads. One main construction compound and five civil engineering satellite construction compounds will be required in this area. Four of these satellite compounds will continue to be used as satellite compounds for railway systems following the completion of civil engineering works at those compounds.

Changes in the design of the Proposed Scheme in this area since the working draft ES

Key design changes include:

- introduction of the NPR Manchester to Leeds junction to enable a connection to a future NPR route;
- introduction of the Manchester south portal (previously located in Hulseheath to Manchester Airport area) into the Davenport Green to Ardwick area;
- amendment to the proposed horizontal and vertical alignment of the Manchester tunnel by up to 160m and 17m respectively through Newall Green, Northenden, Longsight and West Gorton;
- changes to the locations of the Altrincham Road vent shaft, Palatine Road vent shaft and Birchfields Road vent shaft (formerly call Lytham Road vent shaft); and
- introduction of the temporary Manchester tunnel north portal construction sidings, which will provide a facility to handle material from the construction of the Proposed Scheme.

Avoidance and mitigation measures

During the development of the design, measures have been incorporated to avoid or mitigate adverse impacts in this area including:

- the construction of a tunnel through the majority of the Davenport Green to Ardwick area will reduce the potential for impacts on ecology, such as designated sites, habitat and species, as well as potential impacts on communities and their health, the historic environment and historic assets, the landscape and traffic; and
- planting of native broadleaved woodland to connect Wrengate Wood Site of Biological Importance and Heyscroft ancient woodland, with Stenner Woods and Millgate Fields Local Nature Reserve.

Residual effects

The construction and operation phases of the Proposed Scheme are not likely to result in any adverse residual effects on agriculture, forestry, and soils, air quality and land quality in this area.

No likely adverse residual effects have been identified as arising during operation for community, ecology, socio-economics, sound, noise and vibration and water resources.

This section provides a summary of the likely significant residual environmental effects identified for the Davenport Green to Ardwick area.

Community

Construction

Effects associated with noise from, and views of, construction activities will result in temporary effects on approximately 150 properties to the east of the B5093 Wilmslow Road.

Effects associated with noise of construction activities and HGV traffic effects will result in temporary effects on approximately 45 residential properties along the A34 Kingsway.

Effects associated with noise from, and views of, construction activities and HGV traffic effects will result in temporary effects on approximately: 20 residential properties at the south of the A34 Birchfields Road; and at Birchfields Primary School.

Construction of the Proposed Scheme will result in the temporary loss of land at the Withington Golf Club.

Construction of the Proposed Scheme will result in the permanent loss of: land and the club house at the Withington Golf Club; Car Park D at The Christie Hospital with limited alternative car parking space for patients and visitors of the hospital; and parking spaces used for 'park and stride' scheme at the Fallowfield Retail Park car park with no direct pedestrian access to the remaining car parking space.

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

Ecology and biodiversity

Construction

The assumed loss of a single veteran tree located south of Rowrath Road will result in a permanent adverse residual effect. Where reasonably practicable, measures will be taken to protect this veteran tree that is assumed to be lost.

There will be a net increase in hedgerow of 0.8km (0.5 miles), which will result in a permanent beneficial residual effect.

Health

Construction

The combination of construction noise, visual and traffic impacts will change the character of neighbourhoods and may impact on residents' quality of life. The residents of streets to the east of the B5093 Wilmslow Road, the A34 Kingsway, and resident of properties to the south of the A34 Birchfields Road, will experience a combination of effects from construction of the Proposed Scheme. People from these communities are likely to experience construction activities as changing the quality of their neighbourhood and to regard that change as adverse, both in diminishing the amenity of the community and in reducing the sense of its rural character. The presence of construction traffic is also likely to give

rise to concerns about road safety, which may contribute to perceptions of reduced neighbourhood quality.

In addition, noise and visual effects will result in indirect effects on Birchfields Primary School and may result in a reduction of the beneficial wellbeing effects associated with educational attainment.

The temporary construction workforce is likely to be noticeable, with construction vehicles using local roads to access compounds, and workers using facilities within local settlements, particularly Hoo Green. This could mean that local communities see temporary changes to their population size and demographics. During the day, the workforce will be present on construction sites and compounds throughout the area, including work sites and satellite compounds.

Construction of the Proposed Scheme will require land currently occupied by The Christie Hospital Car Park D on the B5093 Wilmslow Road, resulting in in an adverse health effect on patients and staff accessing the hospital. In addition, on the basis of a precautionary assessment, a significant vibration effect on the hospital for a period of greater than one month has been identified. This may cause temporary disruption to hospital activities which involve the use of very vibration sensitive equipment, for example, imaging equipment.

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

Historic environment

Construction

Construction of the Proposed Scheme will result in a permanent physical impact (either permanent loss or partial removal) on: one listed building, the Grade II Milestone adjacent to Withington Fire Station; and 15 non-designated heritage assets including: the site of Church of St Silas and possible graveyard; the site of the King's Head Public House; the site of a post-medieval saw mill; the site of the Ancoats Branch Railway Cutting; the site of buildings on Tempest Street; the site of Chesters Brewery; the site of Victoria Brewery and Starch Works; the site of buildings on Hyde Street; and Brick Field off Gorton Road (site of).

Landscape and visual

Construction

Temporary residual effects will arise from the presence of construction works including night-time lighting and changes to the existing landform and vegetation patterns that will affect the character of the local landscape. Where reasonably practicable, effects will be reduced by early planting to reduce the visibility of the Proposed Scheme. A set of mitigation measures, including those in the draft CoCP, will be implemented to reduce landscape and visual effects further throughout the construction works.

Construction of the Proposed Scheme will result in adverse effects on the Mersey Valley Management Open Space LCA due to removal of vegetation, building demolitions and construction activities.

Construction of the Proposed Scheme will result in significant visual effects at 13 representative viewpoints, including on views from: Newall Green; Davenport Green; Kennett Road and Heartwood Road; the A560 Altrincham Road and Roundwood Road; the B5167 Palatine Road; Footpath Manchester 139, Footpath Manchester 212 and River Mersey; Withington Golf Club golf

course; Lynway Drive; Parkville Road; the B5093 Wilmslow Road, Oak Road; the A34 Birchfields Road; and Footpath Manchester 156 and Byway 156. Of these, views from six representative viewpoint locations will also be subject to adverse night-time visual effects.

Operation

Significant effects will reduce over time as the proposed mitigation planting matures and reaches its designed intention. However, one residential viewpoint location, the view south from B5167 Palatine Road and Footpath Manchester 211, will likely result in a significant visual effect at year 15 of operation.

Socio-economics

Construction

The Proposed Scheme will require the demolition of commercial properties at Fallowfield Retail Park and in the Ardwick area on Rondin Road, Hooper Street and the A665 Midland Street. These will result in adverse effects on the local economy.

Businesses displaced from their existing premises by the Proposed Scheme will be compensated in accordance with the compensation code.

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.

Sound, noise and vibration

Construction

The proposed avoidance and mitigation measures will reduce noise inside all individual dwellings from the construction activities such that residents will not be significantly affected.

Noise and vibration from construction will result in significant effects on residents closest to the construction works in the vicinity of Withington, Rusholme and Beswick (noise effects only).

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.

Noise from construction will result in significant effects on the following non-residential properties: The Open University off the A560 Altrincham Road; The Royals off the A560 Altrincham Road; and Birchfields Primary School on Lytham Road.

View from B5093 Wilmslow Road looking towards the proposed Wilmslow Road vent shaft (year 1 of operation)

On a precautionary basis, vibration from specific construction activities has been identified as resulting in significant residual temporary effects on the medical equipment for imaging proposed to be installed within The Christie Hospital Paterson Building, Wilmslow Road.

A comprehensive set of mitigation measures, including those in the draft CoCP, will be implemented to control noise and vibration throughout the construction works.

HS2 Ltd will continue to seek reasonably practicable measures to reduce or avoid these residual significant noise and vibration effects. In doing so HS2 Ltd will continue to engage with stakeholders to fully understand the receptor, its use and the benefit of the measures.

Traffic and transport

Construction

The most intensive periods of construction of the Proposed Scheme will cause changes in traffic that will result in additional congestion and/or delays for road users of 59 junctions. However, road users of seven junctions will experience improvements in congestion and/or delays.

Increases in traffic during construction will make it more difficult for non-motorised users to cross roads in this area on 50 roads. However, users of seven roads will find it easier to cross due to road improvements.

Changes in bus journey times resulting in public transport delays during the construction period will affect four bus corridors.

There will be a temporary major adverse significant effect on users of one public transport interchange due to an increase in journey length.

Rail possessions and blockades will cause disruption to users of the Ashburys Line and will be managed through a combination of measures that could include rail service diversions or replacement bus services.

Temporary closure or diversion/realignment of one public right of way will increase travel distances for non-motorised users.

Operation

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. This includes 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.

The operation of the Proposed Scheme in 2038 will cause changes in traffic that will result in congestion and/or delays for road users of 20 junctions. However, users of five junctions will experience improvements to congestion and/or delays.

Increases congestion and/or delays for road users in 2046 will be experienced at 29 junctions. However, at six junctions there will be improvements to congestion and/or delays.

Changes to the highway network will change travel patterns resulting in increases in traffic and could also result in increased traffic severance for non-motorised users of 57 roads in 2038. There will also be eight roads where there will be improvements to traffic-related severance.

Increased traffic-related severance (i.e. the ease of crossing roads) for non-motorised users in 2046 will occur on 86 roads. However, 10 roads will show improvements to traffic-related severance.

Changes in bus journey times resulting in public transport delays during operation of the Proposed Scheme will result in adverse effects on three corridors in 2038 and 2046.

The operation of the Proposed Scheme will result in the loss of parking spaces in 2038 and 2046 at Fallowfield Retail Park and The Christie Hospital (Car Park D).

Closure or diversion/realignment of public rights of way and roads will increase travel distances for non-motorised users of one road in 2038 and 2046.

Water resources and flood risk

Construction

On a precautionary basis, it is anticipated that nine residential properties and two sections of road near Palatine Road will experience changes in flood flows. In addition, one residential property in the area south of junction 5 of the M60 and four residential properties, one commercial property and Stenner Lane in the area east of Didsbury flood storage basin (Stenner Lane) will also experience adverse effects on peak flood level due to change in flood flows.

The design of mitigation in this area will be refined in consultation with the Environment Agency and other stakeholders to reduce the flood risk impact and ensure no significant effects on flood risk to nearby receptors as far as reasonably practicable.

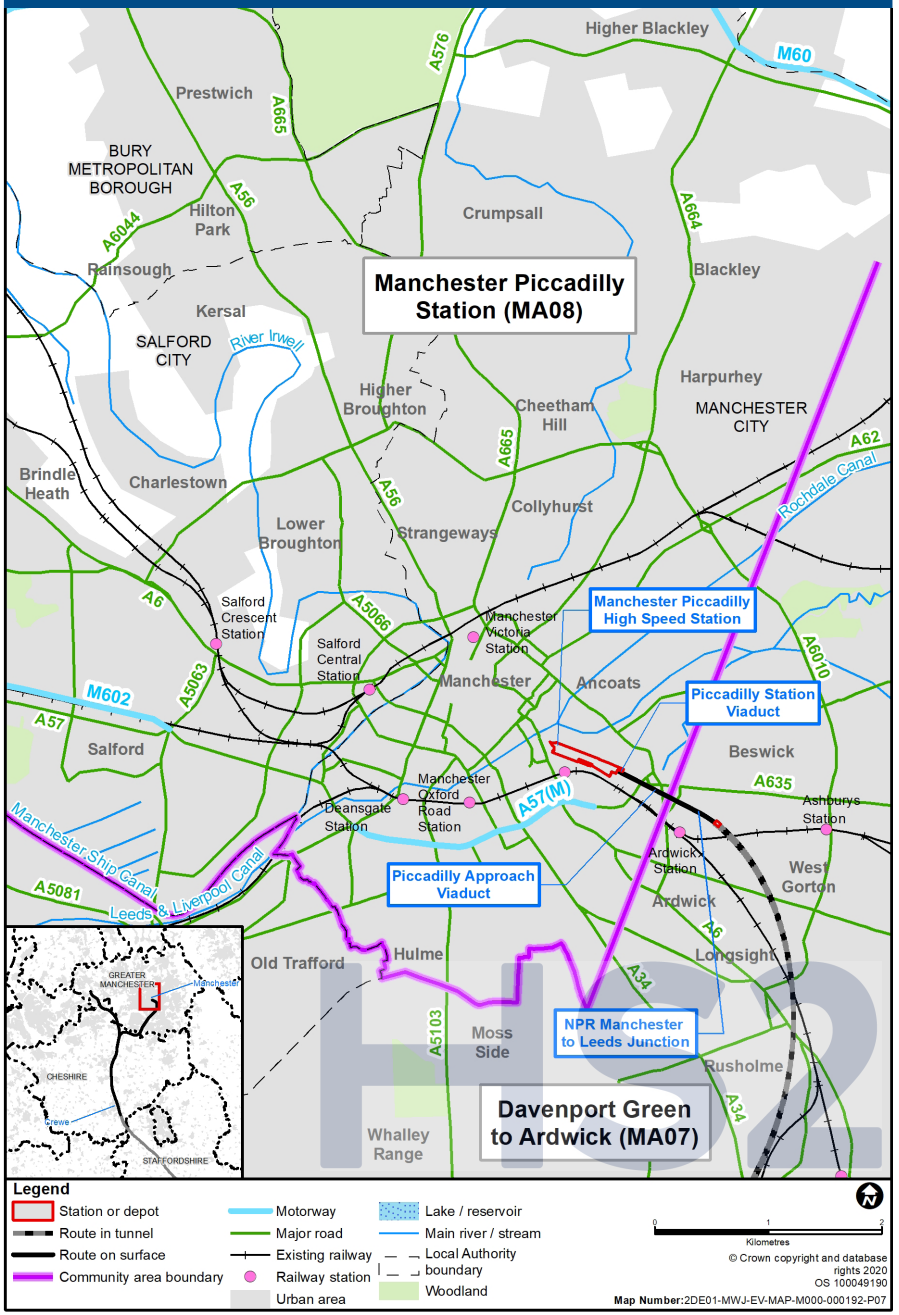
8.9 Manchester Piccadilly Station (MA08)

Overview

The route of the Proposed Scheme through the Manchester Piccadilly Station area will be 1km (0.6 miles) in length and fall within the local authority area of Manchester City Council and the Greater Manchester Combined Authority. The route will extend from Ardwick in the south and travel north-west towards Manchester city centre, before terminating at the proposed Manchester Piccadilly High Speed station, north of and adjacent to the existing Manchester Piccadilly Station (see Figure 30).

The area is entirely urban, with land use comprising light industrial, commercial, road and rail infrastructure throughout. The River Medlock runs through the southern part of the area. Piccadilly and the city centre are the nearest main residential areas, with the University of Manchester's Sackville Street campus to the south-west. The existing Manchester Piccadilly Station, railway and associated facilities are key elements of the urban environment in the area.

Figure 30: Manchester Piccadilly Station area (MA08) context map



The Proposed Scheme

The route of the Proposed Scheme will comprise a section of the HS2 Manchester spur, continuing from the Davenport Green to Ardwick area (MA07) in a north-westerly direction in a cutting. The route will then rise to ground level, transitioning onto embankment and then continue onto viaduct before terminating at the proposed Manchester Piccadilly High Speed station. The station will be located immediately to the north and adjacent to the existing Manchester Piccadilly Station. It will include six platforms, each 415m in length, joined to the existing Manchester Piccadilly Station by a shared concourse with a further ground-level concourse providing access to the high speed platforms. In addition, two multi-storey car parks providing 2,000 spaces, two cycle storage areas providing 520 spaces, drop-off and pick-up areas, bus stops and taxi rank, and public realm improvements will be provided.

The Manchester Piccadilly High Speed station will provide an interchange between high speed and local rail services, as well as Metrolink trams and buses for onward travel. The HS2 Manchester spur will provide for future connections between HS2 and a future NPR route between Manchester and Leeds (see Figure 31 and Figure 32), including connections for these services at the Manchester Piccadilly High Speed station and introduction of a new Metrolink turnback.

The Proposed Scheme in the Manchester Piccadilly Station area will require changes to the existing Metrolink track alignment. This will include relocation of the existing Piccadilly Metrolink stop to underneath the Manchester Piccadilly High Speed station, and expansion to include four 80m platforms. There will also be provision for a new two-platform stop, called the Piccadilly Central Metrolink stop, in the Manchester Piccadilly Station area and the introduction of a new turnback facility replacing an existing one on Sheffield Street.

The Proposed Scheme in the Manchester Piccadilly Station area will require changes to the existing Manchester Piccadilly Station. This will include removal of some of the existing car parking bays, relocation of the short stay car parking spaces at the southern entrance and provision of a new vehicular entrance into the existing car park below the existing station. A new services yard will be provided, accessed from the A6 London Road.

In this area, the Proposed Scheme will require the demolition of 48 commercial properties (including outbuildings) and 26 other structures and buildings (including buildings providing community facilities/services). There will be permanent closure, realignment or diversion of 31 roads and the realignment of the existing Metrolink line. One main construction compound will be required in this area (including one which straddles this area and MA07), which will also be used to install railway systems after the civil engineering has been completed. Four satellite construction compounds will be required in this area.

Figure 31: Visualisation of Manchester Piccadilly high speed station entrance

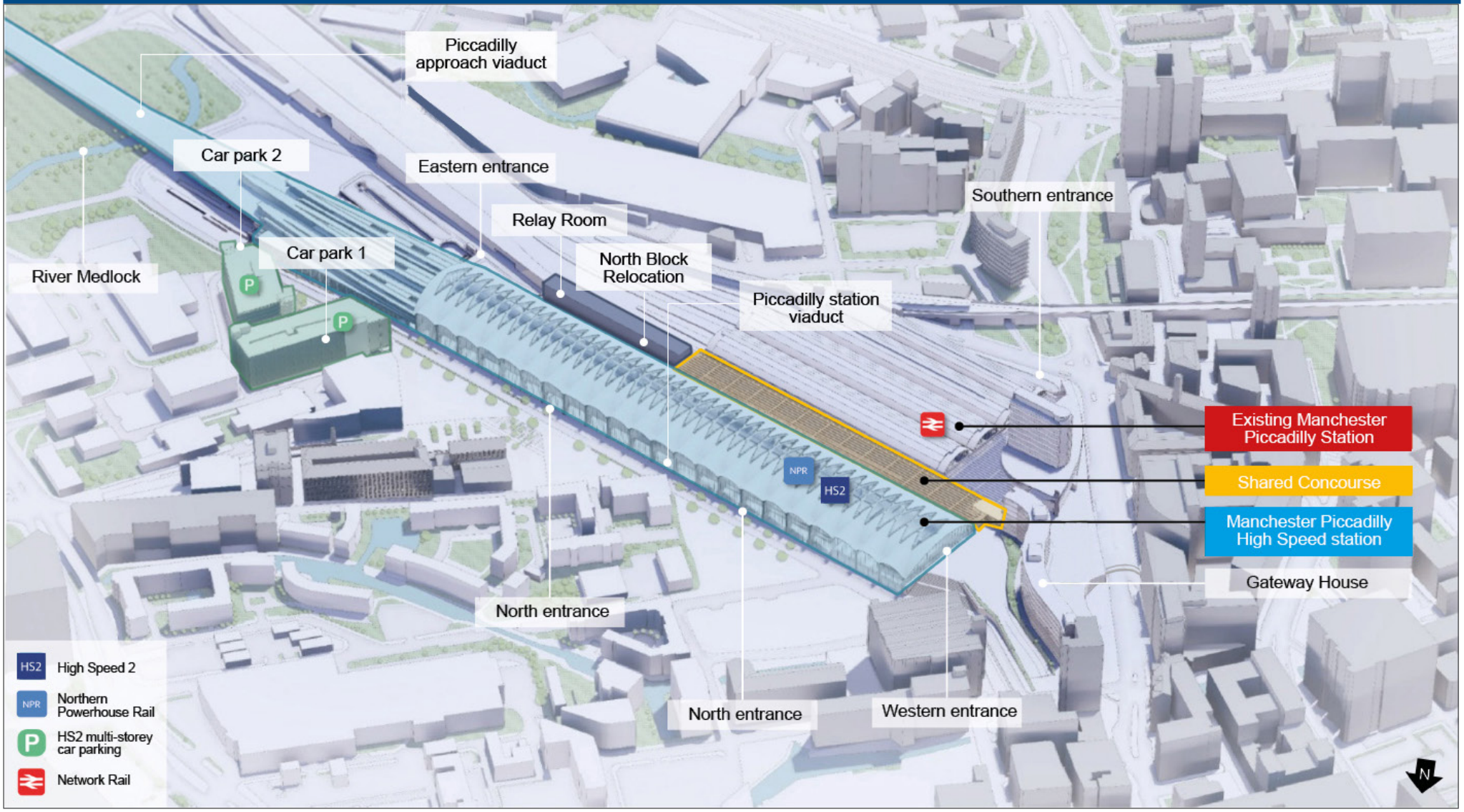
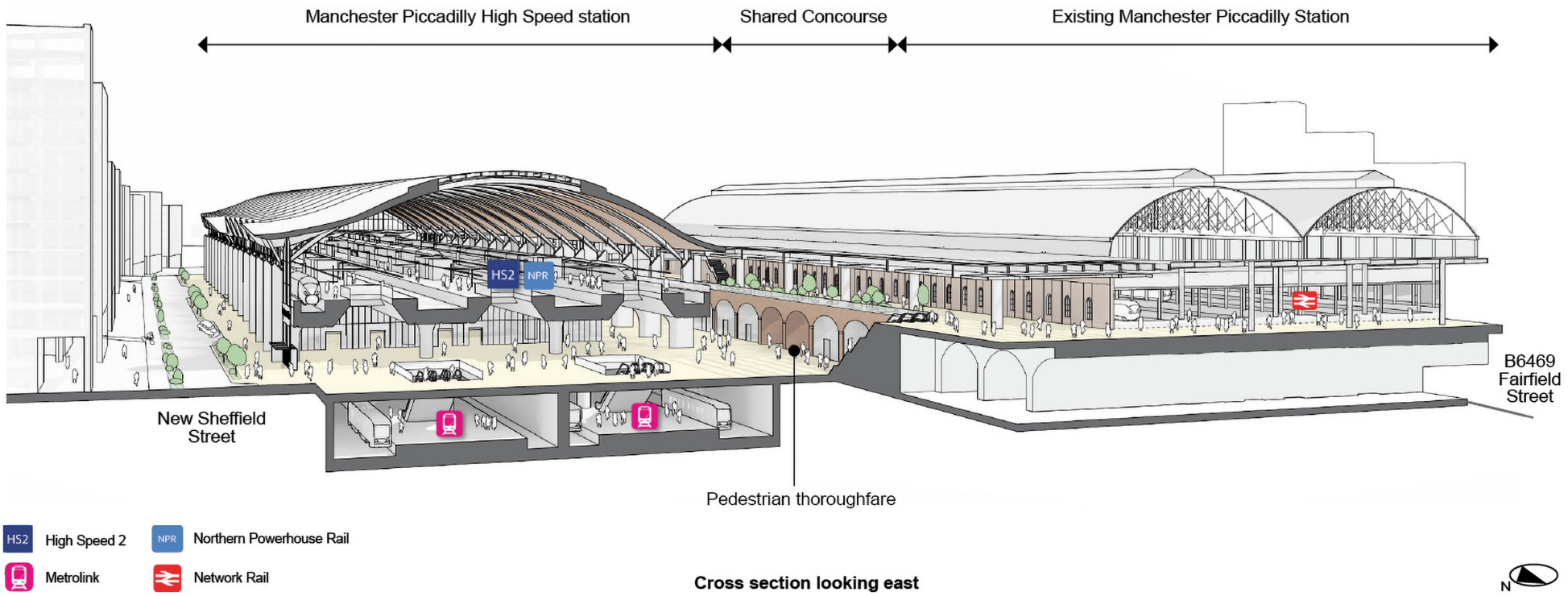


Figure 32: Manchester Piccadilly High Speed station cross-section



Changes in the design of the Proposed Scheme in this area since the working draft ES

Key design changes include:

- the introduction connections to enable future links between HS2 and NPR;
- the reconfiguration of the Manchester Piccadilly High Speed station increasing the width of the station footprint by 10m to provide two additional platforms as well as a change from two viaducts to three viaducts, to provide capacity for future NPR services to use the station;
- works to be conducted on the Metrolink to provide an interchange to the Manchester Piccadilly High Speed station;
- the introduction of a multimodal transport hub located between Manchester Piccadilly High Speed station and existing Manchester Piccadilly Station;
- the introduction of new highway changes between the A635 Mancunian Way, the A635 Fairfield Street, the A665 Pin Mill Brow and the A665 Chancellor Lane; and
- the introduction of the New Islington turnback facility at the existing New Islington Metrolink stop to replace the existing turnback facility on Sheffield Street.

Avoidance and mitigation measures

During the development of the design, measures have been incorporated to avoid or mitigate adverse impacts in this area including:

- the temporary and permanent diversions of public footpaths and highways to maintain connectivity around the existing and proposed stations; and
- the introduction of taller screening, provided by solid temporary hoarding, will provide acoustic screening at works near the B6469 Fairfield Street, Helmet Street, St Andrew's Square, Sparkle Street, Store Street, Piccadilly Village, Wharf Close, Piccadilly Point, Liberty Point, Jutland Street, Ducie Street at the junction with the A6 London Road, on Ducie Street between Peak Street and Pigeon Street, opposite the junction with the A6 and Travis Street, on Wadeson Road between Grosvenor Road and Kale Street and on the Great Ancoats Street between Ducie Street and Store Street. The inclusion of tree planting, green walls and areas of hard and soft landscaping around Manchester Piccadilly High Speed station and multi-modal transport hub will reduce likely significant visual effects.

Residual effects

The construction and operation phases of the Proposed Scheme are not likely to result in any adverse residual effects on: agriculture, forestry and soils, ecology and biodiversity and land quality in this area.

No likely adverse residual effects have been identified as arising during operation for air quality, health, historic environment, and water resources and flood risk.

Construction of the Proposed Scheme in this area is likely to result in a beneficial residual air quality effect and a beneficial residual landscape and visual effect during operation.

The following sections provides a summary of the likely significant residual environmental effects identified for the Manchester Piccadilly Station area at this stage of the design and assessment.

Air quality

Construction

There will be a residual significant beneficial effect at one residential property located on the Chester Street, Manchester and therefore a reduction in annual mean NO2 concentrations that will be experienced at this property.

Two residential properties at Chapeltown Street, Manchester and Farm Lane, Worsley will temporarily experience a worsening of the air quality (NO2 concentrations) as a result of the additional construction traffic generated on these roads.

Community

Construction

Effects associated with noise and vibration from, and views of construction activities and HGV traffic effects will result in temporary in-combination effects on approximately: 390 residential properties in the vicinity of Chapeltown Street; and 215 residential properties in the vicinity of Ducie Street.

Effects associated with noise from, and views of construction activities and HGV traffic effects will result in temporary in-combination effects on approximately 360 residential properties in the vicinity of Pollard Street.

Effects associated with noise from, and views of construction activities will result in temporary in-combination effects on approximately 800 residential properties in the vicinity of New Islington.

Construction of the Proposed Scheme will result in the permanent loss of the premises which house: SOL Christian Academy; Manchester Action on Street Health (MASH) and Manchester Offenders: Diversion Engagement and Liaison Service (MO:DEL) on Fairfield; True Jesus Church on St Andrews Street; Totem Gymnastics on Blackett Street; Cloud Aerial Arts on Blackett Street; and CrossFit Ancoats on Blackett Street.

Permanent closure of the accesses to Straight Blast Gym (SBG Manchester) on Sheffield Street and the Frontline Fitness Performance Centre on North Western Street is likely to affect the ability of these facilities to operate.

Health

Construction

Construction of the Proposed Scheme will result in the demolition of MO:DEL, an NHS mental health and substance abuse service; and MASH, a charity outreach for women in the sex industry. This will reduce the provision of specialist services, affecting health and wellbeing, and will result in an adverse health effect.

True Jesus Church on St Andrew's Street will also be demolished, limiting participation in community events and disrupting existing social networks.

Construction of the Proposed Scheme may affect the ability of the Straight Blast Gym (SBG Manchester) and the Frontline Fitness Performance Centre due to the permanent closure of Sheffield Street and North Western Street respectively.

Construction of the Proposed Scheme will require the demolition of properties housing Cloud Aerial Arts, CrossFit Ancoats and Totem Gymnastics on Blackett Street. The loss of these facilities may reduce the opportunity for health benefits achieved through physical exercise.

SOL Christian Academy, an independent school from nursery through to sixth form, will be demolished due to construction of the Proposed Scheme, reducing the beneficial wellbeing effects associated with education attainment.

HS2 Ltd will continue to engage with the parties affected. Owners and occupiers of properties acquired for the construction of the Proposed Scheme are eligible for compensation in accordance with the compensation code.

The combination of construction noise, visual and traffic impacts will change the character of the urban area and may impact on residents' quality of life. Views of, and noise from construction activities will be noticeable in the vicinity of Chapeltown Street, the A662 Pollard Street, New Islington specifically on Munday Street, Lampark Way and Vesta Street, and Ducie Street. Road closures and diversions will have the potential to reduce community connectivity by increasing journey times, particularly on heavily used commuter routes.

Historic environment

Construction

Construction of the Proposed Scheme will result in a permanent effect due to a physical impact (either permanent loss or partial removal) on one designated heritage asset, the Grade II listed train shed and undercroft at Manchester Piccadilly Station and 61 non-designated heritage assets, including: the site of St Andrew's Church and disused Graveyard; sites of Maskrey Mill and Pin; Bank Top Coal Wharf (site of); and three public houses and two breweries: the Swann Inn (site of) (MA08_0655), Castle Brewery (site of) (MA08_0662), Mitre Inn and adjoining houses (site of).

Landscape and visual

Construction

Temporary residual effects will arise from the presence of construction works including night-time lighting that will affect the character of the local landscape. Where reasonably practicable, effects will be reduced by early planting to reduce the visibility of the Proposed Scheme. A set of mitigation measures, including those in the draft CoCP, will be implemented to reduce landscape and visual effects further throughout the construction works.

Construction of the Proposed Scheme will result in adverse effects on both the Piccadilly, Ardwick and West Gorton Industrial and Infrastructure LCA and the City Centre Core, Historic and Commercial Grain LCA due to the demolition of buildings, presence of construction activity and compounds and loss of connectivity in the area.

Construction of the Proposed Scheme will result in significant visual effects at seven representative viewpoints in this area, including on views from: residential properties on Medlock Valley Way and Store Street Aqueduct; and from Ducie Street, Jutland Street and Chapeltown Street.

Operation

New public realm associated with the proposed Manchester Piccadilly High Speed station and tree planting will reduce adverse effects over time as mitigation planting grows and matures.

View from Jutland Street looking towards the construction of the proposed Manchester Piccadilly High Speed station (construction phase)

Operation of the Proposed Scheme will result in significant visual effect at one representative viewpoint for recreational users looking south east from Ducie Street.

Socio-economics

Construction

Construction of the Proposed Scheme will require the use of the car parking of a furniture store on the A665 Great Ancoats Street. The Proposed Scheme will require demolition of commercial properties on: the A665 Chancellor Lane; Dark Lane, Cresbury Street and William Street; the B6469 Fairfield Street and Crane Street; Helmet Street and St Andrew's Square; and at the existing Manchester Piccadilly Station. There will also be loss of land from West Way Nissan Manchester. The loss of these commercial properties within the land required for the construction of the Proposed Scheme will lead to significant effects.

During construction, businesses along Ducie Street will experience temporary isolation effects as a result of a temporary road closure. Additionally, businesses on North Western Street and Sheffield Street will experience permanent isolation effects as a result of road closures.

During construction customers may also be discouraged from using three hotels and aparthotels, namely: Premier Inn on Dale Street; Staycity Aparthotels at Gateway House; and a hotel on Adair Street (yet to be built) that are expected to be affected by construction works associated with the Proposed Scheme.

Sound, noise and vibration

Construction

The proposed avoidance and mitigation measures will reduce noise inside all individual dwellings from the construction activities such that residents will not be significantly affected.

Noise from construction will result in significant effects on residential communities closest to the construction works at Hulme, Piccadilly and New Islington.

Construction traffic in this area is likely to cause significant noise effects on adjacent residential properties on Chapeltown Street between Store Street and the A665 Great Ancoats Street.

Noise from construction will result in significant effects on non-residential buildings closest to the construction works including: West Way Nissan Manchester, A665 Chancellor Lane; Dragon Heart Nursery, Ardwick Green North; Macdonald Hotel, A6 London Road; MSS Tower, Sackville Street; University of Manchester Morton Laboratory, Sackville Street; University of Manchester Moffat Building, Sackville Street; University of Manchester Barnes Wallis Building, Sackville Street; new hotel, A6 London Road; Tower Block Piccadilly Station, Piccadilly; Monroes Bar Hotel, A6 London Road; Motel One, A6 London Road; 3 Piccadilly Place, Piccadilly; Staycity Aparthotel, Piccadilly; Transport for Greater Manchester, Piccadilly; DoubleTree by Hilton Hotel, Piccadilly Place; Malmaison Hotel, Gore Street; Rodwell Tower, Piccadilly; Abode Manchester, Piccadilly; Premier Inn, Dale Street; Your Smile Clinic, Dale Street; La Reserve Aparthotel, Ducie Street; Native Aparthotel, Ducie Street; Office on 11 Ducie Street; Dakota, Ducie Street; Ducie House, Ducie Street; Paradise Wharf, Ducie Street; The Northern Quarters Serviced Apartments, Laystall Street; Aeroworks, Adair Street; Ibis Hotel, A62 Pollard Street; Fabrica, A665 Great Ancoats Street; St Anne's RC Primary School, Carruthers Street; and St Anne Presbytery, Carruthers Street.

Noise and vibration from specific construction activities has been identified as resulting in significant residual temporary effects on the non-residential buildings at: Staycity Aparthotels, Piccadilly; Premier Inn, Dale Street; La Reserve Aparthotel, Ducie Street; Native, Ducie Street; and Aeroworks, Adair Street.

Construction traffic in this area is likely to cause significant noise effects at Aeroworks (offices), located adjacent to Adair Street.

A comprehensive set of mitigation measures, including those in the draft CoCP, will be implemented to control noise and vibration throughout the construction works.

HS2 Ltd will continue to seek reasonably practicable measures to reduce or avoid these likely residual significant effects due to noise and vibration. In doing so HS2 Ltd will continue to engage with stakeholders to fully understand the potentially affected receptors, their use and the benefit of the measures.

Operation

At the majority of individual residences, the proposed mitigation measures will reduce noise inside dwellings such that it does not reach a level where it will significantly affect residents, and therefore, no likely residual significant effects are identified.

Operational noise will be reduced at source through the effective design and specification of the trains and track. A number of measures have also been incorporated into the design of the Proposed Scheme to mitigate noise effects during operation. These include noise barriers in the form of landscape earthworks and/or noise fence barriers.

During operation there will be residual adverse airborne noise effects on residential properties on Chapeltown Street due to increased noise levels.

Likely residual significant operational beneficial airborne noise effects due to decreased noise levels have been identified at occupants of residential properties on Store Street.

HS2 Ltd will continue to seek reasonably practicable measures to reduce or avoid these likely residual significant noise effects. In doing so HS2 Ltd will continue to engage with stakeholders to fully understand the potentially affected receptors, their use and the benefit of the measures.

Traffic and transport

Construction

Temporary diversions or realignments will result in changes to journey lengths for vehicle occupants, which will result in moderate adverse effects on three roads, which are significant.

The most intensive periods of construction of the Proposed Scheme will cause changes in traffic that will result in additional congestion and/or delays for road users of 64 junctions. However, road users of seven junctions will experience improvements in congestion and/or delays.

Increases in traffic during construction will make it more difficult for non-motorised users to cross roads throughout this area on 53 roads. However, users of 36 roads will find it easier to cross due to road improvements.

There will be a temporary adverse effect on users of the Metrolink Ashton Line associated with the temporary closure and replacement bus service. There will be a further temporary adverse effect for Metrolink Ashton Line passengers who use the Piccadilly Metrolink stop and will be required to board and alight the Metrolink replacement bus services at Piccadilly Gardens.

Changes in journey length during the construction period will result in a temporary adverse effect, for Manchester Piccadilly Station users who interchange at the Manchester Piccadilly Metrolink stop for access to the Metrolink Ashton Line.

The loss of parking during the construction period will impact a customer car park for a furniture retailer on the A665 Great Ancoats Street. There will also be a temporary adverse effect for users of parking at Manchester Piccadilly Station multi-storey car park, Network Rail Ramp, Network Rail undercroft and Gateway House car park, associated with the diversions to pedestrian routes during construction.

Temporary closure or diversion/realignment of footways and roads will increase travel distances for non-motorised users of 13 roads.

Operation

The Proposed Scheme will generate significant major beneficial effects for rail passengers as a result of the introduction of HS2 services at Manchester Piccadilly High Speed station, including substantially improved journey times and reliability between Manchester, the North of England, the Midlands and the South of England and released capacity on the network easing pressure on other passenger rail services.

The operation of the Proposed Scheme in 2038 will cause changes in traffic that will result in congestion and/or delays for road users of 39 junctions.

Increases congestion and/or delays for road users in 2046 will be experienced at 38 junctions. However, at five junctions road users will experience improvements to congestion and/or delays.

Changes to the highway network will change travel patterns resulting in increases in traffic and could also result in increased traffic severance for non-motorised users of 71 roads in 2038. There will also be 59 roads where there will be improvements to traffic-related severance.

Increased traffic-related severance for non-motorised users in 2046 will occur on 66 roads. However, 55 roads will show improvements to traffic-related severance.

The operation of the Proposed Scheme will result in the loss of parking spaces in 2038 and 2046 at: NCP Car Park Manchester on Sheffield Street (Sheffield Street North); parking under Gateway House and ramp; Baird Street Car Park; and Baird Street (on-street parking bays).

There will also be a permanent adverse effect for users of Manchester Piccadilly Station parking as a result of an increase in journey length in 2038 and 2046, associated with the relocation of parking to the new multi-storey car parks on Adair Street.

Closure or diversion/realignment of roads will increase travel distances for non-motorised users of six roads in 2038 and 2046.

Water resources and flood risk

Construction

On the basis of current information, the construction of the Proposed Scheme will result in a beneficial effect on the shape and flow of the River Medlock due to the removal of the existing culvert at Enterprise Park, which will improve the flood flow conveyance in the area.

9 Summary of route-wide effects

9 Summary of route-wide effects

9.1 Introduction

This section of the NTS presents a summary of the likely residual significant environmental effects that have been identified on a route-wide basis. Route-wide effects are those that occur at a larger scale than that presented in the Volume 2, Community Area reports and for which a route-wide assessment is therefore appropriate.

At a route-wide level there will be no likely residual significant effects on community, landscape and visual, land quality, major accidents and disasters, and sound, noise and vibration.

9.2 Agriculture, forestry and soils

Construction of the Proposed Scheme will temporarily require approximately 1,995ha of agricultural land in England, of which 856ha will be high quality agricultural land. Agricultural land required temporarily will be returned to agricultural use, or another use agreed with the landowner and local planning authority. This will be achieved by following good practice guidance set out in the draft Code of Construction Practice (CoCP).

Following construction and restoration to agricultural use, the area of land that will be permanently removed from agricultural use in England will be approximately 927ha, of which approximately 311ha will be high quality agricultural land (which represents less than 0.01% of high quality agricultural land in England). The permanent requirement of all grades of agricultural land represents about 0.01% of the 9.1 million hectares of utilised agricultural land in England.

9.3 Air quality

It is expected that with the operation of the Proposed Scheme, there will be a shift of road, rail and domestic air passengers switching to high speed rail. It has been assumed that this modal shift will reduce car journeys on motorways across Britain. Overall, the modal shift is predicted to bring improvements to air pollutant emissions in 2039 of between 5.4 and 20.7 tonnes of nitrogen oxides and between 8.1 to 8.7 tonnes of particulate matter (includes PM10 and PM2.5) depending on the uptake of electric vehicles.

9.4 Climate change

As with Phase One and Phase 2a, the Proposed Scheme will play a key part of the UK's future low-carbon transport system and will support the Government's overall carbon objectives in achieving net zero by 2050. In comparison with most other transport modes, high speed rail offers some of the lowest carbon emissions per passenger kilometre versus other transport modes during operation.

The greenhouse gas assessment reports on construction and operational emissions associated with the Proposed Scheme in the form of a 'carbon footprint'. The Proposed Scheme's overall greenhouse gas emissions have been contextualised against UK national greenhouse gas emissions and relevant sectors such as the construction and transport sectors.

The Proposed Scheme's carbon footprint over the course of the construction period (2025 to 2038) will represent less than 0.13% of the UK's construction carbon budget over the same period.

During operation, the Proposed Scheme's greenhouse gas emissions represent a small contribution to the UK's predicted annual emissions, being equivalent to less than 0.05% of all of the UK's transport related carbon emissions in 2038.

These figures will decline in line with the continuing replacement of fossil fuel power stations to generate electricity by low-carbon alternatives and the decarbonisation across manufacturing sectors. HS2 Ltd is committed to minimising insofar as is reasonably practicable carbon emissions. The use of electricity for operating rolling stock, stations, and rail systems is a prominent carbon source within the lifetime impacts of the Proposed Scheme. HS2 Ltd's Net Zero Carbon Plan seeks to accelerate the ambition of the construction industry to realise net zero during the construction phase of the Proposed Scheme and also to procure zero carbon electricity from day one of operation.

9.5 Ecology and biodiversity

Designated sites

One site designated as being of international importance for nature conservation will be affected by the construction and/or operation of the Proposed Scheme. Rochdale Canal Special Area of Conservation is 4.6km north of the Proposed Scheme. The canal is designated between the parish of Failsworth, Oldham in Greater Manchester, and the town of Littleborough, north-east of Rochdale. The Special Area of Conservation is also designated as a Site of Special Scientific Interest, which is similarly impacted by the Proposed Scheme. There are construction traffic routes and displaced traffic associated with the Proposed Scheme adjacent to the Special Area of Conservation. For this reason, a Habitat Regulations Assessment has been undertaken. 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 concluded that there may be an adverse effect on this Special Area of Conservation that is significant at the international level. Further assessment will be carried out in accordance with relevant legislation and further opportunities to avoid or reduce effects at this site, will be considered as the design develops. The impacts on the SSSI are predicted to result in a significant adverse effect at the national level. Further opportunities to avoid or reduce effects at this site will be considered as the design develops.

Habitats

In England, there are 16 woodlands that are either classified as ancient woodland or have been assessed as ancient woodland for the purpose of the ES, where there would be a direct loss of this habitat due to the construction of the Proposed Scheme. In Scotland, there is one ancient woodland where there would be a direct loss of this habitat. A total of 5.7ha of ancient woodland will be lost due to construction of the Proposed Scheme across England and Scotland. This loss is significant at a national level. The loss of woodland will be compensated through a range of measures including the translocation of ancient woodland soil with its associated seed bank receptor sites that have, wherever possible, been chosen because they link to and/or are adjacent to ancient woodland fragments. This will seek to increase the connectivity of fragmented ancient woodland parcels. Other measures such as planting native tree and shrub species of local provenance, and translocation of coEFFECTIVE PPIce stools and dead wood, will be undertaken as part of the compensation for each ancient woodland impacted.

At least 24 veteran trees will be lost due to the construction of the Proposed Scheme which is significant at the national level. Where reasonably practicable, measures will be taken to protect veteran trees within and adjacent to construction works to reduce the number that will be lost.

At the regional level, 53.5ha of semi-natural broadleaved woodland, 27.8ha of grassland and 313 ponds will be lost due to the construction of the

Proposed Scheme. Overall, approximately 87ha of habitats of principal importance will be lost as a result of construction of the Proposed Scheme, including the various habitats identified above. This is a significant effect at a national level. Where these habitats of principal importance will be lost, opportunities for the creation of compensatory habitat have been identified. A total of approximately 240ha of habitats of principal importance will be created, consisting mainly of lowland mixed deciduous woodland and lowland meadow with some wetland habitats. In addition, there will be further areas of landscape planting of native broadleaved woodland, which will contribute to habitat creation.

Species

The construction of the Proposed Scheme will result in the loss of barn owl territories and, during operation, barn owls are also at risk of being struck by passing trains. HS2 Ltd will pursue opportunities with local landowners, such as the provision of owl nesting boxes to help increase barn owl populations away from the route of the Proposed Scheme.

9.6 Electromagnetic interference

High voltage electrical equipment creates electromagnetic fields, which can potentially have implications for human health and may cause electromagnetic interference to other electrical/electronic equipment (e.g. communications) or infrastructure (e.g. power lines). In addition, features such as tower cranes can cause temporary interference to TV reception.

The main potential source of electromagnetic interference associated with the Proposed Scheme will be the traction power system, comprising the overhead line equipment along the route and supporting infrastructure such as feeder stations. The railway communications system will, in addition, generate radio signals. The level of electromagnetic fields diminishes rapidly with distance from the source, so the extent of any interference or harmful effects will be limited to only a short distance horizontally and vertically from the railway boundary or the boundary of any traction power sub-station or switching station.

The railway's own operating systems will need to be immune to electromagnetic interference and radio interference, whilst levels of exposure for passengers and staff must be acceptable. This will be achieved by ensuring that all electrical equipment complies with the relevant standards for electromagnetic compatibility and personal protection.

Three third-party receptors beyond 50m from the Proposed Scheme have been identified which have very sensitive equipment or systems. These are Pickmere Radio Telescope, Manchester Airport and The Christie NHS Foundation Hospital. The technical assessment has identified a potential risk of an electromagnetic interference effect on these receptors. In light of this, on a precautionary basis, a likely significant effect has been identified at these receptors.

HS2 Ltd is undertaking on-going engagement with the owners and operators of these facilities to establish the electromagnetic sensitivity levels and risk of electromagnetic interference. Any appropriate mitigation measures will be identified during on-going engagement.

Except for these receptors, no other likely significant effects electromagnetic interference effect have been identified in the assessment including to human health or those individuals fitted with active medical implants including pacemakers.

9.7 Health

The Proposed Scheme will impact on a range of environmental and socio-economic factors that have the potential to affect the health and wellbeing of the population across the route as a whole, and also at the wider regional level. The health assessment has considered impacts during construction such as employment and income, housing, transport (traveller

stress and road safety), planning blight and uncertainty; and railway noise during operation. Since there are no accepted criteria for defining 'significant' health effects, professional judgements have been made as to the level and type of impact that could potentially affect health.

The Proposed Scheme will result in the displacement of some existing businesses through land required for its construction. When assessed on a route-wide basis, the relocation and loss of jobs as a result of the displacement of businesses is not considered to affect overall employment levels and associated levels of health and wellbeing across the community as a whole. Businesses displaced from their existing premises by the Proposed Scheme will be compensated in accordance with the Compensation Code.

Certain routes will be subject to significant increases in traffic flows and/or diversions for the medium to long term. Traffic management plans will be produced to ensure no direct adverse health effects associated with road safety, but increased traffic flows and congestion may contribute to traveller stress. HS2 Ltd will engage with local authorities and communities on road safety during construction works.

Assessed on a precautionary basis, construction of the Proposed Scheme will result in the demolition of a total of 87 residential properties across the route of the Proposed Scheme. Those affected by relocation to a new residential property will be likely to experience adverse effects, which may include: stress associated with the move itself; negative feelings associated with attachment to existing homes; feelings of frustration or anxiety related to uncertainty and lack of control; practical issues such as specific adaptation requirements; and reduced access to family, social networks, employment or education. These effects may occur prior to, during and after the relocation process. HS2 Ltd will continue to engage with those parties affected. Owners and occupiers of properties acquired for the construction of the Proposed Scheme are eligible for compensation in accordance with the Compensation Code.

During the operation of the Proposed Scheme, residents along the route could be exposed to noise from passing trains. Exposure to noise from the Proposed Scheme will potentially cause sleep disturbance, and annoyance related health issues, however, this potential risk is a small effect on a small population.

9.8 Historic environment

The Proposed Scheme will not have a direct physical effect on any World Heritage Site, Grade I listed buildings, Category A, B or C listed buildings in Scotland, registered park and garden (inventory garden and designed landscape in Scotland) or registered battlefield (inventory battlefield in Scotland).

The Proposed Scheme will require the demolition of one Grade II listed building, Buckhall, The Four Seasons Hotel.

The Proposed Scheme will also directly result in a permanent effect as a result of physical impact to: three Grade II listed buildings (the Train shed and undercroft at Manchester Piccadilly Station, Preston Railway Station and the Railway Viaduct over the River Ribble) and one Grade II* listed building (Citadel Station, also known as Carlisle Station) within the land required for construction. These listed buildings will be altered but not demolished.

Permanent construction and operation phase effects are predicted to alter the character and appearance of the Trent and Mersey Canal conservation area. A permanent construction phase effect is also predicted in relation to Bostock conservation area as a result of landscape planting proposed within the conservation area.

Two Grade II listed mileposts (Milepost, Bostock Road (east) and the Milestone adjacent to Withington Fire Station) will be removed during

construction and then reinstated in, or as close as possible to their original location.

Also within the land required for the construction of the Proposed Scheme are two burial grounds: St Andrew's Church and disused graveyard (site of), and St Silas' Church and disused graveyard (site of), both in Manchester, and both non-designated heritage assets of high value.

Mitigation of the effects of the Proposed Scheme on the historic environment will include a programme of historic environment investigation, recording, reporting and archiving guided by the historic environment research and delivery strategy.

9.9 Socio-economics

The Proposed Scheme will enable the realisation of wider socio-economic benefits for businesses, communities and local authorities. Good connectivity will strengthen the links between businesses, workers and customers and offer improved accessibility to labour markets, supply chains, finance and research.

Generating demand for property development around the Manchester Piccadilly High Speed station and Manchester Airport High Speed station will provide substantial new employment space and new homes. The Strategic Regeneration Framework for Manchester Piccadilly proposes almost 8.0 million square feet of development of which around 55% will be for residential use equating to over 5,000 residential units.

At a route-wide level the Proposed Scheme is expected to generate the equivalent of approximately 8,800 full-time construction jobs, which is considered a significant beneficial effect. Of these 6,060 full-time construction jobs will be based at worksites along the Proposed Scheme. The construction works will also generate additional demand for goods and services in the local area, which could stimulate business growth and opportunities to generate further employment (equivalent to 3,300 full-time jobs), which will be a significant beneficial effect.

Construction of the Proposed Scheme will result in the displacement of some existing businesses through land requirements. It is considered that this will result in the relocation of approximately 6,500 jobs. In total, approximately 1,650 jobs may be lost route-wide from businesses directly and indirectly affected during the construction phase. In the context of the economies of the North West, which provide over 3.3 million jobs, the potential level of job loss is a relatively small proportion of total employment which will diminish over time as the UK and regional economies grow and new opportunities for employment for people who have lost their jobs, and have been unable to find work, come forward. Discussions with a number of businesses are ongoing, with the aim to limit the impact of the Proposed Scheme on their operations.

At a route-wide level, the Proposed Scheme will generate 4,180 direct operational jobs (traincrew, maintenance crew etc), and 1,670 indirect jobs, creating a moderate beneficial effect, which is considered to be significant.

On completion the Proposed Scheme will generate wider benefits of £3.75 billion (present value, 2015 prices).

9.10 Traffic and transport

Without the Proposed Scheme, the WCML and other routes would become increasingly congested. The Proposed Scheme is expected to bring benefits to transport users across a variety of trip types including commuter, business and leisure passengers.

Traffic and transport effects during construction and operation have been considered at a regional and route-wide level. The traffic and transport assessment is largely based upon the output from transport models, which rely on economic modelling and assessment.

Whilst continued growth in demand is forecast for long-distance rail travel to 2038 when the Proposed Scheme is assumed to open and beyond 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 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. Forecasts for rail demand are expected to recover and still continue to grow in the longer term.

During construction, the impacts of construction traffic on the road network is focused on the roads close to the Proposed Scheme and these are considered within Volume 2, Community Area reports. The reuse of material in the construction of the Proposed Scheme and the use of rail to transport materials, where reasonably practicable, will help to reduce the wider traffic impacts of such movements. Impacts on the wider strategic road network are not considered to result in any route-wide level effects.

Where construction or maintenance cannot safely be undertaken while trains are running on a section of the conventional railway, trains are diverted or stopped and possession of a section of railway is taken for a specified period. Each closure period is known as a 'possession', or when over an extended period, typically more than a weekend, this is known as a 'blockade'. Engineering works required on the conventional rail network, and expected rail possessions and blockades during construction of the Proposed Scheme, will have the potential to cause disruption to the travelling public and freight services. Those at a sufficient route-wide scale include rail passengers and freight services on the WCML, and around Preston Station and Carlisle Station. Possessions and blockades affecting WCML services (passenger and freight services) and the potential for route-wide effects include: eight blockades of up to nine days each; three 100-hour possessions; eight 72-hour possessions; 93 possessions lasting 54 hours; and 41 possessions lasting 27 hours. In isolation each of these have limited impacts but taken together and recognising the substantial number and extended duration of the possessions and blockades that will affect users of the WCML, this will lead to a major adverse effect on rail passengers and freight which is significant.

Whilst rail passenger effects can be mitigated by rail replacement services, it is more difficult to mitigate effects on freight in the event of blockades closing the WCML in this area, and if no diversionary routes are available or suitable.

HS2 Ltd will continue to work with Network Rail to seek to reduce the impacts of possessions and blockades on the railway network, where reasonably practicable.

The introduction of the Proposed Scheme will provide improved journey times through use of HS2 services and build on the already significant beneficial effects of Phase One and Phase 2a.

During operation, there will be substantial changes to train patterns and frequencies on the rail network, both as a direct result of Proposed Scheme services and also to take advantage of the capacity released on the conventional rail network. This includes the potential for new services to take up conventional rail network train paths released by HS2 services taking over the role of providing for long-distance travel. Together with the new HS2 services, these changes will provide journey time and accessibility benefits and are likely to reduce crowding and congestion on the conventional rail network. These service improvements are a benefit in overall use of rail services and will shift use from private car and air travel during the operation of the Proposed Scheme.

The Proposed Scheme, including Phase One and Phase 2a, comprises 11 services per hour in each direction to and from London Euston and three services per hour starting at Birmingham Curzon Street. Volume 3, Route-wide effects provides more detail of these.

Substantial journey time benefits will be provided by the Proposed Scheme with the biggest proportionate benefits achieved where the service uses just the HS2 route. These are presented in Table 1 of this NTS.

The impact of the Proposed Scheme will be a reduction in annual vehicle travel by car on strategic long-distance routes of 106 million kilometres by 2046. The in-combination impact of HS2 Phase One, Phase 2a and the Proposed Scheme will be a reduction in annual vehicle travel by car on strategic long-distance routes of 239 million kilometres by 2046.

The Proposed Scheme will increase demand for rail travel and provide beneficial relief to the conventional rail network as well as beneficial reductions in long distance travel by car, both of which are substantial increases compared to Phase One and Phase 2a in combination. These impacts for the Proposed Scheme in isolation are considered to provide a major beneficial effect which is significant.

9.11 Waste and material resources

Construction of the Proposed Scheme will be undertaken in accordance with the measures set out in the draft CoCP. This includes plans to reduce waste generated from construction activities where reasonably practicable; reuse soil and agricultural subsoil close to the point of excavation; and reuse excavated material that is either uncontaminated or can be cleaned.

Based on the design approach adopted for the Proposed Scheme, it is forecast that approximately 31 million tonnes of material will be generated throughout the 14-year construction period, of which approximately 84% (approximately 26 million tonnes) will be diverted from landfill. This will be achieved by reusing suitable excavated material to construct the necessary engineering and environmental mitigation earthworks along the route of the Proposed Scheme and reusing, recycling or recovering construction and demolition wastes where feasible. A further 1.4 million tonnes of excavated material and construction waste will be generated through construction of the off-route works, of which approximately 73% (approximately 1 million tonnes) will be diverted from landfill.

This will leave approximately 4.6 million tonnes of inert material and approximately 22,600 tonnes of hazardous material (equivalent to 0.07% of the overall excavated material, including demolition waste for the Proposed Scheme) to be disposed as waste to landfill which will result in minor environmental effects, and approximately 417,000 tonnes of non-hazardous material to be disposed as waste to landfill, which will result in a moderate adverse environmental effect.

Borrow pits will be used in order to meet the shortfall of acceptable engineering material. Borrow pits will be backfilled with materials generated from the construction of the Proposed Scheme. In all cases there will be a net balance of material extracted from and backfilled in borrow pits, with the result that there will be no impact on the local or regional landfill capacity. It is forecast that approximately 3.5 million tonnes of material will be excavated from the borrow pits.

Operational waste will arise from passengers travelling in trains, from track maintenance and the operation of depots and signalling locations. It is forecast that approximately 5,000 tonnes of railway station and train waste will be generated in 2039 (i.e. first full year of operation), with approximately 1,750 tonnes of this requiring off-site disposal to landfill. It has been assumed for the purposes of this assessment that all railway station and train waste requiring off-site disposal to landfill will be sent to non-hazardous waste landfill. The off-route works associated with the Proposed Scheme will generate a further 8,070 tonnes of operational waste in 2039, with approximately 1,800 tonnes requiring off-site disposal to landfill.

The quantity of rolling stock maintenance waste that will require off-site disposal to landfill in 2039 will be approximately 2,610 tonnes of a total of approximately 13,000. It has been assumed that the major portion of rolling stock maintenance waste requiring off-site disposal to landfill will be sent

to non-hazardous waste landfill. The potential for hazardous waste from rolling stock maintenance will be negligible. Any hazardous wastes will be disposed to hazardous waste treatment and disposal facilities.

It is estimated that track maintenance will generate approximately 4,640 tonnes of waste during the first year of operation in 2039, of which 96% (4,465 tonnes) will be diverted from landfill.

Around 142 tonnes of ancillary infrastructure waste will be generated in the first year of operation, from the operation of the infrastructure maintenance depots; infrastructure maintenance bases; signalling equipment; and operations and maintenance sites. Of this total, 50 tonnes will likely be sent to landfill with the remaining diverted for reuse, recycling and recovery. The potential for hazardous waste generated from operation is negligible. Any hazardous wastes will be disposed to hazardous waste treatment and disposal facilities.

Overall, the first year of operation will result in approximately 4,589 tonnes of waste being sent to landfill which will be non-hazardous waste, and will result in negligible environmental effects. This waste will be generated from railway station and train waste i.e. passenger waste generated (1,751 tonnes), rolling stock maintenance waste (2,610 tonnes), waste from track maintenance (178 tonnes) and ancillary waste (50 tonnes).

During operation of the Proposed Scheme waste generation will be kept as low as reasonably practicable.

9.12 Water resources and flood risk

The Water Framework Directive aims to protect and enhance the quality of the water environment. It takes a holistic approach to the sustainable management of water by considering the interactions between surface water, groundwater and water-dependent ecosystems.

A route-wide Water Framework Directive Compliance Assessment has been undertaken. The risk of the Proposed Scheme resulting in long-term deterioration in any element used to determine the Water Framework Directive status of the surface water, groundwater and water-dependent ecosystems encroached upon by the Proposed Scheme has been reduced insofar as is reasonably practicable within the design.

The Water Framework Directive Compliance Assessment has concluded that the Proposed Scheme has the potential to cause a deterioration in the current status and/or prevent the future achievement of status objectives of six surface water bodies and one groundwater body. Whilst every effort will be made to ensure a Regulation 19 derogation application (legal instrument seeking to proceed with the Proposed Scheme despite the potential for deterioration of water bodies in spite of consideration of mitigation measures and enhancements) is not required, where unavoidable, such an application will be prepared on a route-wide and/or specific water body basis, as appropriate, in consultation with the Environment Agency.

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10 Summary of off-route effects

10 Summary of off-route effects

10.1 Introduction

The off-route effects assessment describes the likely significant environmental effects associated with works required for the Proposed Scheme that are remote from the Phase 2b Western Leg route corridor, including those which extend into Scotland. Such works are referred to as 'off-route works' and include works to allow HS2 trains to call at stations further north on the West Coast Main Line (WCML) and works to provide stabling and supporting facilities to serve HS2 trains at or near the start/ end of journeys.

Since the publication of the working draft Environmental Statement (ES) further design and optioneering studies were undertaken to determine the extent of physical off-route works required. These studies confirmed that:

- physical works will be required at Preston Station and Carlisle Station to accommodate HS2 trains calling at these stations;
- HS2 trains will not stop for passengers at Carstairs Station, and Carstairs Station has been removed from the scope of off-route works;
- HS2 trains will split and join (the process by which 2 x 200m trains combine to form a 400m train and vice versa) at Carlisle Station instead of Carstairs Station;
- a site in Annandale has been identified for a new depot between Carlisle, Glasgow and Edinburgh, to be accessed from the WCML; and
- there will be minor modifications required to the conventional railway network, such as track, signalling and overhead line works, associated with other off-route works, as part of the Proposed Scheme beyond those included in the ES.

All environmental topics have been evaluated as part of a scoping exercise which determined the extent to which environmental topics should be included in the off-route works assessment, having regard to whether there are likely to be significant effects that relate to them. Where no potential for likely significant effects were identified, an environmental topic, or aspects of the environmental topic (e.g. operation), has been scoped out of the assessment. Therefore, Volume 4, Off-route effects, describes the off-route works that have the potential to give rise to likely significant environmental effects. It presents findings for those environmental topics that are scoped in and reports the environmental baseline, an assessment of construction and operational effects, the proposed mitigation measures, the likely significant residual environmental effects and any requirements for monitoring for each of those environmental topics.

This section reports the likely significant residual environment effects arising during construction and/or operation of off-route works.

Route-wide environmental topics (i.e. climate change, electromagnetic interference, major accidents and disasters, and waste and material resources) are not considered to give rise to local level impacts from the construction and/or operation of off-route works. The route-wide impacts for these environmental topics are described in Section 9 of this non-technical summary (NTS). Section 9 also considers the overall changes to employment levels arising from the construction and operation of the Proposed Scheme including off-route works.

10.2 Off-route railway stations

Off-route railway stations affected by the Proposed Scheme fall into two separate categories:

- existing railway stations where construction of improvements, alterations and adaptations will be required to enable these stations to be served by HS2 trains; and
- existing railway stations across the rail network where there will be changes in passenger numbers as a consequence of the introduction of HS2 services.

10.3 Off-route railway stations – improvements, alterations and adaptations at existing off-route railway stations

Once the Proposed Scheme is completed and in conjunction with Phase One and Phase 2a there will be new HS2 services, or an increased frequency of services, to destinations including Liverpool, Preston, Carlisle, Glasgow and Edinburgh.

Existing off-route railway stations on the conventional railway network (e.g. WCML) at Preston and Carlisle will require physical construction works to allow 400m long HS2 trains to call at these stations and to address station capacity constraints arising from use by HS2 services. These works have the potential to give rise to likely significant residual environmental effects.

Preston Station

Overview

Preston Station is situated within Preston city centre, to the south of the A59 Ring Way, west of Butler Street and east of Christian Road and West Cliff (see Figure 33). Preston Station falls within the local authority areas of Preston City Council and South Ribble Borough Council. The land required for the operation of the Proposed Scheme at Preston Station is within Network Rail ownership.

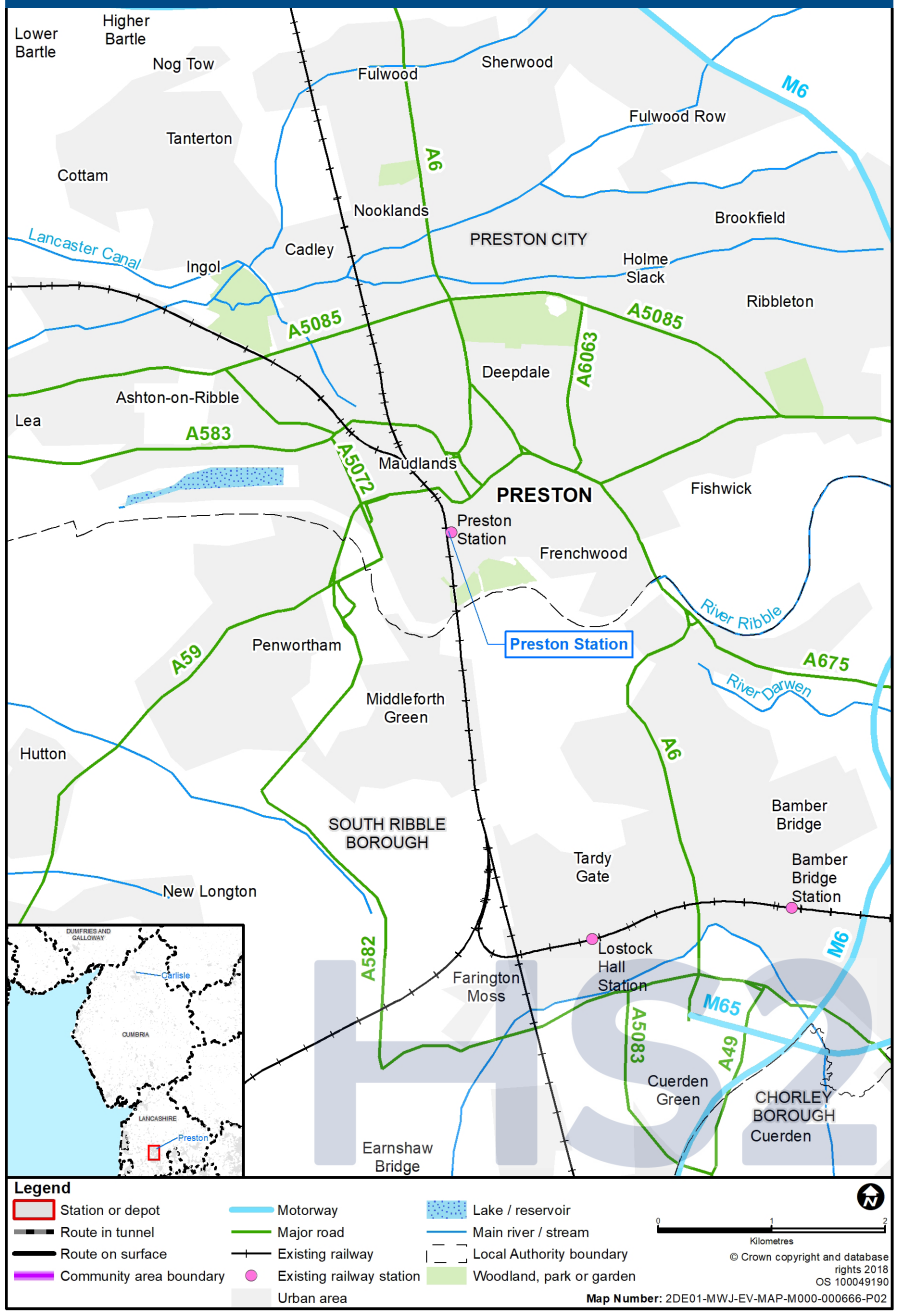
The Preston Station area is predominantly urban in character with much of the land surrounding the station being of industrial, business, retail and leisure use, with some residential properties in the vicinity of the station.

The Proposed Scheme

Works are required to the existing Preston Station as part of the Proposed Scheme. These works will include the extension of two existing platforms and reinstatement of a platform not currently used for passenger trains, in order to accommodate 400m HS2 trains to call at the station. To provide lift and stair access for the public to the reinstated platform, luggage and passenger subways will be refurbished and reopened and a new footbridge will be provided between one of the existing platforms and the reinstated platform to provide further passenger access. There will also be modifications to the track layout, signalling, overhead line equipment and other railway systems within the Preston Station area to facilitate the Proposed Scheme.

In this area, the Proposed Scheme will not require any building demolitions. There will be no permanent closures, realignments or diversions of roads or public rights of way. There will be no permanent diversions or realignments to any watercourses. One main construction compound and one satellite construction compound will be required in this area.

Figure 33: Preston Station area context map



Changes in the design of the Proposed Scheme in this area since the working draft ES

The working draft ES identified a requirement to undertake works at Preston Station to accommodate HS2 trains by extending one or more of the existing platforms.

Since the publication of the working draft ES further design development has identified that extensions will be required to two platforms to accommodate 400m HS2 trains, and reinstatement of a platform to accommodate conventional rail services.

Avoidance and mitigation measures

During the development of the design, measures have been incorporated to avoid or mitigate adverse impacts in this area including: the design of Preston Station to meet the requirements of HS2 users by providing sufficient concourse and platform space to accommodate long-term growth in rail passenger demand; and the introduction of taller temporary screening between residential properties and the construction worksites at Fishergate Court and Christian Road, to avoid or reduce likely community significant effects during construction.

Residual effects

For those environmental topics scoped in, the construction and operation phases of the Proposed Scheme are not likely to result in any adverse residual effects on air quality, historic environment and socio-economics in this area.

No likely adverse residual effects have been identified as arising during operation for sound, noise and vibration.

The following sections provide a summary of the likely significant residual environmental effects identified for the Preston Station area for those environmental topics scoped in.

Sound, noise and vibration

Construction

The proposed avoidance and mitigation measures will reduce noise inside all individual dwellings from the construction activities such that residents will not be significantly affected.

Noise from construction will result in significant effects on residential communities closest to the construction works in the local residential community area of Fishergate Court and Christian Road, Preston.

Noise from construction will result in significant effects on the following non-residential buildings in Preston at: Numbers 4 and 5 Butler Street; Lancashire County Council; the former Park Hotel Complex, East Cliff; and Numbers 1, 2, 3, 5, 6 and 7 Fishergate Court, Fishergate.

A comprehensive set of mitigation measures, including those in the draft Code of Construction Practice (CoCP), will be implemented to control noise and vibration throughout the construction works.

HS2 Ltd will continue to seek reasonably practicable measures to further reduce or avoid these likely residual significant noise effects and will continue to engage with stakeholders to fully understand the potentially affected receptors, their use and the benefit of the measures.

Traffic and transport

Construction

Construction of the Proposed Scheme will require the temporary loss of: 66 parking spaces at the existing Network Rail offices at North Union House; 28 spaces at the Station Car Park; and 57 parking spaces within the Network Rail Technical Support Depot.

Construction of the Proposed Scheme will include works requiring a number of rail possessions and blockades on the WCML and its branches including lines from Colne, Ormskirk and Blackpool. These possessions and blockades will disrupt passengers and rail freight services using these lines.

Operation

The Proposed Scheme will generate significant major beneficial effects for rail passengers as a result of the introduction of HS2 services at Preston Station, including improved journey times between Preston Station, the Midlands and the south of England and released capacity on the network easing pressure on other passenger rail services.

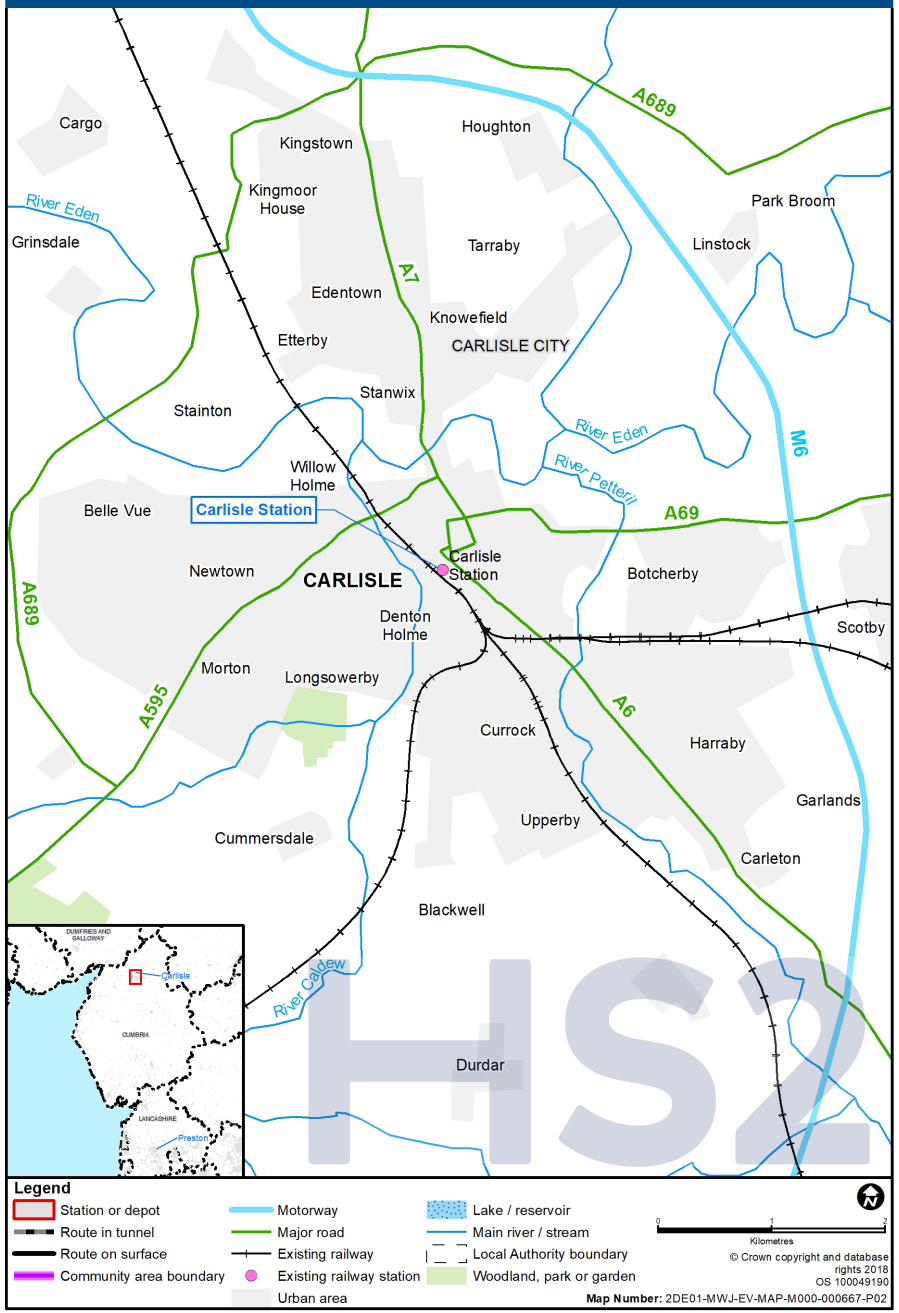
Carlisle Station

Overview

Carlisle Station is situated within Carlisle city centre, to the south of Victoria Viaduct and English Street, west of the A6 Botchergate and east of James Street (see Figure 34). Carlisle Station falls within the local authority area of Carlisle City Council. The land required for the operation of the Proposed Scheme at Carlisle Station is within Network Rail ownership.

The Carlisle Station area is predominantly urban in character with much of the land surrounding the station being of industrial, business, retail and leisure use, with some residential properties within the vicinity of the station.

Figure 34: Carlisle Station area context map



The Proposed Scheme

Works are required to the existing Carlisle Station as part of the Proposed Scheme. These works will include the extension of two existing platforms, infilling of an existing platform and construction of a new platform, in order to allow 400m HS2 trains to call at the station. The provision of a new passenger lift via an existing subway created in an existing undercroft (i.e. railway arch) will provide access to the new platform and a new footbridge will provide further pedestrian access. In addition, there will be modifications to the track layout, signalling, overhead line equipment and other railway systems within the Carlisle Station area to facilitate the Proposed Scheme. To accommodate the new footbridge, a section of the existing canopy above platform 1 will need to be removed.

In this area, the Proposed Scheme will not require any building demolitions. There will be no permanent closures, realignments or diversions of roads or public rights of way. There will be no permanent diversions or realignments to any watercourses. One main construction compound and one satellite construction compound will be required in this area.

Changes since the working draft ES

The working draft ES identified a potential need to undertake works at Carlisle Station to accommodate HS2 trains introduced by the Proposed Scheme. Since the publication of the working draft ES, a decision has been taken for 400m long HS2 trains from Euston to call at Carlisle and split into two 200m trains for separate onward journeys to Edinburgh and Glasgow. The opposite will occur in the southbound direction towards London.

Avoidance and mitigation measures

During the development of the design, measures have been incorporated to avoid or mitigate adverse impacts in this area including: the design of Carlisle Station to meet the requirements of HS2 services between London Euston and Scotland and the opportunity for services to split and join at Carlisle; the extension, widening and reinstatement of platforms and provision of a new footbridge link to maintain capacity for non-HS2 users at Carlisle Station; and the design of the Proposed Scheme to reduce the impacts on the Grade II* listed building of Carlisle Station along with the Grade II Detached West Wall within the station.

Residual effects

For those environmental topics scoped in, the construction and operation phases of the Proposed Scheme are not likely to result in any adverse residual effects on air quality and socio-economics.

No likely adverse residual effects have been identified as arising during operation for sound, noise and vibration.

The following sections provides a summary of the likely significant residual environmental effects identified for the Carlisle Station area for those environmental topics scoped in.

Historic environment

Construction

Construction of the Proposed Scheme will result in a permanent effect as a result of physical impact (either permanent loss or partial removal) on the Grade II* Citadel Station (also known as Carlisle Station). The Grade II* listed station building will be directly impacted by the construction of a new footbridge between platform 1 and the new platform and, the provision of a new passenger lift and stairs access via a subway created in the existing undercroft. However, the physical impacts are not to the architectural elements which contribute most to the station's heritage value.

The Proposed Scheme will alter the traditional layout of platforms 1 and 2 of the station and introduce a new footbridge in proximity to the island buildings and the wall. This will affect the historic layout and fabric of the

listed station. It will also affect the ability to appreciate the heritage value of the station.

In addition, new structures and changes to the platform layout may reduce the ability to appreciate the heritage value of the station, in particular the relationship between the Grade II listed Detached West Wall of Citadel Station and the Grade II* listed station buildings, resulting in a significant effect.

Operation

Changes to the setting of Grade II listed Detached West Wall of Citadel Station due to the presence of the Proposed Scheme will continue throughout operation of the Proposed Scheme.

Sound, noise and vibration

Construction

The proposed avoidance and mitigation measures will reduce noise inside all individual dwellings from the construction activities such that residents will not be significantly affected.

Noise from construction will result in significant effects on the following non-residential buildings in Carlisle at: Victoria House, Victoria Viaduct; The Citadel, English Street; Carlisle Enterprise Centre, James Street; The Hallmark Hotel, Court Square; Studio A Dance Company, Crown Street; Hebron Evangelical Church, Botchergate; and Vasey and Sons (Carlisle) Ltd, Lancaster Street.

A comprehensive set of mitigation measures, including those in the draft CoCP, will be implemented to control noise and vibration throughout the construction works.

HS2 Ltd will continue to seek reasonably practicable measures to further reduce or avoid these likely residual significant noise and will continue to engage with stakeholders to fully understand the potentially affected receptors, their use and the benefit of the measures.

Traffic and transport

Construction

Construction of the Proposed Scheme will require the temporary loss of 74 parking spaces at the Avanti Trains car park, accessed from South George Street.

Construction of the Proposed Scheme will include works that require a number of rail possessions and blockades in this area on the WCML and its branches including on the Cumbrian Coast Line and the Newcastle Line. These possessions and blockades will disrupt passengers and rail freight services using these lines.

Operation

The Proposed Scheme will generate significant major beneficial effects for rail passengers as a result of the introduction of HS2 services at Carlisle Station, including improved journey times between Carlisle Station, the Midlands and the south of the England and released capacity on the network easing pressure on other passenger rail services.

10.4 Off-route railway stations – forecast changes in passenger numbers at existing stations

Continued growth in demand is forecast for long-distance rail travel to 2033 when HS2 Phase One is assumed to be fully open, 2038 when the Proposed Scheme is assumed to open and beyond. However, 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 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. Forecasts for rail demand are expected to recover and still continue to grow in the longer term.

The operation of the Proposed Scheme, and the consequent release of capacity elsewhere, will result in changes to passenger numbers at some off-route railway stations across the conventional railway network. This includes HS2 Phase One stations at London Euston, Old Oak Common, Birmingham Interchange and Birmingham Curzon Street.

Conventional railway stations selected for assessment are those that are predicted to experience a greater than 10% increase in the number of passengers, or an increase of over 700 daily passengers, as a result of the Proposed Scheme and in combination with Phase One and Phase 2a. These railway stations are Milton Keynes Central, Crewe, Preston, Lancaster, Carlisle and Glasgow Central.

As a result of the Proposed Scheme, there are 11 stations which are forecast to have a reduction of footfall of greater than 10%, with cumulative reductions up to 50%. These stations are generally directly impacted by alternative faster HS2 services. Consequently, it is expected that a number of passengers would use a Proposed Scheme station to divert to more convenient, faster Proposed Scheme services. This will have the benefit of releasing capacity on the existing rail network, as well as on the transport network local to the off-route stations. These include: London Paddington; London Kings Cross; London Marylebone; Coventry; Nuneaton; Birmingham International; Birmingham New Street; Lichfield Trent Valley; Warrington Bank Quay; Manchester Airport; and Stockport.

The Proposed Scheme, in combination with Phase One and Phase 2a, will give rise to changes in passenger numbers and increased traffic on local roads and in/out of some conventional railway stations. The following off-route railway stations are those that have the potential for significant effects to arise due to an increase in passenger numbers. Only likely residual significant effects are presented.

Milton Keynes Central station

The introduction of HS2 services and the use of resulting released capacity on the conventional network will provide potential for service improvements and reduced crowding on trains for passengers who use Milton Keynes Central Station, which is expected to result in increased passenger demand. It is forecast that by 2046, passenger demand at Milton Keynes Central Station will increase by approximately 10%, equivalent to 4,450 additional passengers per day as a result of the Proposed Scheme in combination with Phase One and Phase 2a.

The forecast increase in daily passengers due to the Proposed Scheme in combination with HS2 Phase One and Phase 2a will result in an increase in traffic flow on Avebury Boulevard west of South Elder Roundabout resulting making it more difficult for non-motorised users trying to cross that road. There will be an increase in parking and cycling demand as a result of the increased passenger numbers using the station.

Crewe, Preston and Lancaster

The introduction of HS2 services calling at Crewe Station is expected to result in increased passenger demand entering and leaving the station. It is forecast that by 2046, passenger demand at Crewe Station will increase by approximately 10%, equivalent to 2,554 additional passengers per day, as a result of the Proposed Scheme in combination with Phase One and Phase 2a.

The introduction of HS2 services calling at Preston Station is expected to result in increased passenger demand entering and leaving the station. It is forecast that by 2046, passenger demand at Preston Station will increase

by approximately 16%, equivalent to 3,518 additional passengers per day, as a result of the Proposed Scheme in combination with Phase One and Phase 2a.

The introduction of HS2 services calling at Lancaster Station is expected to result in increased passenger demand entering and leaving the station. It is forecast that by 2046, passenger demand at Lancaster Station will increase by approximately 15%, equivalent to 1,276 additional passengers per day, as a result of the Proposed Scheme in combination with Phase One and Phase 2a.

The forecast increase in daily passengers due to the Proposed Scheme in combination with HS2 Phase One and Phase 2a will result in an increase in parking and cycling demand and use of drop-off facilities as a result of the increased passenger numbers using Crewe, Preston and Lancaster stations.

Carlisle

The introduction of HS2 services calling at Carlisle Station is expected to result in increased passenger demand entering and leaving the station. It is forecast that by 2046, passenger demand at Carlisle Station will increase by approximately 20%, equivalent to 1,682 additional passengers per day, as a result of the Proposed Scheme in combination with Phase One and Phase 2a.

The forecast increase in daily passengers due to the Proposed Scheme in combination with HS2 Phase One and Phase 2a will result in an increase in traffic flow on Court Square Brow making it more difficult for non-motorised users trying to cross that road. There will be an increase in parking and cycling demand and use of drop-off facilities as a result of the increased passenger numbers using the station.

Glasgow

The introduction of HS2 services calling at Glasgow Central Station is expected to result in increased passenger demand entering and leaving the station. It is forecast that by 2046, passenger demand at Glasgow Station will increase by approximately 6%, equivalent to 4,854 additional passengers per day, as a result of the Proposed Scheme in combination with Phase One and Phase 2a.

No residual significant effects on have been identified as a result of the operation of the Proposed Scheme.

10.5 Off-route depots

The Proposed Scheme increases the number of HS2 trains serving the north of England and Scotland. Stabling facilities and light maintenance will be required for these trains. This is because it is not operationally efficient for them to be returned from the terminating stations on the conventional network to the proposed HS2 depot at Crewe approximately 150 miles away on the new HS2 route at the end of the day and then returned in the morning. The use of off-route depots will reduce the movement of empty HS2 trains.

The off-route depots will be used for stabling and servicing, such as cleaning and maintenance of HS2 trains.

The operation of the Proposed Scheme will require the construction of a new depot at Annandale; and alterations to one other existing depot at Polmadie (alterations to the existing depot to facilitate use by HS2 trains assessed in the Phase One ES and not assessed further for Phase 2b).

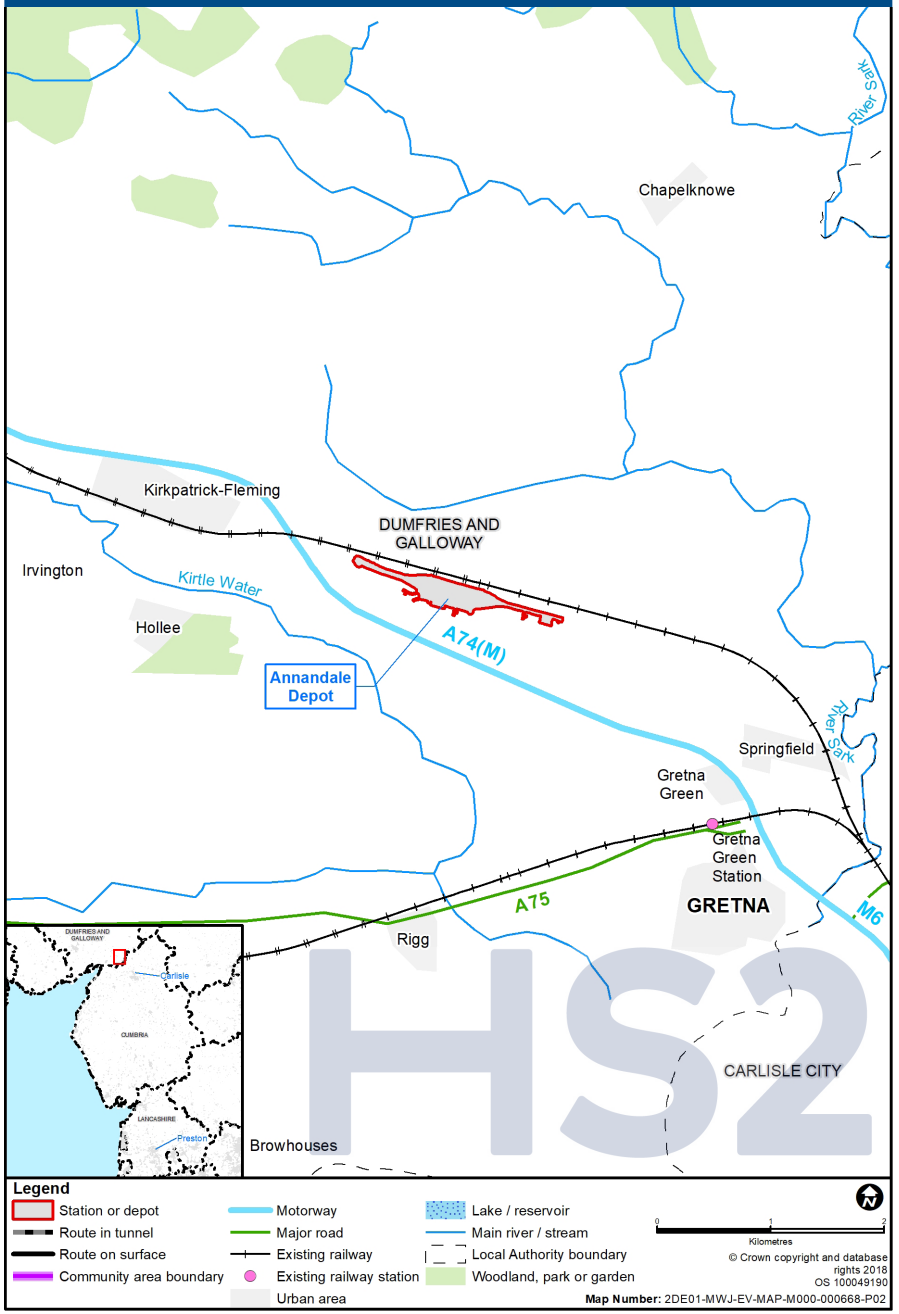
Annandale depot

Overview

The Annandale depot will occupy 80ha of land located north of the B7076 and off the existing WCML, approximately 3km (1.9 miles) north-west of Gretna Green and approximately 2km (1.2 miles) south-east of Kirkpatrick-Fleming (see Figure 35). The proposed Annandale depot location is within the local authority area of Dumfries and Galloway Council.

The area is predominantly rural in character with agriculture being the main land use. This is interspersed with areas of woodland, isolated dwellings and farmsteads.

Figure 35: Annandale area context map



The Proposed Scheme

The Proposed Scheme at Annandale depot requires works for the provision of stabling and light maintenance facilities to accommodate up to 28, 200m long HS2 trains, that will serve destinations on the WCML predominantly starting or terminating in Carlisle, but also some from or for Glasgow or Edinburgh. Infrastructure required includes an access to the depot and minor modifications to the track layout including a section of track to allow trains to be moved between sidings signalling, a sub-station, overhead line equipment and other railway systems on the WCML to facilitate the Proposed Scheme. The depot will require a carriage washing machine plant, a maintenance shed for the servicing, cleaning and maintenance of passenger rolling stock, a stabling area where trains will be stored overnight and cleaned inside and workshops, offices and stores in a two-storey building.

A subway beneath the depot will provide access by foot, including stairs and ramps to platforms and tracks. A surface car park will provide approximately 120 car spaces. Balancing ponds will provide necessary railway and highway drainage and pumping stations to manage drainage and general wastewater. A wastewater treatment plant will be constructed onsite.

In this area, the Proposed Scheme will not require any demolitions. There will be permanent closure, realignment (including widening) or diversion of three roads. Three watercourses will be permanently diverted or realigned. One main construction compound and three satellite construction compounds will be required; one satellite construction compound for civil engineering and railway systems works and two to be used solely as satellite compounds for railway systems works.

Changes since the working draft ES

The working draft ES identified the need to stable approximately 28 HS2 trains, each 200m in length, in either one depot/stabling facility with the capacity for 28 trains, or two or more smaller facilities between Carlisle, Glasgow and Edinburgh. Since the publication of the working draft ES it has been confirmed that the requirement is for one 28 train depot and further studies have confirmed a location near Annandale as the preferred location for the depot as well as the extent of physical works required.

Avoidance and mitigation measures

During the development of the design, measures have been incorporated to avoid or mitigate potential adverse impacts in this area including: the realignment and reinstatement of public highways to maintain agricultural access; the rationalisation of road realignments and mitigation planting to reduce the area of agricultural land required; the realignment of the Ewes Burn to include an open channel to reduce the loss of aquatic habitat and maintain free passage for wildlife; and three overbridges to maintain farm access and public access across the Proposed Scheme whilst not discouraging movement of wildlife species across the Proposed Scheme. Advance planting will be implemented early in the construction programme to provide visual screening and to integrate the Proposed Scheme into the surrounding landscape; and compensatory woodland planting in areas of loss to provide habitat connectivity, enhancing the landscape and green infrastructure connectivity, as well as connectivity of historic landscape features.

Residual effects

The construction and operation phases of the Proposed Scheme are not likely to result in any adverse residual effects on air quality and land quality.

No likely adverse residual effects have been identified as arising during operation for ecology and biodiversity, socio-economics and sound, noise and vibration.

The following sections provide a summary of the likely significant residual environmental effects identified for the Annandale depot area.

Agriculture, forestry and soils

Construction

Construction of the Proposed Scheme will result in temporary significant effects at five farm holdings in this area due to the proportion of land required and/or due to severance (i.e. where areas of agricultural holdings are cut off from the surrounding area). Of these five, three farm holdings will be permanently significantly affected due to the proportion of land required or due to severance. Land required temporarily will, in accordance with a restoration scheme agreed with the landowner and the relevant planning authority, be returned to the farm holding following the completion of construction.

Ecology and biodiversity

Construction

Construction of the Proposed Scheme will result in the permanent loss of 0.2ha of ancient woodland from the woodland to the south of Grahamshill Railway Cottage. The loss of ancient woodland will be compensated through a range of measures, including the planting of 2.1ha native broadleaved woodland to the south of Grahamshill Railway Cottages and the WCML. Woodland planting will include further measures such as translocation of ancient woodland soil with its associated seed bank where appropriate.

On a precautionary basis, it is assumed that there will be a reduction in hedgerow of 5.5km, which will result in a permanent adverse residual effect that is significant at up to county level. However, restoration of land required only for the construction of the Proposed Scheme to its current use, offers the potential for additional retention and replacement of hedgerow.

Historic environment

Construction

Construction of the Proposed Scheme will result in a permanent effect as a result of physical removal of part of the following non-designated assets: Whinnyrig Field System; and Redhouse Milestone.

Construction of the Proposed Scheme will result in the temporary impact on the setting of Grahamshill Farmhouse and Steading, a Category B listed building. Permanent alterations to the settings of this asset will result in changes to the way that it is experienced and understood.

Operation

Changes to the setting of Grahamshill Farmhouse and Steading will continue throughout the operation of the Proposed Scheme.

Landscape and visual

Construction

Temporary residual effects will arise from the presence of construction works including night-time lighting and changes to the existing landform and vegetation patterns that will affect the character of the local landscape. Where reasonably practicable, effects will be reduced early planting to reduce the visibility of the Proposed Scheme. A set of mitigation measures, including those in the draft CoCP, will be implemented to reduce landscape and visual effects further throughout the construction works.

Construction of the Proposed Scheme will result in significant effects on two landscape character areas (LCA), the River Sark Flats LCA and the Southern Flow Plateau LCA due to changes in landforms and impacts on tranquillity.

Construction activities will be visible in views from 10 representative viewpoint locations within the area resulting in significant effects, including on views from: The Mill Forge hotel and wedding venue; Redhouse Farm House and Cottage; Cranberry Cottage; and Bensmoor Wood to Douglas Steading core path. Of these 10 representative viewpoint locations, views from eight will also be subject to adverse night-time visual effects due to additional lighting associated with construction compounds.

Operation

The introduction of prominent new features into the area, including the depot and sidings will result in substantial changes to the character of the area. During operation, the significant effects of the Proposed Scheme on the character and appearance of the local landscape will substantially reduce over time as mitigation planting grows and matures, however, effects may remain significant.

The Proposed Scheme will have a residual adverse effect on the River Sark Flats LCA and the Southern Flow Plateau LCA due to changes in landforms and impacts on tranquillity associated with the agricultural and river valley landscape.

Operation of the Proposed Scheme will result in significant visual effects at seven viewpoints within the area, which includes views from: The Mill Forge hotel and wedding venue and Redhouse Farm House and cottage; Cranberry Cottage; and Bensmoor Wood to Douglas core path.

Socio-economics

Construction

During construction, customers may be discouraged from using The Mill Forge hotel and wedding venue in Kirkpatrick-Fleming as it is expected to be affected by construction works associated with the Proposed Scheme.

Sound, noise and vibration

Construction

The proposed avoidance and mitigation measures will reduce noise inside all individual dwellings from the construction activities such that residents will not be significantly affected.

Noise from specific construction activities will result in a significant effect at The Mill Forge hotel and wedding venue.

A comprehensive set of mitigation measures, including those in the draft CoCP will be implemented to control noise and vibration throughout the construction works.

HS2 Ltd will continue to seek reasonably practicable measures to further reduce or avoid these residual significant noise effects and will continue to engage with stakeholders to fully understand the receptor, its use and the benefit of the measures.

Traffic and transport

Construction

During the construction period, there will be increases in traffic, which will make it more difficult for non-motorised users wishing to cross three different parts of the B7076: between Annandale depot main compound access and Gretna Green motorway services access road; between A74(M) junction 21 northbound off-slip and Annandale depot main compound access; and an unnamed road serving Cove Crossing.

Operation

During the operation period, there will be increases in traffic, which will make in more difficult for non-motorised users seeking to cross three different parts of the B7076: between B6357 and A74(M) junction 21; between A74(M) junction 21 and Annandale depot site access; and between Annandale depot site access and Gretna Loaning.

Water resources and flood risk

Construction

On a precautionary basis, it is anticipated that a residual effect will remain on two potential springs 200m west and 300m north-west of Redhall Castle due to the Proposed Scheme interrupting groundwater flow to these features.

The design of mitigation in this area will be refined in consultation with the Scottish Environment Protection Agency and other stakeholders to reduce impact to groundwater flows and ensure no significant effects on these springs as far as reasonably practicable.

Operation

On a precautionary basis, subject to further study at the detailed design stage of the project, it is anticipated that significant residual effects will remain on surface water quality in Ewes Burn during operation of the Proposed Scheme.

The design of mitigation in this area will be refined in consultation with the Scottish Environment Protection Agency and other stakeholders to reduce the impact on surface water quality and ensure no significant effects on Ewes Burn as far as reasonably practicable.

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