LONDON-WEST MIDLANDS ENVIRONMENTAL STATEMENT

Non-technical summary

November 2013

ES 3.0.0

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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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Foreword

The Government is promoting legislation for a new north-south railway between London, Birmingham and the West Midlands - the High Speed Rail (London-West Midlands) Bill 2013. The railway is referred to as 'Phase One of High Speed 2 (HS2)'. If enacted by Parliament, the Bill will provide the powers to construct, operate and maintain Phase One of HS2. It will grant 'development consent' for that project.

As required by law and Parliamentary rules, the Government has provided Parliament with a detailed statement assessing the likely significant effects of the project on the environment - an Environmental Statement (ES). This document is the Non-Technical Summary (NTS) of the ES. Parliamentary rules allow a period of at least eight weeks (56 days) for members of the public and any other interested parties to send any comments they may have on the ES to the Secretary of State for Transport. Details of the closing date for comments and the address to which you should send your comments have been posted on the HS2 Ltd website (www.hs2.org.uk).

The Secretary of State will publish all comments he receives 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 in advance of the date fixed for the Second Reading debate on the Bill for the Phase One project in the House of Commons.

Contents

1. Introduction

This is the Non-technical summary (NTS) of the Environmental Statement (ES) which the Government has submitted to Parliament in support of the High Speed Rail (London-West Midlands) Bill 2013.

1.1 The project - Phase One of HS2

Phase One of HS2 is the first phase of a new high speed railway network proposed by the Government to connect major cities in Britain. It will bring significant benefits for inter-urban rail travellers through increased capacity and improved connectivity between London, the Midlands and the North. It will release capacity on the existing rail network between London, Birmingham and the West Midlands and so provide opportunities to improve existing commuter, regional passenger and freight services.

Phase One of HS2 will provide dedicated high speed rail services between London, Birmingham and the West Midlands. It will extend for approximately 230km (143 miles). Just north of Lichfield, high speed trains will join the West Coast Main Line for journeys to and from Manchester, the North West and Scotland. Phase One will also include a link to HS1 (Channel Tunnel Rail Link) in London, allowing some services to continue directly to mainland Europe via the Channel Tunnel. Phase One of HS2 and connections to existing railways are shown in Figure 1.

The proposed HS2 network

In January 2009 the Government established HS2 Ltd to develop proposals for a new high speed railway between London and the West Midlands. HS2 Ltd was also asked to consider the case for high speed services to northern England and Scotland.

In December 2009 HS2 Ltd produced its initial report to Government *'High Speed Rail - London to the West Midlands and Beyond'*. HS2 Ltd recommended a preferred route between London and Birmingham, including a junction with the West Coast Main Line just north of Lichfield.

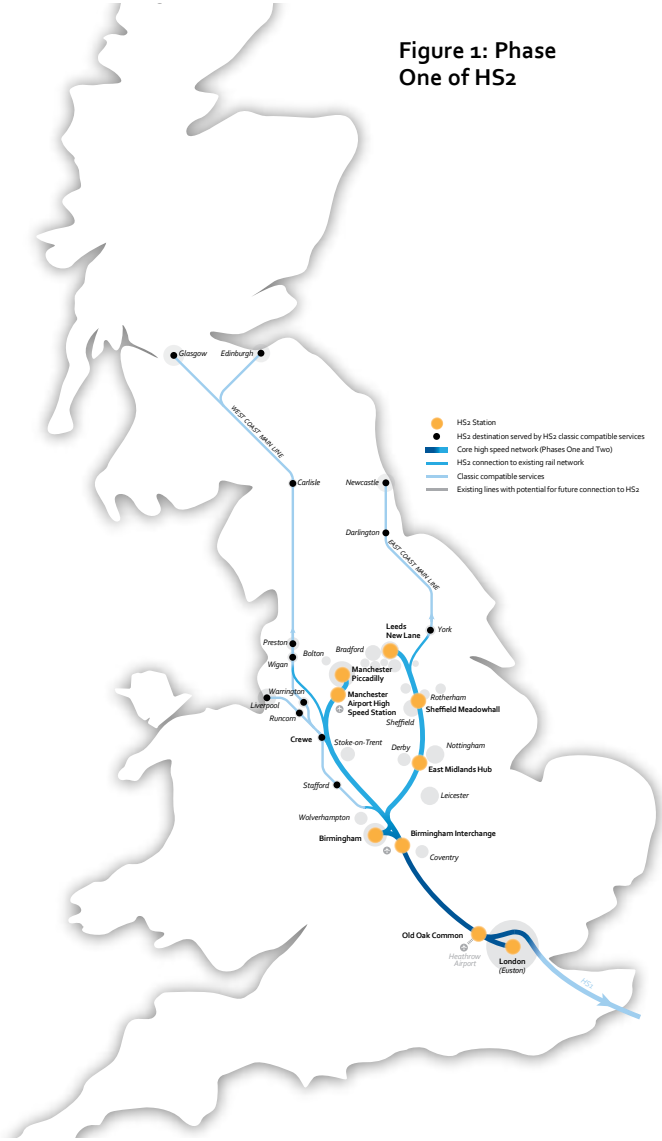


Figure 1: Phase One of HS2

In March 2010 the Government presented its response to Parliament in the Command Paper *'High Speed Rail'*. The Government supported HS2 Ltd's preferred route between London, Birmingham and the West Midlands and the development of a wider, Y-shaped, high speed rail network extending to Leeds and Manchester.

Between February and July 2011 the Government undertook a nationwide public consultation on its proposed strategy for high speed rail and its preferred route to serve London, Birmingham and the West Midlands. In January 2012, in response to public consultation, the Government published the Command Paper *'Investing in Britain's Future - Decisions and Next Steps'*.

In the 2012 Command Paper, the Government confirmed its commitment to developing a high speed rail network as a key element of its transport and wider economic strategy. The 2012 Command Paper published the Government's chosen route to serve London, Birmingham and the West Midlands, as the first phase of the proposed Y network. The Phase One project promoted by the Bill and assessed in the ES has been developed on the basis of that route.

In future, Phase Two of HS2 will extend the high speed rail network northwards to Leeds and Manchester. Phase Two will run between Birmingham and Leeds and between Birmingham and Manchester, with connections onto the West Coast Main Line south of Wigan and the East Coast Main Line south of York.

The proposed HS2 network and connections to existing railways are shown in Figure 2.

Development consent for Phase One of HS2 - the hybrid Bill

The Government has decided that it should obtain development consent for Phase One of HS2 by primary legislation - an Act of Parliament. Use of primary legislation allows the Government to seek the full range of statutory powers and authorisations that a project of this size and complexity requires, including revisions to the rail regulatory regime and the planning regime and provisions to enable the making of subsequent orders and regulations by way of statutory instrument. The Government followed the same approach for both the Channel Tunnel Rail Link (now HS1) and Crossrail.

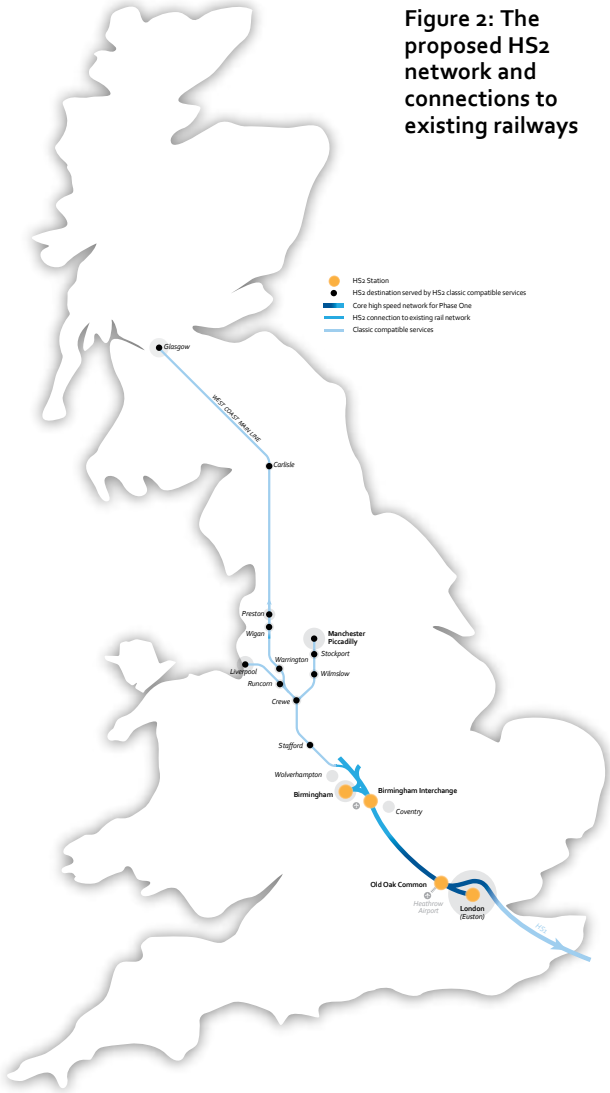


Figure 2: The proposed HS2 network and connections to existing railways

The Government's Bill for Phase One of HS2 is a 'hybrid' Bill. In practice, this means that persons whose specific private or local interests are directly and specially affected by the Bill are able to petition Parliament and to present their case to a Select Committee of Members of Parliament, in accordance with the instructions given by the House of Commons at Second Reading. Such persons would, for example, include those whose properties are to be compulsorily purchased for the Phase One project and local authorities situated along the Phase One route. The Select Committee then reports 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 a Government Bill.

Phase One of HS2 - Environmental Statement
As required by law and Parliamentary rules, the Government has provided Parliament with a detailed statement assessing the likely significant effects of the Phase One project on the environment - the ES. The ES has been prepared by a group of independent environmental consultants on behalf of HS2 Ltd.

The ES includes the following documents:

- **This Non-technical summary (NTS).** The NTS provides a summary of the Phase One project and its likely significant residual effects on the environment. The NTS summarises those features of the design and other measures included in the project in order to avoid, reduce or manage its adverse effects on the environment. Residual effects are those significant adverse and beneficial environmental effects of the project which are likely to remain after those measures are in place.
- **Volume 1: An introduction to the ES and the project.** Volume 1 provides an overview of the Bill and the environmental impact assessment (EIA) process. It explains the approach to consultation. It gives details of the project and construction techniques. It includes an outline of the main alternatives which the Government has considered both to the HS2 network and the Phase One project.
- **Volume 2: Community Forum Area (CFA) reports.** Volume 2 consists of 26 reports and associated map books which provide a comprehensive description of the project at a local level. The reports make a detailed assessment of the likely significant beneficial and adverse effects of the project on the environment along the route. They explain the design and other mitigation measures included in the project in order to avoid, reduce or manage the adverse effects of the project on the environment. Their coverage corresponds to the areas covered by the consultative Community Forums along the route of the Phase One project which were established by the Government in 2012.
- **Volume 3: Route-wide effects.** Volume 3 makes an assessment of the likely significant environmental effects of the project that have been considered at a geographical scale greater than the community forum area level. An example is the effect of the project on the Chilterns Area of Outstanding Natural Beauty (AONB).
- **Volume 4: Off-route effects.** Volume 4 makes an assessment of any likely significant environmental effects of the project at locations beyond the Phase One route corridor and its associated local environment.
- **Volume 5: Appendices and map books.** Volume 5 contains supporting environmental information and maps.
- **Glossary of terms and list of abbreviations.** This defines terms and explains abbreviations used in the ES.

Phase Two of HS2

Phase Two of HS2 is at an earlier stage of preparation. Route proposals for the Phase Two project are subject to public consultation from July 2013 until January 2014. In July 2013 the Government published a Sustainability Statement for the Phase Two proposals. The Government intends to promote a future Bill seeking development consent for the Phase Two project. As required by law and Parliamentary rules, the Phase Two project will be subject to a full EIA at that stage.

Where appropriate, the ES for the Phase One project assesses the likely significant environmental effects of constructing and operating both phases of the HS2 network.

1.2 Approach to the environment

EIA has been integral to the development of the project. Environmental assessment has been the foundation of route selection, design development, arrangements for construction and operation of the railway, and measures to mitigate the project's environmental impacts. In developing the project, HS2 Ltd's aim has been twofold: to enable the nation to take full advantage of the opportunities and benefits offered by the project and to mitigate the adverse environmental effects of the project as effectively as it reasonably can.

In February 2011, the Government consulted the public on its preferred route and route options for Phase One of HS2. Those route options were considered in the HS2 London to West Midlands Appraisal of Sustainability published in February 2011. In January 2012 the Government announced its selection of the proposed route for the Phase One project and published the Review of the HS2 London to West Midlands Appraisal of Sustainability. The Government recognises that the project will have significant effects on those who live close to the route and upon the local environment through which it will pass. Since early 2012 HS2 Ltd has engaged closely with local communities along the proposed Phase One route and other stakeholders to identify and seek to resolve issues of concern. In May 2013 the Government consulted the public on a draft of the ES and refinements of the design for the Phase One project. Responses to those consultations have been considered in finalising the project for the Bill and compiling the ES.

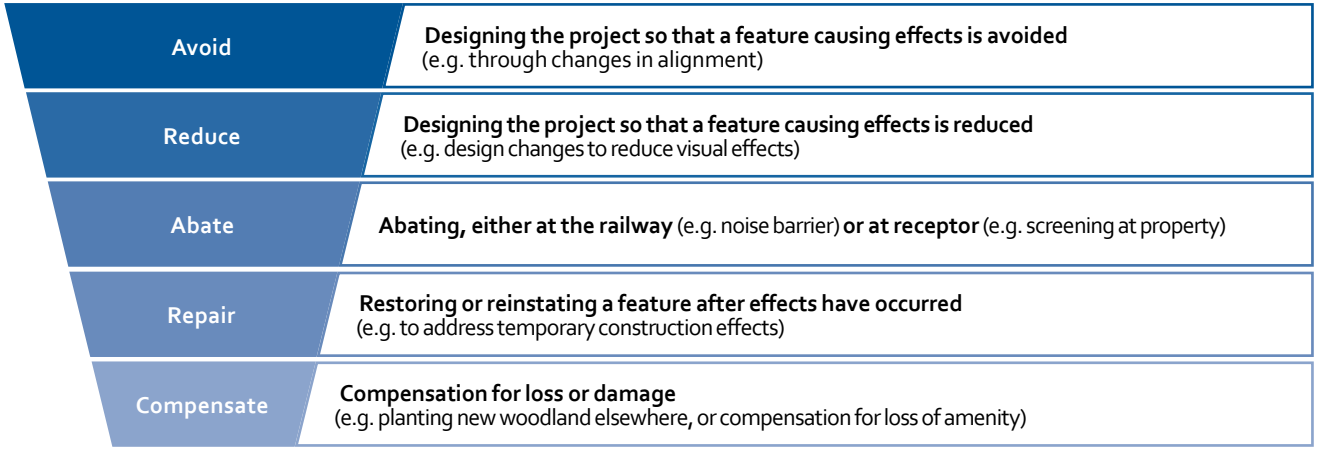
Section 1.3 summarises the process of consultation and engagement since the Government first published a proposed route between London and the West Midlands in March 2010.

The law requires the ES to include a description of the measures envisaged in order to avoid, reduce and, if possible, remedy the significant adverse effects of the project. HS2 Ltd's approach to mitigating adverse effects on the environment of the Phase One project is shown in Figure 3. HS2 Ltd's aim has been to avoid adverse environmental effects, where reasonably practicable, through the design of the project. Where this is not achievable, HS2 Ltd has considered measures to reduce or abate such effects. Where, despite efforts to avoid and reduce them, significant adverse environmental effects are predicted to occur, HS2 Ltd has proposed repair and compensation measures. In some cases, such measures may actually lead in the longer term to an overall improvement in the environment.

The mitigation actually proposed depends on an assessment of the nature and severity of the adverse environmental effect and of the effectiveness and value for money of the mitigation measures under consideration. Mitigation measures applied in the design of the Phase One project include:

- developing the route of the project to avoid likely adverse environmental effects, especially on residential properties, community facilities, public open space, businesses, farm buildings, sites of ecological and/or heritage importance and the wider landscape;
- where appropriate and reasonably practicable using tunnels and cuttings to reduce noise effects and provide visual screening for local communities;
- using earth mounding and planting to screen views and integrate the project into the local landscape;
- providing noise barriers (fence barriers or earth mounds) to reduce effects on communities;
- providing links across the route 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 for the construction and operation of the project;
- managing excavated materials locally to achieve, as far as reasonably practicable, a balance of cut and fill volumes so as to reduce the number of heavy lorries on local roads;
- avoiding or reducing impacts on floodplains and flood storage areas; and
- providing balancing ponds to control surface water run-off.

Figure 3: Approach to mitigation



HS2 Ltd's aim is to ensure that, during construction of the project, significant adverse environmental effects will either be avoided or mitigated. The draft Code of Construction Practice (CoCP) for the project forms part of the ES, as detailed in Section 4.2.

In order to ensure that the environmental effects of the Phase One project will not significantly exceed those assessed in the ES, the Secretary of State will establish a set of controls known as Environmental Minimum Requirements (EMRs) see Section 5.2.

1.3 Consultation and engagement

The Government first published its proposals for high speed rail, including a preferred route for a high speed rail line between London, Birmingham and the West Midlands, in 2010. Between February and July 2011 the Government consulted the public both on its proposed high speed rail strategy and on its preferred route for the line between London, Birmingham and the West Midlands.

In January 2012, the Government published its decision to promote HS2 in two phases and its chosen route for Phase One. A key consideration in refining the route was to reduce the noise and visual impact upon local communities.

In March 2012, HS2 Ltd established community forums along the Phase One route to enable wider public engagement on the design of the project and its effects. Over 150 meetings have taken place with the community forums. The areas covered by each community forum are shown in Figure 13 (page 52).

Other forums have been established:

- the **national environment forum,** which involves national representatives of environmental statutory authorities and government departments. The forum provides advice on environmental policy, including approaches to mitigation. Members of the forum include English Heritage, Natural England and the Environment Agency;
- a **route-wide planning forum** and associated sub-groups that facilitate discussion between HS2 Ltd and local planning authorities on route wide technical planning and environmental matters, such as acoustics and cultural heritage; and
- a **non-governmental organisation forum** that meets to exchange views with a variety of independent environmental organisations, such as The Wildlife Trusts and the Ramblers, in order to benefit from their expertise.

In Spring 2012, HS2 Ltd published for consultation a draft scope and methodology report for the ES, setting out how the EIA of the Phase One project would be undertaken. This report was issued to statutory bodies, non-government organisations, local authorities and parish councils, and was available on the HS2 Ltd website, allowing comment by local interest groups and the public. Consultation responses informed the published EIA scope and methodology report.

Since the Government published its chosen route for the Phase One project in January 2012, HS2 Ltd has continued to develop and refine the design of the project, to reduce its environmental effects, to resolve engineering issues and to improve value for money. In May 2013 the Government consulted upon 14 significant design refinements. In recognition of the importance of ensuring widespread public engagement on the project, in May 2013 the Government also published a draft ES and an earlier draft of the CoCP for public consultation. HS2 Ltd has considered responses to these consultations in finalising the Phase One project for the Bill. The responses have informed the compilation of the ES and the draft CoCP published with the ES.

Arrangements for public participation and comment on the ES are summarised in the Foreword to this NTS.

Visualisation of the Colne Valley viaduct

2. The case for Phase One of HS2

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 has stated the following key objectives:

- to provide sufficient capacity to meet long term demand;
- to improve connectivity by delivering better journey times and making travel easier; and
- to improve resilience and reliability across the network.

The Government has made clear that the strategy to deliver these key objectives must be affordable and represent good value for money, keep both disruption to the existing rail network and impacts on local communities and the environment to the minimum, and deploy proven and effective technology.

The Government's case for a new north-south high speed rail network is primarily to ensure that the inter-urban rail network supports the economic development of the country by providing sufficient capacity and improved connectivity between urban centres. The need for additional capacity will become increasingly pressing on Britain's key north-south inter-urban rail routes, particularly on the West Coast Main Line from the mid-2020s.

The Government's view is that further incremental upgrades to the existing north-south rail network will be insufficient to provide the necessary capacity and improved performance required to meet the country's long-term economic needs. Further incremental upgrades would result in prolonged and unacceptable disruption to the existing network. Therefore, new railways are needed. These could operate at classic speeds or at high speed. The Government has concluded that building new classic rail lines would not be significantly cheaper than new high speed lines, nor would their effects on the environment and communities be significantly less than those of high speed rail. Classic rail lines would deliver far fewer benefits in terms of enhanced connectivity and support for long-term economic growth. The Government also considers that high speed rail would have greater potential to attract travellers from air and road transport, creating opportunities to reduce carbon emissions.

2.2 Enhancing capacity and connectivity

Demand for rail travel in Britain is increasing. It is the Government's view that even major enhancement packages to existing rail lines cannot provide sufficient rail capacity between London, the Midlands and the North over the coming decades. The Government has concluded that a new line must be built. Such a line will provide new, fast, long-distance services and release significant capacity on existing routes, such as the West Coast Main Line, which could be redistributed to benefit both passenger and freight movements.

Phase One of HS2 will link London, Birmingham and the West Midlands, greatly improving capacity and connectivity and reducing journey times. Phase One will also include a link to HS1 in London, allowing some services to continue to mainland Europe via the Channel Tunnel. The interchange at Old Oak Common will offer the opportunity to link to Crossrail, the Great Western Main Line and an onward link to Heathrow Airport.

Phase Two of HS2 will extend the high speed railway between Birmingham and Leeds and between Birmingham and Manchester, with connections onto the West Coast Main Line south of Wigan and the East Coast Main Line south of York. The potential also remains, pending decisions after the Airports Commission's report, to provide a direct link in Phase Two to Heathrow Airport.

In addition to the gain in capacity, enhanced connectivity is one of the key objectives of HS2, delivering wider transport choice and reduced journey times that will translate into long-term economic benefits.

2.3 Generating growth

Efficient movement of people and freight is essential for economic growth as enhanced capacity and good connectivity strengthen the links between businesses, workers and customers and remove geographical barriers to markets. The ability of rail to provide direct connections into urban centres makes it a particularly effective means of moving large numbers of people into and between urban areas. The extension of the high speed rail network to the north of England reflects the Government's intention that the regional benefits of high speed rail travel are distributed as widely as possible.

The proposed stations at Old Oak Common and Birmingham Interchange will improve the accessibility of the surrounding areas - Park Royal and the West Midlands region - and Heathrow and Birmingham airports respectively. Both stations will offer connections to other urban transport links, such as Crossrail at Old Oak Common, and enhance access to regional markets as well as key facilities such as the National Exhibition Centre and Birmingham Airport.

2.4 Controlling greenhouse gas emissions

The project has been developed against a background of concern and strengthening policy regarding climate change. The Climate Change Act 2008 requires at least an 80% reduction in the United Kingdom's (UK) greenhouse gas emissions as compared to 1990 levels by 2050. The Carbon Plan (2011) sets out the Government's plans for achieving the greenhouse gas emissions reductions committed to in the Climate Change Act and the first four carbon

budgets. Low carbon transport is an essential part of the Carbon Plan. The Plan states that rail travel will become substantially decarbonised through increasing electrification and the use of more efficient trains and lower carbon fuels. The Plan also mentions that the high speed rail network being developed by HS2 "will transform rail capacity and connectivity to promote long-term and sustainable economic growth".

One of the principal policy tools available to help implement the Carbon Plan is the European Union Emissions Trading System (the EU ETS). The EU ETS sets a limit on the total amount of greenhouse gases that can be emitted across Europe. Companies receive or buy emission allowances which they can trade with one another. In that way companies are able to stay within agreed emission targets. If they fail to do so, they are liable to be fined.

The EU ETS regulates greenhouse gas emissions from certain sectors of the economy. For example, the EU ETS regulates emissions of the UK's electricity generation sector used to power the project. The EU ETS regulates EU cement and steel industries whose products are likely to be used in the construction of the project.

Transport is a significant source of greenhouse gas emissions (mainly carbon dioxide) and is responsible for around one-quarter of the UK's emissions. Government research suggests that different methods of transport produce very different levels of carbon emissions. For example, 91% of the transport-related greenhouse gas emissions in 2011 came from road transport and 3% from railways. Encouraging a shift to modes of transport with lower carbon emissions is an important element of EU and UK Government policy in addressing climate change.

The construction of a new high speed rail line will result in substantial greenhouse gas emissions. However, in terms of enhancing inter-urban 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. (See Section 9.4 for more details). High speed rail is considered to draw an optimum balance between carbon reduction and economic benefits. Furthermore, the carbon emissions of high speed rail are likely to reduce in future as the energy supply is decarbonised, i.e. as Britain moves away from using gas, oil and coal-fired power stations and towards renewable and low carbon sources of energy.

Visualisation of Curzon Street station, central Birmingham

3. Description of the Phase One project

3.1 Stations

Four stations are proposed:

- **Euston,** central London - the existing station will be upgraded and extended by approximately 75m to the west to become the London terminus for the project. Eleven new HS2 platforms will be provided and 13 of the existing 18 platforms will be retained. The upgraded station will include a single modernised concourse and improved connections with rail, London Underground (Northern and Victoria lines and a new direct link with Euston Square underground station) and bus services;
- **Old Oak Common,** west London - a new interchange station will be constructed on the site of the existing First Great Western and Heathrow Express depots. It will provide six platforms for HS2 services including a connection to HS1, and eight platforms for services on the Great Western Main Line, Crossrail and Heathrow Airport;
- **Birmingham Interchange,** Solihull - a new station with four platforms will be constructed close to the National Exhibition Centre, to the east of the M42. A people-mover system will provide a direct link to Birmingham International station, the National Exhibition Centre and Birmingham Airport; and
- **Curzon Street,** central Birmingham - a new terminus station will be constructed within Eastside. It will include seven platforms and a pedestrian link with Moor Street station.

3.2 The route

Leaving Euston station, the route will descend into the Euston tunnel for approximately 7.4km (4.6miles) curving round to the west, broadly in line with the West Coast Main Line, to the new interchange station at Old Oak Common. This tunnel will require three ventilation shafts, located at Adelaide Road, Alexandra Place and Salusbury Road. Ventilation shafts along the route will require an associated surface structure (known as a 'headhouse'). There will be a link to HS1 from Old Oak Common via an existing junction north of St. Pancras International station. From Old Oak Common the HS1 link will be constructed partly in tunnel (approximately 6.3km (4miles) long) and partly along an upgraded section of the North London Line.

Leaving Old Oak Common station, the route will pass through an approximately 0.3km (0.2 mile) long tunnel and the Victoria Road crossover box (to allow trains to change tracks and reverse in and out of Old Oak Common Station) and enter a tunnel running under Ealing, Northolt and Ruislip for approximately 13.5km (8.4miles), which broadly follows the alignment of the Chiltern Main Line and the London Underground Central Line. This tunnel will require four ventilation

shafts, located at West Gate, Greenpark Way, Mandeville Road and South Ruislip. The route will emerge from tunnel south of the Ruislip Golf Course at West Ruislip alongside the Chiltern Main Line (Marylebone to Aylesbury Line) and will curve northwards to cross the Colne Valley on an approximately 3.4km (2.1mile) long viaduct.

The route will continue north-westwards to enter the Chiltern tunnel, an approximately 13.5km (8.4 miles) long tunnel just inside the M25, to pass underneath a section of the Chiltern Hills, Chalfont St. Giles and to the southern edge of Amersham. This tunnel will require four ventilation shafts, located in the vicinity of Chalfont St. Peter, Chalfont St. Giles, Amersham and Little Missenden. The route will emerge from tunnel within the Chilterns AONB on the western side of Hyde Heath.

The route will then be in cutting before passing between South Heath and Great Missenden within the approximately 1.2km (0.8mile) long South Heath tunnel. It will continue on surface and will pass over the Wendover Dean valley and over the A413 and Marylebone to Aylesbury Line on viaducts before entering an approximately 1.3km (0.8mile) long tunnel to the west of Wendover. The route will then pass to the south-west of Stoke Mandeville and Aylesbury, and to the north-east of Waddesdon, in cutting or at surface level.

At Calvert the route will cross under the former Bicester to Bletchley railway (part of the proposed East-West Rail Line) where the infrastructure maintenance depot will be located. It will continue to broadly follow the corridor of the former Great Central Main Line railway, largely in cutting, before passing to the east of Brackley.

The route will then head north-west through open countryside, largely in cutting, but with an approximately 2.1km (1.3miles) long tunnel past Greatworth. It will then enter Chipping Warden tunnel, an approximately 2.5km (1.6miles) long tunnel past Chipping Warden and Aston le Walls, before running largely on the surface towards Ladbroke and Southam. Beyond Southam the route will pass beneath Long Itchington Wood and Ufton Wood in an approximately 1.9km (1.2mile) long tunnel.

The route will head between Kenilworth and Coventry, passing Offchurch, Cubbington and through part of the Stoneleigh Park Exhibition and Conference Centre. The route will then enter the Burton Green tunnel, an approximately 0.6km (0.4mile) tunnel, on the alignment of the disused Kenilworth to Balsall Common line.

From Burton Green the route will head north-west, near Berkswell, to cross the Rugby to Birmingham branch of the West Coast Main Line. The route will then curve to the north, past Hampton-in-Arden, towards the proposed Birmingham Interchange station. Leaving the station, the route will head north across the M42 to a triangular junction (known as the 'delta junction') located to the west of Coleshill.

Heading north through the delta junction, the route will cross the M6 and M42 and will then split to provide a connection for the proposed eastern leg of Phase Two of HS2 to Leeds at the A4097 Kingsbury Road, to the north-west of Curdworth. Beyond this, the route will cross the M42 again, before curving to the north-west to pass close to Middleton. From Middleton the route will curve west of Tamworth, and to the east of Lichfield, before splitting alongside Fradley Park, just to the south of the Trent and Mersey Canal, where a connection will be provided to enable the proposed western leg of Phase Two of HS2 to Manchester. The Phase One route will turn westwards and connect with the West Coast Main Line to the south of Handsacre.

The delta junction connections will follow the M42/M6 from the north and the M6 from the south to pass westwards and follow the Water

Orton rail corridor into Birmingham city centre. The route will pass to the north of Castle Bromwich and over the River Tame, where it will enter the Bromford tunnel to the east of the A452 Chester Road. The tunnel will be approximately 2.9km (1.8miles) long and will emerge next to the rolling stock maintenance depot to be located at Washwood Heath. The route will continue westwards before arriving at the new Birmingham terminus at Curzon Street, located within Eastside in Birmingham city centre.

Land required

The land required for the project will include the operational rail corridor, stations, depots and mitigation (including earthworks, land for sustainable placement of excavated material and new ecological habitats). Land will be acquired to divert or realign some roads, public rights of way and watercourses. Land will also be required for construction activity including site compounds; worker accommodation sites; and temporary diversion of roads, public rights of way, private access routes and for permanent access to the railway for maintenance purposes. Land required only for construction activity will ordinarily be restored to its previous ownership and use following completion of the project.

Railway corridor

Where the railway is at ground level, the project will ordinarily require a minimum width of 19m between boundary fences to accommodate two railway tracks (for northbound and southbound services) and other features including signalling; telecommunication and overhead line equipment; electricity cables; railway drainage; and access tracks. However, the width of the railway corridor will vary along its length in order to accommodate the existing ground, cuttings and embankments.

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

Certain sections of the railway corridor will be wider to accommodate the approaches to stations, depots and junctions, or where maintenance loops are required.

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 context (e.g. whether in an urban or rural setting).

Figure 4: Indicative two-track rail corridor

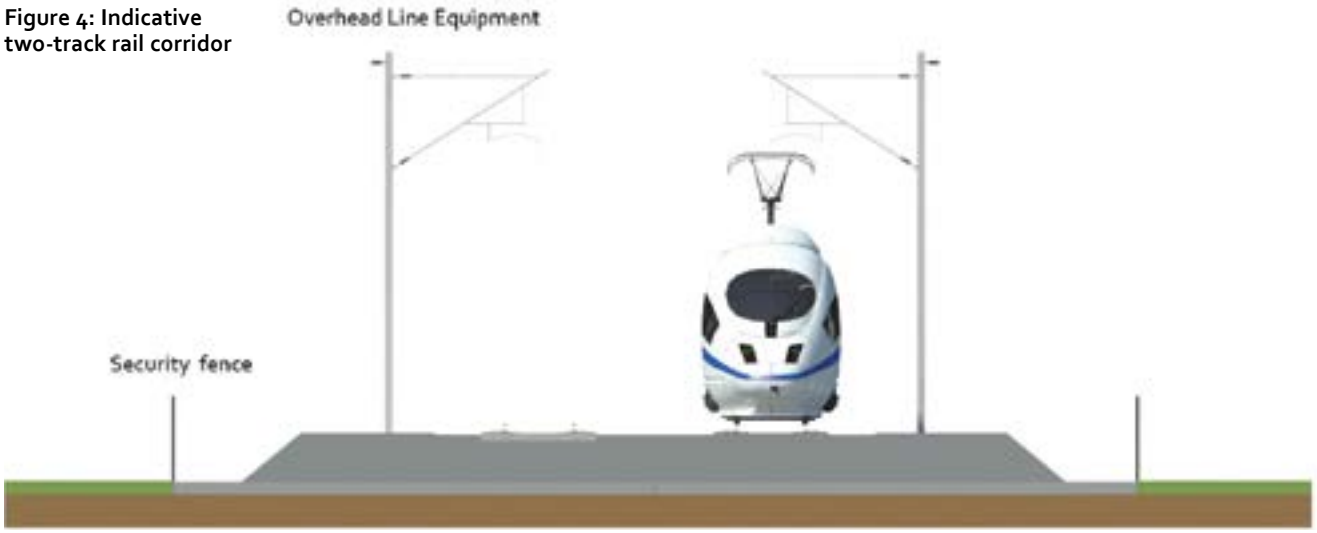


Figure 5: Viaduct (generic)

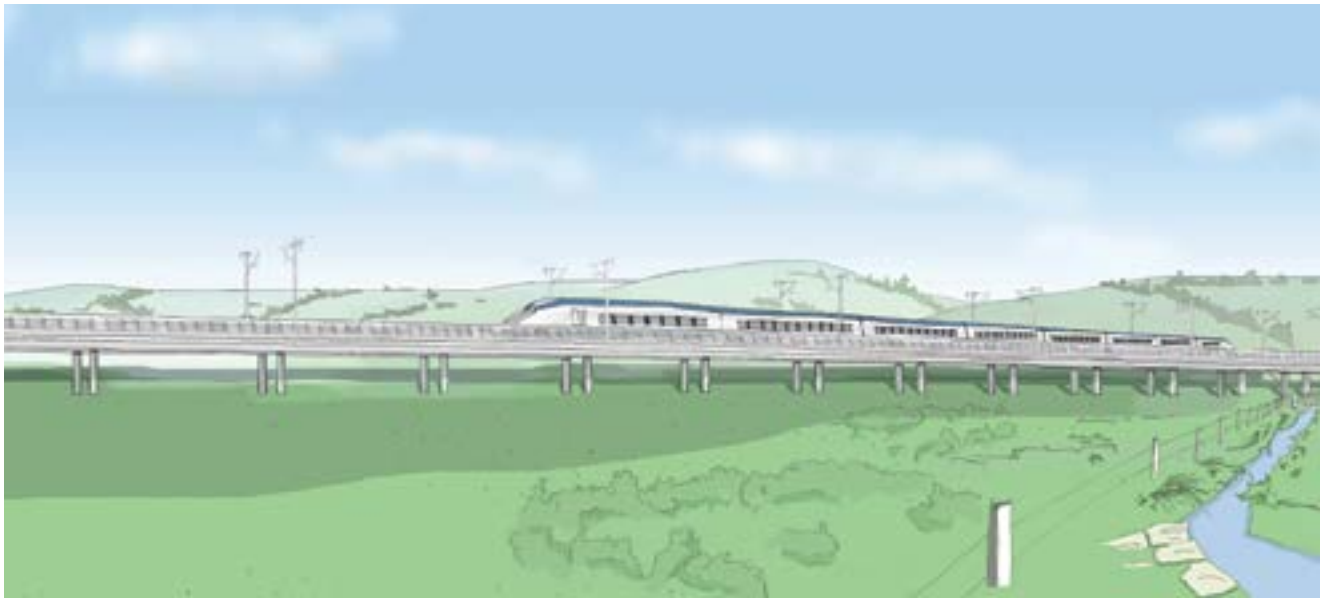


Figure 6: Tunnel portal (generic) in a rural location

3.3 Other components of the Phase One project

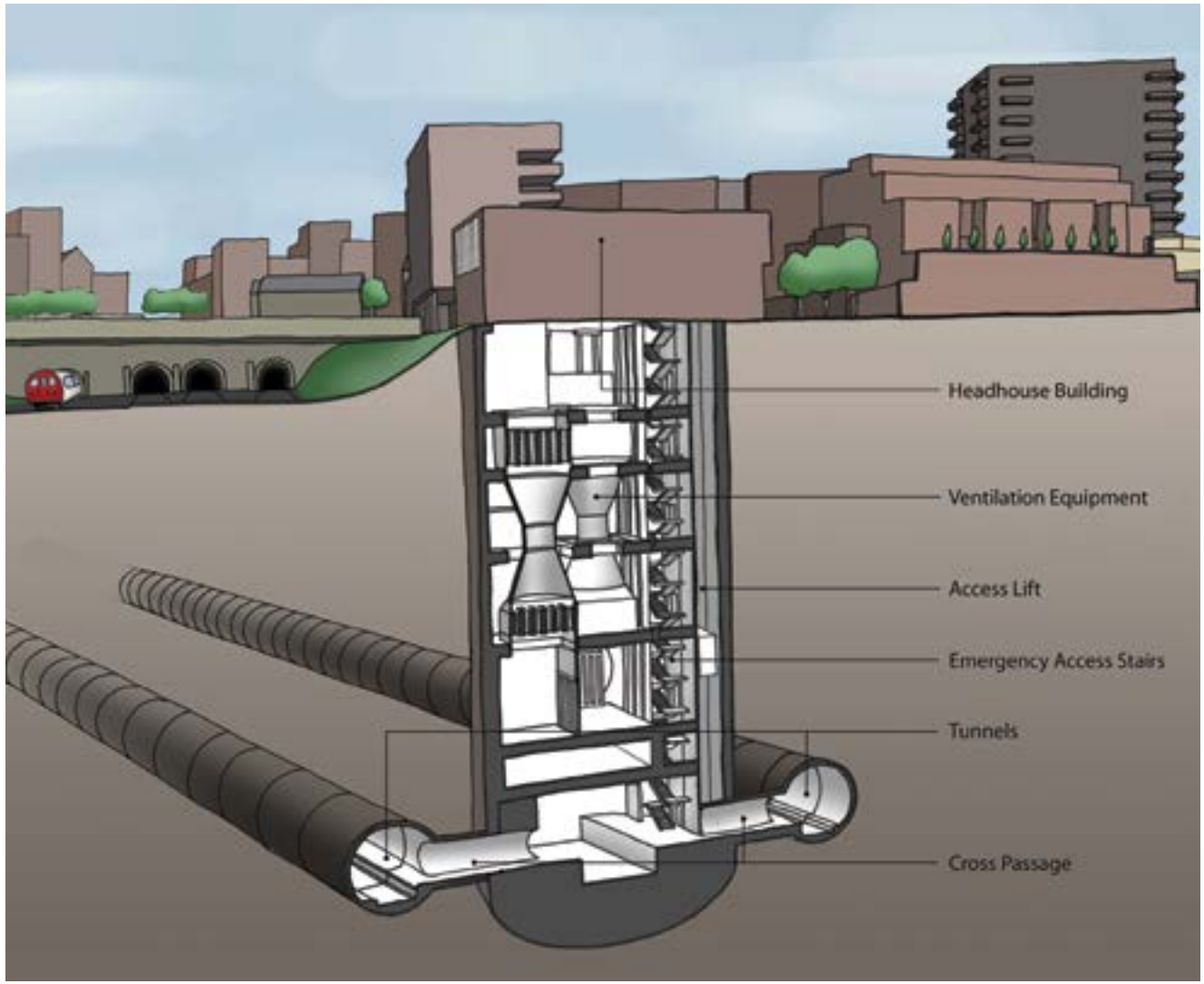
Bridges and viaducts

Where the route passes over or under a feature, such as a public right of way, road, main river or existing railway, bridges or viaducts will be required. Viaducts will be built where crossings over 45m in length are needed (an example of a viaduct is shown in Figure 5). The height of the bridges and viaducts is determined by the route alignment, surrounding ground levels and the features being crossed.

Tunnels

Tunnels will be constructed at a number of locations along the route, using two methods of construction. Long or deep tunnels will be created using a tunnel boring machine. With the exception of the HS1 - HS2 Link tunnel, which is a single bore and single track tunnel, all other bored tunnels will be twin bore, comprising two parallel tunnels each containing a single rail track. Short tunnels will be constructed using a cut-and-cover method, which involves excavating downwards, building a structural box and then restoring the land over the top.

Figure 7: Ventilation shaft and headhouse in an urban location



Where necessary, tunnel portals have been designed to reduce noise and air pressure effects as trains enter/exit the tunnels. An example of a tunnel portal is shown in Figure 6.

For safety reasons, tunnels longer than 1km (0.6miles) are required to have cross-passage escape routes between individual bores (if twin-bore) and to the surface. Shafts for ventilation (and in some cases, for emergency services access and exit) will be required at 2-3km (1.2-1.9mile) intervals 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. An example of a cross-section of a ventilation shaft and headhouse is shown in Figure 7.

Priority will be given to re-using the material excavated from tunnels and cuttings locally to form rail or road embankments, earth mounds ('bunds') for noise and visual mitigation and restoring land over cut-and-cover tunnels

Cuttings and embankments

To achieve the speeds required for high speed rail, the route must be designed without tight curves or steep gradients. To allow this, sections of the route will be in cutting or embankment. Cuttings are where material has been excavated to maintain rail levels below the existing ground level. An example of a cutting is shown in Figure 8.

Figure 8: Cutting (generic)

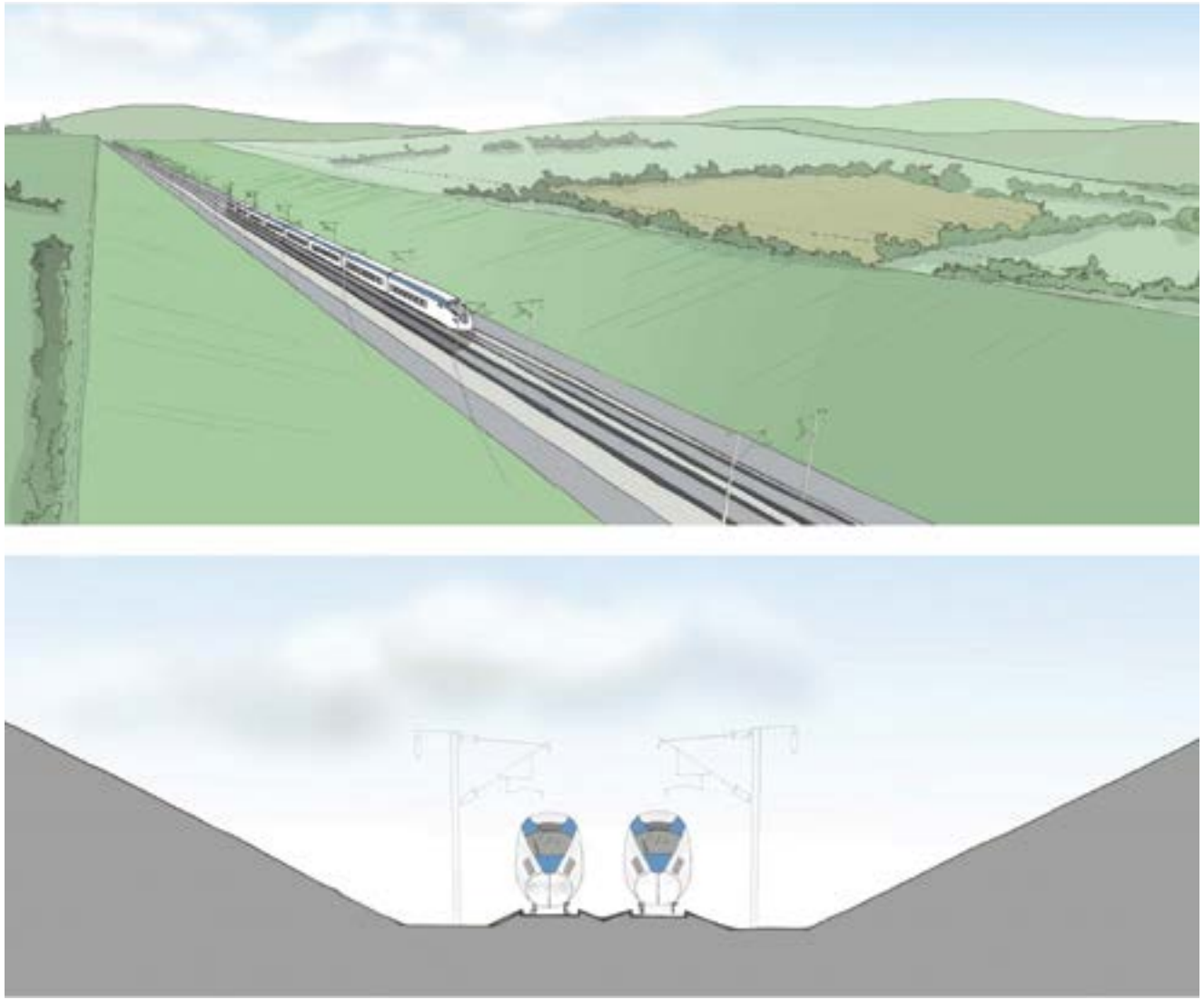
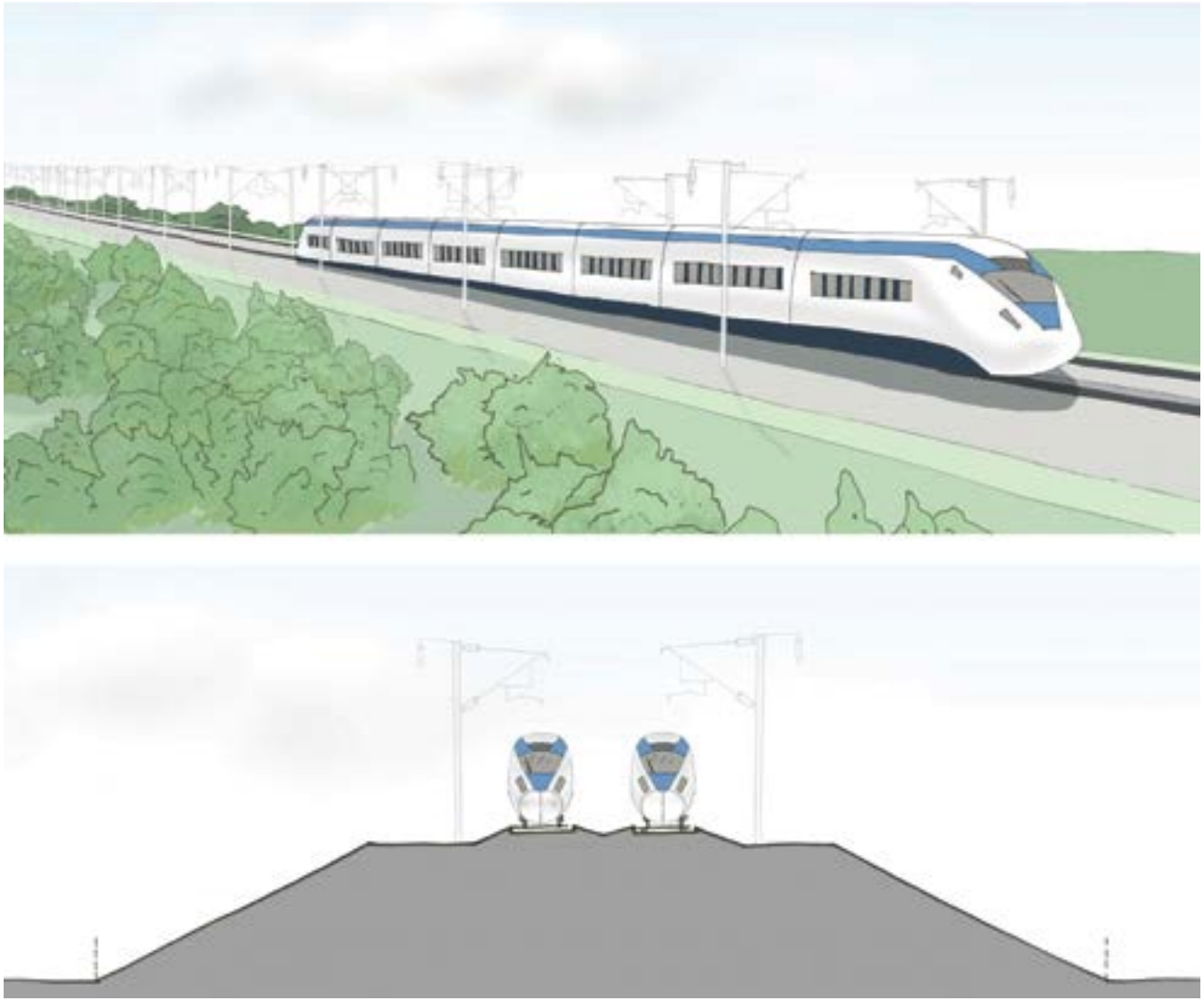


Figure 9: Embankment (generic)



Embankments are where the rail level is maintained above the existing ground level using earth material, known as 'fill'. An example of an embankment is shown in Figure 9.

Depots
The project will include an infrastructure maintenance depot at Calvert (north of Aylesbury) and a rolling stock maintenance depot at Washwood Heath in Birmingham. More detailed information on these depots can be found in Section 4.4.

Track
The railway alignment has been designed to allow for train speeds of up to 400kph (250mph). The track will either be ballasted track, whereby the rails will be fastened to concrete sleepers supported by ballast (a form of crushed rock), or slab track, whereby the rails will be supported on a continuous concrete structure.

Train control and telecommunications
The train control and telecommunications system will be operated from a route-wide network control centre at the Washwood Heath depot. It will not require traditional trackside signals for its operation. The primary purpose of the network control centre will be to supervise and control activities on the railway.

The project will use radio communications as part of its operations and train control system, which will require radio antennae to be mounted on short extension poles fixed to the overhead line equipment masts approximately every 2km (1.2miles).

Power supply
The project will require connections to the National Grid for the supply of electricity to power the project. The proposed principal connections (known as 'traction power feeder stations') will be located at approximately 50-70km (31-43.5miles) intervals at Ickenham, Quainton and Burton Green. Each feeder station will comprise two separate compounds: a National Grid compound and an HS2 compound, the latter known as an 'auto-transformer feeder station'. All of these compounds will require road access and fencing; some will require new electricity pylons.

Smaller auto-transformer stations will also be provided along the route at approximately 5km (3 mile) intervals. These will accommodate electrical switch gear and associated equipment.

Power will be transmitted to the trains through overhead line equipment. An example of overhead line equipment is shown in Figure 4 (page 15).

Road, public right of way, utility and watercourse diversions

Where road diversions are required, the nature of and programme for the works will be undertaken in consultation with the relevant highway authority. Where roads, public rights of way and utilities need to be diverted or realigned, they will normally follow the shortest practicable route, taking into account safety, pedestrian and traffic flows, construction duration and local environmental effects. Where watercourses require diversion, channel flow will be designed and maintained in consultation with the relevant regulatory authority.

Noise barriers

To avoid or reduce significant noise effects, the project incorporates noise barriers, generally in the form of landscape earthworks i.e. cuttings and embankments, noise fence barriers or 'low-level' barriers on viaducts.

3.4 Potential future connections

Provision has been made for future extensions to the railway:

- on either side of the Colne Valley for the potential future link to Heathrow Airport;
- north-west of Curdworth, near Coleshill, for a Phase Two extension to Leeds; and
- east of Lichfield for a Phase Two extension to Manchester.

4. Construction and operation of the Phase One project

4.1 Construction programme

Construction and commissioning of the Phase One project is expected to take place between 2017 and the end of 2026. The duration, intensity and scale of works along the route will vary over this period.

Initial works will include the establishment of compounds and worksites, and preliminary activities such as utility diversions. Preparatory mitigation works will also take place at this time, including, where appropriate, habitat creation and transfer of protected species to suitable alternative locations. This will be followed by the main period of construction activity, to construct major components of the project including cuttings, embankments, bridges, viaducts and stations. Once these major components have been built, activity will focus on the installation of track, overhead line equipment, train control and telecommunications system. A period of system testing and commissioning will then follow.

4.2 Construction management

Code of Construction Practice and local environmental management plans

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. At a local level, site-specific control measures will be included within local environmental management plans.

The draft CoCP will be finalised when the Bill is enacted. HS2 Ltd and its contractors will be required to comply with the CoCP throughout the construction period. HS2 Ltd and its contractors will engage with the community, particularly focusing on those who may be affected by construction, such as local residents, businesses and community facilities. HS2 Ltd or its contractors will notify local communities in advance of any road or public right of way realignments, diversions or closures. HS2 Ltd will appoint appropriately experienced community relations personnel.

The local environmental management plans will build on the project wide environmental requirements contained within the draft CoCP.

The plans will set out how the project will adapt and deliver the required environmental and community protection measures within each relevant local authority area. The local environmental management plans will be developed by HS2 Ltd in consultation with local communities, local authorities and other stakeholders.

Construction compounds

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

Thirty-one main construction compounds will be required. 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 the storage of construction equipment and materials, maintenance and parking facilities, together with the main welfare facilities for staff. Overnight accommodation for construction staff will be provided at some compounds.

Two hundred and ninety nine satellite construction compounds will be required. Satellite construction compounds will generally be smaller, providing office accommodation for a limited number of staff. They will include

local storage for construction equipment and materials, welfare facilities, and limited car parking for staff and site operatives.

Some compounds will include railheads, which will be used as the delivery location for bulk rail-borne materials, such as ballast, rails and sleepers. Sites identified for such railheads include West Ruislip, Calvert, Kingsbury Road, Willesden Euroterminal and Streethay.

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 and utilities;
- accessibility for local workforce and the presence of existing local facilities;
- existing land use and proximity to sensitive features of the environment and communities; and
- ease of establishing and maintaining security.

Details for construction compounds are provided for each area in the relevant community forum area summary report in Section 8.

Construction worksites

Construction worksites are areas which are principally used for the purpose of construction works. 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 (including heavy goods vehicles and light goods vehicles) or rail to deliver construction material or machinery.

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. HS2 Ltd will require its contractors to adhere to these core working hours for each site, subject to the categories of additional hours described in the following paragraphs.

Guidance on all 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. To maximise productivity within the core working hours, the 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.

Work within existing stations, track-laying activities and works requiring possession of major transport infrastructure may be undertaken during night-time, Saturday afternoons, Sundays and/or bank holidays for reasons of safety or operational necessity. These works will often involve consecutive night works over weekends and may on occasions involve longer durations. Activities outside core working hours that are likely to give rise to disturbance will be kept to a reasonably practicable minimum.

Tunnelling (excluding cut-and-cover tunnels) and directly associated activities (such as removal of excavated material from tunnels, supply of materials and maintenance of 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 site boundary for removal during core working hours.

Certain activities, such as earthworks, are season and weather dependent. Contractors will 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. Certain other specific 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.

Site restoration
On completion of construction, all temporary construction equipment, buildings and storage areas and access roads will be removed from the site, allowing the land to be restored.

Former agricultural and forestry land will be restored to that use where reasonably practicable. Some additional areas of land may be restored for the provision of compensatory and replacement ecological habitat and landscape mitigation.

System testing and commissioning
Commissioning will allow operational procedures to be tested and refined alongside the training of staff. This will start on the section of route closest to the route-wide network control centre at Washwood Heath depot to allow the testing of train operating systems at the earliest opportunity. The period of testing and commissioning is expected to extend over four years, commencing in 2022 and completing in 2026.

4.3 Services and operating characteristics

HS2 trains
There will be two types of trains: trains that will run only on the high speed network (known as 'captive' trains) and trains which will be able to run on both the high speed network and the existing network (known as 'classic compatible' trains). Depending on demand and the time of day, services will operate as 200m long trains, carrying up to 550 passengers, or as two trains coupled together to form 400m long trains, carrying up to 1,100 passengers. Trains will travel at speeds of up to 360kph (225mph).

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

- between Euston station and Old Oak Common station - up to 230kph (140mph);
- between Old Oak Common station and the Chiltern tunnel - up to 320kph (200mph);
- between the Chiltern tunnel and Birmingham Interchange station - up to 360kph (225mph);
- between Birmingham Interchange station and Handsacre (junction with the West Coast Main Line) - up to 360kph (225mph); and
- between Birmingham Interchange station and Curzon Street station - up to 230kph (140mph).

HS2 services
Services will operate between 05:00-24:00 from Monday to Saturday and between 08:00-24:00 on Sunday. Maintenance and engineering works will normally take place outside these operational hours, unless the works can be fully separated to enable them to be undertaken during the day with trains operating at the same time.

The assumed initial service pattern for Phase One is for up to 11 trains per hour in each direction in the peak. Phase One can accommodate up to 14 trains per hour in each direction during peak hours. On Phase Two coming into operation, up to 18 trains per hour will be able to run between London and Birmingham Interchange station.

Visualisation of Washwood Heath Depot

The proposed journey times for Phase One (assuming high speed operation from London to the West Midlands, with onward running via the classic network on the West Coast Main Line, and station stops at Old Oak Common and elsewhere) are set out in Table 1.

Table 1: Assumed Phase One journey times from Euston station

Station	Fastest journey time from Euston station, London (hours:minutes)
Birmingham Interchange	00:38
Birmingham Curzon Street	00:49
Manchester Piccadilly	01:40
Liverpool Lime Street	01:50
Preston	01:48
Glasgow Central	04:00

Operating staff

Phase One is estimated to directly create approximately 2,200 new jobs for the operation of stations and trains, infrastructure and maintenance. Additional employment will be created by the provision of other facilities such as retail outlets at stations.

4.4 Maintenance, stabling and service preparation

HS2 trains will be maintained at the Washwood Heath depot, where activities will include cleaning, servicing and routine repairs of the trains. The facility will operate 24 hours a day, 365 days a year, with up to 500 staff working in shifts either in jobs within the depot (maintenance and support staff) or to start or finish their day at the depot (e.g. train drivers).

The principal infrastructure maintenance activities will be managed and resourced from the infrastructure maintenance depot at Calvert (north of Aylesbury), creating up to 300 new jobs. This depot will provide the base for infrastructure maintenance work for the Phase One railway, such as track and overhead line inspections, maintenance and renewal, ballast cleaning and replacement of mechanical and electrical equipment.

Two maintenance loops will be provided to enable maintenance trains to be temporarily parked overnight (known as 'stabling') without returning to the infrastructure maintenance depot at Calvert. Maintenance loops will be provided close to Stoke Mandeville in Buckinghamshire and close to Wormleighton in Warwickshire, to reduce travel distances for maintenance.

In order to reduce the number of empty train movements, trains will be stabled for service preparation between the last service of the day and the first service of the following day. Train stabling and service preparation will be required at stations and depots on the route. Stabling and service preparation will also be required at existing facilities in Liverpool (Edge Hill), Manchester (Longsight and Longsight International) and Glasgow (Polmadie) for classic compatible trains. The assessment of the environmental effects at these existing facilities is summarised in Section 10.

View looking to the proposed line of route from public right of way near Rookery Farm

5. Preparation of the Environmental Statement

5.1 Introduction

The main steps in the preparation of the ES of Phase One of HS2 are shown in Figure 10 and are outlined in this section. The ES has been prepared in accordance with European legislation and Government guidance on EIA. It provides detailed information and assessment on the likely significant effects of the project on the environment. Where likely significant adverse environmental effects are identified, the ES sets out mitigation to avoid, reduce or manage those effects.

The EIA process for the Phase One project comprises the following related activities:

- preparation of a scope and methodology report ('scoping') to determine the scope of the assessment, including the range of environmental topics to be addressed. This scoping report was finalised in September 2012 following consultation with the public, local authorities and a wide range of environmental organisations. An addendum to the scope and methodology report has been produced which highlights where there has been further development of the methodology, or changes to legislation and/or best practice guidance since September 2012;
- collection of information about current environmental conditions ('the baseline') in the vicinity of the project;
- prediction of future environmental conditions without the project ('the future baseline');
- assessment of the likely beneficial and adverse significant environmental effects of the project in accordance with the scope and methodology report;
- development and assessment of proposed mitigation for identified likely significant adverse environmental effects;
- assessment of the remaining significant adverse environmental effects of the project assuming the proposed mitigation is in place (referred to as 'residual effects');
- public consultation on the draft ES;
- further environmental assessment and refinement of the project design, including consideration of comments received on the draft ES; and
- finalisation and submission of the ES with the Bill for the Phase One project.

The Foreword to this NTS summarises the arrangements for public participation and comment on the ES, following submission of the Bill and the ES to Parliament.

During the EIA process and the design of the project, the likely effects of climate change have been taken into account in two ways: firstly, by considering the projected impacts of climate change on the natural and built environment and upon communities affected by the project; and secondly, by considering how the impacts of climate change may affect the resilience of the project. Further information on HS2 Ltd's approach to consideration of climate change in the design of the project is summarised in Section 9.4.

5.2 Meeting environmental requirements

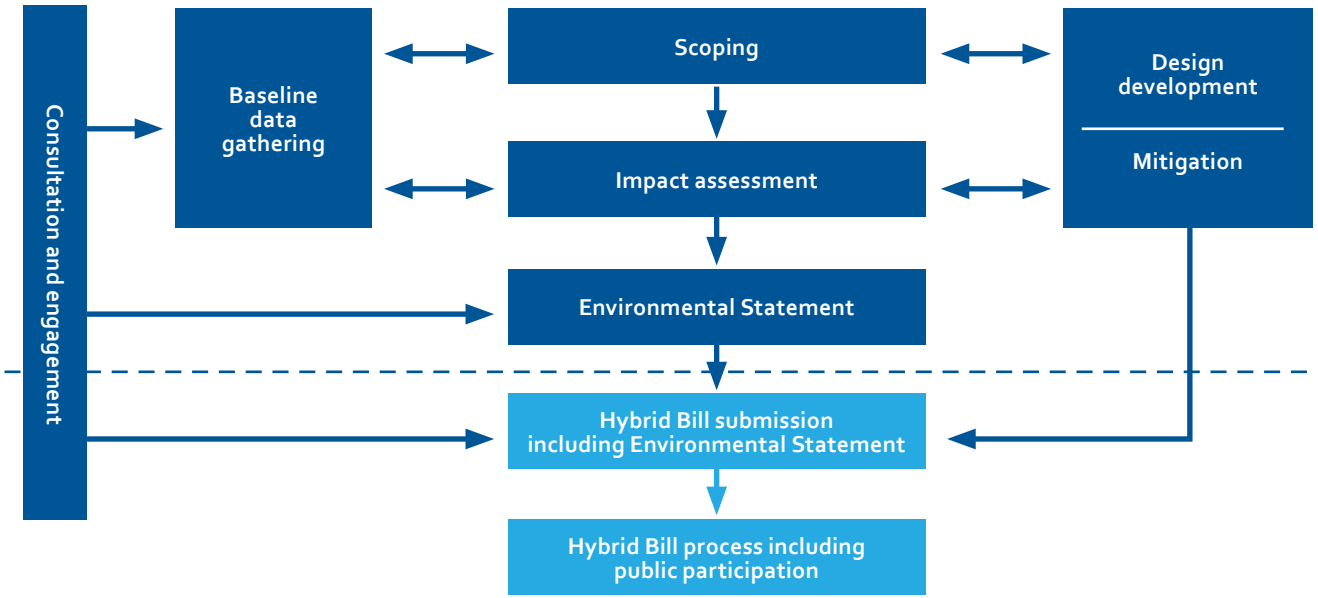
In order to ensure that the environmental effects of the project do not significantly exceed those assessed in the ES, the Secretary of State will establish the EMRs. The EMRs sit alongside the statutory environmental controls included in the Bill. Throughout construction and operation of the Phase One project, HS2 Ltd and its contractors will be required to comply with both the EMRs and those statutory environmental controls.

The EMRs will require HS2 Ltd and its contractors to adopt measures to reduce the adverse environmental effects reported in the ES, provided that such measures are reasonably practicable and do not add unreasonable cost or delay to the construction or operation of the project.

The EMRs will include:

- general principles, by which the Secretary of State commits that the environmental effects reported in the ES are not exceeded through application of the environmental mitigation assessed in the ES;
- the CoCP;
- an Environmental Memorandum; which is a framework for HS2 Ltd and its contractors and stakeholders, such as the Environment Agency, Natural England and English Heritage, to work together to ensure that the design and construction of the Phase One project is carried out with due regard for environmental considerations;

Figure 10: Environmental impact assessment process diagram



- a Planning Memorandum, which will set out an agreement between the Government and the local planning authorities relating to the processing of detailed planning approvals under the provisions of the Bill, including the design and appearance of stations, bridges, viaducts, ventilation shaft headhouses, tunnel portals, noise barriers and earthworks;
- a Heritage Memorandum, which will set out a commitment to limit the impact on the historic environment and will address the elements of the design and construction works that have a direct impact on heritage assets; and
- undertakings and assurances given during the passage of the Bill through Parliament.

If changes are required to the project due to circumstances that were not foreseeable at the time of the ES, these will be assessed to ensure that they do not have significant adverse environmental effects greater than those identified in the ES. If such a change is found to have such effects, it will be subject to a separate development consent process and to environmental impact assessment in its own right.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6. Strategic, route-wide and local alternatives

6.1 Introduction

The Government and HS2 Ltd considered four categories of alternatives:

- doing nothing: a future scenario where no further investment in transport infrastructure was to take place beyond that already planned or committed;
- strategic alternatives: those that do not involve high speed rail;
- route-wide alternatives: those involving different layouts or operational characteristics for a high speed railway between London and the West Midlands; and
- local alternatives: those which consider different design, construction and mitigation arrangements for the route at or around a community forum area level.

At the various levels, alternatives have been evaluated on a comparative basis against benefits, cost, engineering design and environmental impact.

6.2 Doing nothing

The 'doing nothing' scenario would involve no further investment in transport infrastructure beyond the projects that are already planned or committed. Successive governments have concluded that such an approach is incapable of meeting the future travel needs of Britain (without unacceptable overcrowding on transport infrastructure) and would come at a significant economic cost.

6.3 Strategic alternatives to high speed rail

The Government's policy is to ensure there is sufficient transport capacity and connectivity between the largest and most productive urban centres to support long-term economic growth. Before deciding to proceed with HS2, a wide range of options to address Britain's inter-urban transport challenges were reviewed. These included domestic aviation, new motorways, a new classic speed rail line as well as upgrades to existing roads and railways.

The carbon emissions from air travel are significantly greater than those from high speed rail. The capacity of London's airports is limited and providing for future growth in international travel will be a significant challenge without also serving additional demand from domestic air services. The Government therefore intends for more people to take the train instead of air for domestic and short-haul journeys to mainland Europe, both in order to achieve environmental benefits and to release capacity at airports for longer journeys.

The Government also decided not to give further consideration to major new motorways as an alternative to HS2. This is because high speed rail is preferable in terms of both capacity and journey times (particularly in urban areas) and has lower carbon emissions per passenger kilometre and the local environmental effects of new roads would be greater than a new railway.

The Government nevertheless intends to increase the capacity of strategic roads through the 'managed motorways' initiative (including variable speed limits and the use of motorway hard shoulders) but even with junction improvements and some widening these measures can only add approximately 20% to existing road capacity. This is less than the forecast growth in demand for road travel and would not be an alternative for serving the growth in demand for long distance inter-urban train journeys.

Although a new classic rail line could address the long-term capacity constraints on the existing rail network, the cost would be almost as high as those of high speed rail without delivering the reduced journey times and having only marginal environmental benefits. For these reasons, the new classic rail line option was rejected.

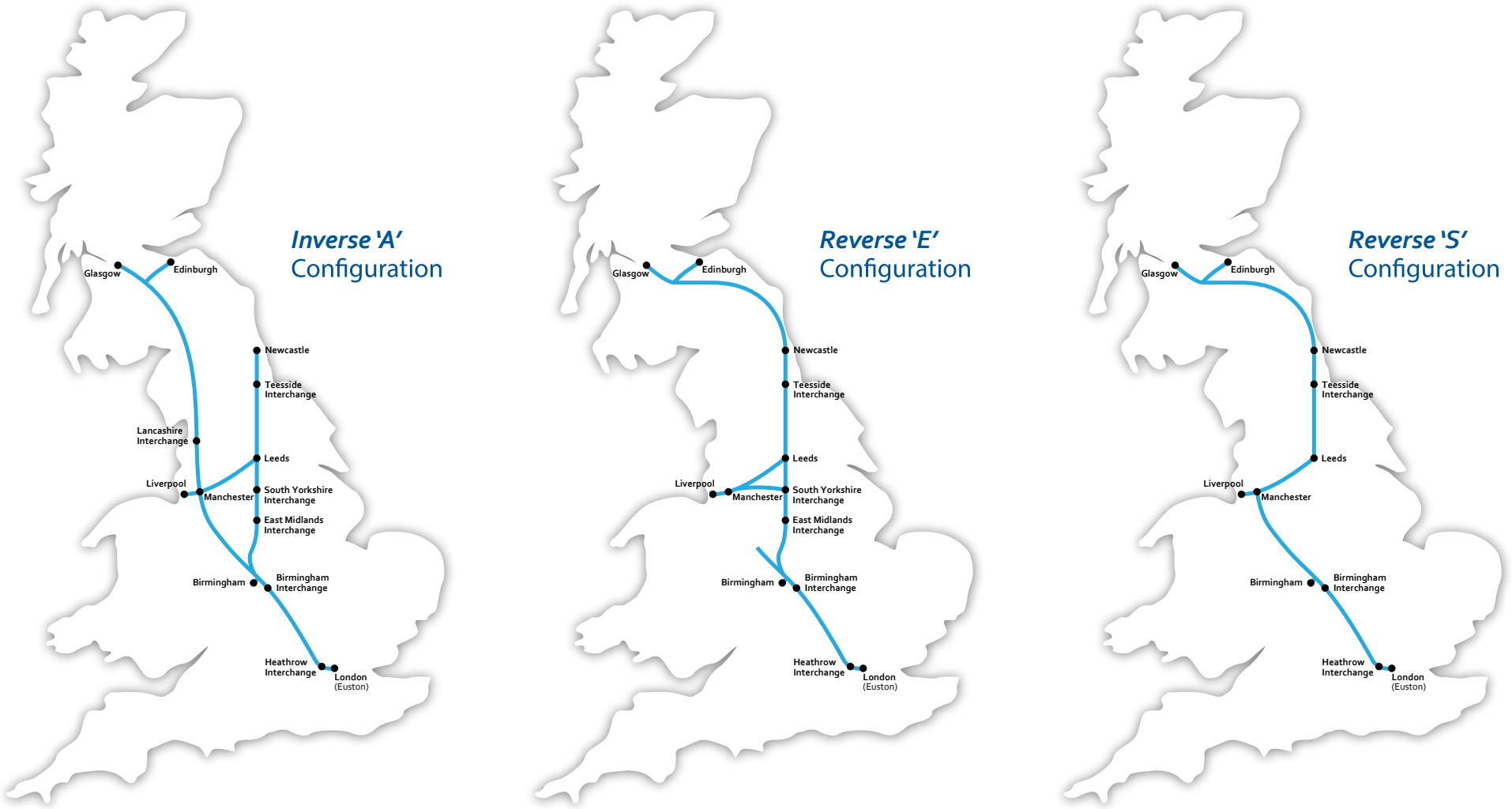
The existing main rail network, including lines between London, the Midlands and the North, has undergone, or is undergoing, successive major upgrade programmes. The potential for capacity upgrades has been explored both as an alternative to HS2 Phase One to the West Midlands and also as an alternative to both phases of HS2. The Government has concluded that further upgrades will not provide the scale of capacity increase and connectivity benefits that are needed to fulfil the Government's objectives. Rail upgrades will not meet the Government's objectives for future performance of the rail network and will cause considerable disruption to existing train services during construction.

6.4 Route-wide alternatives

Shape of the high speed rail network

Several options for the configuration of the high speed network were evaluated in 2009 including the 'Inverse A', 'Reverse S' and 'Reverse E' options shown in Figure 11. The 'Inverse A' option was found to perform best in terms of providing a balance between journey times and capacity. It was refined to produce the current 'Y' network. The Government also concluded that the trans-Pennine link between Manchester and Leeds in the 'Inverse A' option would be better achieved through upgrading existing railway lines, rather than a new high speed link. Based on a comparative assessment of the cost, environmental impacts and engineering complexities of each option, it was decided the 'Y' network was most appropriate.

Figure 11: Alternative configurations considered for the high speed rail network



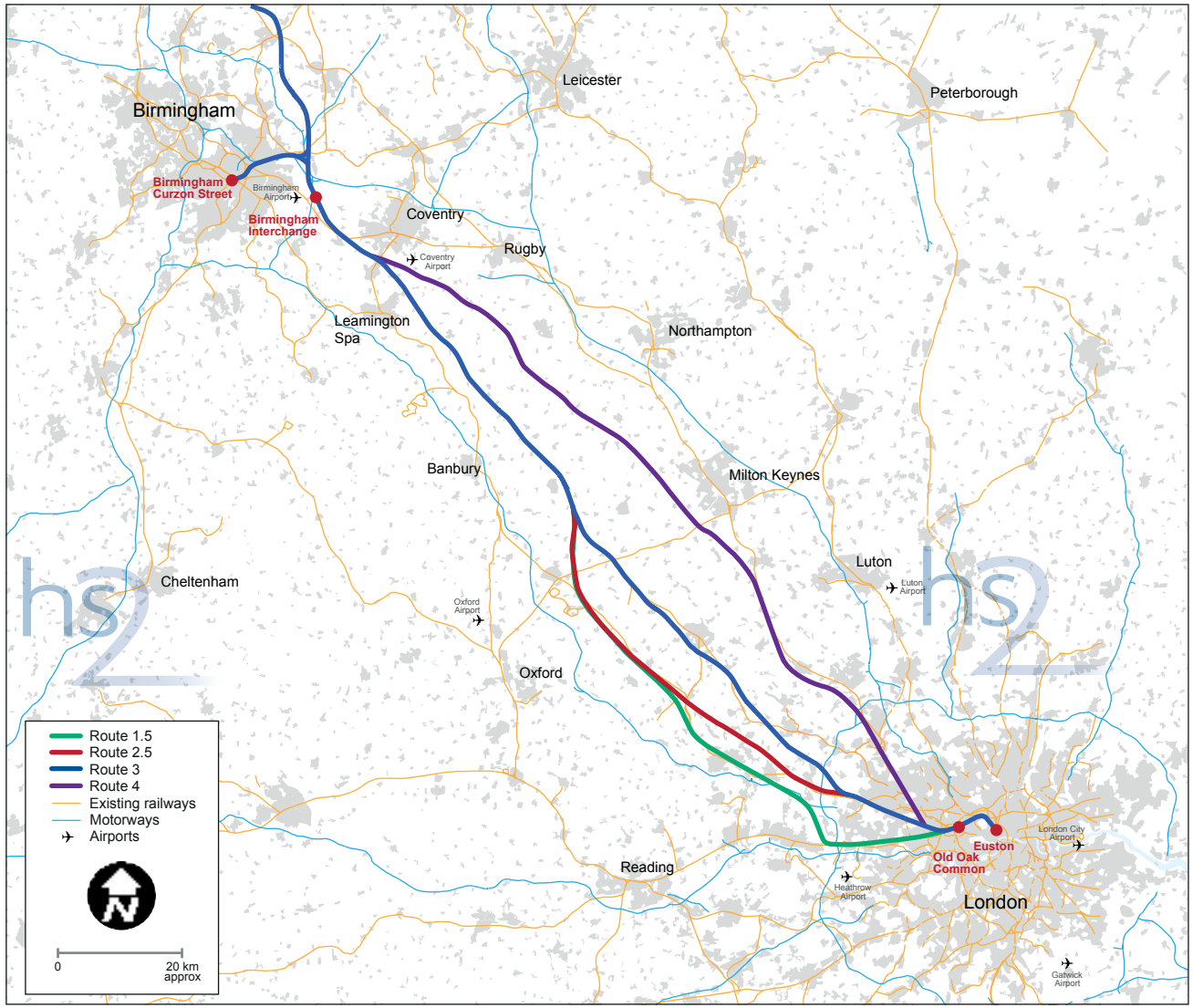
Alternative train speeds
Three options were considered for the maximum design speed of the high speed network: 300kph (186mph); 360kph (225mph); or 400kph (248mph). Whilst lower operating speeds would allow greater flexibility in the alignment of the route to avoid environmentally sensitive areas, operating at a maximum speed of 300kph, as compared with 360kph, would increase journey times between London and Birmingham and destinations in the north of England and Scotland. This increased journey time would reduce the economic and connectivity benefits of high speed rail with little environmental gain. The 300kph maximum speed was therefore considered unacceptable.

While the project would operate at 360kph, the route alignment has been designed to allow for train speeds of up to 400kph in the future, in case there is a commercial case to do so and technology allows this to be achieved without additional significant adverse environmental effects. Reducing the design speed to 360kph was not found to deliver a significant environmental gain over a 400kph design speed. Furthermore, upgrading the alignment after opening to achieve a design speed of 400kph at a later date would be a major exercise, incurring significant cost and disrupting rail services. For these reasons, a maximum design speed of 400kph was adopted for the project.

London terminus
Twenty-seven potential sites were considered for the London terminus, including expanding existing stations in central and/or outer London and the development of a completely new station. Twenty-five of the sites were rejected, primarily because they were insufficiently central, provided limited onward transport connections and/or would involve unacceptable costs or effects. A station located below ground level at King's Cross railway lands was considered but rejected because of the complexity and cost of avoiding London Underground tunnels, the Thameslink station and underground utilities, as well as the effects on the on-going regeneration plans for the area. Euston station was found to be the only viable option.

London interchange station
Of the interchange options considered, only Iver emerged as a realistic alternative to Old Oak Common. Iver could be the location for a park and ride station for HS2 and Crossrail and would be closer to Heathrow, but an interchange at Iver would add 15-30 minutes to the journey to central London when compared to the Old Oak Common option via Crossrail. Consequently, fewer passengers would use it as an interchange and it would be significantly less effective in relieving congestion on the public transport network around Euston station. An interchange station at Iver would also be more expensive to build and would result in greater environmental impacts.

Figure 12: Route options between London and the West Midlands



Alternative routes between London and the West Midlands

A large number of alternatives were considered for the route between London and West Midlands. From the initial set of options, a number of alternative alignments were evaluated based on potential journey times, engineering feasibility, likely environmental effects and cost. From this evaluation, four options (shown in Figure 12) were selected for further examination:

- **Route 1.5** - A through route via Heathrow Airport - This route provided for main line services to Heathrow Airport, running to the west of Route 2.5, before re-joining Route 2.5 north-east of Bicester;
- **Route 2.5** - via Princes Risborough - This route passed through three tunnels under the Chilterns, then largely on surface before re-joining Route 3 near Bicester;

- **Route 3** - A413 Valley and Great Central route - This route broadly aligned to existing transport corridors (A413, Marylebone to Aylesbury line) before joining the route of the former Great Central Line between Aylesbury and Brackley; and
- **Route 4** - West Coast Main Line corridor - This route ran in tunnel to Kings Langley, and then broadly parallel with the M1 corridor to pass to the west of Milton Keynes and between Kenilworth and Coventry.

Route 1.5 was discounted due to its cost and longer journey times. Each of the three remaining options would have different environmental effects, but overall the difference between the three options in environmental terms was found to be marginal. The preferred route (Route 3) was selected because it would offer shorter journey times, with associated economic benefits and for less cost.

Alternative routes through the West Midlands
Three general route corridors through the West Midlands were considered:

- around the east side of Birmingham, with a link into Birmingham city centre;
- around the west side of Birmingham, with a link into Birmingham city centre; and
- directly through Birmingham city centre.

Routes that pass directly through Birmingham city centre were rejected because the amount of land required and higher cost were not justified by the potential connectivity benefits. Routes around the western edge of Birmingham presented significant environmental and technical problems and would have resulted in longer journey times to the north. A route around the eastern edge of Birmingham, following existing transport and industrial corridors, with a link to the city centre along the Water Orton corridor was selected as the preferred option. The selection of the Water Orton corridor allowed Birmingham city centre to be accessed equally well by HS2 trains from the north-west and north-east in Phase Two. This option also had the benefit of allowing an interchange (i.e. Birmingham Interchange station) to be built to provide access to key destinations such as the National Exhibition Centre, Birmingham Airport and the wider West Midlands region.

Additional connections to the classic rail network
An additional connection to the existing railway near Lichfield was considered which would connect HS2 to the Midland Main Line. However, this would require substantial engineering works at considerable cost, disproportionate to the benefits it would provide, given the proposal to develop a high speed link to Leeds through the East Midlands in Phase Two.

Birmingham terminus
Birmingham city centre was chosen as the preferred location for the West Midlands terminus following analysis of the projected demand for the project. A number of locations for a station in central Birmingham were considered, including upgrades and expansions of Moor Street, Snow Hill, New Street stations and development of a completely new station. Curzon Street was selected as the preferred location because all the other options had significant engineering, capacity and/or land use constraints. This option also provides the opportunity to return the former Curzon Street station area to railway use and offers the best opportunities to support development in the Eastside area of Birmingham.

West Midlands interchange
As part of route development in the West Midlands, 10 options for a West Midlands interchange station were considered. Once the preferred route to the east of Birmingham had been identified, an area close to the National Exhibition Centre was selected as the preferred location. That area offered the best opportunities for connections to Birmingham Airport, Birmingham International station, the National Exhibition Centre, the motorway network and the wider West Midlands region.

Intermediate station between London and the West Midlands
Intermediate stations were considered alongside route options at Aylesbury, Bicester (to serve Oxford) and Milton Keynes. While an intermediate station would bring a range of potential benefits to the communities it serves, it would come at the cost of both reduced capacity and increased journey time for long distance passengers. These costs outweighed the benefits and therefore an intermediate station was not included.

Depot and maintenance facilities
HS2 would require a rolling stock depot for the maintenance of high speed trains. A site in the West Midlands was preferred since it would be centrally located in relation to the completed HS2 network. In addition, the region provides access to the relevant engineering skills. Ten sites were evaluated and Washwood Heath (Birmingham) was considered to offer the best balance on operational, cost and environmental grounds.

HS2 would also require a depot for major infrastructure maintenance work, including maintenance of the track, signalling equipment and other rail infrastructure. The depot would need to be centrally located on the Phase One route to reduce travel distances to work sites, and thereby any disruption to the proposed high speed services. It was concluded that a depot at Calvert (north of Aylesbury) would be the most appropriate location due to the ability to connect to existing railways for supply of railway materials, other maintenance trains and equipment and because it would have fewer adverse effects on the environment and local communities.

Maintenance loops
Two maintenance loops will be required along the route, for the holding of maintenance trains, and to provide a safe stopping location for any HS2 train that develops a fault. Seven sites were considered for the two loop locations. Stoke Mandeville (Buckinghamshire) and Wormleighton (Warwickshire) were selected as drawing the best balance between operational and environmental impact.

Connection to HS1
Options were examined for a connection to HS1, either at classic or high speed. Options were also considered for an improved interchange between Euston station and St. Pancras International, such as a people mover. The Government favoured a classic-speed rail connection to HS1, using part of the North London Line, to enable passengers to travel between the North, the Midlands and mainland Europe.

Connection to Heathrow Airport
Options for direct HS2 services to Heathrow were explored including through routes and a loop or spur off the main HS2 line. A station on the main line at Heathrow Airport was rejected because of the cost and the increase to journey times for the majority of HS2 passengers. Several options for the location of a Heathrow station were also considered including at the Central Terminal Area, Terminal 5, on the northern perimeter of the airport and at Iver.

In 2012 the Government accepted the strategic importance of a direct high speed link to Heathrow Airport. Of the options for a direct link to Heathrow Airport, HS2 Ltd favours a spur to Terminal 5 on grounds of cost, passenger benefits and construction feasibility, to be implemented as part of Phase Two of HS2. Later in 2012 the Government set up the Airports Commission to examine options for Britain's international aviation hub. In January 2013 it suspended further work on a direct HS2 link to Heathrow Airport until the Commission has reported.

6.5 Local alternatives

In response to the 2011 public consultation, a range of options were examined in order to avoid or reduce potential impacts on sensitive areas, such as making changes to the alignment of the route for Phase One and the provision of landscaping and noise barriers. The benefits of such changes were weighed against their cost-effectiveness and any implications they might have on journey time and wider economic benefits. The 2012 Command Paper summarised the changes made to the proposed Phase One route as a result of this process.

Since April 2012, as part of the design development process, a series of local alternatives have been reviewed by engineering, planning and environmental specialists. Alternatives were developed specific to each community forum area, but they can be broadly categorised as follows:

- station configuration: including alternative track and platform layout;

- train speed: reducing the train speed to address potential environmental impacts, such as noise and vibration;
- route alignment: moving the route further away from residential areas, or raising or lowering the route in places to reduce the area of land required for construction, or to reduce landscape and visual impacts;
- how the route passes through an area: having the route run in tunnel instead of cutting, or on embankment instead of viaduct;
- location and/or design of project features: including viaducts, bridges, tunnels, tunnel portals, ventilation shaft head houses and auto-transformer feeder stations; and
- design and/or location of diversions for utilities, watercourses, public rights of way and roads.

These alternatives were assessed against the Phase One route, published in January 2012, based on the following criteria:

- environmental impact: whether the alternative would have more or less environmental impact for each environmental topic area assessed in the ES (e.g. sound, noise and vibration and landscape and visual);
- cost: whether the alternatives would be more cost effective, or incur additional costs;
- engineering requirements: the degree of design complexity and the impact this would have on construction durations, environmental impacts and construction and operational costs; and
- journey times, where relevant.

Based on this assessment some alternatives were taken forward and amendments made to the January 2012 route. For example, in the Northolt Corridor community forum area, the local community were concerned about the route passing through the densely developed urban area at surface, because of the potential environmental impacts it could cause. HS2 Ltd took this concern into account in selecting an alternative design. The route now runs in tunnel in this area. This greatly reduces the number of required demolitions and the extent of landscape and visual, sound, noise and vibration and traffic and transport effects.

Visualisation of Birmingham Interchange Station

7. Environmental overview

7.1 Introduction

The following section provides a summary of the assessment of likely significant beneficial and adverse environmental effects of the project on an environmental topic basis. For each topic, the approach to mitigation is described.

7.2 Agriculture, forestry and soils

In rural areas, agriculture is the most common land use. In developing the Phase One route HS2 Ltd has limited the adverse impacts on agricultural land farm holdings as far as is reasonably practicable.

HS2 Ltd has selected a route alignment with the aim of avoiding the highest quality agricultural land, insofar as this can be reconciled with the need to satisfy or balance a number of other important environmental and engineering considerations.

Construction of the project will require approximately 2,500ha of high-quality agricultural land and 2,300ha of poorer quality agricultural land. Wherever reasonably practicable, the land required temporarily for construction will be re-instated, reducing the amount of agricultural land lost to approximately 1,500ha of high-quality and 1,300ha of poorer quality. Where land access, drainage schemes and water supplies used for livestock and irrigation will be affected during construction of the project, these will also be re-instated.

Where the project does affect areas of high quality agricultural land, a range of measures will be put in place to help reduce impacts. Good quality agricultural soil will be stripped prior to construction and stored appropriately for future use. HS2 Ltd will follow industry best practice which has been successfully applied to other large infrastructure projects.

Owners and operators of affected agricultural holdings will be entitled to receive compensation under existing statutory compensation arrangements.

7.3 Air quality

The railway will operate efficient, non-polluting (at source) electrically powered trains. Changes in road traffic flows at Euston and Old Oak Common will result in localised beneficial and adverse effects. The adverse effects will occur at locations on Euston Road/Upper Woburn Place and on a short section of the A4000 Old Oak Lane. These are due to changes in nitrogen dioxide concentrations from road traffic emissions. These effects should be considered in the context of improvements in air quality that will result from the reduction in vehicle emissions, due to factors such as improved vehicle design. Otherwise, no significant local air quality effects are anticipated during the operation of the project.

During construction, the emission of dust from construction activities will be controlled by measures within the draft CoCP. No significant effects are predicted.

Construction traffic will cause temporary significant effects for local air quality, but this is confined to a limited number of roads, in Euston, Primrose Hill to Kilburn, Kilburn to Old Oak Common, South Ruislip to Ickenham, Colne Valley and Stoke Mandeville and Aylesbury.

7.4 Community

The assessment of effects on the community takes account of a range of impacts, including demolition, or partial loss, of dwellings, community facilities and public open space, road closures and diversions, amenity impacts including the effects of construction traffic, noise and visual impacts.

The draft CoCP includes measures to reduce noise, air quality, visual and construction traffic effects on local communities during construction. Proposed measures include appointment of community relations personnel, the sensitive laying out of construction sites to reduce nuisance and maintaining public roads and rights of way around construction sites, wherever reasonably practicable.

HS2 Ltd has developed the design of the Phase One route with the aim of minimising demolitions and loss of community facilities. Overall, the project will require the demolition of 339 dwellings and 21 community facilities. Community wide adverse effects, whereby a substantial number of local people are significantly affected by the construction of the project, are limited to the Regent's Park Estate, Camden; Park Village East, Camden; Wells House Road, Ealing; South Heath; Thorpe Mandeville and Lower Thorpe; Chipping Warden; Burton Green; Gilson; Water Orton; and the small rural community which lies between Weeford and Whittington in Staffordshire.

Where it has not proved possible to avoid adverse impacts resulting from the temporary or permanent loss of public open space or a community facility, HS2 Ltd will engage with local authorities in order to identify and put in place appropriate further mitigation measures. Such measures could include improvements to public open spaces or community facilities in the local area or the provision of new open space or community facilities to replace those lost to the project.

Where private businesses that provide community facilities are displaced by the project they will be entitled to receive compensation under existing statutory compensation arrangements.

7.5 Cultural heritage

The project will not require the demolition of any Grade I or Grade II* listed building. In designing the project, HS2 Ltd's aim has been to avoid or reduce direct adverse impacts on heritage assets. For example, the design of the remodelled Euston station has been refined to avoid the demolition of the Grade II* listed Royal College of General Practitioners building on Melton Street. The route has been re-aligned to avoid the site of the scheduled Roman villa at Edgcote, to reduce the impact on Edgcote House and the main area of the registered battlefield.

The project will affect Edgcote battlefield and one scheduled monument (Grim's Ditch). Eighteen Grade II listed buildings will be directly affected: six will be demolished, four will be altered and eight will be removed and relocated. There will be modification to a boundary wall to the Grade I listed Hartwell House. Two Grade II* registered parks and gardens and 81 lengths of historic hedgerow will be directly affected.

HS2 Ltd and its contractors will undertake investigation and recording of archaeological remains and built heritage affected by the project, before and/or during construction works. The results of the investigation and recording works will be reported and made available to local communities, increasing our understanding of the heritage along the route.

Provision is made for appropriate measures to mitigate the impact of the railway on the setting of heritage assets. For example, planting will be used at Hartwell House registered park and gardens near Aylesbury to ensure that the rural character of its setting is preserved.

7.6 Ecology

HS2 Ltd's aim has been to design the project so as to avoid or reduce adverse impacts on habitats, protected species and other features of ecological value, where reasonably practicable. For example, in the Waddesdon and Quainton area the project has been designed to avoid taking land from the adjacent Sheephouse Wood Site of Special Scientific Interest (SSSI), designated for the quality of its ancient woodland.

No internationally designated sites will be affected by the project. Two SSSI will be affected. HS2 Ltd has engaged with Natural England in order to identify and put in place appropriate measures to mitigate or compensate for the effect of the project on these nationally designated sites.

Where adverse impacts cannot be avoided, HS2 Ltd has included mitigation and compensation measures to reduce effects on species and habitats. For example, in the Waddesdon and Quainton area there will be measures to reduce the impact on Bechstein's bat (a European protected species). Measures will be put in place to allow bats to fly safely across the railway line between areas of woodland habitat.

In rural areas, the construction of the project will result in the loss of barn owl territories. During operation, barn owls may also be struck by passing trains. HS2 Ltd will pursue opportunities with local landowners to provide owl nesting boxes to help increase barn owl populations away from the route.

Where reasonably practicable, HS2 Ltd will seek to limit the effects of loss of habitat by creating new areas of habitat, to a level where the loss is no longer assessed to be significant. For example, in the Ladbroke and Southam area an area of woodland in Windmill Hill Spinney will be lost. Approximately 11ha of woodland and scrub planting and 7.7ha of species-rich grassland will be created adjacent to this area to compensate for that loss. This compensatory habitat will be suitable for a range of species including butterflies and bumblebees.

7.7 Electromagnetic compatibility

The generation of electromagnetic fields will be managed during construction and operation of the Phase One project 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 good practice. The main source of electromagnetic fields from operation of the project 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.

7.8 Land quality

The Phase One route does not cross any active landfill sites. In a limited number of locations the project will be constructed on land that is potentially contaminated from its previous use. Such a location is Camley Street in Camden Town, where a construction compound will be located within an existing light industrial estate which comprises a series of motor vehicle repair garages. In these locations, by applying industry standard best practices to manage areas of potential contamination, HS2 Ltd will avoid any significant adverse effects to the local environment and communities.

7.9 Landscape and visual assessment

HS2 Ltd has designed the project with the aim of avoiding or reducing landscape and visual impacts along the route. Overall, of a total Phase One route distance of approximately 230km, about 53km is in tunnel. Approximately 74km is in cutting. Approximately 65km of the route is on embankment. There is approximately 19km of the route on bridges and viaducts. The remainder comprises retaining walls and approaches to stations.

The route has been kept low in the landscape, where reasonably practicable. For example, at Greatworth, Chipping Warden and Aston le Walls the route will be in cutting and tunnel to avoid landscape and visual effects on these rural villages. Through the Chilterns AONB between Chalfont St. Giles and Wendover, a distance of over 20km, measures have been incorporated into the design of the project to limit landscape and visual effects. The route will pass through the AONB in tunnel for 12.1km and in cutting for 5.5km. This will avoid or greatly limit the visibility and noise of the railway in the rural landscape.

Woodland and vegetation is planned alongside the railway through the Chilterns. Overall, the special characteristics of the Chilterns AONB will not be significantly affected.

Individual elements of the project, such as bridges and viaducts, will be designed to ensure that they are in keeping with the local landscape. Detailed design, materials and finishes will be subject to approval by the local planning authority under the provisions of the Bill.

Trees and vegetation will be planted along the route to provide visual screening. For example, planting will take place to the south of Aylesbury, to reduce visual impacts and integrate the railway into the surrounding area. HS2 Ltd and its contractors will maintain and monitor these newly planted and landscaped areas. Two million trees will be planted to integrate the railway into the landscape.

The draft CoCP includes measures to limit landscape and visual impacts during construction. These include protecting existing trees, use of well-maintained fencing around construction areas and designing lighting to avoid intrusion on adjacent residential properties.

7.10 Socio-economics

HS2 Ltd estimates that the project will create the equivalent of approximately 14,600 full time construction jobs. Depending on the skill levels required, these jobs will be available to local people along the route. HS2 Ltd expects to create 1,000 apprenticeships as part of the construction workforce for the project.

HS2 Ltd estimates that a further 5,480 jobs will be created by the suppliers of goods and services to construct the project and through the money that construction staff will spend in the local area.

HS2 Ltd has estimated that Phase One will support the generation of 30,000 jobs around the four stations. The HS2 Growth Task Force has been established to look at development opportunities around stations, wider regeneration opportunities, working with the supply chain for goods and services and seeking ways to increase skills and apprenticeship opportunities.

In order to construct the project, it is expected that approximately 300 existing businesses will be required to relocate to new premises, with the risk that jobs will be lost. Any such direct loss of businesses and employment may have knock-on effects through the business supply chain and result in further job losses.

In total, HS2 Ltd estimates that approximately 1,510 jobs are at risk route-wide from businesses directly and indirectly affected during the construction of the project. Businesses displaced by the project will be entitled to receive compensation for being required to relocate to new premises under existing statutory compensation arrangements. HS2 Ltd will provide appropriate, additional support to help businesses relocate to new premises.

7.11 Sound, noise and vibration

HS2 Ltd has designed the project with the aim of avoiding or limiting noise and vibration impacts along the route. HS2 Ltd has been able to limit the overall noise impact of the surface sections of the Phase One route through sensitive design. The route has been aligned so as to avoid many noise-sensitive locations and to be low within the landscape where reasonably practicable. Operational noise will be reduced at source through the effective design and specification of the trains and track, as well as by noise barriers. Noise and vibration has been assessed using a proven methodology based upon the assessment of the HS1 project.

The assessment of sound, noise and vibration considers the likely significant noise and vibration effects arising from operation of the project, assuming full operation of the Y network. The assessment considers effects on occupiers of residential properties and changes in the noise environment of local communities along the route. The assessment also considers the effects of noise on community facilities such as schools, hospitals, places of worship, and also commercial properties such as offices and hotels.

Sixty-seven dwellings are assessed to be significantly affected by noise from the operation of the railway. For dwellings which satisfy the applicable qualifying criteria, HS2 Ltd will offer noise insulation. If noise insulation is accepted by the owner, this will help to reduce or avoid these effects.

Operation of the railway has been assessed as likely to result in increases in external noise that are considered significant around a limited number of residential areas and non-residential buildings. These effects occur mainly within 300m of the route.

Taking account of modern high speed trains and resilient track designs, the project will not give rise to significant ground-borne noise or vibration effects on those living close to the railway.

The draft CoCP includes measures to control noise and vibration during construction. These measures include screening along the edge of the construction worksites, the use of quiet and low-vibration equipment and restricted working hours. Where required, HS2 Ltd will offer noise insulation and temporary rehousing, which, if accepted, will avoid significant adverse effects in terms of indoor noise levels from the construction of the railway. In some locations the mitigation measures have not been able to avoid an increase in community noise levels. Residual effects will occur at a number of residential areas and non-residential buildings that are located closest to the construction activities.

HS2 Ltd will work with those affected to further reduce or avoid noise effects from construction and operation of the project, where reasonably practicable.

7.12 Traffic and transport

Once operational, the Phase One project will bring significant benefits for inter-urban rail travellers through increased capacity and improved connectivity between London, the Midlands and the North. At Old Oak Common, the project will provide interchange facilities to Heathrow Airport, the Great Western Main Line and Crossrail. At Birmingham Interchange, the project will provide an interchange to Birmingham Airport, the West Coast Main Line and local train services.

The project will also bring significant benefits in releasing capacity on the existing rail network between London, Birmingham and the West Midlands and so provide opportunities to improve commuter and regional passenger services and freight services.

The Old Oak Common interchange will provide new opportunities for local access to the Great Western Main Line and Crossrail. Interchange to Crossrail at Old Oak Common and improvements at Euston Station will help to limit the effects of the Phase One project on passengers using the London Underground through Euston.

During operation, any significant effects on the existing road network are expected to be very limited and localised in extent.

The draft CoCP includes mitigation measures to reduce and manage traffic and transport impacts during construction of the project. Construction of the project will lead to increased vehicular traffic and so cause increased congestion and journey times at a number of locations along the route. In order to keep disruption and congestion resulting from construction traffic to a reasonable minimum, HS2 Ltd will put in place measures to limit the number of construction vehicles using the public road network, especially local roads. A series of travel plans will be implemented to help mitigate the transport related effects during construction (such as through the management of construction staff movements).

It will be necessary to close, realign or divert certain local roads and public rights of way along the Phase One route, both during construction and in a limited number of cases, permanently. In all such cases, alternative routes will be available. Where a new bridge across the route is required, it will ordinarily be constructed offline so as to enable the existing bridge to continue in use until its replacement is ready to bring into public use.

7.13 Waste and material resources

During the construction and operation of the project, HS2 Ltd's objective is to limit the generation of waste, and to reuse, recycle and recover waste generated by the project, with disposal to landfill only as a last resort.

Construction of the project will result in the generation of approximately 128 million tonnes of excavated material, over 90% will be re-used in the construction of engineering embankments and environmental mitigation earthworks included in the design. Construction of the project will require almost 5 million tonnes of waste to be disposed of to landfill. Over 90% of this residual waste will come from excavation, the remaining 10% being waste from demolition, construction and worker accommodation sites. Prior to implementation, HS2 Ltd will investigate further measures to limit surplus construction waste and the quantity of residual project waste to landfill. Opportunities may also arise at the time of construction to supply surplus excavated material for use in local construction projects.

Where the transportation of that material would result in significant adverse environmental effects, sustainable placement will be used. Sustainable placement is the on-site placement of surplus excavated material to avoid causing environmental effects (e.g. transport) that would otherwise be associated with the off-site disposal of that material. Sites for sustainable placement have been selected on the basis of their suitability for the on-site placement of surplus excavated material.

HS2 Ltd estimates that, during the first year of operation in 2026, the project will generate approximately 18,000 tonnes of waste, principally from the four railway stations, passenger trains, track maintenance and depots. 77% of this waste will be reused, recycled or recovered. 23% (4,150 tonnes) will be disposed of to landfill as non-hazardous waste.

7.14 Water resources and flood risk assessment

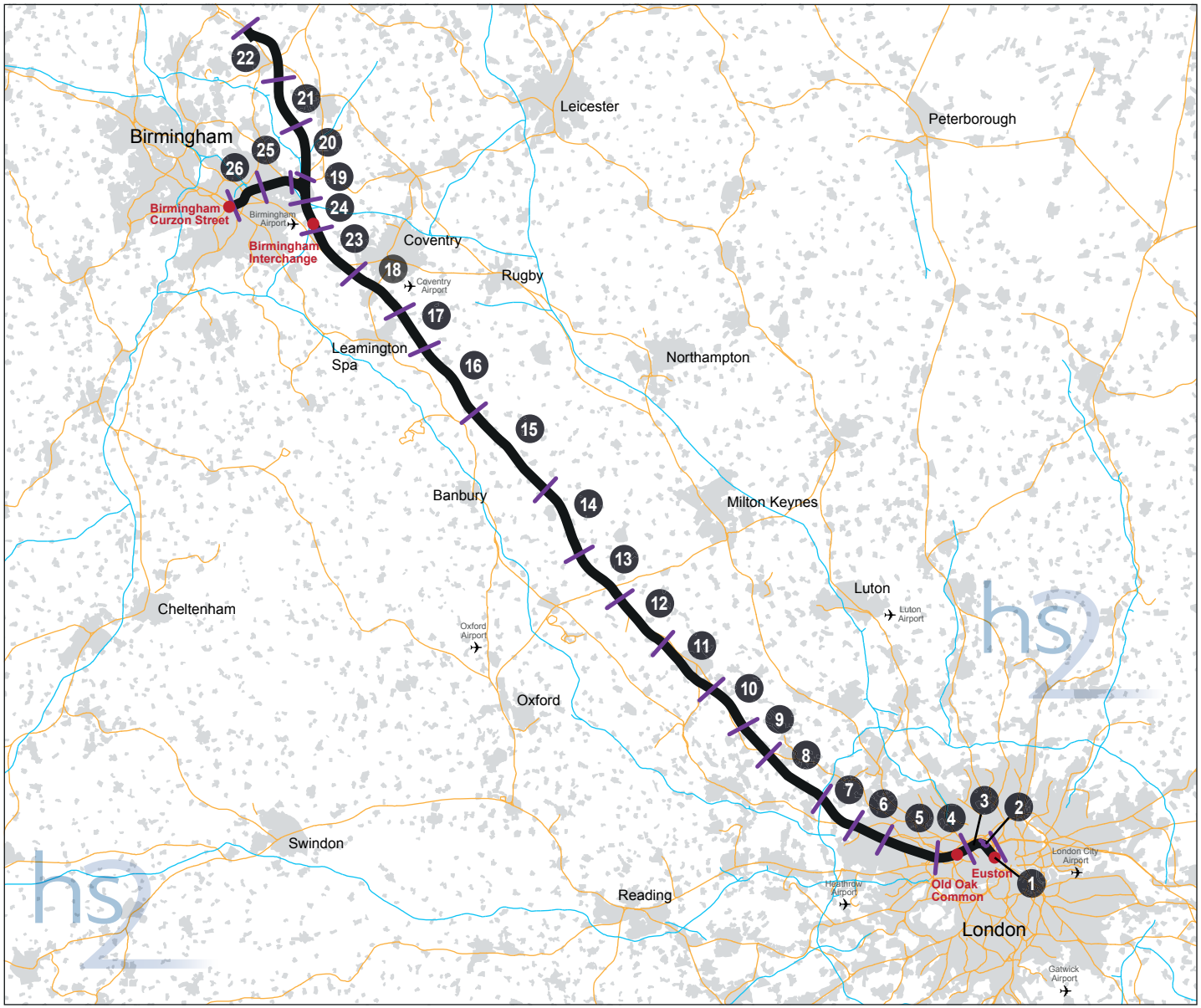
HS2 Ltd has designed the project to avoid or reduce adverse impacts on rivers, streams, ponds, canals and groundwater. Structures along the route have been designed to ensure the quality of watercourses is not adversely affected. The route crosses rivers and streams either by viaduct, clear span bridges or, where necessary, culverts. River diversions, such as at the River Tame in Castle Bromwich and Canley Brook near Stoneleigh, have been designed to be sympathetic to their surroundings and take account of ecological requirements. Cuttings have been designed to take into account the potential impact on springs, ponds, watercourses and ecological sites. Tunnels and ventilation shafts have been designed so as to avoid significant impacts on groundwater levels and flow.

The project has been designed to avoid an increase in the risk of flooding, taking into account the projected impact of climate change. Where required, the project will mitigate loss of floodplain by creating replacement flood storage areas.

Sustainable drainage has been incorporated into the design, such as balancing ponds to control the rate, volume and quality of runoff. Where reasonably practicable, drainage has been directed back to the ground to recharge groundwater levels.

Measures set out in the draft CoCP will reduce effects during construction, including effects on local groundwater levels during excavation works. Where there is a potential risk to groundwater abstractions, HS2 Ltd will agree a management strategy with the Environment Agency in consultation with the relevant water company to effectively manage this risk.

Figure 13: Phase One route showing community forum areas



Community forum areas

HS2 station
Proposed Phase One route
CFA boundary
Existing railways
Motorways
Airports

8. Summary of environmental effects by community forum area

For each community forum area (CFA) as shown in Figure 13, this section provides:

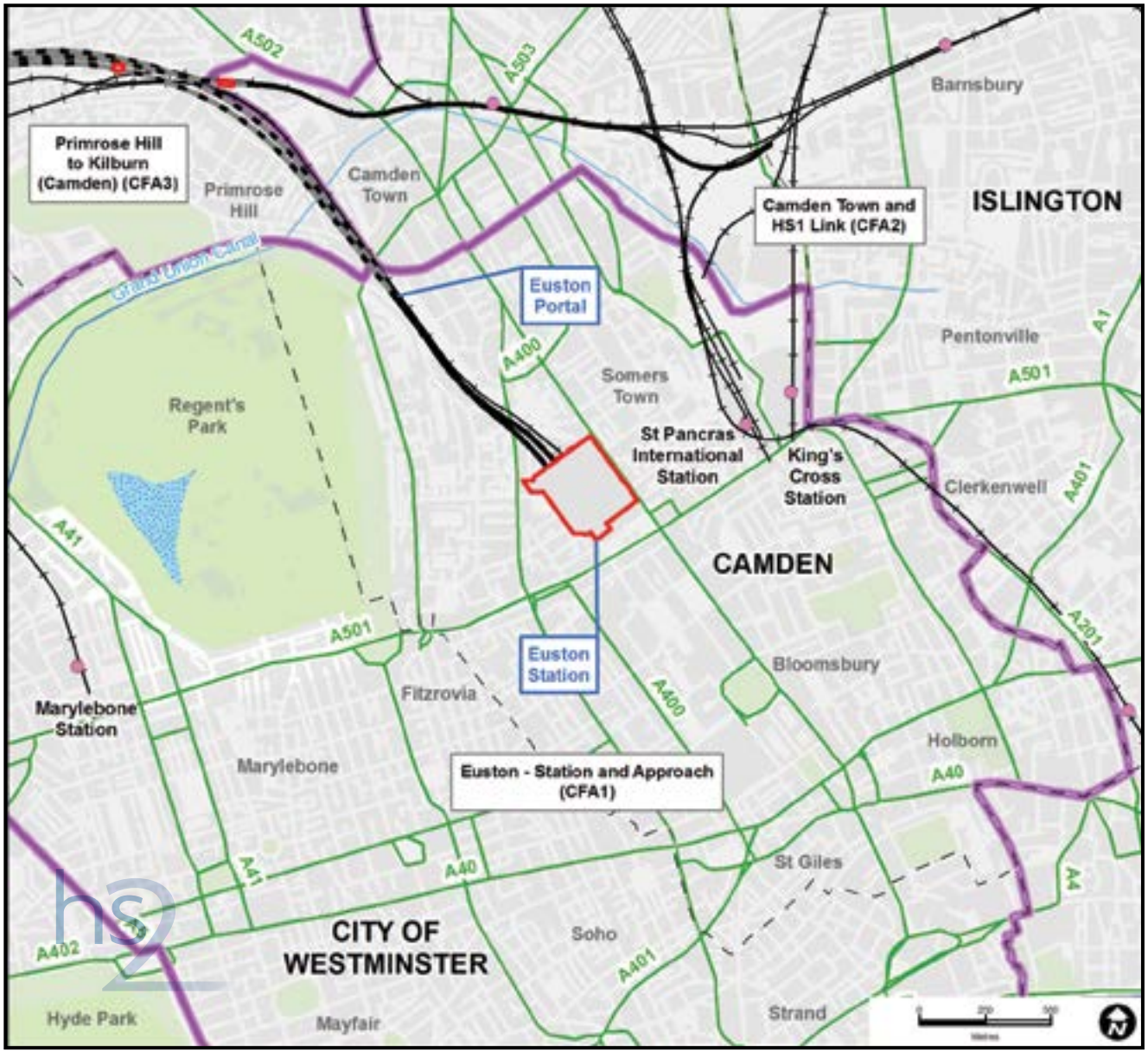
- a summary of the existing environment within the CFA;
- (if applicable) the policy framework for the stations and depots;
- a brief description of the project in the CFA area; and
- a description of the likely residual effects in the CFA for the following environmental topics:
  - agriculture, forestry and soils;
  - air quality;
  - community;
  - cultural heritage;
  - ecology;
  - land quality;
  - landscape and visual assessment;
  - socio-economics;
  - sound, noise and vibration;
  - traffic and transport; and
  - water resources and flood risk assessment.

In addition to the summaries of each CFA, climate is discussed on a Phase One route-wide basis in Section 9, and waste and material resources in Section 7.

For each CFA, the summary of significant environmental effects is generally confined to residual effects, i.e. those significant adverse and beneficial environmental effects of the project which are likely to remain after the range of mitigation measures already incorporated into the design of the project and the draft CoCP are in place.

Legend for all following CFA maps

Figure 14: The Euston Station and Approach area context map



8.1 Euston – Station and Approach

Overview

The Euston area is a highly developed part of north London, with the main land uses including Euston station, the West Coast Main Line, operational and maintenance facilities for existing rail infrastructure and mixed business and residential communities, such as the Regent's Park Estate and Somers Town. Euston station is served by the London Underground Victoria line, and both the Charing Cross and Bank branches of the Northern line. Euston Square Underground station, which serves the Circle, Hammersmith & City and Metropolitan lines, is approximately 300m from Euston station along Euston Road.

The project

Euston station will be the London terminus for HS2 (see Figure 14). The existing station will be upgraded and extended by approximately 75m to the west to provide 11 new platforms for HS2 services. Much of the existing station will be refurbished and 13 of the existing 18 platforms will be retained. The upgraded station will include an integrated concourse and improved connections with rail, London Underground and bus services.

Three new entrances to the station will be provided; two from Cobourg Street and one from Eversholt Street, whilst the existing entrance to the south of the station will be improved. A new east-west bridge for pedestrians and cyclists will be provided connecting Hampstead Road to Eversholt Street. Euston Underground station ticket hall will be extended to accommodate increased passenger flows and access to the Underground station will be improved. A sub-surface pedestrian link will be provided from Euston Underground station to Euston Square Underground station. During operation, it is anticipated that approximately 500 jobs will be created at Euston station.

Demolition of Grant Thornton House and One Euston Square will allow a high quality station design and a unified station frontage onto Euston Road. Public areas around the station will be reinstated and improved through the restored Euston Square Gardens and its larger forecourt, moving the bus station from the middle of the gardens to Melton Street, allowing the creation of a continuous open public space. The northern entrance of the station will incorporate pedestrian and cycle facilities, green space and planting.

The existing railway cutting to the north of Euston station will need to be widened and the three existing bridges across the railway between London Euston and Parkway will be demolished and reconstructed. Along the western side of this section, new retaining walls will be constructed. The western Park Street tunnel will be permanently closed to allow the construction of a new high speed tunnel.

Main construction compounds will be located at The Podium 1 Eversholt Street and on the site of the National Temperance Hospital. Twelve satellite construction compounds will be required at various times and locations during the construction period. The construction works for the expansion and remodelling of Euston station and widening of the station approach will require the demolition of 214 dwellings, largely comprising social rented housing in Regent's Park Estate, four community facilities and a number of commercial buildings, railway buildings and structures in the Euston area. The Government is working in partnership with London Borough of Camden on the replacement of social rented housing that will be demolished.

During construction, six roads will be closed for up to 10 years. Disruption will be kept to a minimum by implementing a well-managed, phased construction, including the provision of alternative access. Changes to the local road network following completion of the works will involve the closure of nine roads.

A number of utilities, such as gas, electricity and water mains and sewers, will need to be diverted.

Policy

National and regional policies support the location of a HS2 terminus at Euston station. The Government has confirmed the choice of Euston as the right site for the London terminus for HS2, best serving passenger requirements offering greater access to alternative onward travel and also providing the best overall balance of costs and benefits compared with all of the other London terminus options considered.

The London Plan 2011 states that the HS2 will "support future development and regeneration priority areas, and increase public transport capacity". The Mayor's Transport Strategy supports the development of a national high speed rail network. It seeks to ensure that the London terminus for a high speed line is centrally

located, well connected to the existing public transport network, and widely accessible to maximise access to jobs and London's population. The strategy states that Euston station will "best meet these criteria".

The London Borough of Camden, the Greater London Authority and Transport for London, in consultation with HS2 Ltd, have worked jointly to develop a vision and objectives for the Euston area which form the basis of the Euston Area Plan, taking forward previous plans and aspirations for the integrated development of the station and its surroundings, including the provision of employment space to support over 7,700 jobs. The plan recognises that HS2 has the potential to bring benefits to the "area for both local residents and businesses and for London as a whole''.

Residual effects

Construction and operation of the project in this area are not likely to result in any adverse residual effects on ecology, land quality and water resources and flood risk. Similarly, no likely adverse residual effects have been identified as arising during operation for cultural heritage or socio-economics.

Air quality

Locations along Euston Road and Upper Woburn Place will experience permanent reductions and improvements in air quality as a result of changes to the road layout once the project is in operation. These effects should be considered in the context of improvements in air quality that will result from the reduction in vehicle emissions, due to factors such as improved vehicle design.

Community

188 residential properties on the Regent's Park Estate will be demolished. The project will permanently require land occupied by the Old Tenants Hall, Hampstead Road open space and Eskdale Play area. The loss of St James's Gardens will be offset by the provision of new areas of public open space as part of the design of the new station. This will include a multi-use games area, children's play area and associated planting.

Artist impression of Euston station from the north-east, adjacent to Doric Way, central London

The construction of the project will result in the demolition of 18 dwellings on Cobourg Street, five dwellings on Euston Street and three on Melton Street. The amenity of residents at the remaining properties at the corner of Cobourg Street and Starcross Street is predicted to be affected by nearby construction activity (due to noise and visual effects). The construction traffic and noise on some sections of A400 Hampstead Road, Stanhope Street, Robert Street and Albany Street are predicted to affect the amenity of residents and some community facilities. The University College London premises at Wolfson House will be required permanently.

Euston Square Gardens will be affected throughout the construction period and the playground adjacent to Lancing Street will also be affected temporarily. Noise and views of construction will temporarily affect the amenity of residents of St. Richard's House, Eversholt Street. Other residents along Eversholt Street will experience similar amenity effects.

To the north of Euston station, residents at Park Village East are predicted to experience temporary isolation and amenity (noise and visual) effects. The amenity of residents at Mornington Terrace and Mornington Crescent will also be temporarily affected, as a result of construction vehicle activity and changes in air quality.

Artist impression of Euston station entrance from the south-west, adjacent to Drummond Street, central London

The amenity of residents will be temporarily affected on sections of A41 Wellington Road and A5205 St John's Wood Road.

Despite the provision of noise mitigation, the amenity of approximately 50 to 60 residential properties at Coniston, Langdale and Augustus House on the Regent's Park Estate will be affected permanently by views of and noise arising from the operation of the project.

Cultural heritage

A number of heritage assets will be demolished. These include the Grade II listed 14-15 Melton Street, the western cutting wall of the Parkway Tunnel, and the Euston railway cutting retaining wall and parapet at Park Village East. At St James's Gardens, the post-medieval burial ground will be permanently lost.

Listed buildings including the Southampton monument and Christie monument in St James's Gardens, the war memorial in Euston Square Gardens and the Mornington Street Bridge piers and lamp stands, west and east ends will be relocated, altering their setting. The setting of the Grade II* listed buildings in Park Village East

Artist impression of Euston station from the south, adjacent to Euston Road, central London

will be temporarily affected during construction and the setting of the Grade II* listed 1-9 Melton Street will be affected permanently.

Land quality

With the application of the measures contained within the draft CoCP, no adverse impacts are anticipated with respect to contaminated land. The remediation of pockets of former industrial land within the footprint of the project, including at the upgraded and expanded Euston station, will result in a beneficial effect.

Landscape and visual assessment

Construction will affect views within this built-up area, including at Staveley and Waterhead residential blocks on Varndell Street, Langdale, Augustus House, Cartmel, Coniston and Newlands residential blocks, apartments on Barnby Street and Dalehead, Gillfoot and Oxenholme apartments. Views from Euston Square Gardens will also be affected.

The extended and remodelled Euston station and the reconstructed Hampstead Road Bridge will affect views in this built-up area. The station frontage will incorporate high quality architectural design and Euston Square Gardens will be restored. The loss of St James's Gardens will be offset by the introduction of a new public open space around the station.

Socio-economics

The peak number of construction staff within the Euston area will be approximately 2,100 between the years 2020 and 2023, decreasing to approximately 1,125 by around 2024. Approximately 500 new permanent jobs will be

created by the project in relation to the operation of Euston Station. New retail opportunities at the remodelled Euston station will create approximately 45 additional jobs.

The project will contribute to the regeneration of the surrounding Euston area, helping attract businesses and investment, creating approximately 2,000 indirect jobs (i.e. jobs not directly related to the operation of the project).

It is estimated that the project will result in the displacement or possible loss of a total of 3,090 jobs within the Euston area. The impact on the local economy from the loss/relocation of jobs is considered to be relatively moderate in the context of the total number of people employed in the London Borough of Camden (approximately 291,000) and the scale of economic activity and opportunity in the area.

The project will require the demolition of business premises within Euston station and at the front of the station, the Royal Mail delivery office, offices on 132-140 Hampstead Road, Ibis Hotel, Thistle Euston Hotel, The Cottage Hotel, Wolfson House and 93-103 Drummond Street.

The presence of the construction works may discourage people from using the Roj Café and Sandwich Bar on Eversholt Street, the Exmouth Arms on Starcross Street and the Wesley Hotel on Euston Street.

Sound, noise and vibration

A comprehensive set of mitigation measures, including those in the draft CoCP will be implemented to manage noise and vibration during construction. These include the phasing of construction works, the careful planning of construction traffic and deliveries and the use of quiet and low-vibration equipment and screening along the edge of the construction worksites. These arrangements have been informed by discussions with local residents and have been reviewed with a view to further limiting noise effects.

Noise from construction is likely to result in significant adverse effects at residential areas closest to the construction works, including those at St Richards House, Park Village East, Mornington Terrace, Ampthill Estate, Cobourg Street and Regent's Park Estate. A number of non-residential properties, including St Mary's Church, St Aloysius' Roman Catholic Church and the mosque in Starcross Street, are likely to be affected and construction traffic is likely to affect residential areas and non-residential properties alongside a number of local roads.

A number of mitigation measures have been included in the design of the project to mitigate noise effects during operation. Screening has been included in the project design to reduce noise from passing trains at a number of locations, including the Regent's Park Estate and Park Village East.

Operation of the railway has been assessed as likely to result in a significant increase in external noise around residential properties closest to the route within the Regent's Park Estate, including Augustus House, Coniston House and Langdale House.

Road closures in the area will result in a beneficial effect as a result of reduced noise levels for residential areas on Drummond Street, Robert Street and Varndell Street. Other changes to road traffic will result in adverse noise effects around North Gower Street, Cobourg Street, Stanhope Street, Mornington Street and Arlington Street.

Artist impression of Euston station entrance from the north-west, adjacent to Hampstead Road, central London

Traffic and transport

Rail users will benefit from improved journey times to the Midlands and beyond; lower crowding levels on trains to and from Euston station as a result of additional capacity on HS2; and released capacity on other rail services easing pressure on the West Coast Main Line with resultant reliability benefits.

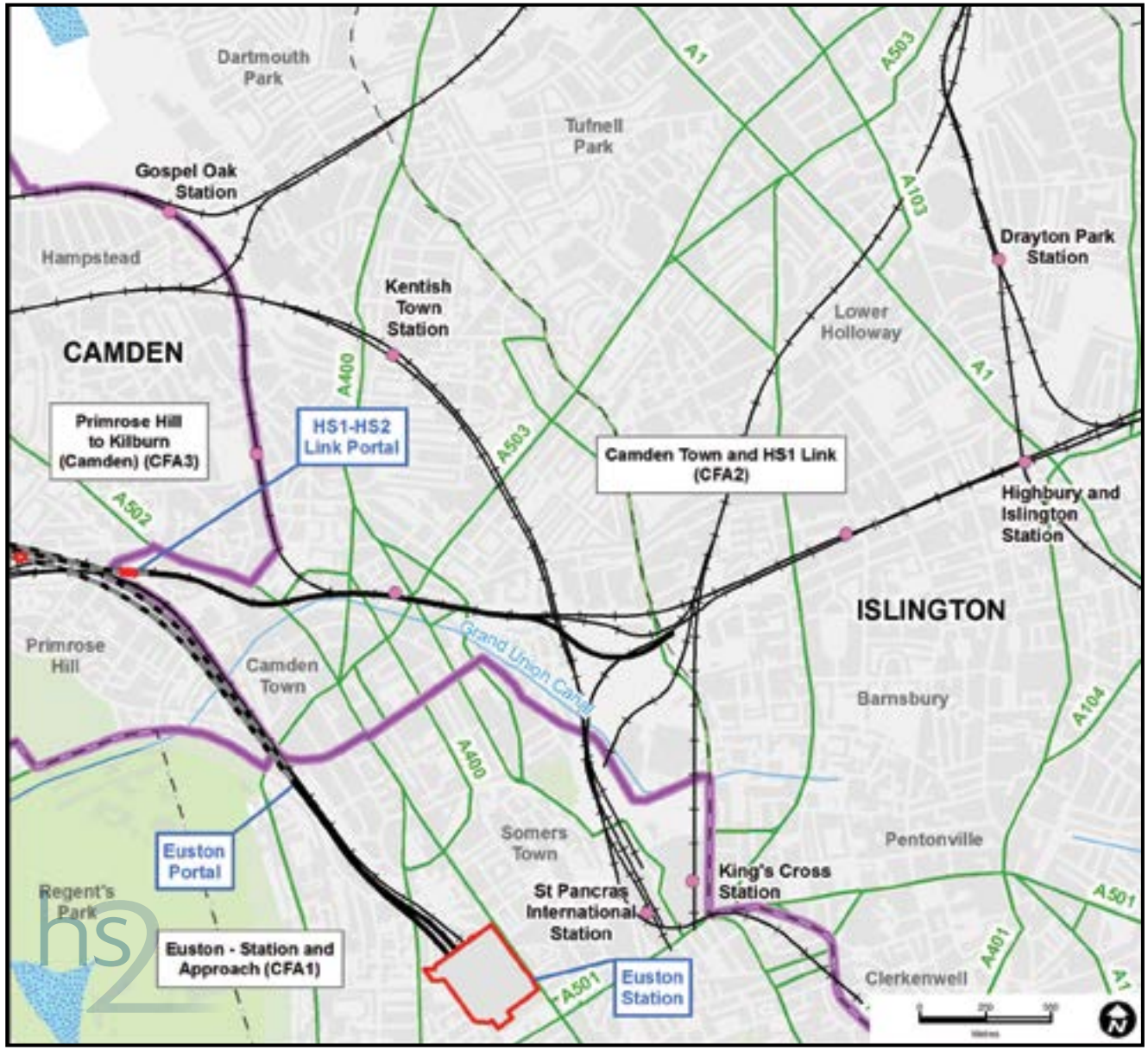
There will also be improvements to Euston station and Euston Underground station, including improved accessibility, reduced crowding levels in the new Euston station concourse and additional escalators to underground platforms. The new bus station will provide increased capacity and greater flexibility in bus routeing. Cycle parking capacity will be increased and there will be improvements to cycle and walk routes on roads surrounding the station, including an east-west link bridge.

Construction at Euston station will lead to delays for some rail users due to the need for works on the existing rail network. Works at Euston Underground station will require the closure of platforms on the Victoria and Northern lines, with no platform closures for more than five months.

Increases in traffic flows affecting pedestrians and cyclists will be concentrated on Euston and Hampstead Road and other roads in close proximity to Euston station, particularly in the Somers Town and King's Cross area. Temporary road closures and diversions will also affect pedestrians and cyclists primarily to the west of the station. Construction works will also impact on parking and loading in the immediate vicinity and on access routes to the construction sites.

During operation, changes to access to the bus station and increased traffic flows will lead to increased journey times on some bus routes. Pedestrians and cyclists will be affected by changes in traffic flows that result from permanent road closures and changes to the local road network and station access. These changes will occur on roads to the east of Euston station in the Somers Town and King's Cross area, as well as in the Regent's Park and Camden Town areas.

Figure 15: Camden Town and HS1 area context map



8.2 Camden and HS1 Link

Overview

The Camden Town and HS1 Link area is a highly developed part of London, made up of 19th and 20th century terraced housing and commercial and industrial buildings. The area contains limited open space and is dominated by transport uses with busy roads, the North London Line, part of the London Overground Network and the Regent's Canal.

The project

The route through this area will run on upgraded existing railway lines, bridges and viaducts until it enters a newly constructed tunnel approximately 100m to the east of the Regent's Park Road Bridge (see Figure 15).

The route will commence to the east of the A5200 York Way on HS1 infrastructure and proceed in a westerly direction towards Camden Road on the existing North London Line viaducts, before passing through Camden Road station. The route will then follow the existing North London Line in a westerly direction towards Primrose Hill, crossing over the Camden Market area on a modified existing railway bridge and

over the access road from A502 Chalk Farm Road to Morrison's supermarket and Juniper Crescent. The route will then descend into a tunnel approximately 100m to the east of Regent's Park Road Bridge and proceed into the neighbouring Primrose Hill to Kilburn area.

Main construction compounds will be required at Camley Street and Juniper Crescent. Thirteen satellite construction compounds will be required at various times during the ten years of construction in the area. The project will require the demolition of six residential buildings, the Ivy House dental practice and commercial properties at 120-136 Camley Street. Works will be needed to a number of bridges and viaducts in this area, including the Kentish Town Viaduct.

The existing North London Line will be rerouted to the northern side of Camden Road station, where platform one will be removed from service and platforms three and four will be reinstated to serve the North London Line. A series of temporary road closures will be required, including Randolph Street and A5202 St. Pancras Way/Baynes Street.

Residual effects

Construction and operation of the project in this area are not likely to result in any adverse residual effects on air quality, ecology, land quality or water resources and flood risk. Similarly, no likely adverse residual effects have been identified as arising during operation for community, cultural heritage or socio-economics.

Community

Construction works to replace bridges will result in temporary effects on the amenity of some residents in properties close to those works, due to noise and visual effects. These include residents living on the A5202 St Pancras Way, Wrotham Road, Baynes Street, Randolph Street, Kentish Town Road, the A503 Camden Road, Royal College Street and the A502 Chalk Farm Road. The bridge works will be phased to reduce disruption. The construction of the HS1-HS2 Link tunnel portal is predicted to affect the amenity of residents at Juniper Crescent, as a result of noise and visual effects.

Planning permission has been granted for the development of a social housing scheme and to relocate Hawley Primary School at Hawley Wharf. If constructed, a housing block within that scheme would need to be demolished in order to construct the Kentish Town Viaduct. The works would also result in short-term temporary noise and visual effects for staff and pupils at the relocated Hawley Primary School. The amenity of residents in the remaining parts of the residential development (i.e. part of the wider Hawley Wharf scheme) and Hawley Road would also be temporarily affected by noise and visual effects. HS2 Ltd is currently in discussions with the developers of the Hawley Wharf scheme to allow both to proceed.

A small amount of land will be required during construction at Camden Gardens. This requirement, plus the noise and visual effects of construction activity, will generate effects on the users of Camden Gardens. The dental practice on Kentish Town Road will be demolished.

Cultural heritage

The canopy of the Grade II listed Camden Road station will be partially demolished. The project will require the demolition of a number of non-designated built heritage assets including 51 and 53 Kentish Town Road, 110 Camden Road, Primrose Hill station and platform and the Up Empty Carriage Line (disused tunnel).

Land quality
With the application of the measures contained within the draft CoCP, no adverse impacts are anticipated with respect to contaminated land. The main construction compound at Camley Street will be located within an existing light industrial estate which comprises a series of motor vehicle repair garages. The remediation of this potentially contaminated site will be beneficial.

Landscape and visual assessment
Construction in this area will affect views of Camden Road station, the bridge locations and areas around the tunnel portal structure containing the construction site compounds.

Once the railway is operational there will be changes to views of the modified Kentish Town Road Bridge and Randolph Street Bridge from Kentish Town Road/Jeffrey's Street Junction and residential properties on Randolph Street.

Socio-economics
The project will require the demolition of business units at 120-136 Camley Street and 110 Camden Road and construction activity will prevent access to business units at 90-94 Baynes Street (for approximately 10 months), 77-79 and 88 Randolph Street (for approximately 10 months); and 49 Kentish Town Road (for approximately three years and seven months).

Bars, cafes and restaurants on Chalk Farm Road may experience a loss of trade due to construction of the proposed Chalk Farm Road Bridge and viaduct works.

It is estimated that the project will result in the displacement or possible loss of approximately 130 jobs in the Camden Town and Hs1 Link area. Taking into account the availability of alternative premises, skill levels of local people and the relatively healthy local economy, the displacement or possible loss of jobs is considered to be relatively modest compared to the scale of economic activity and opportunity in the area.

Sound, noise and vibration
Measures in the draft CoCP will be implemented to manage noise and vibration during construction, such as the use of screening along the edge of the construction worksites. Tall screening will be used to protect the residential properties between the A400 Kentish Town Road and the A5202 St. Pancras Way.

Noise from the phased construction is likely to result in significant adverse effects at residential areas closest to the construction works, including those on the A503 Camden Road, Baynes Street, Randolph Street, A5202 St. Pancras Way, Wrotham Road, A502 Chalk Farm Road, Agar Grove, A400 Kentish Town Road, Juniper Crescent, Hawley Road and Regent's Park Road. The duration of such works will vary from one month to one year. Hawley Primary School and commercial properties in Castlehaven Road, Baynes Street and the A502 Chalk Farm Road will similarly be affected.

Hawley Primary School and commercial properties in Castlehaven Road, Baynes Street and the A502 Chalk Farm Road will similarly be affected.

A number of mitigation measures have been included in the design of the project to mitigate noise effects during operation, including the use of screening at various locations including along the edge of the viaducts. Operation of the railway has been assessed as likely to result in a significant increase in external noise around residential properties closest to the route on Rousden Street, Randolph Street, A5202 St. Pancras Way, Wrotham Road, Agar Place and Agar Grove.

Traffic and transport

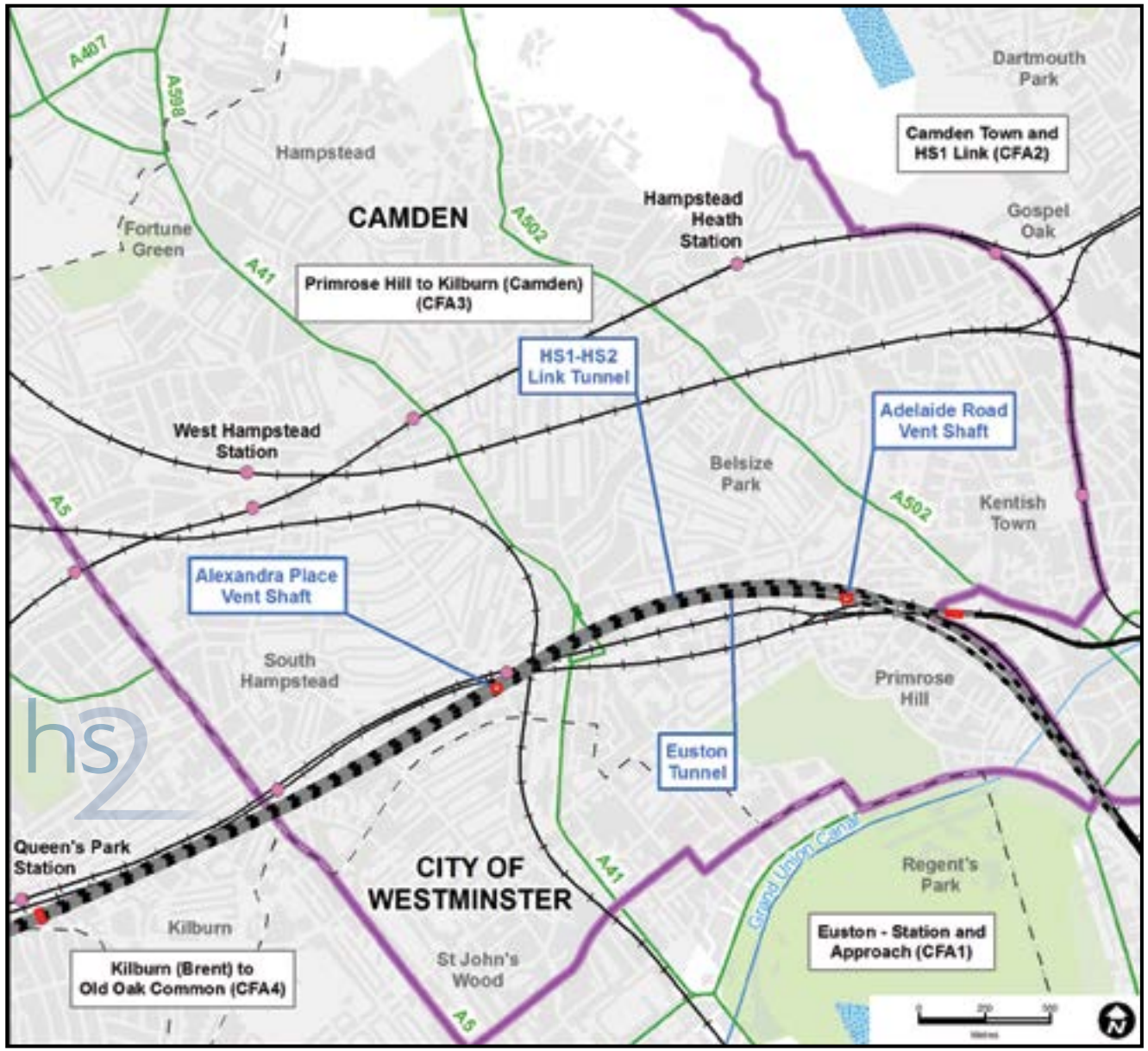
Construction works will require temporary road closures at A5202 St. Pancras Way/Baynes Street; Torbay Street/Leybourne Street/Castlehaven Road; and Chalk Farm Road. Although diversions will be provided, this will lead to congestion on a number of roads, including Chalk Farm Road/ Castlehaven Road; A400 Kentish Town Road/ Hawley Crescent; Gloucester Avenue/Oval Road and Pentonville Road/Claremont Square. In order to help reduce this effect, construction works will not occur on adjacent bridges at the same time, reducing the risk of alternative road routes being unavailable during temporary road closures.

Several car parking bays will be required at Randolph Street, Rousden Street and Chalk Farm Road for periods in excess of four weeks. During construction the need for temporary diversions of traffic and increased traffic will require careful management of measures at Royal College Street and Chalk Farm Road to maintain road safety.

During operation, decreases in traffic flows, resulting from a redistribution of traffic in the area, will improve conditions at Agar Grove; Bayham Street; Camden High Street; A503 Camden Road; A400 Camden Street; Copenhagen Street; Greenland Road and A5202 St. Pancras Way. There will be an increase in delays at the A5200 York Way/Market Road junction. Increases in traffic flows will affect pedestrians and cyclists at Caledonian Road; A5200 York Way; Albert Street north of Delancey Street; Arlington Road; Camden Park Road; Oval Road; and A4201 Parkway. A footpath on Camley Street will be permanently realigned, increasing journey distance for pedestrians and cyclists by approximately 200m.

Proposed bridge at St Pancras Way / Randolph Street, central London

Figure 16: Primrose Hill to Kilburn (Camden) Area context map



8.3 Primrose Hill to Kilburn (Camden)

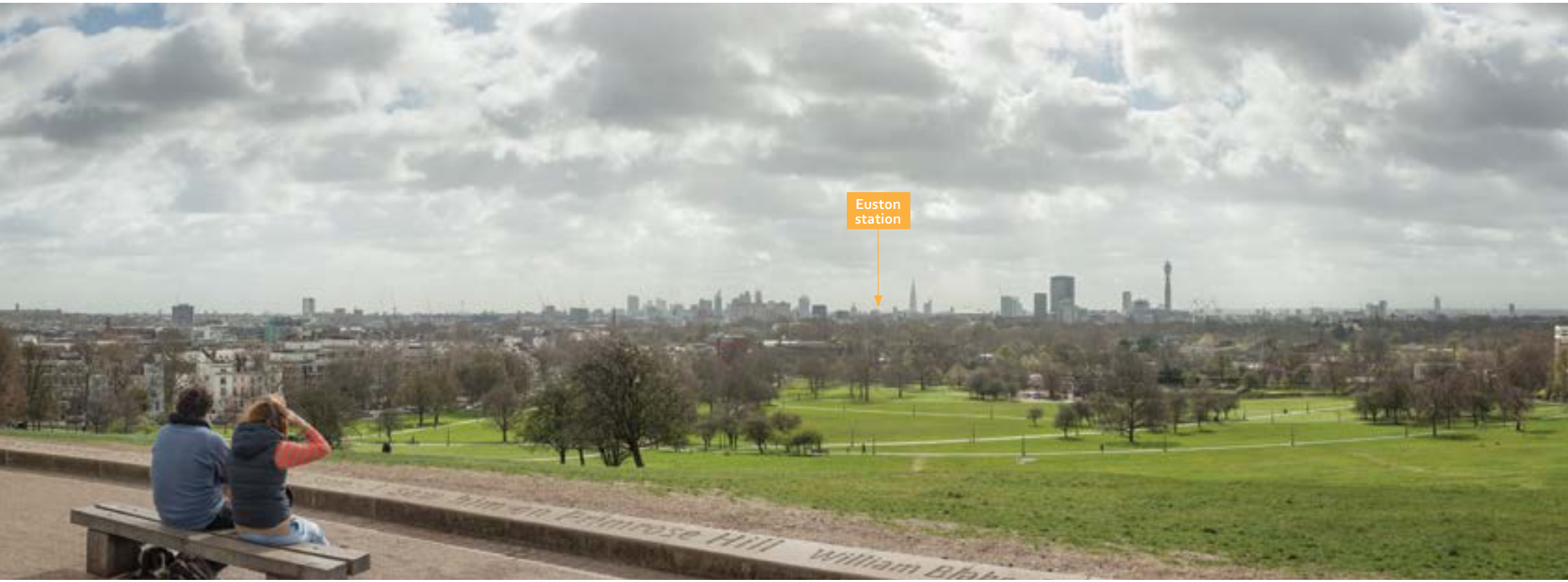
Overview

The Primrose Hill to Kilburn (Camden) area is urban in character and includes Primrose Hill, South Hampstead, Swiss Cottage and St. John's Wood. The main open spaces in the area include Primrose Hill Park and Adelaide Road Local Nature Reserve. There are a number of major transport routes passing through the area including the A41, the West Coast Main Line, the North London Line and the London Underground Metropolitan and Jubilee lines.

The project

From Primrose Hill to Kilburn the new route will be in tunnel (see Figure 16). Two tunnels will be required; a twin bored tunnel for the route into Euston Station and a single bored tunnel for the HS1 Link.

The twin bored tunnel will pass beneath the A4201 Parkway, between Mornington Terrace and Park Village East, and will run in a north-westerly direction towards Adelaide Road. The HS1 Link tunnel will start in the vicinity of the Regent's Park Road bridge passing beneath the existing railway westwards towards Adelaide Road.



View from Primrose Hill showing protected vista looking towards Euston station

A ventilation shaft and associated surface headhouse building will be provided on railway land adjacent to Adelaide Road that will also enable emergency access to the tunnels. The tunnels will then head south-west to a second ventilation shaft and associated headhouse building at Alexandra Place, before leaving the area underneath Kilburn High Road.

Within this area, the main above-ground construction works will be limited to the two ventilation shafts and main construction compounds required at these locations. One satellite construction compound will be located in the east of this area for the modifications to the existing railway at Euston. Construction will require the demolition of two dwellings and one community facility in the area. The temporary diversion of traffic at Alexandra Place and the temporary closure of the B509 Adelaide Road will be required. Temporary pedestrian diversions will be required at Alexandra Place, Adelaide Road, Langtry Walk and Loudoun Road. A sewer and water main will need to be diverted.

Residual effects
Construction and operation of the project in this area are not likely to result in any adverse residual effects on ecology, land quality or water resources and flood risk. Similarly, no likely adverse residual effects have been identified as arising during operation for air quality, community, cultural heritage, socio-economics or sound, noise and vibration.

Air quality
A reduction in air quality as a result of construction traffic will affect residential properties on A502 Haverstock Hill/Chalk Farm Road, England's Lane, at the junction of A502 Rosslyn Hill and Heath Street, A41 Finchley Road and at the junction of the A41 Finchley Road and Hendon Way.

Community
Construction activity at the Adelaide Road ventilation shaft and headhouse site will result in temporary noise and visual effects on the amenity of residents at Beaumont Walk, King Henry's Road and the B509 Adelaide Road. The amenity of residents further east on the B509 Adelaide Road and on Regent's Park Road will also be affected due to increased construction traffic, noise and visual effects.

The increase in traffic in the area during construction will adversely affect the amenity of residents on sections of Haverstock Hill and Rosslyn Hill, and those using Haverstock School and Hampstead Seventh Day Adventist Church. Residents around the A41 Finchley Road junction with Hendon Way and along the section south of the junction with B509 Adelaide Road (toward St John's Wood), will experience adverse amenity effects during construction, resulting from increased traffic and air quality effects from vehicle emissions.

The Alexandra Place ventilation shaft and headhouse will result in the loss of the launderette, which will affect the local community. The construction activity will also affect the amenity of residents opposite the ventilation shaft headhouse, on Loudoun Road (due to noise and visual effects).

Cultural heritage
A number of built heritage assets including 1 to 8 Langtry Walk and 61 to 83 Loudoun Road will be demolished and a tunnelled section of the Up Empty Carriage Line will be partially demolished.

The construction of the Alexandra Road ventilation shaft headhouse will permanently affect the setting of Alexandra Road Estate and Alexandra Road Conservation Area.

Landscape and visual assessment
As the route is entirely in tunnel through this area, effects will be limited to those resulting from construction of the two ventilation shaft headhouses, the demolition of buildings and the construction of the HS1-HS2 Link tunnel portal east of Regent's Park Road bridge.

Construction of the shafts will affect views within the local area, including from the junction of Regent's Park Road and Gloucester Avenue, King Henry's Road, Adelaide Road, Eton Road, Alexandra Road, Loudon Road and Belsize Road.

The presence of the headhouses will affect views from Adelaide Road, King Henry's Road, Alexandra Place and Loudon Road. The visual effect of these features will reduce over time as planting matures.

Socio-economics

Construction of the ventilation shaft and associated features will require the demolition of 12 commercial units at 61-83 (odd numbers only) Loudoun Road and six commercial units at 1 to 8 Langtry Walk.

It is estimated that the project will result in the displacement or possible loss of around 50 jobs in this area. Taking into account the availability of alternative premises, skill levels of local people and the relatively healthy local economy, the displacement or possible loss of jobs is considered to be relatively modest compared to the scale of economic activity and opportunity in the area.

Sound, noise and vibration

Measures in the draft CoCP will be implemented to manage noise and vibration during construction, such as the use of screening along the edge of the construction worksites.

Construction is likely to create adverse noise that will temporarily affect residential areas closest to the ventilation shaft construction worksites at Adelaide Road and Alexandra Place. Potential significant adverse effects are reported for, Applied Sustainable Health, James Town Mental Health Centre, Adelaide Road Medical Centre. Noise from construction traffic on the A502 Haverstock Hill and England Lane is likely to affect a limited number of residential and commercial properties, Haverstock School and the Seventh Day Adventist Church.

Traffic and transport

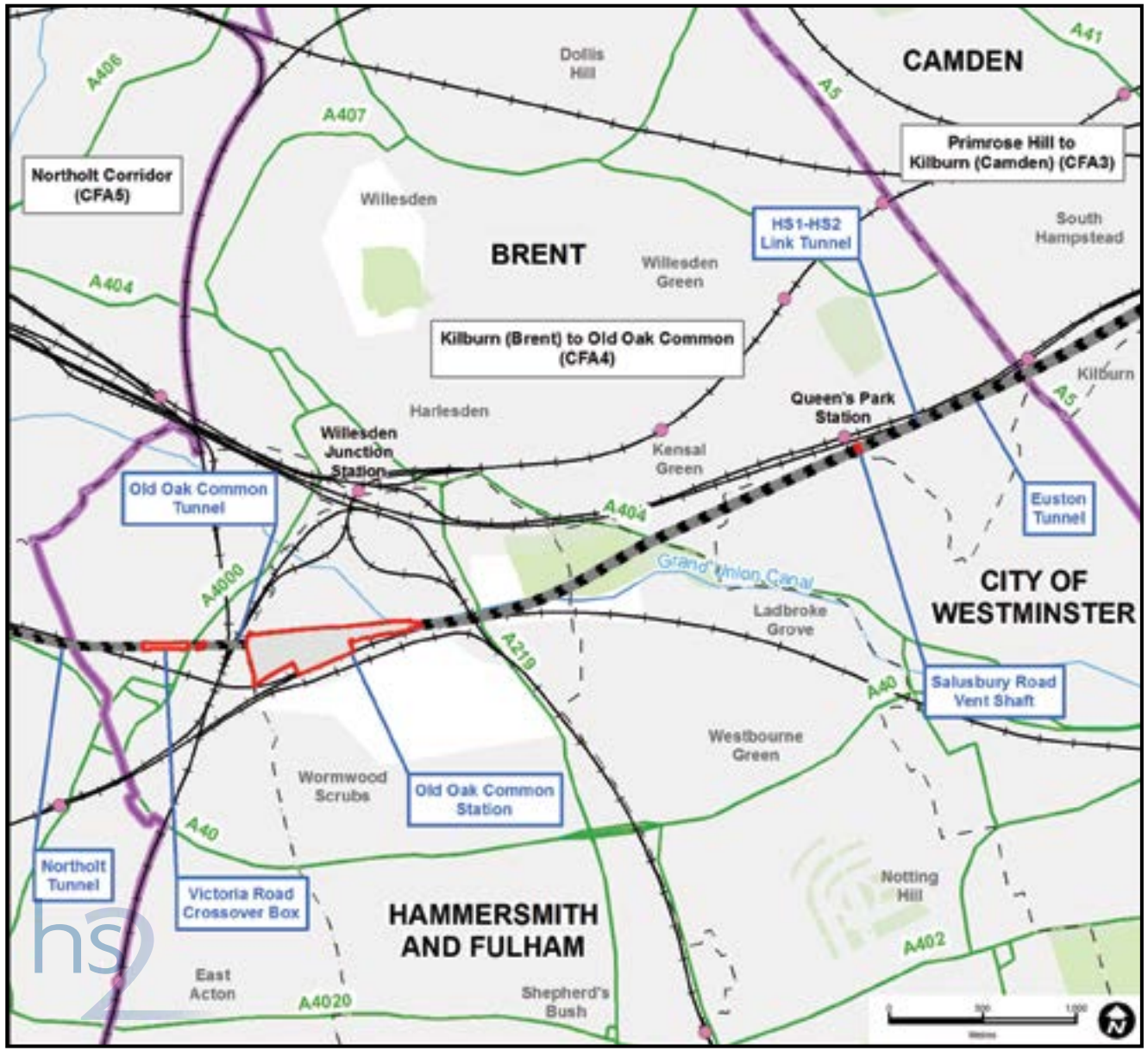
The main construction effects are expected during the period of peak construction traffic together with a road closure at Chalk Farm Road bridge in the Camden Town and HS1 Link area and closures of the B509 Adelaide Road. Diversions and delays to four bus routes are expected when Adelaide Road is subject to a full closure. There will be temporary bus stop relocations to diversion routes during full closure of Adelaide Road. There will be reduced traffic flows on Harmood Street and westbound on Prince of Wales Road between Grafton Road and Talacre Road.

Changes in traffic flows during construction will lead to additional temporary congestion and increased delays at: Haverstock Hill/Parkhill Road; Gloucester Avenue/Oval Road; and Albert Terrace. Construction traffic flows in this area will affect pedestrians and cyclists using local roads. There will be a temporary loss of parking on England's Lane, Alexandra Place and at Dinerman Court private off-street car park.

The need for temporary diversions of traffic and increased traffic during construction will require traffic management measures at A41 Finchley Road and St John's Wood Park.

During operation pedestrians will experience decreases in traffic flow on Prince Albert Road and increased traffic flows on the B507 Abbey Road.

Figure 17: Kilburn (Brent) to Old Oak Common area context map



8.4 Kilburn (Brent) to Old Oak Common

Overview

The Kilburn (Brent) to Old Oak Common area extends from the Kilburn High Road in the east to the Park Royal Road in the west. The area is mainly residential, with industrial and commercial units located to the west in the Park Royal area. Open spaces include Queen's Park, Paddington Cemetery, Kensal Green Cemetery, Wormwood Scrubs and Little Wormwood Scrubs. A number of railway lines pass through this area including the West Coast Main Line and the Great Western Main Line.

The project

Between Kilburn and Old Oak Common, the route will be in tunnel, running beneath Kilburn High Road in the east and heading south-west towards Salusbury Road (see Figure 17). A ventilation shaft and associated headhouse and an auto-transformer station will be located at Salusbury Road

The new interchange station will occupy existing railway land at Old Oak Common. The interchange will connect the project with

Crossrail, Heathrow Express and services on the Great Western Main Line. The station will also include a connection to HS1 via the HS1 link. The existing Heathrow Express depot will need to be relocated, as discussed in Section 10.4.

To the west of Old Oak Common station, the route will continue in tunnel. Immediately west of Victoria Road an open below-ground crossover box will be provided to allow trains to change tracks and reverse in and out of Old Oak Common Station. The Northolt tunnel will run west from the crossover box beneath North Acton and Ealing towards West Ruislip.

Main construction compounds will be located at Salusbury Road, Old Oak Common, Victoria Road and Willesden EuroTerminal. Four satellite construction compounds will be required. The Willesden EuroTerminal main compound will include a railhead for the temporary storage, loading and removal of excavated material by rail. These sites will support the construction of the Old Oak Common station, the Victoria Road crossover box and the construction of the Euston and Northolt tunnels.

Temporary road and footpath closures will be required on Old Oak Common Lane, with associated diversions in place. Atlas Road will be partially closed to traffic throughout the works whilst Bethune Road will be permanently closed. Construction will require the demolition of two community facilities and a number of electricity substations and structures.

Artist impression of Old Oak Common station from the north-east

Policy

National and regional policies support the location of a HS2 station at Old Oak Common. The Government has confirmed the choice of Old Oak Common as the site for the London interchange station for HS2, to enable rail interchange and onward travel via Crossrail, the Heathrow Express, the Great Western Main Line and HS1.

The new HS2 interchange station at Old Oak Common will be located at the heart of the Park Royal Opportunity Area, identified in the London Plan 2011 as an area with significant capacity for regeneration. The Mayor of London recognises that with the proposals for the new HS2 station and Crossrail station in place, Old Oak Common has the potential to become one of the best

connected railway stations in the UK. This would give rise to significant economic development in the immediate and surrounding area, leading to the creation of approximately 90,000 jobs and 19,000 new homes.

Residual effects
Construction and operation of the project in this area are not likely to result in any adverse residual effects on ecology or land quality. Similarly, no likely adverse residual effects have been identified as arising during operation for community, cultural heritage, socio-economics, sound, noise and vibration and water resources and flood risk.

Air quality
Construction and operation traffic will give rise to air quality effects on residential properties along the A4000 Old Oak Lane and Wales Road Farm. These construction effects will be of limited duration and occur during periods of peak traffic movements during the construction phase. During operation, changes in road traffic flows will result in adverse effects on a short section of the A4000 Old Oak Lane. These effects should be considered in the context of improvements in air quality that will result from the reduction in vehicle emissions, due to factors such as improved vehicle design.

Community
The public toilets at Premier Corner will be demolished for construction of the Salusbury Road ventilation shaft and headhouse. Close to the Salusbury Road ventilation shaft and headhouse construction site, noise and views of construction activities will affect the amenity of residents in properties on Claremont Road and the B414 Salusbury Road.

Residents of Wells House Road are predicted to experience isolation effects during construction, due to decreased access to surrounding areas. The amenity of residents at Wells House Road, Shaftesbury Gardens, Midland Terrace and Old Oak Common Lane will be affected due to noise and visual effects.

Open space at Victoria Gardens and Cerebos Gardens will be temporarily required during construction and the children's play area will be temporarily lost. The premises of Kensington and Chelsea College at Park Royal will be required permanently.

Cultural heritage
Archaeological assets which may be affected during the construction of the project include the site of a medieval manor house and the Roman road at Watling Street. The non-designated carriage shed at Old Oak Common, currently used by First Great Western, will be demolished.

Land quality
With the application of the measures contained within the draft CoCP, no adverse impacts are anticipated with respect to contaminated land. The remediation of the Old Oak Common station area and former industrial land will be beneficial.

Landscape and visual assessment
As the route is in tunnel through this area, effects during construction will be limited to those resulting from works for the ventilation shaft headhouse, the auto-transformer station, the Victoria Road crossover box and Old Oak Common station.

Construction will affect views within the area, including residential areas at Salusbury Road, Kilburn Lane, Claremont Road, Wells House Road, Victoria Road, Shaftesbury Gardens and Midland Terrace. Views from non-residential areas will also be affected, including from the open space at Wormwood Scrubs, Acton Cemetery and the Grand Union Canal towpath.

Old Oak Common station, the ventilation shaft headhouse and auto-transformer station at Salusbury Road will affect views in the local area.

Artist impression of Old Oak Common station from the north-west

The visual effect of these features will reduce over time as planting matures.

Socio-economics

The construction of the project will create approximately 780 full-time equivalent jobs within the Old Oak Common area. Approximately 180 new permanent jobs will be created by the project in relation to the operation of Old Oak Common Interchange station.

The 'Vision for Old Oak' masterplan document recognises that Old Oak Common could be one of the best connected railway stations in the UK, helping to regenerate the area with up to 90,000 jobs and 19,000 new homes, schools, open spaces, shops and leisure facilities.

It is estimated that the project will result in the displacement or possible loss of around of 1,540 jobs within the Old Oak Common area. The impact on the local economy from the loss/ relocation of jobs is considered to be relatively modest compared to the scale of economic activity and opportunity in the area.

Construction of the project will require the demolition of a number of commercial properties, including the Waitrose and John Lewis warehouse at 96 Victoria Road, the London Underground

Limited train crew facility at Premier House on Kilburn Lane, and silos (material storage buildings) at Willesden Euroterminal.

During construction of the project, customers may be discouraged from using the Holiday Inn Hotel on Victoria Road as a result of construction activities associated with the Victoria Road crossover box compound.

Sound, noise and vibration
Measures in the draft CoCP will be implemented to manage noise and vibration during construction, including the use of quiet and low-vibration equipment and screening along the edge of the construction worksites. Tall screening will be used in a number of locations, including adjacent to the residential properties at Wells House Road, Wales Farm Road, Shaftesbury Gardens, Midland Terrace, Victoria Road, Bashley Road, Old Oak Common Lane and Stephenson Street.

Noise from construction is likely to affect residential areas closest to the construction works at the Salusbury Road ventilation shaft and Old Oak Common. Potential significant adverse effects are reported for St Luke's Church, the Blessing Medical Centre and a limited number of commercial properties located close to this construction.

Traffic and transport
The opening of Old Oak Common interchange station will provide substantial transport accessibility improvements for local users and passengers from the wider area. There will be a significant beneficial effect on rail capacity and improved journey times across London and beyond from services interchanging at the new Old Oak Common station to Birmingham and destinations to the North.

Measures included within the draft CoCP, in combination with a travel plan, will help mitigate the transport related effects during construction. The majority of excavated material will be transported by rail rather than road, reducing the number of construction vehicles on the local road network.

At Salusbury Road the construction works will have limited temporary adverse effects on pedestrians and bus passengers and will result in loss of parking provision at the car park.

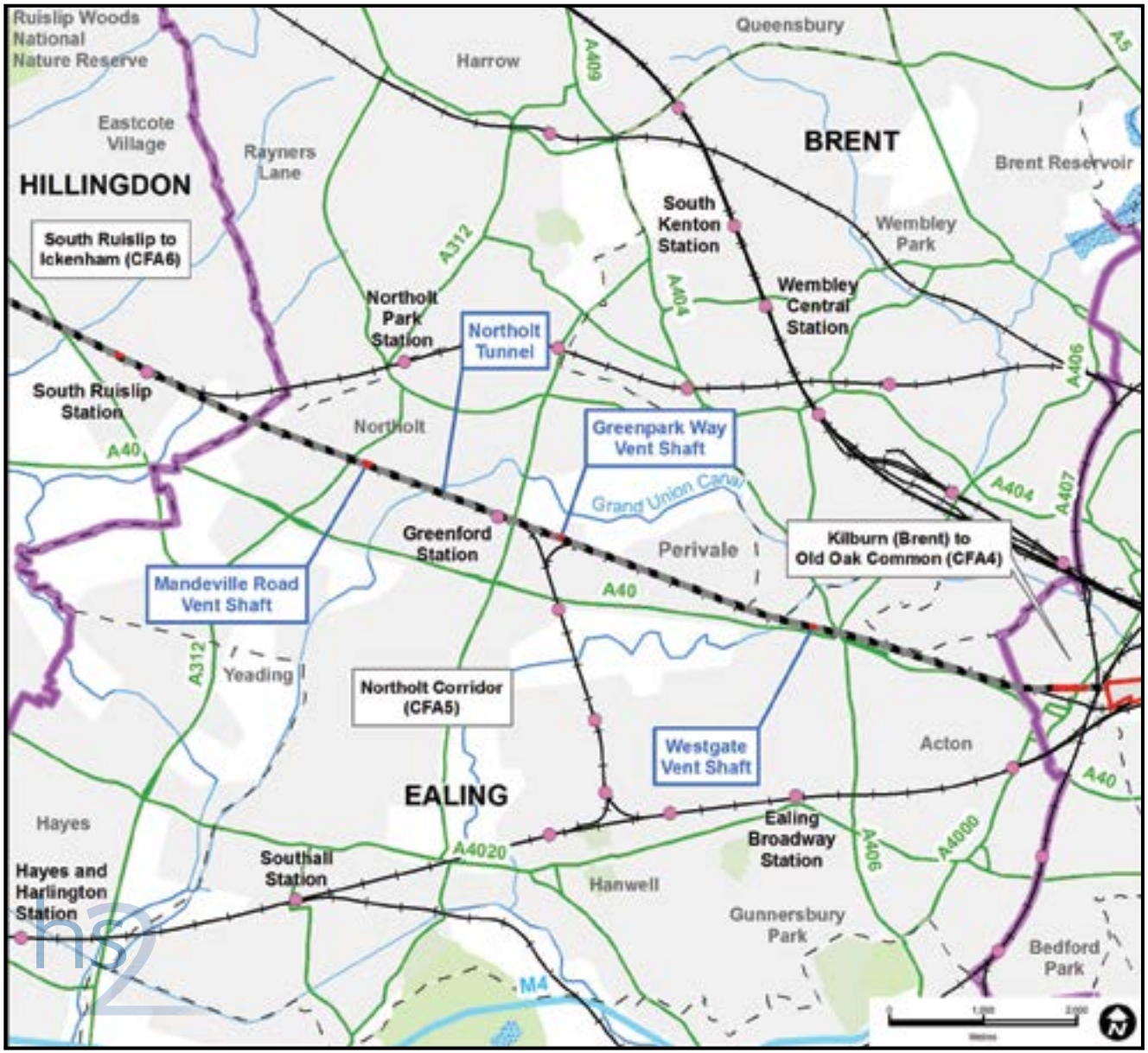
Changes in traffic flows resulting from construction traffic and diversions associated with the construction works required at Old Oak Common will lead to congestion, increasing delays for road users on Tubbs Road/Nightingale Road, A40 Western Avenue/Savoy Circus and Old Oak Common Lane/A40 Savoy Circus.

Traffic diversions due to the temporary closure of Old Oak Common Lane and permanent closure of Bethune Road will result in increased travel distances for all users of these roads. Increases in traffic flows due to diversions and construction traffic will affect pedestrians and cyclists on some local roads.

Increasing the clearance at the railway bridges on Old Oak Common Lane will allow the passage of double decker buses, a significant beneficial effect. Improvements will be made for pedestrians and cyclists. During operation, road improvements made by the project will limit traffic delays and congestion in the vicinity of Old Oak Common station. There will be congestion, an increase in delays and some effects on pedestrians and cyclists due to changes in flows on the already heavily used wider road network in the area.

Water resources and flood risk assessment
Monitoring arrangements will be agreed with the Environment Agency and in consultation with the Canal & River Trust, Network Rail and Crossrail to manage the potential for a breach of the Grand Union Canal wall. The risk of the canal wall being breached, during the construction phase, and consequent flooding, is therefore considered to be negligible.

Figure 18: Northolt Corridor area context map



8.5 Northolt Corridor

Overview

The Northolt Corridor area is a densely developed part of London comprised of residential areas, open spaces including Horsenden Hill and Sudbury Golf Course, and industrial and commercial development, including the largest business park in London at Park Royal. Major transport routes run through the area including the London Underground Central line and the Hangar Lane Gyratory, providing a major road intersection between the A40, the A406 and the A4005.

The project

The route will be in tunnel through this area (see Figure 18). The Northolt Tunnel will enter the area beneath the B4492 Park Royal Road, west of Acton Cemetery, and proceed in a north-westerly direction before leaving the area to the south of Rabournmead Drive in South Ruislip. Ventilation shafts and associated surface headhouses will be required at Westgate, Greenpark Way and Mandeville Road.

The main surface construction works will be limited to the three ventilation shaft headhouses. Main construction compounds will be required

at these locations. A satellite construction compound will be located in this area to support modifications to the existing railway in Euston and Camden Town. Construction will require the demolition of two dwellings and a pumping station at Mandeville Road. No diversions of roads will be required. Gas, water mains and two sewers will need to be diverted.

Residual effects
Construction and operation of the project in this area are not likely to result in any adverse residual effects on air quality, cultural heritage, ecology, land quality, socio-economics or water resources and flood risk. Similarly, no likely adverse residual effects have been identified as arising during operation for community, landscape visual assessment or sound, noise and vibration.

Community
There will be a temporary loss of public open space in the centre of Northolt Village. Residents on the south side of Carr Road and in Badminton Close are predicted to experience noise and visual effects on their amenity during construction of the Mandeville Road ventilation shaft and headhouse.

Landscape and visual assessment
Landscape and visual effects will be limited to those resulting from construction of the three ventilation shafts and associated headhouses at Westgate, Greenpark Way and Mandeville Road.

The presence of construction works and the new headhouses will affect views within the local area, including at Carr Road and Badminton Close, from Northolt Station and the public right of way over the existing railway, east of Mandeville Road. Where appropriate, planting will be implemented to screen the headhouses. As this planting matures, the visual effect of the headhouses will reduce.

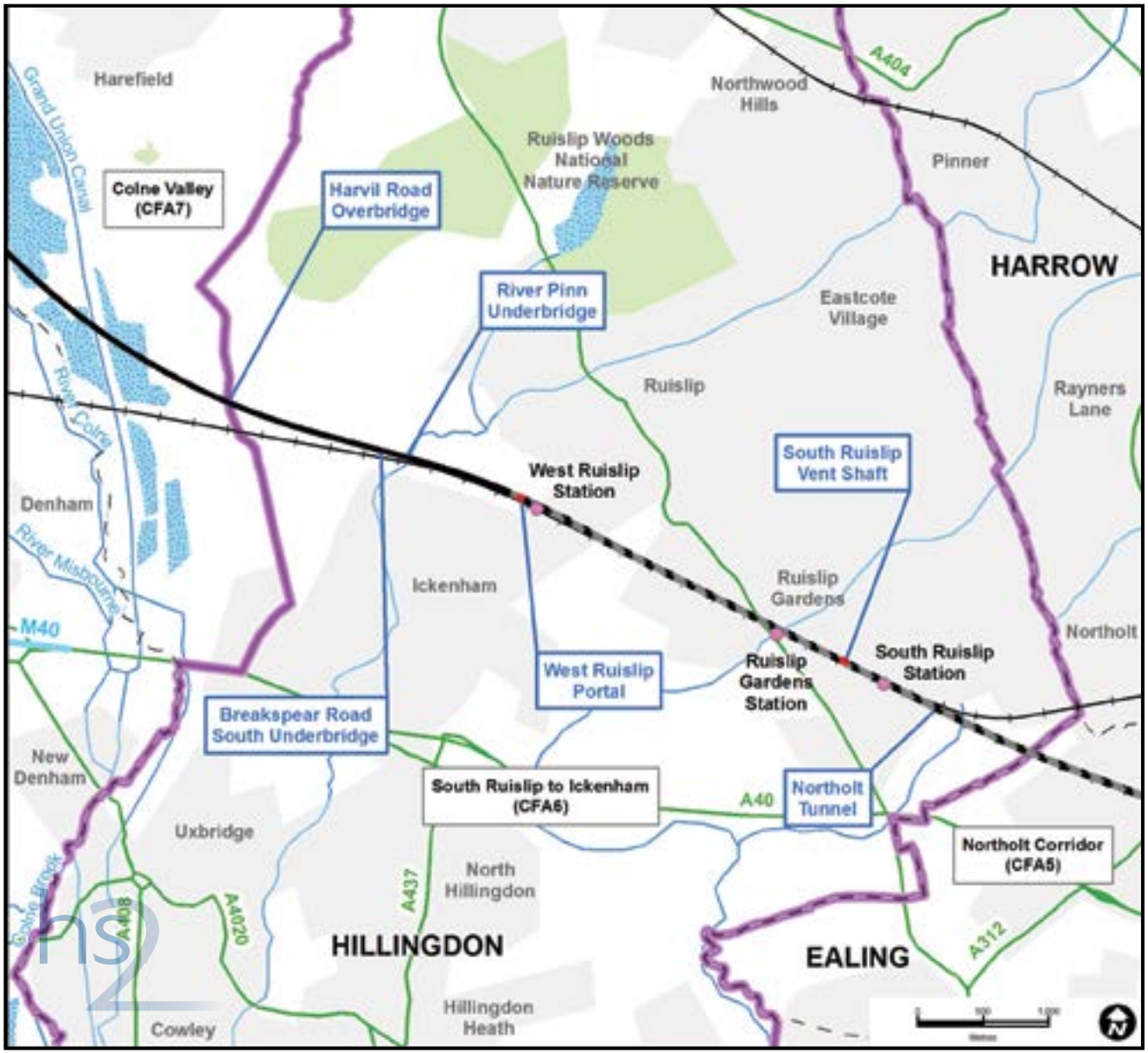
Sound, noise and vibration
Measures in the draft CoCP will be implemented to manage noise and vibration during construction, including the use of quiet and low-vibration equipment and screening along the edge of the construction worksites. Tall screening will be used in a number of locations, including adjacent to commercial properties at the Westgate and Manhattan Business Parks and Greenford Mail Centre, and alongside residential communities on Conway Crescent, Perivale.

Noise from the construction is likely to be significant on residential areas closest to the construction works at Carr Road and Belvue Road in Northolt. Potential adverse effects are reported for Westgate House, Westgate Media and Broadcast, AGB House, Westworld, Manhattan House, Greenford Mail Centre and the ITV studios at Perivale Business Park.

Traffic and transport
During construction, changes in traffic flows will lead to congestion, increasing delays for road users at the junction of Horn Lane/Friary Road. Increased traffic flows will affect pedestrians on Friary Road.

During operation there will be an increase in congestion resulting in delays to vehicle users in B4492 Acton Lane/Mordaunt Road. Increased traffic flows will affect pedestrians on Friary Road.

Figure 19: South Ruislip to Ickenham area context map



8.6 South Ruislip to Ickenham

Overview

The South Ruislip to Ickenham area is suburban in character in the east and becomes more rural to the north and north-west of Ickenham. The area includes a mix of residential properties, industry, open space, farmland and an aerodrome. A number of roads and railway lines pass through the area including the A40, the A4180, the London Underground Central, Metropolitan and Piccadilly lines and the Marylebone to Aylesbury Line.

The project

The route will be in tunnel through a large section of this area. The Northolt tunnel will enter the area directly south of Rabournmead Drive and proceed north-west, before emerging in West Ruislip to the west of Ickenham Road (see Figure 19). A ventilation shaft and associated surface headhouse and an auto-transformer station will be located at South Ruislip. After leaving the tunnel, the route will cross the River Pinn and Breakspear Road South on bridges and then run in cutting to Harvil Road, Ickenham, where it will leave the area to cross the Colne Valley on viaduct.

Main construction compounds will be required at South Ruislip for construction of the ventilation shaft and headhouse building and at West Ruislip for the bridges, embankments, cutting and tunnel construction. The main compound at West Ruislip will include a temporary railhead for the delivery of bulk rail-borne materials, such as ballast, rails and sleepers. Two tunnel boring machines will be launched from the West Ruislip compound to form the west end of the Northolt tunnel. Three satellite construction compounds will be required.

The project will require the demolition of two dwellings and the Ruislip Rifle Club. The project will also require land at Ruislip Golf Club. Permanent diversions will be required for Harvil Road and the access road to the pharmaceutical research facility. Gas, electricity and water mains and four sewers will need to be diverted so that they will not be adversely affected by the project.

Residual effects

Construction and operation of the project in this area are not likely to result in any adverse residual effects on land quality or socio-economics. Similarly, no likely adverse residual effects have been identified as arising during operation for agriculture, forestry and soils, air quality, community, cultural heritage or water resources and flood risk.

Agriculture, forestry and soils

Three areas have been identified for the sustainable placement of surplus excavated materials and for the proposed restoration of the land for landscape and ecological planting. One is located to the north of Newyears Green Lane and two are located on the land between Breakspear Road South and Harvil Road to the south of the project. This will result in land take from 10 small agricultural holdings which are unlikely to remain viable as agricultural businesses.

Air quality

Residential properties close to Swakeleys Road and the A40 will experience a temporary reduction in air quality as a result of construction traffic movements.

Community

Land will be required for the project at Ruislip Golf Club and users of the club house will experience noise and visual effects. HS2 Ltd will work with Ruislip Golf Course and the London Borough of Hillingdon to identify a means by which it could operate as an eighteen hole golf course throughout operation of the project. Land used by Ruislip Rifle Club will be required for the project.

Some residents at The Greenway and residents along southern sections of Harvil Road and Breakspear Road South will experience temporary amenity effects due to construction noise and views of construction works. On Ickenham Road, noise and construction traffic will affect residents and visitors at Blenheim Care Centre and visitors to Church of Jesus Christ Of Latter Day Saints.

Cultural heritage

Archaeological assets will be permanently removed including possible Bronze Age cremations at Copthall Covert, possible Palaeolithic artefacts in the Thames Terrace Gravels and a Romano-British settlement north of Newyears Green Farm.

Construction of the project will change the setting of several heritage assets, including Highway Farm, Brackenbury Farm moated site, St Leonards Farmhouse and Copthall Farmhouse.

Landscape and visual assessment

The presence of construction works and changes to the existing landform and vegetation patterns will significantly affect the character and appearance of the local landscape. During operation, the effect of the project on the character and appearance of the local landscape will substantially reduce over time as mitigation planting grows and matures. Significant effects will remain in some parts of the local landscape

due to the presence of the infrastructure, engineered landforms and overhead line equipment.

The presence of construction works will cause temporary effects on views within the area, including at the tower block at Josiah Drive, The Greenway and Ickenham Close, Oak Farm and Harvil Road, several public rights of way, Ruislip Golf Course and the pharmaceutical research facility. During operation, the tunnel portal and ventilation shaft headhouse as South Ruislip will continue to affect views within the local area. The visual effect of the project will reduce over time as planting matures.

Sound, noise and vibration

Measures in the draft CoCP will be implemented to manage noise and vibration during construction, including the use of quiet and low-vibration equipment and screening along the edge of the construction worksites. Tall screening will be used in a number of locations, including around the South Ruislip ventilation shaft construction worksite and adjacent to the residential communities at B466 Ickenham Road, The Greenway, Hoylake Crescent, Breakspear Road South, Copthall Road West, Harvil Road, Hill Rise, Field Way, Glenhurst Avenue and the pharmaceutical research facility.

Noise from construction is likely to result in significant adverse effects on residential areas closest to the construction works at Cottesmore House in West Ruislip, The Greenway in Ickenham and Breakspear Road South in Harefield. Potential significant adverse effects are reported for the buildings at Ruislip Golf Centre and The Church of Jesus Christ of Latter Day Saints. Noise from construction traffic is likely to affect a limited number of residential properties on B467 Swakeleys Road in Ickenham.

A number of mitigation measures have been included in the design of the project to mitigate noise effects during operation, including the use of tall noise barriers at north-west Ickenham. The tunnels will reduce noise around South and West Ruislip. Operation of the railway has been assessed as likely to result in increases in external noise that are considered significant around residential properties closest to the route in the north-west of Ickenham. The pharmaceutical research facility near Breakspear Road South may be affected by vibration.

Traffic and transport

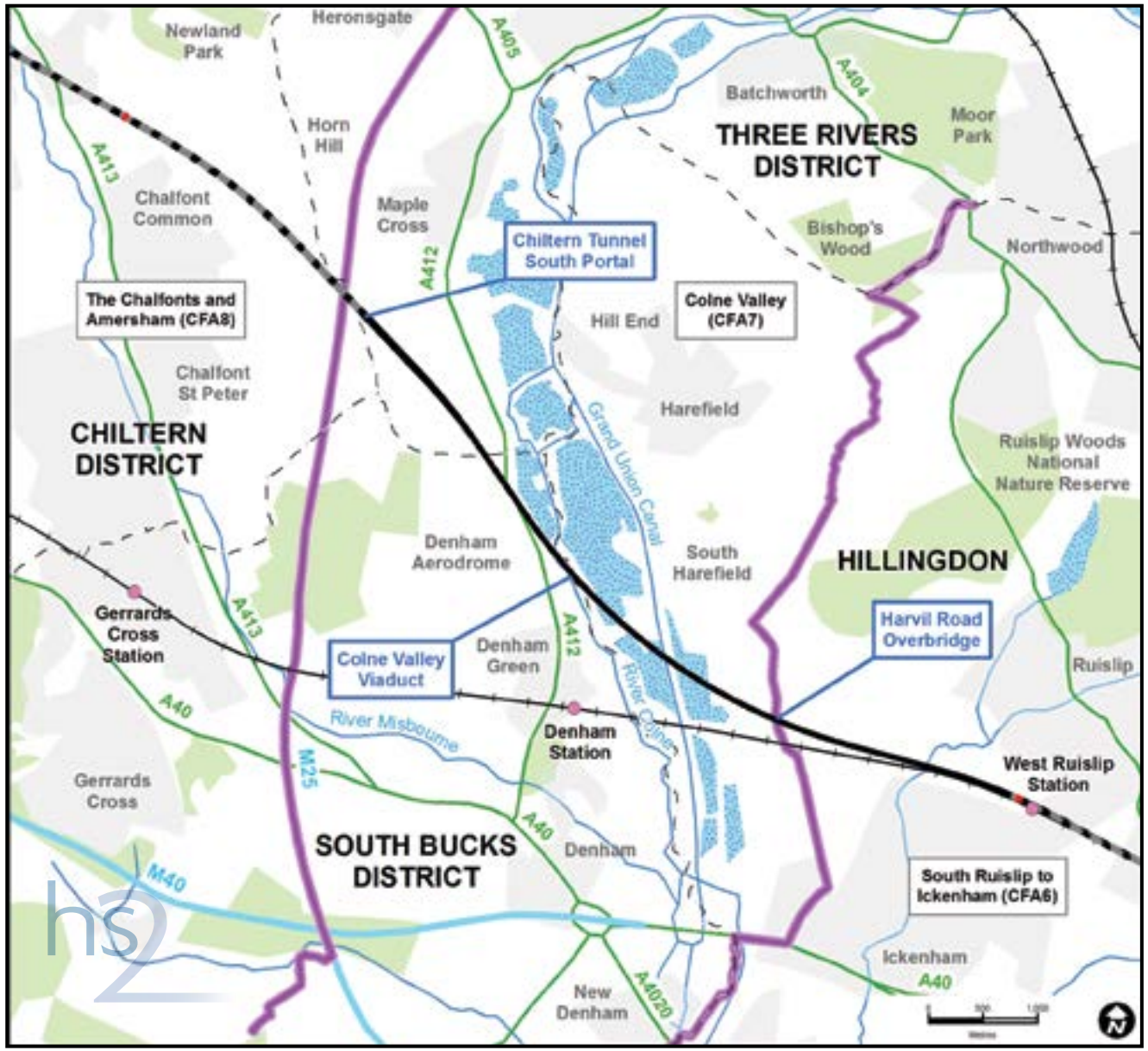
Construction traffic will lead to congestion at Swakeleys Road/Harvil Road, Swakeleys Road/Woodstock Drive and Swakeleys Roundabout (A40 Junction). The changes in traffic flows will affect pedestrians using Ickenham Road, Breakspear Road South, Harvil Road, Swakeleys Drive/Woodstock Drive and Ladygate Lane. Construction works will require the temporary diversion of 11 public rights of way.

Once the project is operational, traffic and highway conditions are expected to return to their pre-construction conditions. There will be a small improvement in journey times on Harvil Road, but an increase in travel distance on two public rights of way.

Water resources and flood risk assessment

Construction works such as tunnelling and piling could affect groundwater quality which has the potential to temporarily affect public water supply. HS2 Ltd will agree a management strategy with the Environment Agency in consultation with the water company to manage this potential effect.

Figure 20: Colne Valley area context map



8.7 Colne Valley

Overview

The Colne Valley area sits between the suburban fringe of London and the Chilterns and is made up of agricultural land, commuter towns and villages, including Ickenham, Ruislip, South Harefield and Harefield. A number of roads and railway lines pass through the area including the A412 Denham Way/North Orbital Road and the Chiltern Main Line.

The project

The route will enter this area passing under Harvil Road, north of Ickenham (see Figure 20). An auto-transformer feeder station will be located to the west of Harvil Road to supply power to the project (see Section 3.3 for further details). The route will proceed in a north-westerly direction on a viaduct across the Colne Valley, west of South Harefield and east of Denham Green, over the Grand Union Canal, Colne Valley Lakes including the Hillingdon Outdoor Activity Centre, the Mid Colne Valley Site of Special Scientific Interest, the River Colne and A412 Denham Way/North Orbital Road. The route will then pass west of West Hyde in a series of cuttings and embankments,

before entering the Chiltern tunnel immediately east of the M25 between junctions 16 and 17, east of Chalfont St. Peter. An auto-transformer station will be required approximately 400m east of the M25 at West Hyde.

Two main construction compounds will be required for the construction of the Colne Valley viaduct and the Chiltern tunnel. Seven satellite construction compounds will be required in this area.

Construction will require the demolition of one dwelling and three outbuildings at Hillingdon Outdoor Activity Centre. Tilehouse Lane will be permanently realigned to the west of the existing road and Chalfont Lane will be temporarily diverted during construction. A temporary diversion of the private access to Denham Park Farm quarry site will be required during different phases of the construction period. Short lengths of the Newyears Green Bourne and the River Colne will be permanently realigned and utility diversions will be required.

Landscape planting and habitat creation have been included within the project, including lowland mixed deciduous woodland at Tilehouse Lane woodland creation area.

Residual effects

Construction and operation of the project in this area are not likely to result in any adverse residual effects on land quality. Similarly, no likely adverse residual effects have been identified as arising during operation for agriculture, forestry and soils, air quality, ecology or water resources and flood risk.

Agriculture, forestry and soils

An area has been identified for the sustainable placement of surplus excavated materials located to the south-east of South Harefield. The sustainable placement area will be restored to agricultural land when completed.

View from Hillingdon Outdoor Activities Centre looking towards the proposed Colne Valley viaduct

Construction of the project will result in land take from three agricultural holdings (Park Lodge Farm, Home Farm and Denham Park Farm). Approximately 130ha agricultural land will be permanently lost including 84ha of high quality land.

Air quality
Residential properties on Swakeleys Road, between Harvil Road and the A40, will experience a temporary reduction in air quality as a result of construction traffic.

Community
Land used for water-based and land-based activities at Hillingdon Outdoor Activity Centre, will be required during both construction and operation. It is unlikely that Hillingdon Outdoor Activity Centre will continue to operate during the construction of the project. If it does, there will be noise and visual effects on users during the construction period.

Construction traffic and noise will affect the amenity of residents along sections of Harvil Road between the junction with Swakeleys Road north to Harvil Farm and at South Harefield, south of the junction with Moorhall Road. There will be noise and visual effects on users of Denham Water-ski Club during construction.

The land required for construction will result in the closure of part of Old Shire Lane Circular Walk, with a longer alternative route provided.

During operation, the amenity of residential properties next to Denham Grove (De Vere Hotel) will be affected, as a result of noise and visual effects. If the Hillingdon Outdoor Activity Centre continues to operate in its current location, the users will experience noise and visual effects.

Cultural heritage
A number of heritage assets will be lost including the locally listed Dews Farm and archaeological remains at Dews Farm, Denham Park Farm, Chenies and Denham Grove. The project will pass through the ancient woodland at Battlesford Wood.

The setting of a number of heritage assets will be affected by the presence of construction machinery and the loss of vegetation, including Savay Farm.

The presence of the Colne Valley viaduct, together with the noise from passing trains, will affect the setting of the Grade I listed Savay Farm and the Savay scheduled monument.

Ecology
Approximately 1ha of ancient woodland will be lost in the Mid Colne Valley. One of the two locations used by pochard duck for breeding in this area will be lost, resulting in a temporary effect on the local population. Corn bunting habitat will be lost from farmland between the M25 and the A412 Denham Way/North Orbital Road, resulting in a permanent effect on the local population.

Landscape and visual assessment
The temporary presence of construction works and changes to the existing landform and vegetation patterns will significantly affect the character and appearance of the local landscape. During operation, the effect of the project on the character and appearance of the local landscape will substantially reduce over time as mitigation planting grows and matures. Significant effects will remain in some parts of the local landscape due to the presence of the infrastructure, engineered landforms and overhead line equipment.

The presence of construction works will cause temporary effects on views within the area, including at Tilehouse Lane, Park Lane, Chalfont Lane and Old Uxbridge Road and a number of public rights of way. Views from the Chiltern Main Line, Denham Media Park and Broadwater Sailing

Club will also be affected. During operation, the Colne Valley viaduct and the auto-transformer feeder station at Ickenham will continue to affect views within the local area. The visual effect of the project will reduce over time as planting matures, notably at each end of the Colne Valley viaduct.

Socio-economics
The combination of air quality, noise and vibration and visual impacts during construction and operation of the project may lead to a loss of trade for the Denham Grove (De Vere Hotel).

Sound, noise and vibration
Measures in the draft CoCP will be implemented to manage noise and vibration during construction, including the use of quiet and low-vibration equipment and screening along the edge of the construction worksites. Tall screening will be used to protect the residential properties around and including Denham Grove.

Noise from construction is likely to result in significant adverse effects on Denham Grove De Vere Hotel, the building at Hillingdon Outdoor Activity Centre and the clubhouse at Denham Waterski Club. Noise from construction traffic is likely to affect a number of residential and commercial properties on Harvil Road and B467 Swakeleys Road.

A number of mitigation measures have been included in the design of the project to mitigate noise effects during operation. Tall barriers will be included on the viaduct over the Colne Valley to help reduce adverse noise effects.

The occupiers of 1-2 Weybeards Cottages on Old Uxbridge Road are assessed to be significantly affected by noise from the operation of the railway. Both properties are likely to qualify for noise insulation. If noise insulation is accepted by the owner, this will help to reduce or avoid these effects.

Operation of the railway has been assessed as likely to result in increases in external noise that are considered significant around a limited number of residential areas closest to the route at Wyatt's Covert and Savay Lane (Denham Green). Denham Grove and the clubhouse at the Hillingdon Outdoor Activity Centre are also likely to be affected.

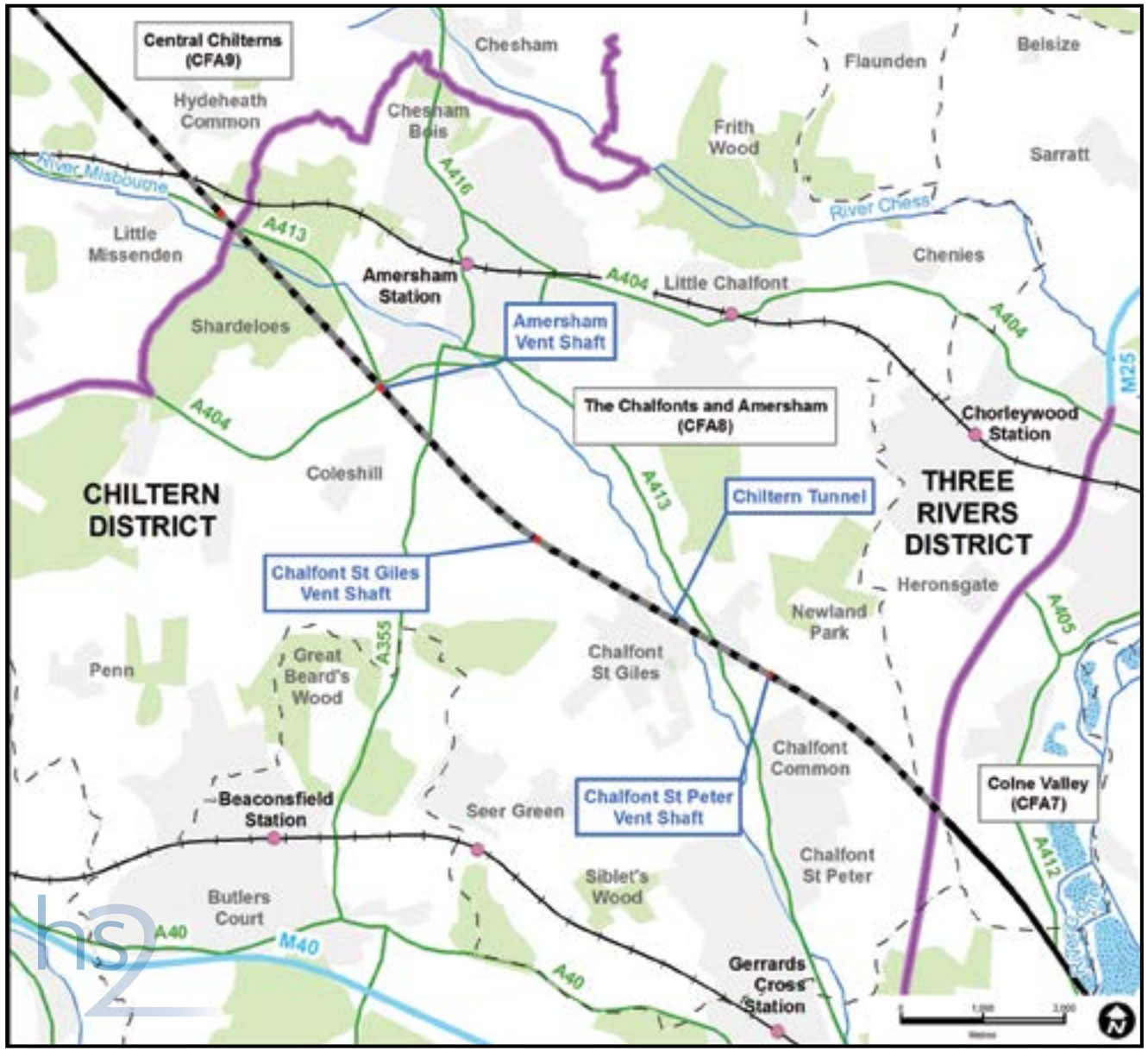
Traffic and transport
The increase in traffic during construction will lead to congestion and delays at junctions in the area including the A412 Denham Way junction with Chalfont Lane and the A412 North Orbital Road junction with Denham Green Lane. Temporary closure of Chalfont Lane and Tilehouse Lane will cause delays as diversions will be required. Construction traffic in this area will affect pedestrians, cyclists and horse riders on local roads including Woodland Road, Denham Green Lane and Swakeleys Road between the A40 and Harvil Road.

Five public rights of way will be temporarily closed and five public rights of way will be permanently realigned.

Water resources and flood risk assessment
Construction works such as tunnelling and piling could affect groundwater quality which has the potential to temporarily affect public water supply. HS2 Ltd will agree a management strategy with the Environment Agency in consultation with the water company to manage this potential effect.

A jetty required for the construction of the viaduct across the River Colne may temporarily increase the risk of local flooding. The detailed design of the jetty and a flood risk management plan will be implemented in consultation with the Environment Agency.

Figure 21: The Chalfonts and Amersham area context map



8.8 The Chalfonts and Amersham

Overview

The Chalfonts and Amersham area is predominately rural in character and partly within the Chilterns AONB. The area includes a number of small villages including Horn Hill, Chalfont St. Peter and Chalfont St. Giles and the town of Amersham. The M25 forms the south-eastern boundary of the area and is the busiest local transport corridor in the vicinity. There are several main roads in the area including the A413, the A355 and the A404.

The project

The route will be in tunnel through this area (see Figure 21). The Chiltern tunnel will comprise of twin bored tunnels, approximately 13.5km in length, of which 11.3km will be within The Chalfonts and Amersham area. The Chiltern tunnel will commence east of the M25 between junctions 16 and 17 and east of Chalfont St. Peter. The route will pass to the north-west under Chalfont St. Giles and the River Misbourne. It will continue to the south of Amersham Old Town through to the junction of the A413 with Mop End Lane, west of Amersham. There will be three

ventilation shafts with associated headhouses in this area, near Chalfont St. Peter, Chalfont St. Giles and Amersham respectively. An auto-transformer station will also be located at the Chalfont St. Giles ventilation shaft.

Within this area, the main surface construction works will be limited to the three ventilation shafts, their associated headhouses and the auto-transformer station. Three satellite construction compounds will be required at these locations. A number of utilities, mainly electricity cables, will need to be installed.

Residual effects

Construction and operation of the project in this area are not likely to result in any adverse residual effects on air quality, cultural heritage, ecology, land quality, socio-economics or sound, noise and vibration. Similarly, no likely adverse residual effects have been identified as arising during operation for agriculture, forestry and soils, community, traffic and transport or water resources and flood risk.

Agriculture, forestry and soils

Construction of the project will result in land take from two agricultural holdings. These are Chalfont Valley Equestrian and Ashwell's Farm.

View looking south-east to the proposed Chiltern Tunnel portal from Hornhill Road

Community
Loss of the manège facility at Chalfont Valley Equestrian during construction may prevent the centre from continuing to operate. The equestrian centre will also experience adverse effects from construction traffic and visual impacts during construction.

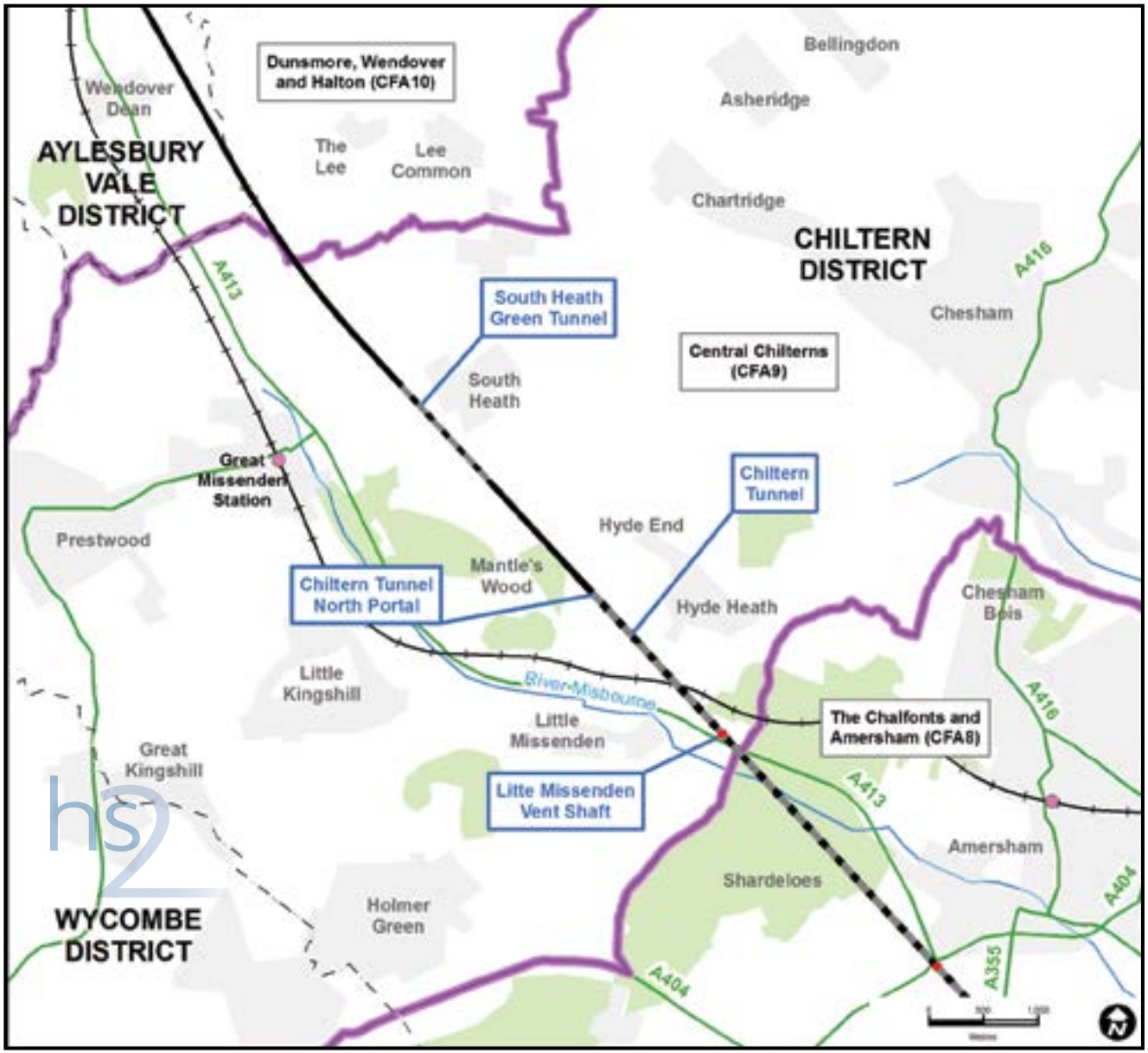
Landscape and visual assessment
The presence of construction works and changes to the existing landform and vegetation patterns will in some locations significantly affect the character and appearance of the local landscape. During operation, the effect of the project on the character and appearance of the local landscape will substantially reduce over time as mitigation planting grows and matures. Effects will remain in some parts of the local landscape due to the presence of the ventilation shaft headhouses.

The presence of construction works will cause temporary effects on views within the area including at Shire Lane and on Horn Hill, from Denham Lane, Chesham Lane, Bottom House Farm Lane, Piggotts Orchard and from a number of public rights of way. During operation, the three ventilation shaft headhouses and the auto-transformer feeder station will continue to affect views within the local area. The visual effect of the project will reduce over time as planting matures.

Traffic and transport
During construction, intermittent traffic congestion will occur at the junctions of the A413 with School Lane (Amersham Old Town) and Shardeloes, and of the A413 Amersham Bypass with the A404 Whielden Lane. Increased traffic during construction will affect pedestrians and cyclists using local roads, including the A413/A413 Amersham Bypass, between A404 Whielden Lane and B485 Frith Hill/Chesham Road; Bottrells Lane/Silver Hill/High Street (Chalfont St Giles)/ Pheasant Hill, between Bottom House Farm Lane and A413 London Road; Chesham Lane/Denham Lane, between Joiners Lane and Chalfont St. Peter ventilation shaft and headhouse satellite compound; and at Joiners Lane. Two public rights of way will be temporarily realigned with users having to travel increased distances.

Water resources and flood risk assessment
Construction works such as tunnelling and piling could affect groundwater quality which has the potential to temporarily affect public water supply. HS2 Ltd will agree a management strategy with the Environment Agency in consultation with the water company to manage this potential effect.

Figure 22: Central Chilterns area context map



8.9 Central Chilterns

Overview

The Central Chilterns area is predominately rural in character consisting of agricultural land and areas of woodland. Settlements in the area include Little Missenden, Great Missenden, Little Kingshill, Hyde Heath and South Heath. The route through this area is entirely within the Chilterns AONB. A number of main roads and railway lines pass through the area including the A413, the A4128 and the Marylebone to Aylesbury Line.

The project

The route will enter the area in tunnel beneath the A413 junction with Mop End Lane, heading north-west. A ventilation shaft and adjacent auto-transformer station will be to the north of the A413 at Little Missenden (see Figure 22). Emerging from the tunnel north-west of Hyde Heath, the route will run in cutting to the west of Hyde Heath then enter a 1.2km long tunnel past South Heath. The route will then run in cutting to Leather Lane, to the west of Ballinger Common, where the route will leave this area.

The project will require the demolition of eight dwellings and two community facilities, Weights

and Measures Gym and Annie Bailey's public house. Hyde Lane and Frith Hill will be temporarily closed for up to two years and the B485 Chesham Road, Leather Lane and King's Lane will be permanently realigned. A number of utilities, including electricity, will need to be installed or diverted. Five satellite construction compounds will be required in this area.

Planting and habitat creation have been included within the project, including, for example, two large areas of lowland mixed deciduous woodland; one immediately south of the Chiltern tunnel north portal and the other to the west of the Hedgemoor and Farthings Wood Local Wildlife Site.

Residual effects

Construction and operation of the project in this area are not likely to result in any adverse residual effects on air quality, land quality or socio-economics. Similarly, no likely adverse residual effects have been identified as arising during operation for agriculture, forestry and soils or water resources and flood risk.

Agriculture, forestry and soils

Construction of the project will result in land take from seven agricultural holdings. Three holdings (Mulberry Park Hill, Elwis Field Farm and 94 King's Lane) will be likely to cease to operate. Approximately 98ha agricultural land will be permanently lost including 78ha of high quality land.

Community

Construction of the project will lead to the permanent loss of land at Mantle's Wood in Hyde Heath and Sibley's Coppice in South Heath; residential properties in Hyde End; residential properties and community infrastructure in South Heath. There will be a temporary effect on residential amenity for some properties in South Heath as a result of increased traffic associated with construction, effects on views from the works and increased noise from construction vehicles and construction works. Land at Sibley's Coppice in South Heath will be temporarily required during construction. During operation, there will be residual permanent adverse effects on residential amenity for some properties in Hyde End from residential demolitions within the community and on Potter Row in South Heath due to noise from passing trains and views of the railway.

Cultural heritage

A number of archaeological assets will be permanently lost. These include archaeological remains in Mantle's Wood, on land to the north of Rowan Farm between the junctions of Hyde Lane and Chesham Road, on land between Hedgemoor Wood and Cudsden's Farm and west of Broome Farm, on land between B485 Chesham Road and Frith Hill passing through Sibley's Coppice ancient woodland and archaeological remains at the western edge of Potter Row. The project will result in the demolition of Annie Bailey's public house on the B485 Chesham Road, Chiltern Cottage and the Weights and Measures Gym both on Frith Hill.

The setting of several historic landscapes, settlements and buildings will be affected by the project. These include: Mantle's Wood, Farthings Wood, Sibley's Coppice, seven historically important hedgerows, Hyde Farm, Sheepcotts Cottage, Woodlands Park and Cottage Farm, Bury Farm and Hammondshall Farm.

Ecology
The project will result in the permanent loss of ancient woodland from: Mantle's Wood (approximately 6ha); Farthings Wood (approximately 0.5ha); and Sibley's Coppice (approximately 2.5ha). There will be a beneficial increase in the extent of semi-natural broadleaved woodland as a result of the planting of over 40ha of new woodland.

Landscape and visual assessment
The presence of construction works and changes to the existing landform and vegetation patterns will significantly affect the character and appearance of the local landscape. During operation, the effect of the project on the character and appearance of the local landscape will substantially reduce over time as mitigation planting grows and matures. Effects will remain in some parts of the local landscape due to the presence of the infrastructure and engineered landforms.

The presence of construction works will cause temporary effects on views within the area, including at the A413 Amersham Road, Hyde Lane, Cudsdens Court, B485 Chesham Road, Frith Hill and Potter Row. Views from a number of public rights of way and local roads will be affected. During operation, the Chiltern tunnel northern portal and associated infrastructure will continue to affect views within the area. The visual effect of the project will reduce over time as planting matures.

Sound, noise and vibration
Measures in the draft CoCP will be implemented to manage noise and vibration during construction, including the use of quiet and low-vibration equipment and screening along the edge of the construction worksites. Tall screening will be used around the Little Missenden ventilation shaft construction worksite and adjacent to the residential communities on Hyde Lane, B485 Chesham Road, Frith Hill and South Heath.

Noise from construction is likely to result in significant adverse effects on residential areas closest to the construction works at South Heath along Sibleys Rise, Bayleys Hatch and Frith Hill. Noise from construction traffic on King's Lane is likely to affect a limited number of residential properties in South Heath.

A number of mitigation measures have been included in the design of the project to mitigate noise effects during operation, including noise screening at various locations in this area.

The occupants of Sheepcotts Cottage on Hyde Lane in Hyde Heath have been assessed to be significantly affected by noise from the operation of the railway. For dwellings which satisfy the applicable qualifying criteria, HS2 Ltd will offer noise insulation. If noise insulation is accepted by the owner, this will help to reduce or avoid these effects.

Operation of the railway has been assessed as likely to result in increases in external noise that are considered significant around residential areas closest to the route in South Heath on Hyde Lane and in Hyde End on Potters Row.

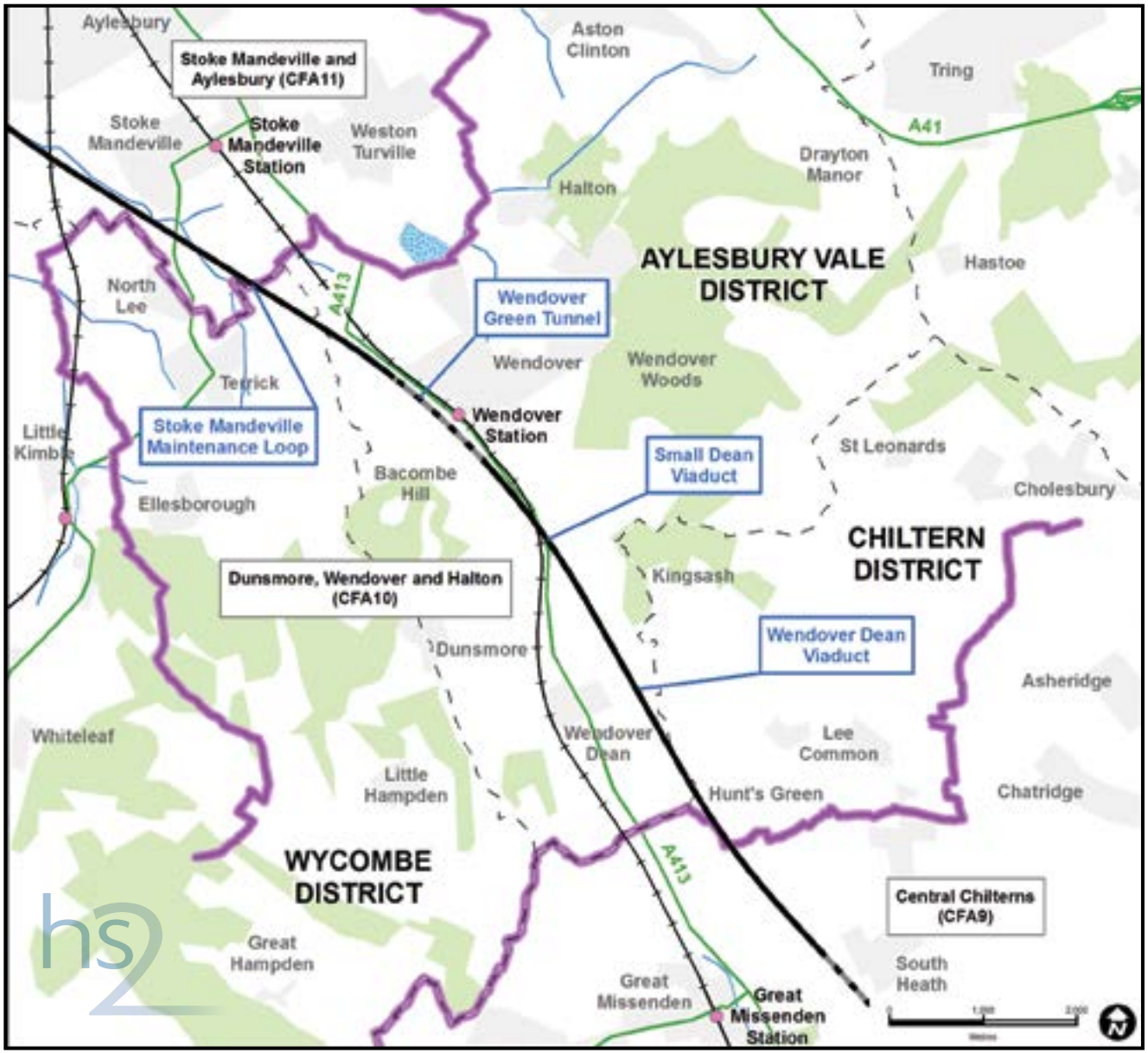
Traffic and transport
The increase in traffic during construction will lead to congestion and delays at junctions in the area including at the A413 London Road/A4128 Link Road and the A413 London Road/B485 Frith Hill; B485 Frith Hill/Chesham Road. Construction traffic in this area will affect pedestrians and cyclists using roads in the area including the A413 London Road/Nash Lee Road, Potter Row and King's Lane.

Temporary closure of Frith Hill and Hyde Lane during construction will increase journey times for users of these roads due to the additional travel distance required. Temporary closure and associated diversion of eight public rights of way during construction will affect pedestrians and cyclists due to the increased travel distances required by associated diversions.

The permanent realignment of eight public rights of way and two roads (King's Lane and the B485 Chesham Road) will have significant effects on pedestrians and cyclists due to the increased travel distances required by use of diverted or alternative routes.

Water resources and flood risk assessment
Construction works such as tunnelling and piling could affect groundwater quality which has the potential to temporarily affect public water supply. HS2 Ltd will agree a management strategy with the Environment Agency in consultation with the water company to manage this potential effect.

Figure 23: Dunsmore, Wendover and Halton area context map



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8.10 Dunsmore, Wendover and Halton

Overview

The Dunsmore, Wendover and Halton area is mainly rural in character, with areas of agricultural land, woodland and a number of villages including Wendover, Hunt's Green, Wendover Dean, Dunsmore and Kingsash. The majority of the route through this area is within the Chilterns AONB. A number of main roads and railway lines pass through the area including the A413 London Road/Nash Lee Road, and the Marylebone to Aylesbury Line.

The project

The route will enter this area in cutting at Leather Lane, north of Great Missenden (see Figure 23). It will proceed in a north-westerly direction on viaduct, over farmland to the north-east of Wendover Dean. Passing to the east of Dunsmore on a series of embankments and cuttings, the route will then cross the A413 London Road and Marylebone to Aylesbury Line on viaduct at Small Dean. It will then run parallel to the A413 London Road/Nash Lee Road and Marylebone to Aylesbury Line, passing Wendover in tunnel,

and emerging in cutting on the western edge of Wendover. An auto-transformer station will be required at Wendover, near Hartley Farm, south of Rocky Lane. Proceeding north-west, the route will cross the B4009 Nash Lee Road and pass to the east of Nash Lee. An auto-transformer station will be required north of Nash Lee Road on the east side of the route, near Stoke Grove.

One main construction compound will be located at the Small Dean viaduct. Nine satellite construction compounds will be required. Construction of the project will require the demolition of eight dwellings and Ellesborough Road Cricket Ground and pavilion owned by Wendover Cricket Club. Bowood Lane and Ellesborough Road will be temporarily diverted and Rocky Lane, the B4009 Nash Lee Road, the Nash Lee Lane junction with the B4009 Nash Lee Road will be permanently realigned. Bacombe Lane will be closed to enable the construction of the Wendover tunnel, with a temporary link provided to Ellesborough Road until the route is reinstated above Wendover tunnel. A number of utilities, including electricity, will need to be installed or diverted.

Residual effects

Construction and operation of the project in this area are not likely to result in any adverse residual effects on air quality, socio-economics, land quality or water resources and flood risk. Similarly, no likely adverse residual effects have been identified as arising during operation for agriculture, forestry and soils or community.

Agriculture, forestry and soils

An area has been identified for the sustainable placement of surplus excavated materials located near Hunt's Green Farm. The sustainable placement area will be restored to agricultural land when completed.

Construction of the project will result in land take from ten agricultural holdings. Of these, five holdings, including Durham Farm, Road Barn Farm and three smaller grazing holdings will cease to operate. Approximately 90ha agricultural land will be permanently lost including approximately 58ha of high quality land.

Community

Six residential properties will be demolished near Wendover and the Wendover Cricket Club's cricket ground and pavilion on Ellesborough Road will be lost. There will be temporary residential amenity effects for properties on both Bacombe Lane and Ellesborough Road, due to noise and visual effects. Similar temporary residential amenity effects will be experienced by properties on A413 London Road, east of Dunsmore.

There will be amenity effects due to noise and visual effects for some properties in Nash Lee during operation of the project.

Cultural heritage

Archaeological assets will be permanently removed including buried archaeological remains associated with Grim's Ditch Scheduled Monument, on land to the east of Wellwick Farm and north of Coneycroft Farm, on the west side of Hunt's Green Farm, around Upper Wendover Dean Farm, Wendover Dean Farm and Manor Farm, and on land between Bacombe Lane and Ellesborough Road. Earthworks and buried medieval remains of ridge and furrow will be lost east of Stoke Grove Farm and south of Nash Lee Road. Construction of the project will require the demolition of Durham Farm, Road Barn Farm, a railway bridge just north

of Road Barn Farm and 30-40 Ellesborough Road. Sections of 16 historically important hedgerows will be removed.

The presence of the construction works will affect the setting of a number of historic settlements and buildings including the surviving remains of Grim's Ditch Scheduled Monument, the ancient woodland at Jones' Hill Wood, Wendover Dean Farm, Upper Wendoverdean Farm, Wellwick Farm and Wendover southern focus. The operation of the project will affect the setting of the Wendover southern focus, Wendover Dean Farm, Upper Wendoverdean Farm and Old Mill House.

Ecology
Approximately 1ha of ancient woodland at Jones' Hill Wood will be lost. Planting to support existing habitats will include 5ha of semi-natural broadleaved woodland in this area.

Landscape and visual assessment
The presence of construction works and changes to the existing landform and vegetation patterns will significantly affect the character and appearance of the local landscape. During operation, the effect of the project on the character and appearance of the local landscape will substantially reduce over time as mitigation planting grows and matures. Significant effects will remain in some parts of the local landscape due to the presence of the infrastructure, engineered landforms and overhead line equipment.

The presence of construction works will cause temporary effects on views within the area, including at London Road, Bowood Lane, at the junction of King's Lane and Rocky Lane in Kingsash, near Little London in Dunsmore, on Small Dean Lane, Rocky Lane, Ellesborough Road, Nash Lee Road, Nash Lee Lane and Risborough Road. Views from a number of public rights of way and local roads will also be affected.

During operation, Wendover Dean and Small Dean viaducts will continue to affect views within the local area. The visual effect of the project will reduce over time as planting matures. The proposed planting will result in a beneficial visual effect on users of the public right of way along Bowood Lane.

Sound, noise and vibration
Measures in the draft CoCP will be implemented to manage noise and vibration during construction, including the use of quiet and low-vibration equipment and screening along the edge of the construction worksites. Tall screening will be used adjacent to the residential communities on Nash Lee Road, Ellesborough Road and Bacombe Lane.

Noise from construction is likely to result in significant adverse effects on residential areas closest to the construction works on Bacombe Lane and Ellesborough Road in Wendover. Potential significant adverse effects are reported for St Mary's Church, the Chiltern Way Federation School Wendover Campus and the community hall in Wendover.

A number of mitigation measures have been included in the design of the project to mitigate noise effects during operation, including tall noise barriers on the approach to the southern portal of the Wendover tunnel.

The occupiers of four dwellings closest to the route have been assessed to be significantly affected by noise from the operation of the railway. For dwellings which satisfy the applicable qualifying criteria, HS2 Ltd will offer noise insulation. If noise insulation is accepted by the owner, this will help to reduce or avoid these effects. The following dwellings are likely to qualify: Hartley Farm on Rocky Lane and Larkfield, Long Meadow and Cobwebs on Bacombe Lane.

Operation of the railway has been assessed as likely to result in increases in external noise that are considered significant around residential areas closest to the route in Wendover Dean (in the vicinity of Bowood Lane, London Road, Rocky Lane and Cheshunt Lane), Bacombe Lane in Wendover and Nash Lee Lane and Nash Lee Road in Nash Lee. St Mary's Church in Wendover is also likely to be affected.

Traffic and transport

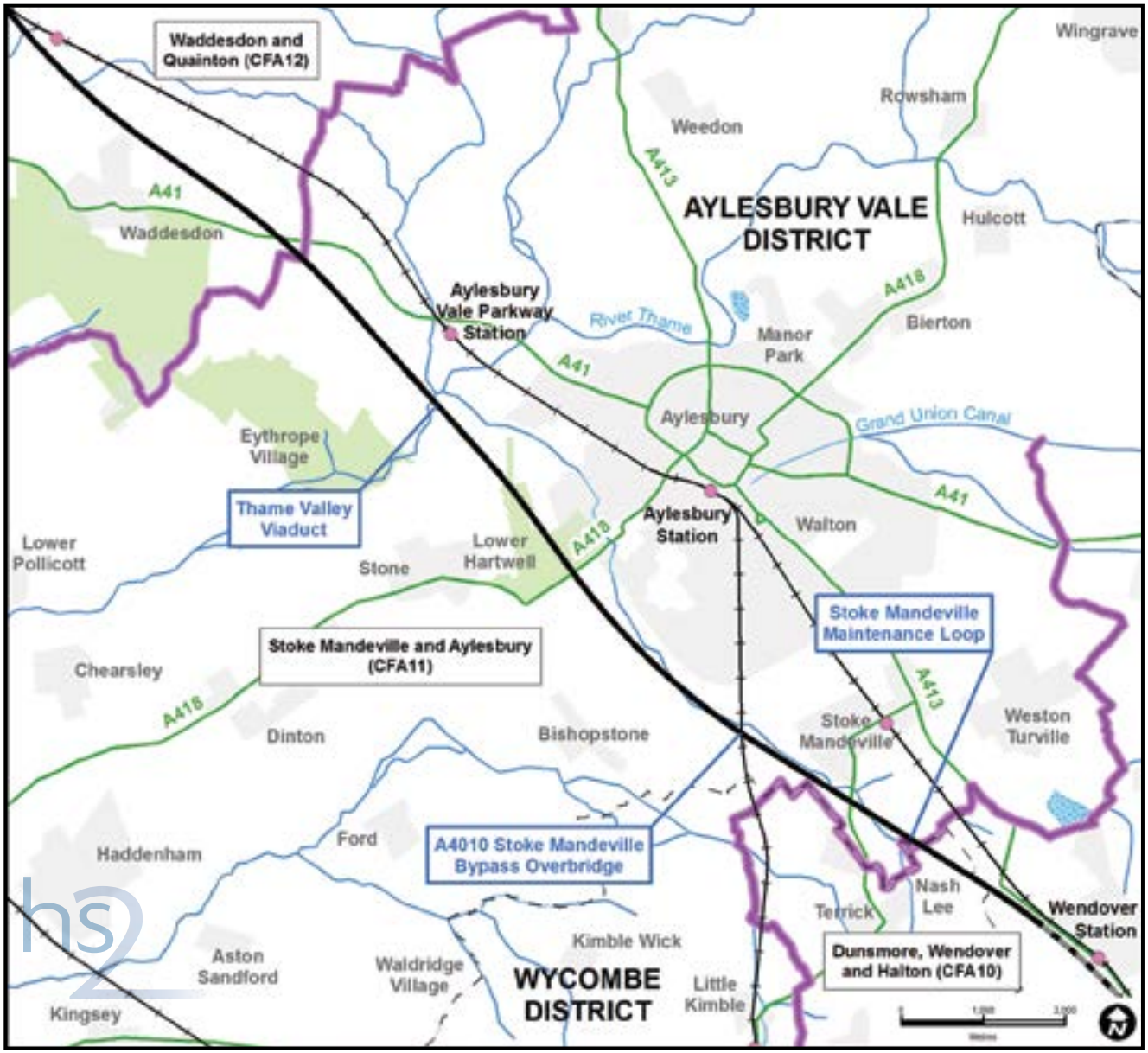
Sustainable placement of excavated materials on four fields adjacent to the project will avoid the traffic effects associated with the transfer of this material on the road network.

Increase in traffic during construction will lead to traffic congestion and delays at a number of junctions in the area including that of the A4010 Risborough Road with B4009 Nash Lee Road; the A413 Nash Lee Road with B4009 Nash Lee Road; the A413 Nash Lee Road with Small Dean Lane; the A413 London Road with Rocky Lane; the A413 London Road with Dunsmore Lane; and the A413 London Road with Bowood Lane. Construction traffic in this area will affect pedestrians and cyclists crossing and using local roads in the vicinity of the works.

Temporary closure of Bacombe Lane and Small Dean Lane during construction will cause delays for the users of these roads due to increased travel distances. The temporary closure and diversions of Ellesborough Road, Bowood Lane and 11 public rights of way will affect pedestrians and cyclists due to the increased travel distances.

During operation two public rights of way will be permanently realigned, along with Bacombe Lane. These realignments will affect pedestrians and cyclists due to increased travel distances.

Figure 24: Stoke Mandeville and Aylesbury area context map



8.11 Stoke Mandeville and Aylesbury

Overview

The Stoke Mandeville and Aylesbury area is rural in character with extensive areas of agricultural land. Settlements in the area include Aylesbury, Stoke Mandeville, Bishopstone, Stone, Lower and Upper Hartwell. A number of roads and railway lines pass through the area including the A41 Bicester Road, the A418 Oxford Road, the A413 Wendover Road and the Chiltern Railway Line, comprising the Marylebone to Aylesbury Line and the Princes Risborough to Aylesbury Line.

The project

The route will enter this area just north of Nash Lee and run in a north-westerly direction across A4010 Risborough Road and Marsh Lane and under the Princes Risborough to Aylesbury Line (see Figure 24). The route will continue to the west of Stoke Mandeville and Aylesbury, passing under the A418 Oxford Road, and then to the east of Hartwell House. An auto-transformer station will be located to the east of Sedrup. The route will cross the River Thame on viaduct to the east of Waddesdon and head north-west across the

Aylesbury Vale, before leaving the area south of the A41 Bicester Road. Part of the associated road works required in this area will be the introduction of a new length of road, forming an A4010 Stoke Mandeville bypass and running to the south and west of Stoke Mandeville. A maintenance loop will be provided to the south of A4010 Risborough Road, near Stoke Mandeville.

One main construction compound will be located off the A41 Bicester Road and seven satellite construction compounds will be required in this area. Construction of the project will require the demolition of two dwellings. The A4010 Risborough Road, Old Risborough Road and Marsh Lane will be permanently closed to vehicular traffic with the Stoke Mandeville bypass providing an alternative route. The A418 Oxford Road will be permanently realigned. A number of utilities, including gas and electricity, will also need to be diverted.

In this area Buckinghamshire County Council, the National Trust and other local groups support initiatives for green infrastructure between the project and the edge of Aylesbury. Areas for planting and habitat creation have been incorporated into the project - for example, at Stoke Brook, land south of Aylesbury Sewage Works Local Wildlife Site, land west of Putlowes Farm and land south-west of Fleet Marston Farm. HS2 Ltd is committed to working with these groups and the wider community and has included land within the project to enable the provision of additional landscape planting, open space and habitat creation.

Residual effects
Construction and operation of the project in this area are not likely to result in any residual effects on land quality, socio-economics and water resources and flood risk. No likely adverse residual effects have been identified as arising during construction for sound, noise and vibration. Similarly, no likely adverse residual effects have been identified as arising during operation for agriculture, forestry and soils or air quality.

Agriculture, forestry and soils
Construction of the project will result in land take from six agricultural holdings. Whitethorn Farm is likely to cease operating due to property demolition and loss of agricultural land (approximately 2.3ha). Approximately 208ha of agricultural land will be permanently lost including approximately 86ha of high quality land.

Air quality
Locations along the A41 Bicester Road in Aylesbury will experience a temporary reduction in air quality as a result of construction traffic.

Community
Residents of Whitethorn Close and Old Risborough Road in Stoke Mandeville will experience significant permanent isolation effects associated with the construction of a new road and the subsequent increased travel distances to community facilities in Stoke Mandeville. Land will be permanently lost at Aylesbury Park Golf Club.

During operation, some residential properties in Stoke Mandeville will experience amenity effects as a result of the presence of the project and operational noise.

Cultural heritage
The Grade II listed Glebe House will be demolished. Archaeological assets will be lost including the remains associated with the site of the former Church of St Mary's at Stoke Mandeville, the Romano-British site on A4010 Risborough Road, prehistoric/Romano-British remains to the south-west of Stoke Mandeville Hospital, part of the curtilage wall of the Grade I listed Hartwell House, prehistoric and Romano-

British remains between Walton Court and Bishopstone and around Locke's Pit. Medieval settlement remains within Hartwell House Registered Park and Garden and to the north of Hartwell House Registered Park and Garden, Fleet Marston Romano-British small town and enclosures south of Fleet Marston cottages will also be removed due to construction. Sections of 10 historically important hedgerows will also be removed.

The project will affect the setting of several historic settlements, buildings and landscapes. These include: Hartwell House Registered Park and Garden, Stoke House, Hall End, Sedrup and Lower Hartwell.

The noise and visual effects arising during the operation of the project will affect the setting of Hartwell Park, Stoke House, the deserted medieval village earthworks to the south of Stoke Mandeville, the Stoke Mandeville village envelope, Old Moat Farmhouse, Lower Hartwell and Putlowes Farm.

Landscape and visual assessment

The presence of construction works and changes to the existing landform and vegetation patterns will significantly affect the character and appearance of the local landscape. During operation, the effect of the project on the character and appearance of the local landscape will substantially reduce over time as mitigation planting grows and matures. Significant effects will remain in some parts of the local landscape due to the presence of the infrastructure, engineered landforms and overhead line equipment.

The presence of construction works will cause temporary effects on views within the area, including at Old Risborough Road, on Mayflower Close, at Upper Hartwell, at Lower Hartwell, at Putlowes and Coneyhill Cottages. Views from a number of public rights of way and local roads will also be affected. During operation, the Thame Valley viaduct and the raised railway on embankment with noise barriers past Aylesbury will continue to affect views in the local area. The visual effect of the project will reduce over time as planting matures.

The National Trust and HS2 Ltd have discussed plans for mitigation in the Aylesbury and Hartwell House area and additional land has been incorporated into the project to allow improved landscape integration.

Sound, noise and vibration

A number of mitigation measures have been included in the design of the project to mitigate noise effects during operation. In this area, noise barriers will be included at various locations and tall barriers will be used to the south-west and north-west of Aylesbury, to the south of Stoke Mandeville and at Lower Hartwell and Hartwell House.

The occupiers of five dwellings closest to the route have been assessed to be significantly affected by noise from the operation of the railway. For dwellings which satisfy the applicable qualifying criteria, HS2 Ltd will offer noise insulation. If noise insulation is accepted by the owners, this will help to reduce or avoid these effects. The following are likely to qualify: Putlowes Drive in Fleet Marston, Mill House Farm on Risborough Road, Whitethorn Farm, 5 Whitethorn Close and Old Moat Farm in Stoke Mandeville.

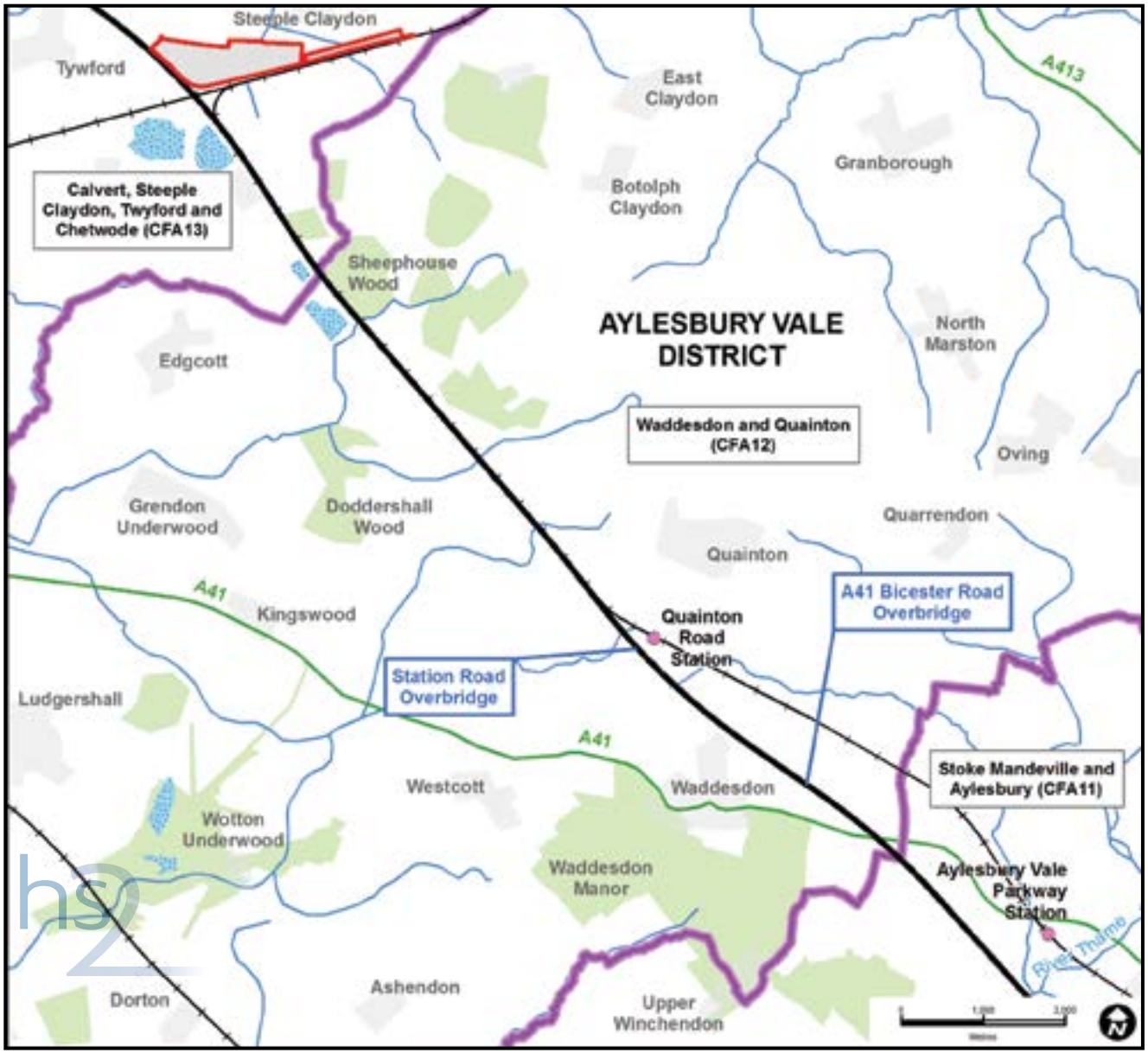
Operation of the railway will lead to changes in the external noise environment that are considered significant around residential areas closest to the route at the southern and western edges of Stoke Mandeville, the south-western edge of Aylesbury and at Sedrup. Booker Park School is also likely to be affected. Residential areas on Risborough Road and the Church of St Mary the Virgin in Stoke Mandeville are likely to experience a reduction in noise due to the closure of Risborough Road that is considered significant.

Traffic and transport

Increase in traffic during construction will cause intermittent traffic congestion at a number of junctions in the area, including the A41 Bicester Road with Aylesbury Way Parkway, the A418 Oxford Road with Coldharbour Way, and the A418 Oxford Road with the A41 Gatehouse Road and the A41 Friarge Road. Construction traffic in this area will affect pedestrians, cyclists and horse riders using roads including the A41 Bicester Road, West of A418 Oxford Road, and the A418 Oxford Road, between Thame and Aylesbury. Temporary realignment of 11 public rights of way will increase travel distances for pedestrians and cyclists.

The A4010 Stoke Mandeville bypass will result in a decrease in traffic flow on nearby roads including Marsh Lane, east of the A4010 Stoke Mandeville bypass; south of the A4010 Stoke Mandeville bypass; and the A4010 Risborough Road, north of the A4010 Stoke Mandeville bypass. It will benefit pedestrians, cyclists and horse riders using these roads. The stopping up of Old Risborough Road will increase traffic flow on this road affecting pedestrians, cyclists and horse riders using the road as well as requiring the diversion of the 300 and 321 bus services. The permanent closure of A4010 Risborough Road, Marsh Lane and Old Risborough Road will cause delay for users of these roads due to the additional travel distance required to use the A4010 Stoke Mandeville bypass. The permanent diversion of a number of public rights of way will be required to accommodate the project and the A4010 Stoke Mandeville bypass will increase travel distances due to the length of diverted or alternative routes for pedestrians, cyclists and horse riders.

Figure 25: Waddesdon and Quainton area context map



8.12 Waddesdon and Quainton

Overview

The Waddesdon and Quainton area is mainly rural with mixed agricultural land. Settlements in the area include Waddesdon and Quainton. A number of roads and railway lines pass through the area including the A41 Bicester Road, Chiltern Main Line and the Aylesbury Link railway line.

The project

The route will enter this area to the south of the A41 Bicester Road, near Fleet Marston, and proceed in a north-westerly direction past Waddesdon to the south-west (see Figure 25). It will pass through the southern edge of Quainton, near the Buckinghamshire Railway Centre, and will then run parallel to the Aylesbury Link railway line crossing over the River Ray and passing Finemere Wood Site of Special Scientific Interest. The route will leave the area at the north-west corner of Sheephouse Wood Site of Special Scientific Interest. A National Grid traction power feeder station will be located to the east side of the project, close to the Quainton auto-transformer feeder station.

One main and two satellite construction compounds will be required in this area and are located at the A41 Bicester Road, Station Road and Woodlands cutting. One dwelling will be demolished. The A41 Bicester Road, Station Road and Edgcott Road will be permanently realigned and a section of Blackgrove Road and Station Road will be permanently closed. A number of utilities, including electricity, will need to be diverted.

Planting and habitat creation have been included within the project - including, for example, new woodland habitat between Finemere Wood and Sheephouse Wood and grassland at Grendon and Doddershall Meadows Local Wildlife Site.

Residual effects

Construction and operation of the project in this area are not likely to result in any adverse residual effects on air quality, land quality, socio-economics or water resources and flood risk. Similarly, no likely adverse residual effects have been identified as arising during operation for agriculture, forestry and soils, community or sound, noise and vibration.

Agriculture, forestry and soils

Construction of the project will result in land take from six agricultural holdings. Of these, two (Crosslands Farm and Woodlands Farm Cottage 2) are likely to cease to operate due to the amount of their land permanently required. The remaining holdings will retain sufficient land to be able to continue to operate, although Glebe Farm is likely to cease dairy farming.

Community

The amenity of residential properties on Grendon Road and Buckingham Road and the village hall in Edgcott will be temporarily affected due to increased noise and construction vehicles. Users of St Leonard's Church in Grendon Underwood will experience similar effects. Access to the Buckinghamshire Railway Centre's overflow car park will be lost during construction. The car park's capacity will be permanently reduced by approximately 40%, which may affect the ability of the centre to hold special events in the future.

Cultural heritage

Archaeological assets will be permanently removed including the remains associated with Doddershall deserted medieval village, a possible mill mound and Roman ditches at two locations.

The project will require the demolition of a number of non-designated assets including The Lodge and several railway bridges. Earthworks near Glebe Farm, ridge and furrow in ten separate locations and sections of two historically important hedgerows will also be removed.

The project will affect the setting of Doddershall House, well and gate piers, the Claydon registered park and garden and conservation area, Stoke House, Hall End, Sedrup and Lower Hartwell.

The noise and visual effects arising during the operation of the project will affect the setting of the complex of listed buildings at Doddershall House, Upper South Farm, Lower South Farm and the Claydon Registered Park and Garden and conservation area.

Ecology

Approximately 1.5ha of ancient woodland south-east of Calvert will be lost. To compensate for losses of woodland, broadleaved woodland will be planted, increasing the amount in the area and improving woodland connectivity, resulting in a beneficial effect.

Landscape and visual assessment

The presence of construction works and changes to the existing landform and vegetation patterns will significantly affect the character and appearance of the local landscape. During operation, the effect of the project on the character and appearance of the local landscape will substantially reduce over time as mitigation planting grows and matures. Significant effects will remain in some parts of the local landscape due to the presence of the infrastructure, engineered landforms and overhead line equipment.

The presence of construction works will cause temporary effects on views within the area including at Lower Blackgrove Farm, Wayside Farm, Upper South Farm, Middle Farm and Lower South Farm and those located south of Woodlands Farm. Views from Doddershall House, Finemerehill House and a number of public rights of way and local roads will also be affected. During operation the auto-transformer feeder station and National Grid substation at Quainton will continue to affect views within the local area. The visual effects of the project will reduce over time as planting matures.

Sound, noise and vibration

Measures in the draft CoCP will be implemented to manage noise and vibration during construction, such as the use of screening along the edge of the construction worksites. Construction traffic on Grendon Road/ Buckingham Road and Buckingham Road/Gawcott Road is likely to result in significant adverse effects on residential properties adjacent to the roads in Edgcott and Gawcott as well as Edgcott Village Hall and St Leonard's Church.

A number of mitigation measures have been included in the design of the project to mitigate noise effects during operation.

The occupiers of eight dwellings at Crossroads Farm, Woodlands Barn, Woodlands Farmhouse, Woodlands Farm Cottages and Woodlands Lodge near Quainton and Upper Greatmoor Farm and Lower Greatmoor Farm near Edgcott have been assessed to be significantly affected by noise from the operation of the railway. For dwellings which satisfy the applicable qualifying criteria, HS2 Ltd will offer noise insulation. If noise insulation is accepted by the owner, this will help to reduce or avoid these effects.

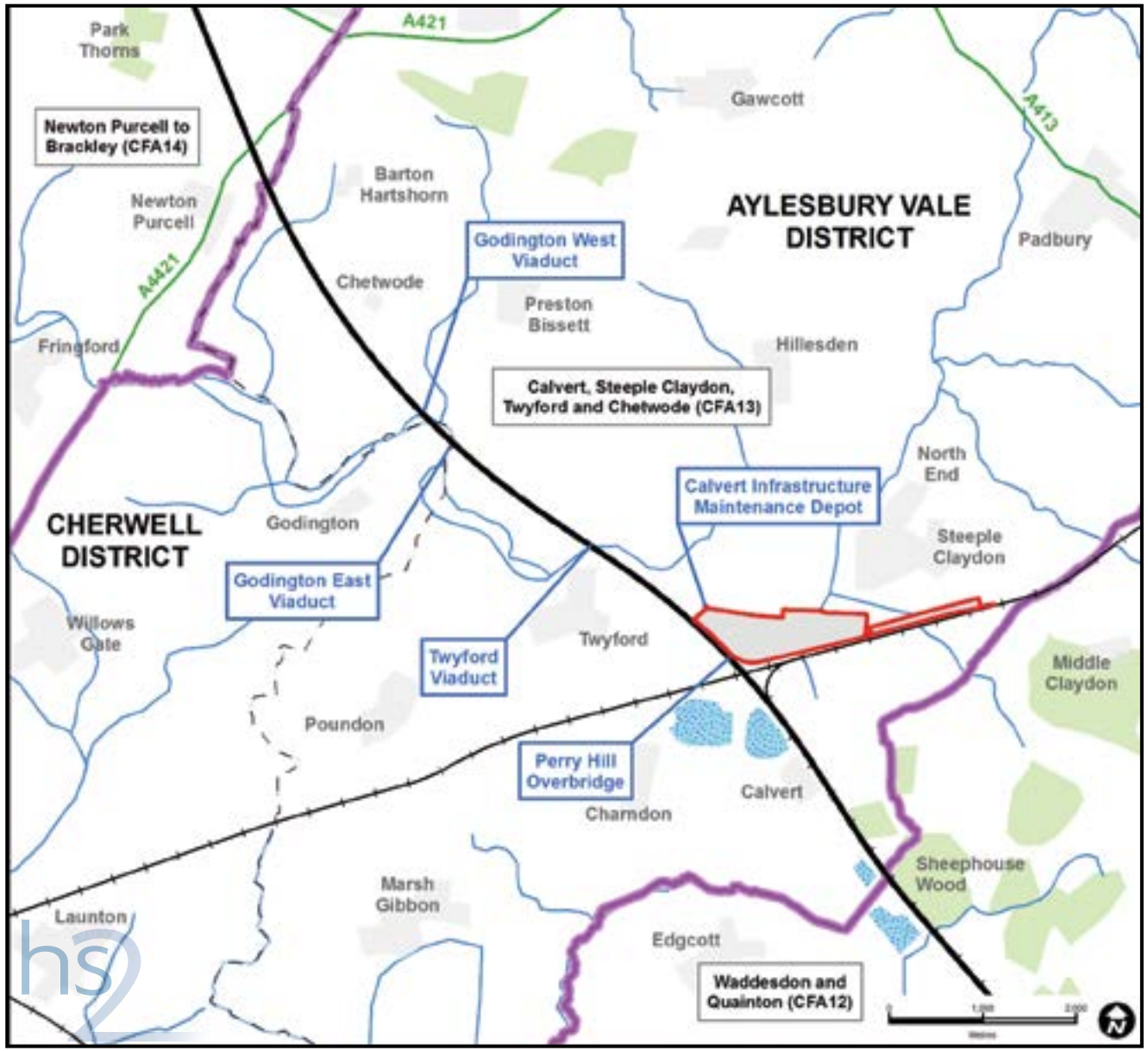
Traffic and transport

The increase in traffic will lead to congestion at junctions in the area, including the A41 Aylesbury Road/The Broadway, Grendon Road/Edgcott Road and Marsh Gibbon Road and Edgcott Road/ Main Street and The Broadway. An increase in traffic during construction and traffic generated by operational staff at the Calvert depot, will affect pedestrians, cyclists and horse riders using roads in the area, including The Broadway, Buckingham Road, Grendon Road and Edgcott Road.

Six public rights of way will be temporarily closed. The loss of overflow parking capacity at the Buckinghamshire Railway Centre will have a significant effect on visitors during construction and operation.

During operation, road users will be affected by additional travel distance caused by the closure of Station Road and Waddesdon Hill. The Fleet Marston bus stops, from outside Cranwell Gate to the new junction of Waddesdon Hill, will be permanently relocated. Eleven public rights of way will be permanently realigned resulting in increased travel distances for pedestrians and cyclists.

Figure 26: Calvert, Steeple Claydon, Twyford and Chetwode area context map



8.13 Calvert, Steeple Claydon, Twyford and Chetwode

Overview

The Calvert, Steeple Claydon, Twyford and Chetwode area is mainly rural in character, with agriculture being the main land use. Steeple Claydon is the largest settlement in the area. A number of roads and railway lines pass through the area including the A421 Tingewick Road, the A41, the Bicester to Bletchley Line, and the Aylesbury Link railway line.

The project

The route will enter this area at the north-western edge of Sheephouse Wood, to the south of Calvert, and proceed in a north-westerly direction parallel to the realigned Aylesbury Link railway line (see Figure 26). It will pass to the east of Calvert under the realigned Bicester to Bletchley rail line and then to the west of Steeple Claydon, broadly following the alignment of the disused Great Central Main Line.

An infrastructure maintenance depot at Calvert will be located in the land adjacent to the eastern side of the route and the associated tracks will run west to east, on the northern side, alongside the

Bicester to Bletchley Line for approximately 3km. The infrastructure maintenance depot will occupy an area of approximately 37ha and will provide the base for infrastructure maintenance work across the new high speed railway.

The route will pass to the east of Twyford, crossing the Padbury Brook before passing to the east of Godington. It will then pass to the west of Chetwode and will continue on towards the county boundary between Buckinghamshire and Oxfordshire, to the west of Barton Hartshorn.

Main construction site compounds including a railhead will be located at West Street and at Calvert railhead and infrastructure maintenance depot near Steeple Claydon. Railheads will be used as the delivery location for bulk rail-borne materials, such as ballast, rails and sleepers. Six satellite construction compounds will be required. Construction will require the demolition of seven dwellings, an electrical sub-station and a gas pumping station. West Street, School Hill and School End will require temporary diversions and Addison Road, Perry Hill and The Green will be permanently realigned. The Bicester to Bletchley and Aylesbury Link railway lines will be realigned where they cross the route and a number of utilities, including electricity, gas mains and sewers will need to be diverted.

Planting and habitat creation have been incorporated into the project, including for example, scrub and woodland habitat extending south from School Hill to Decoypond Wood.

Residual effects

Construction and operation of the project in this area are not likely to result in any adverse residual effects on air quality, land quality or socio-economics. Similarly, no likely adverse residual effects have been identified as arising during operation for agriculture, forestry and soils or water resources and flood risk.

Agriculture, forestry and soils

An area has been identified for the sustainable placement of surplus excavated materials located adjacent to School Hill, the Aylesbury Link railway line and the Bicester to Bletchley Line, to permanently dispose of surplus excavated material generated from bored tunnels in the London area. This material will be moved off-site by rail as the location at which this surplus excavated material arises and the volumes generated make road transportation impracticable.

Construction of the project will result in land take from eight agricultural holdings. One, a pig farming unit at Twyford, is likely to cease to operate. Approximately 175ha of agricultural land will be permanently lost including approximately 22ha of high quality land.

Community

There will be temporary isolation effects for the communities of Calvert and Charndon during the temporary closure of School Hill, which is the principal link to community infrastructure in Steeple Claydon. There will also be temporary effects on amenity of some residential properties in Calvert and Chetwode and for the Great Moor Sailing Club, as a result of increased traffic associated with construction and noise effects.

The amenity of some residential properties in Chetwode, and a small number of residential properties and the Church of Assumption of the Blessed Virgin Mary in Twyford closest to the route, will experience operational noise and views of the project.

Cultural heritage

The Grade II listed Shepherd's Furze Farmhouse will be demolished. Non-designated assets will also be demolished, including The Station House, Rosehill Cottage and several railway bridges. Archaeological assets will be permanently removed including underground remains associated with Calvert station, the remains of Chetwode Mill and the moat around The Hermitage.

The setting of several historic settlements and buildings will be affected by the project. These include St Mary's House, Sunflower Farmhouse, The Hermitage, Rose Hill Farm and the village of Twyford. Sections of four historically important hedgerows will be removed.

The noise and visual effects arising during the operation of the project will affect the setting of the village of Chetwode, the Church of St Mary, the Church of St Mary and St Nicholas, St Mary's House, Sunflower Farmhouse, The Hermitage, Rose Hill Farm, Blackmoorhill Farm and the village of Twyford.

View looking towards the proposed line of route from Church Gate, Twyford

Ecology

The construction of the eastern bank of Calvert cutting will result in the permanent loss of 1.1ha of ancient woodland from the western side of Decoypond Wood local wildlife site. The proposed extensive new planting of 5.7ha of broadleaved woodland between Sheephouse Wood and Decoypond Wood will increase woodland connectivity in the area.

Landscape and visual assessment

The presence of construction works and changes to the existing landform and vegetation patterns will significantly affect the character and appearance of the local landscape. During operation, the effect of the project on the character and appearance of the local landscape will substantially reduce over time as mitigation planting grows and matures. Significant effects will remain in some parts of the local landscape due to the presence of the infrastructure maintenance depot, engineered landforms and overhead line equipment.

The presence of construction works will cause effects on views within the area, including at Elm Tree Farm, Portway Farm, Cowley Farm and Barton Hill Farm. Views from a number of public rights of way and local roads (e.g. West Street in Twyford) will be affected. During operation, the infrastructure maintenance depot at Calvert and the Twyford embankment will continue to affect local views. The visual effects of the project will reduce over time as planting matures.

Sound, noise and vibration

Measures in the draft CoCP will be implemented to manage noise and vibration during construction, including the use of quiet and low-vibration equipment and screening along the edge

of the construction worksites. Tall screening will be used adjacent to the residential communities at Calvert and Chetwode and non-residential receptors at Godington.

Noise from construction may result in significant adverse effects at the Church of the Assumption of the Blessed Virgin Mary in Twyford. Noise from construction traffic is likely to affect a number of residential and commercial properties closest to the road where it travels along Perry Hill, School Hill and School End.

A number of mitigation measures have been included in the design of the project to mitigate noise effects during operation. In this area screening has been included at various locations including at Calvert and Twyford.

The occupiers of four dwellings at Rosehill Barns, Rosehill Farm and The Hermitage in Chetwode and the one proposed residential dwelling at Manthorne Farm have been assessed to be significantly affected by noise from the operation of the railway. For dwellings which satisfy the applicable qualifying criteria, HS2 Ltd will offer noise insulation. If noise insulation is accepted by the owner, this will help to reduce or avoid these effects.

Operation of the railway has been assessed as likely to result in increases in external noise that are considered significant around residential areas closest to the route in Calvert (in the vicinity of Cotswolds Way, Brackley Lane, Sandy Road and Brickhill Way), Twyford (in the vicinity of Grange Close and Church Street) and Chetwode. The Church of the Assumption of the Blessed Virgin Mary in Twyford is also likely to be affected.

Traffic and transport

Increase in traffic during construction will lead to congestion at a number of junctions in the area, including the A421/the A4421 and Sandpit Hill, Barton Road/the A421, Perry Hill/School Hill and Gawcott Road/the A421. Construction traffic in this area will affect pedestrians, cyclists and horse riders using School End/Barton Hartshorn Road, Manor Farm Road, Barton Road, Perry Hill, School Hill, Buckingham Road/ Gawcott Road and Addison Road.

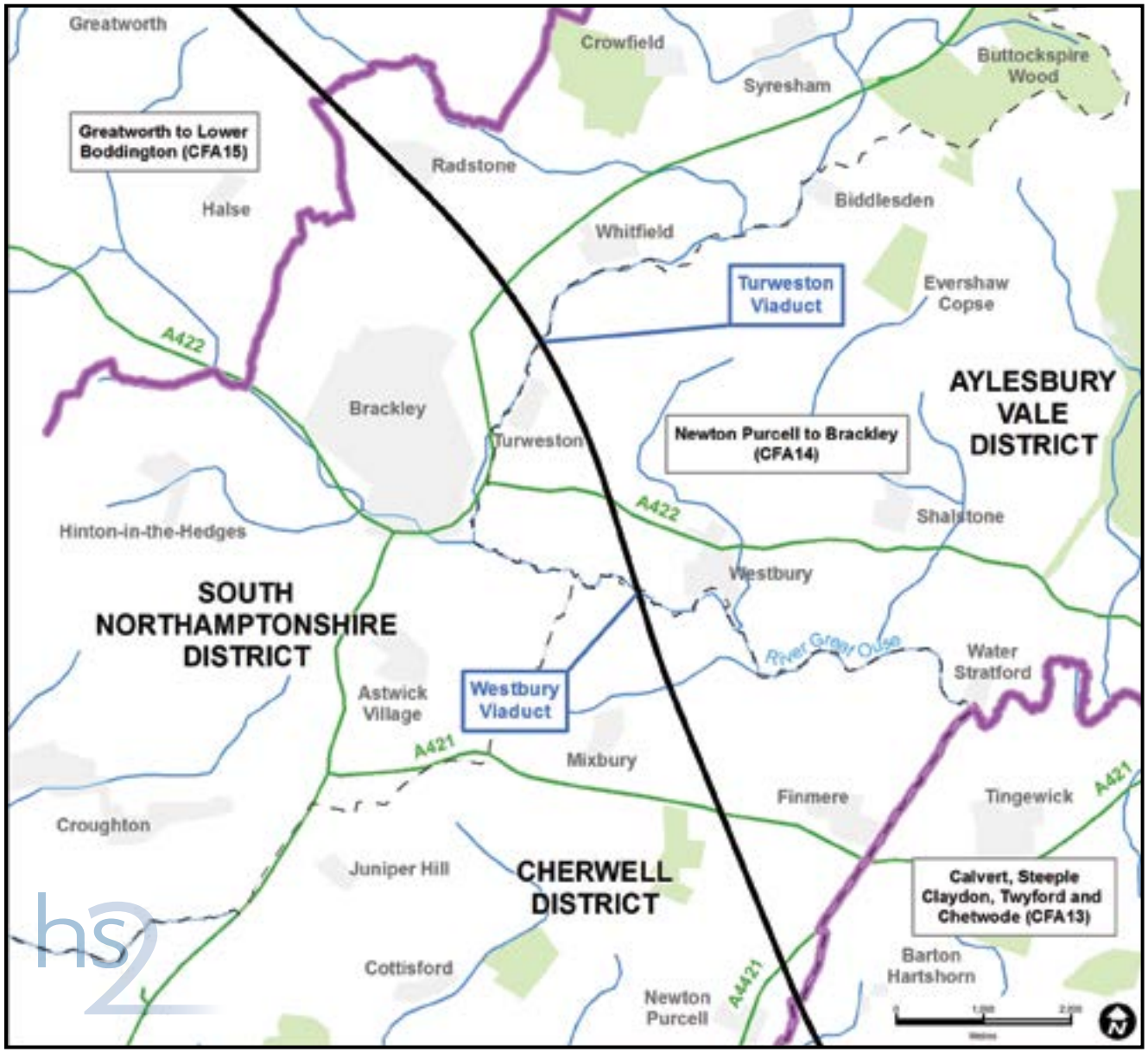
During construction, temporary closures of West Street, School Hill and School End and two public rights of way will cause delays for users due to the additional travel distances required by diversions. The closure of West Street and School Hill will also require the diversion of three bus services resulting in delays for the users of these services.

During operation, an increase in off peak traffic, due to workers commuting to and from the infrastructure maintenance depot will affect pedestrians and cyclists using Main Street, West Street and Perry Hill. The permanent realignments of 14 public rights of way and Addison Road will affect pedestrians and cyclists due increased travel distances.

Water resources and flood risk assessment

The crossings of the Padbury Brook and tributaries at Twyford will create a restriction to floodplain flows, which will reduce the frequency and severity of flooding of land on both banks of Padbury Brook downstream of the project. Replacement floodplain storage will be provided on the west bank, upstream of the former Great Central Main Line embankment. This will ensure there is no flood effect on the agricultural land between the disused Great Central Main Line and the project, upstream of the Great Central Main Line or to Church View Farm.

Figure 27: Newton Purcell to Brackley area context map



8.14 Newton Purcell to Brackley

Overview

The Newton Purcell to Brackley area is mainly rural with mixed agricultural land. Settlements in the area include Newton Purcell, Westbury, Turweston Brackley, Finmere and Mixbury. The main transport routes within the area include the A43 Oxford Road which links the M1 and M40 via Brackley; the A421 London Road, which links the A43 south of Brackley to Milton Keynes, and the A422 Brackley Road, between Banbury and Buckingham.

The project

From Newton Purcell, the route will pass to the east of Mixbury in cutting and cross the River Great Ouse to the west of Westbury (see Figure 27). The route will pass Turweston and cross the River Great Ouse again, upstream of Brackley, to the west of Whitfield. It will then proceed in a north-westerly direction, predominantly in cutting, passing to the west of Radstone, and will leave the area south-east of Halse Copse South.

Two viaducts will be constructed, one west of Westbury and one north of Turweston. Two auto-transformer stations will be constructed; one east of Tibbets Farm and one south of the A43 Oxford Road, near Whitfield.

One main construction site compound will be located near Brackley. Seven satellite construction compounds will be required. The project will require the demolition of five dwellings and Ballabeg Stables. A number of utilities, including electricity, will be diverted.

Planting and habitat creation have been included within the project including for example, land immediately east of Helmdon Disused Railway SSSI for lowland calcareous grassland, scrub, hedgerows and lowland mixed deciduous woodland.

Residual effects
Construction and operation of the project in this area are not likely to result in any adverse residual effects on air quality, land quality or water resources and flood risk. Similarly, no likely adverse residual effects have been identified as arising during operation for agriculture, forestry and soils or socio-economics.

Agriculture, forestry and soils
Construction of the project will result in land take from 11 agricultural holdings. Iletts Farm and three equestrian units are likely to cease to operate. Approximately 163ha of agricultural land will be permanently lost including approximately 104ha of high quality land.

Community
Land from Turweston playing fields will be required for construction and operation of the project. Ballabeg Stables (Ballabeg Arabians) in Turweston will be demolished. Land will be required from Whitfield Racecourse for construction and operation of the project.

The amenity of some residential properties in Radstone will be affected by noise and visual effects from the operation of the project.

Cultural heritage
A number of archaeological assets, including Romano-British remains (notably near Sundale) and surviving remains of the Great Central Railway station at Newton Purcell will be lost. A number of non-designated built heritage assets including Illets Farm and the Station House and bridges associated with the Great Central Railway will be demolished. The project will permanently sever areas of ridge and furrow landscape and six lengths of historic hedgerow.

The setting of the historic settlements of Upper Radstone and Turweston will be affected during the construction and operation of the project and the settlement of Westbury will be affected during construction.

Land quality
With the application of the measures contained within the draft CoCP, no adverse impacts are anticipated with respect to contaminated land. The project route will be adjacent to Finmere Railway Cutting landfill site. The remediation of this potentially contaminated site will result in a beneficial effect.

Landscape and visual assessment
The presence of construction works and changes to the existing landform and vegetation patterns will significantly affect the character and appearance of the local landscape. During operation, the effect of the project on the character and appearance of the local landscape will substantially reduce over time as mitigation planting grows and matures. Significant effects will remain in some parts of the local landscape due to the presence of engineered landforms, infrastructure and overhead line equipment.

The presence of construction works will cause temporary effects on views within the area including at Warren Farm, those at the north-western edge of Westbury, from the north-eastern edge of Turweston, Brackley Sawmills residential development, at the north-eastern

edge of Whitfield and at the southern edge of Radstone. Views from a number of public rights of way and roads will also be affected. During operation, the Westbury and Turweston viaducts and the A4421 Buckingham Road bridge, will continue to affect views within the local area. The visual effects of the project will reduce over time as planting matures.

Sound, noise and vibration

Measures in the draft CoCP will be implemented to manage noise and vibration during construction, including the use of quiet and low-vibration equipment and screening along the edge of the construction worksites. Tall screening will be used adjacent to the residential communities at Newton Purcell, Turweston and Radstone.

Noise from construction may result in significant adverse effects in Radstone at St Lawrence's Church and at the proposed bed and breakfast development at Hall Farm.

A number of mitigation measures have been included in the design of the project to mitigate noise effects during operation, including the use of tall noise barriers at Newton Purcell, Finmere and Turweston.

The occupiers of Oaks Farm have been assessed to be significantly affected by noise from the operation of the railway. For dwellings which satisfy the applicable qualifying criteria, HS2 Ltd will offer noise insulation. If noise insulation is accepted by the owners, this will help to reduce or avoid these effects.

Operation of the railway has been assessed as likely to result in increases in external noise that are considered significant around the residential areas closest to the route at Finmere, Turweston and Radstone. St Lawrence's Church in Radstone is also likely to be affected.

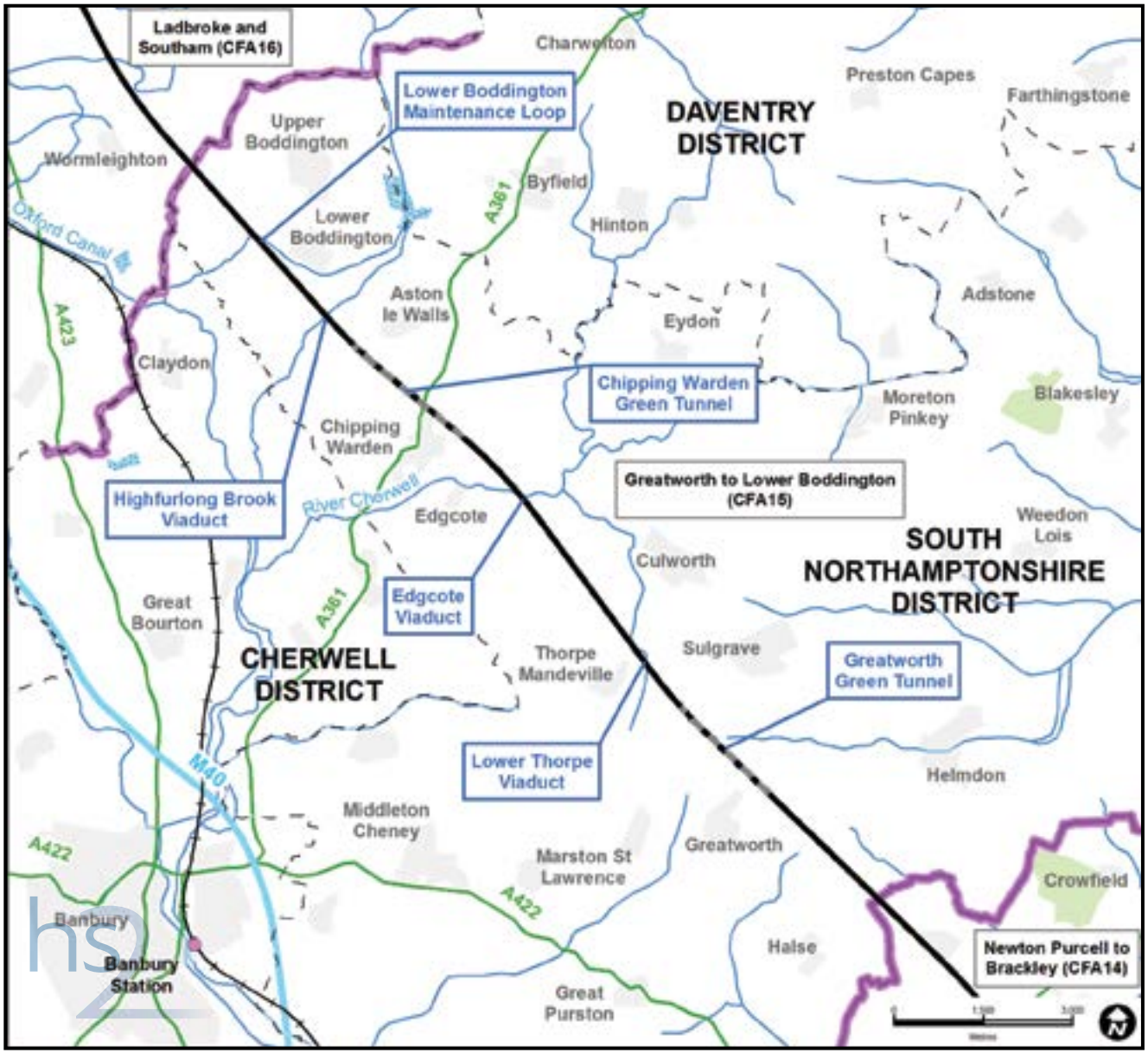
Traffic and transport

Construction works will require the temporary closure of Featherbed Lane, A421 London Road and A422 Brackley Road. A diversion will be provided, but this will cause delay for all road users. The increase in traffic during construction will lead to congestion at a number of the junctions in the area, including J10 of the M40 with the A43 Oxford Road, the A43 junction with the A421 London Road and the A43 junction with the A422 Brackley Road and A43 Oxford Road.

Temporary closure of 11 public rights of way will affect pedestrians and cyclists due to increased travel distances.

During operation twelve public rights of way and four roads (Radstone Road, the A43 Oxford Road, the A422 Brackley Road, A421 London Road and the A4421 Buckingham Road) will be permanently realigned, affecting pedestrians and cyclists due to the increased travel distances. Bus stops outside Shelswell Inn will be removed. HS2 Ltd will work with the local authorities and bus operators to seek to identify alternative bus stop locations to mitigate this effect.

Figure 28: Greatworth to Lower Boddington area context map



8.15 Greatworth to Lower Boddington

Overview

The Greatworth to Lower Boddington area is mostly rural in character, with agriculture being the main land use. Settlements include the villages of Greatworth and Chipping Warden, Thorpe Mandeville, Sulgrave, Culworth, Aston le Walls, Upper Boddington and Lower Boddington. Transport routes include the M1, the M40 and the A361.

The project

From south-east of Halse Copse South, the route will proceed north in a series of cuttings, embankments and viaducts, passing to the east of the settlements of Greatworth, Thorpe Mandeville, Edgcote and Chipping Warden, and to the south-west of Aston le Walls (see Figure 28). Running northwards, it will pass to the north-west of Lower Boddington before reaching the edge of the area at the Northamptonshire and Warwickshire county boundary, west of Fox Covert. Three viaducts will cross Lower Thorpe, the River Cherwell and Highfurlong Brook. Tunnels will be located at Greatworth and at Chipping Warden. Auto-transformer stations

will be adjacent to the southern entrance of the Greatworth tunnel, east of Wardington Road at Edgcote and adjacent to the tunnel entrance at Chipping Warden.

The project will require the demolition of four dwellings. A main construction site compound will be located east of Chipping Warden. Six satellite compounds will be located in the area. Five roads will be permanently diverted and one permanently closed.

Planting and habitat creation have been included within the project including for example, an area of lowland mixed deciduous woodland and lowland meadow grassland to connect Halse Copse South Local Wildlife Site with Halse Copse North Local Wildlife Site.

Residual effects

Construction and operation of the project in this area are not likely to result in any adverse residual effects on air quality or land quality. Similarly, no likely adverse residual effects have been identified as arising during operation for agriculture, forestry and soils, socio-economics or water resources and flood risk assessment.

Agriculture, forestry and soils

Construction of the project will result in land take from 28 agricultural holdings. Of these, five (Lower Thorpe Farm, Twin Oaks, Fir Tree Nursery, Spella Field and The Bungalow) are likely to cease to operate. Approximately 193ha agricultural land will be permanently lost including 29ha of high quality land.

Community

Glyn Davies Wood nature reserve will be inaccessible during construction. Two properties in the small hamlet of Lower Thorpe will be lost. Land will be permanently required for the project at Culworth Grounds Farm and Washbrook Farm, which operate as equestrian centres.

Some residential properties on Banbury Lane as well as users of Church of St John the Baptist, the village hall and The Three Conies public house in Thorpe Mandeville will experience temporary adverse effects on amenity as a result of construction vehicles and noise effects. There will also be temporary adverse amenity effects for some residential properties and Chipping Warden Primary School on the A361 Byfield Road and some residential properties and The Carpenters Arms on Banbury Road in Lower Boddington, in each case due to temporarily increased traffic associated with construction, visual and noise effects.

Up to 10 residential properties around Banbury Lane, in the north of Thorpe Mandeville and in Lower Thorpe will be affected permanently by the views of and noise from the operation of the project.

Cultural heritage

The Grade II listed Lower Thorpe Farmhouse, the non-designated Stone House and a former wireless station within Greatworth Park will be lost. Archaeological assets will be permanently lost including prehistoric cropmark sites, Romano-British settlement remains (notably near Edgcote) and remains that may be associated with the Battle of Edgcote. Twenty-nine lengths of historic hedgerow and part of the ancient woodland of Halse Copse South will be permanently removed. Elements of ridge and furrow that contribute to the setting of historic settlements and buildings such as Greatworth Hall and Thorpe Mandeville will be removed.

The setting of Edgcote House and associated parkland, the landscape of the Battle of Edgcote, Edgcote, Greatworth, Thorpe Mandeville and Lower Thorpe will be affected visually and by noise during operation of the project.

Ecology
Approximately 0.3ha of ancient woodland from Halse Copse South Local Wildlife Site will be lost. There will be an increase in the extent of semi-natural broadleaved woodland between Halse Copse South and Halse Copse North.

Landscape and visual assessment
The presence of construction works and changes to the existing landform and vegetation patterns will significantly affect the character and appearance of the local landscape. During operation, the effect of the project on the character and appearance of the local landscape will substantially reduce over time as mitigation planting grows and matures. Significant effects will remain in some parts of the local landscape due to the presence of engineered landforms, infrastructure and overhead line equipment.

The presence of construction works will cause temporary effects on views within the area, including those at Halse Copse Farm, Hill Farm, Culworth Grounds Farm, dwellings on the western and southern edge of Culworth, dwellings on the western edges of Aston le Walls and dwellings on the south-western edge of Lower Boddington. Views from Greatworth Park, Washbrook Farm Eventing Centre and a number of public rights of way and roads will also be affected.

During operation, Lower Thorpe and Edgcote viaducts and the Banbury Road bridge will continue to affect views in the local area. The visual effects of the project will reduce over time as planting matures.

Socio-economics
The project will require the demolition of industrial premises at Greatworth Park trading estate. As a result, two motorsport engineering businesses will need to relocate. Construction works and construction traffic associated with the Claydon Road bridge may discourage people from using The Carpenters Arms public house for up to three years.

It is estimated that the project will result in the displacement or possible loss of a total of 40 jobs within this area. Taking into account total employment within the area, the impact on the local economy from the displacement or possible loss of jobs is considered to be relatively modest compared to the scale of economic activity and opportunity in the area.

Sound, noise and vibration
Measures in the draft CoCP will be implemented to manage noise and vibration during construction, including the use of quiet and low-vibration equipment and screening along the edge of the construction worksites, where necessary. Tall screening will be used in a number of locations, including adjacent to the residential communities at Greatworth (including Greatworth Park), Thorpe Mandeville, Chipping Warden, Aston le Walls and Lower Boddington.

Potential significant adverse effects from construction are reported for commercial properties at Greatworth Hall and Greatworth Park. Noise from construction traffic is likely to affect residential properties, the Church of St John the Baptist, Thorpe Mandeville village hall and The Three Conies public house along Banbury Lane, where it passes through Thorpe Mandeville.

A number of mitigation measures have been included in the design of the project to mitigate noise effects during operation. Tunnels will avoid and reduce noise effects in and around Greatworth, Chipping Warden and Aston le Walls.

The occupiers of six dwellings closest to the route have been assessed to be significantly affected by noise from the operation of the railway. For dwellings which satisfy the applicable qualifying criteria, HS2 Ltd will offer noise insulation. If noise insulation is accepted by the owner, this will help to reduce or avoid these effects. The dwellings at the following locations are likely to qualify: The Dairy, Granary Barn, The Threshing Barn and The Forge on Culworth Road near Chipping Warden and The Old Dairy and the dwelling at Greatworth Hall.

Operation of the railway has been assessed as likely to result in increases in external noise that are considered significant around residential properties on the eastern edge of Thorpe Mandeville. Offices at Greatworth Hall and at Spella Barn in Lower Boddington are also likely to be affected.

Traffic and transport

Increased traffic during the construction will lead to congestion and delay at junctions including at the A422 with A361 (M40 junction 11); A422 with the B4525 Banbury Lane; A361 Banbury Road with Welsh Road; A361 Badby Road West with B4037 Badby Road; and the A45 Stefen Way/A361 Badby Road West. Construction traffic in this area will affect pedestrians and cyclists using roads including Claydon Road (also known as Hill Road); Welsh Road/ Banbury Road; Appletree Lane; the A361 Byfield Road; Banbury Lane; Marston Road, and Radstone Road.

Temporary closure of Claydon Road; Appletree Lane; Wardington Road; Banbury Lane; and Helmdon Road during construction will cause some additional delay to vehicles due to the additional travel distance required by the associated diversions. The temporary closure of Appletree Lane, Helmdon Road and the permanent closure of Culworth Road will cause some additional delay for bus users, due to bus route diversions.

Temporary closure and associated diversion of 12 public rights of way and nine roads during construction will affect pedestrians, cyclists and horse riders due to the increased travel distances required by associated diversions.

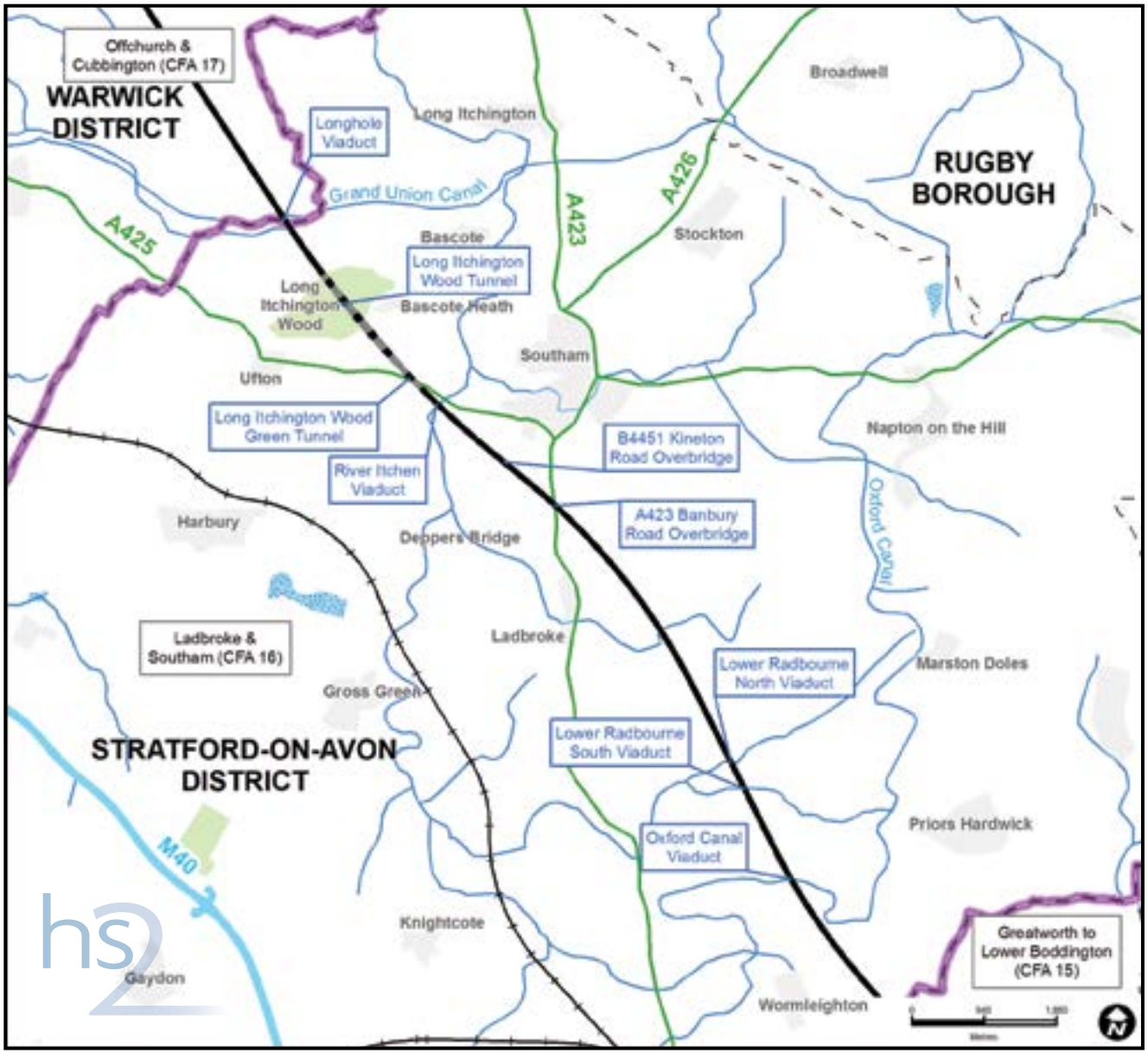
During operation the realignment of Claydon Road (also known as Boddington Road) and stopping up of Culworth Road will cause some additional delay for users of these roads due to the additional travel distance required. The stopping up of Culworth Road will also cause some additional delay for bus users, due to the diversion of bus routes. Permanent realignment of five public rights of way and two roads will affect pedestrians and cyclists due to increased travel distances.

Water resources and flood risk assessment

During construction, water that would otherwise flow into Painters Spinney and Old Barn Spinney would be drawn into the Greatworth tunnel, resulting in temporary adverse effects on the springs in these locations. The effect on groundwater levels and springs is expected to recover following completion of construction, with no significant permanent effect.

Construction of the Thorpe Mandeville cutting will result in the permanent loss of a spring at Costow House and a reduction in groundwater flows and natural flow in watercourses near Costow House. This reduction in surface water flow and groundwater level could also permanently affect the water-dependent ecological habitats at Costow Fields.

Figure 29: Ladbroke and Southam area context map



8.16 Ladbroke and Southam

Overview

The Ladbroke and Southam area is predominantly rural in character with agricultural land and a number of settlements including Wormleighton, Priors Hardwick, Ladbroke, Southam, Ufton, Bascote Heath and Long Itchington. The main transport routes through the area include the A423 Banbury Road and the A425 Leamington Road.

The project

The route through this area will commence at the existing junction of the Wormleighton Road and Stoneton Lane, to the east of Wormleighton (see Figure 29). It will proceed in a north-westerly direction, crossing over the Oxford Canal and Wills Pastures Road before passing to the west of Chapel Bank Cottage and Ladbroke Grove Farm. The route will then pass to the east of Ladbroke, in cutting through Windmill Hill, crossing under the A423 Banbury Road and under the B4451 Kineton Road to the south-west of Southam, before crossing the River Itchen on viaduct. Adjacent to the grounds of the Dallas Burston polo club the route will enter a tunnel, passing under the A425

Leamington Road and Long Itchington Wood, and emerge beyond Ufton Wood. The route will leave the area on viaduct where it crosses over the Grand Union Canal.

Two main construction compounds will be required in this area, located at Lower Radbourne and Long Itchington Wood. Fourteen smaller construction compounds will be required. Three auto-transformer stations will be located at Boddington, Radbourne and outside Stoney Thorpe. A maintenance loop will be provided within the Boddington cutting, near Wormleighton. The project will require the demolition of one dwelling in this area. Permanent realignments will be required for 13 roads and a temporary diversion will be required for the A425 Leamington Road for up to two years. A number of utilities, including electricity, gas and water mains, will need to be diverted.

Ecological mitigation has been included within the project at a number of locations. For example, wet woodland and ponds will be provided adjacent to the fish ponds at Lower Radbourne, areas of woodland will be created near Windmill Hill Spinney and woodland creation and links will be provided between Long Itchington and Ufton Woods SSSI.

Residual effects

Construction and operation of the project in this area are not likely to result in any adverse residual effects on air quality, land quality, socio-economics, sound, noise and vibration or water resources and flood risk. Similarly, no likely adverse residual effects have been identified as arising during operation for agriculture, forestry and soils or ecology.

Agriculture, forestry and soils

Construction of the project will result in land take from 11 agricultural holdings. One holding, The Greenleaf Nursery, is likely to cease to operate. Approximately 241ha of agricultural land will be permanently lost including approximately 29ha of high quality land.

Community

The A425 Leamington Road will be temporarily diverted through part of the Dallas Burston Polo Club. A small group of properties at Starbold Farm, to the south of Southam, will experience some temporary isolation effects during construction.

In the Ladbroke area, a small group of residents at Upper Radbourne, in the vicinity of Paxhall Farm will be affected by changes in amenity due to visual effects and construction traffic. The occupiers of five dwellings in the vicinity of Harp Farm and Starbold Farm at Banbury Road, Southam will experience noise and visual effects during operation.

Cultural heritage

A deserted medieval settlement at Lower Radbourne, a post-medieval brickworks, several cropmark sites and ridge and furrow will be permanently removed. Historic landscape features will be severed including seven lengths of historic hedgerow and an area of former open fields near Ladbroke. A post-medieval farm building approximately 300m east of Windmill Spinney will be demolished.

Operation of the project will affect the settings of Fields House, the Oxford Canal, ancient woodland at Ufton and Long Itchington Woods and a number of non-designated buildings.

Ecology

The tunnel will avoid any significant effects on bats and birds within Long Itchington Wood SSSI and adjacent habitats. The realignment of an unnamed tributary of the River Itchen will lead to a loss of riverbank habitat.

Landscape and visual assessment
The presence of construction works and changes to the existing landform and vegetation patterns will significantly affect the character and appearance of the local landscape. During operation, the effect of the project on the character and appearance of the local landscape will substantially reduce over time as mitigation planting grows and matures. Significant effects will remain in some parts of the local landscape due to the presence of River Itchen, Lower Radbourne North and Oxford Canal viaducts and associated earthworks.

The presence of construction works will cause temporary effects on views within the area including those at Hill Farm, Ladbroke Grove Farm, those adjacent to the A423 Banbury Road and on Ridgeway Lane and Welsh Road. Views from the Dallas Burston Polo Club, Kineton Road Industrial Estate and a number of public rights of way will also be affected. During operation, the viaducts and associated earthworks will continue to affect views in the local area. The visual effects of the project will reduce over time as planting matures.

Sound, noise and vibration
A number of mitigation measures have been included in the design of the project to mitigate noise effects during operation. The tunnel under Long Itchington Wood will reduce noise effects in and around Bascote Heath and Ufton.

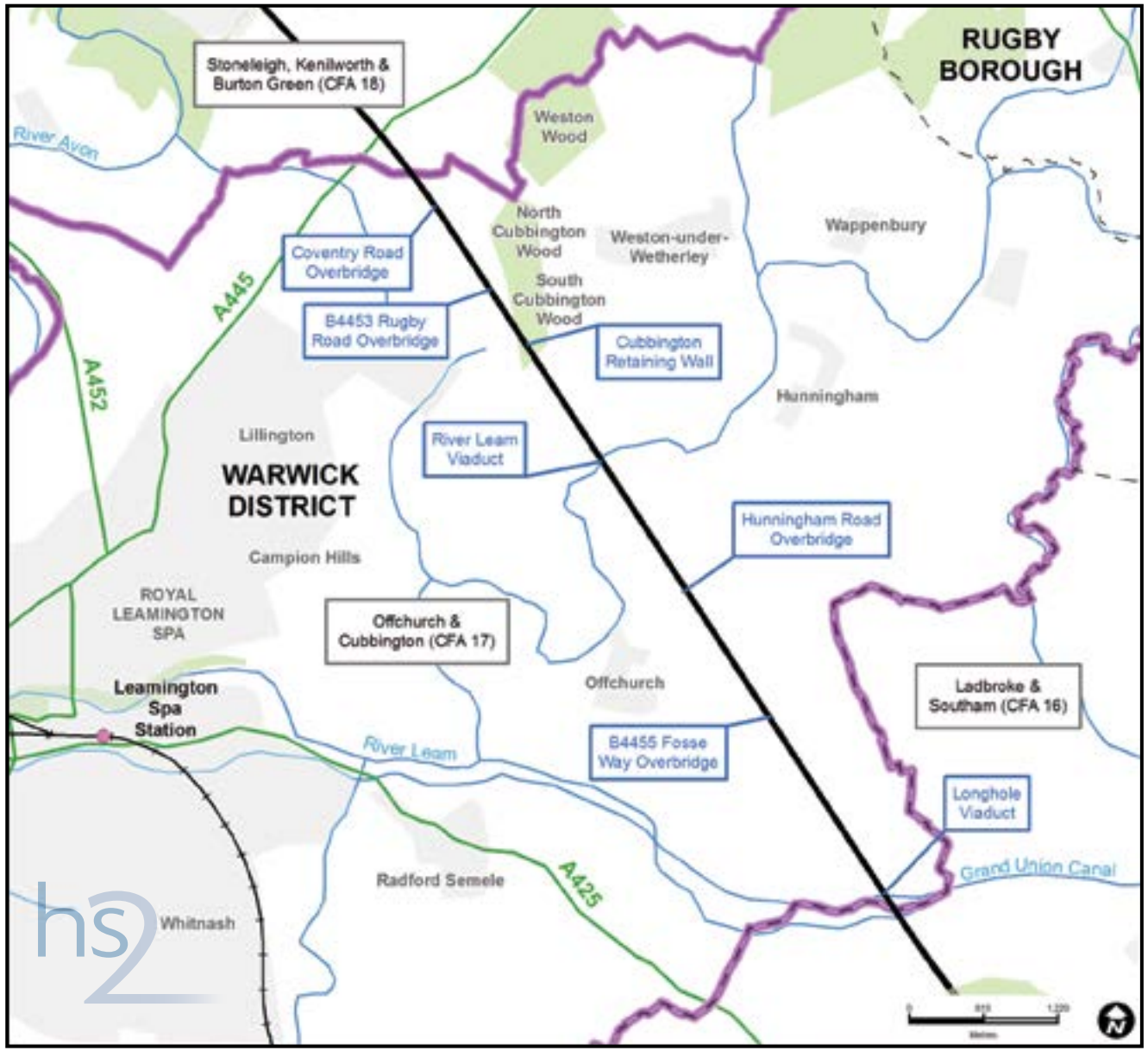
The occupiers of three dwellings - Chapel Bank in Lower Radbourne, Stoneythorpe Lodge in Southam and Field Cottage in Kineton Road, Southam - have been assessed to be significantly affected by noise from the operation of the railway. For dwellings which satisfy the applicable qualifying criteria, HS2 Ltd will offer noise insulation. If noise insulation is accepted by the owner, this will help to reduce or avoid these effects.

Operation of the railway has been assessed as likely to result in increases in external noise that are considered significant for residential properties around Starbold Farm and the A423 Banbury Road.

Traffic and transport
Increase in traffic during construction will lead to congestion and delays on the wider road network at the M40 slip roads, the A422 Hennef Way/A423 Southam Road junction, the A422 Hennef Way/ Concord Avenue junction and the A422 Hennef Way/Ermont Way junction. Construction traffic in this area will affect pedestrians, cyclists and horse riders using roads including the A423 Banbury Road and Glebe Farm access junction, Welsh Road. One footpath will be temporarily diverted. This will result in an increased walking distance of approximately 250m.

During operation, three footpaths and Radbourne Lane will be permanently diverted. This will increase the length of these routes for pedestrians and cyclists by approximately 450m. One bridleway will be permanently diverted by approximately 850m.

Figure 30: Offchurch and Cubbington area context map



8.17 Offchurch and Cubbington

Overview

The Offchurch to Cubbington area is mainly rural in character with agriculture being the main land use. Settlements in the area include Offchurch, Cubbington, Hunningham and Weston-under-Wetherley. The main highways in the area include the B4455 Fosse Way and the B4453 Rugby Road.

The project

The route will enter the area crossing the Grand Union Canal on viaduct to the north of Ufton (see Figure 30). It will proceed in a north-westerly direction, passing over Welsh Road and under Mill Lane, the B4455 Fosse Way, the Offchurch Greenway and Hunningham Road. It will continue in a north-westerly direction crossing the River Leam and passing through the southern edge of South Cubbington Wood, before passing beneath the B4453 Rugby Road and Coventry Road just west of Furzen Hill Farm. An auto-transformer station will be required on the west side of the route immediately to the north of Hunningham Road.

One main construction site compound will be located off the B4455 Fosse Way for up to five

years. Six satellite construction site compounds will be required in the area. Six roads will be permanently realigned and a section of Long Itchington Road will be closed. The permanent realignments will allow the road to cross the railway on a new bridge. A number of utilities, including electricity, gas and water mains, will need to be diverted.

Landscape planting and ecological mitigation have been included within the project at a number of locations. For example, areas of woodland planting adjacent to South Cubbington Wood will be provided as part of measures to increase habitat linkage. There will be additional planting between North Cubbington Wood and Weston Wood.

Residual effects

Construction and operation of the project in this area are not likely to result in any adverse residual effects on air quality, land quality or socio-economics. Similarly, no likely adverse residual effects have been identified as arising during operation for agriculture, forestry and soils, community, ecology or sound, noise and vibration.

Agriculture, forestry and soils

Construction of the project will result in land take from six agricultural holdings. Approximately 137ha of agricultural land will be permanently lost including 110ha of high quality land.

Community

The need to take land for the project at Welsh Road Farm will prevent the holding of the 'Wolf Run' sports event during construction.

The amenity of residents at a number of properties at Welsh Road/B4455 Fosse Way Junction and Hunningham Road will be adversely affected during construction of the project due to traffic and visual effects. Similarly, the amenity for users of the Offchurch Greenway will be affected significantly when construction takes place, as a result of construction vehicles and visual effects.

Cultural heritage

Archaeological assets will be permanently removed, including a section of the Fosse Way Roman road, the River Bytham ancient river alignment, and Valley Fields and Rugby Road Ridge areas of ridge and furrow. Historic landscape features will be severed and permanently removed including hedgerows along the Fosse Way, a section of the historic parish boundary between Cubbington and Stoneleigh and ancient woodland at South Cubbington Woods.

During operation, noise from and views of the project will affect South and North Cubbington Woods ancient woodland and the settings of the Longhole Bridge, the Grand Union Canal, Fields Farm, the buildings to the north-west of Fields Farm and several non-designated buildings and groups of buildings.

Ecology

Approximately 2ha of ancient woodland at South Cubbington Wood Local Wildlife Site and a veteran wild pear tree in a hedgerow to the south of South Cubbington Wood will be lost. Compensation for the loss of woodland habitat including approximately 17.7ha of new woodland planting will result in a permanent significant beneficial effect. The covering and severance of an unnamed tributary watercourse of the River Leam will affect the watercourse habitat.

Landscape and visual assessment
The presence of construction works and changes to the existing landform and vegetation patterns will significantly affect the character and appearance of the local landscape. During operation, the effect of the project on the character and appearance of the local landscape will substantially reduce over time as mitigation planting matures. Significant effects will remain in some parts of the local landscape due to the presence of the Grand Union Canal embankment and the River Leam viaduct and embankment.

The presence of construction works will cause temporary effects on views within the area including those at Bunkers Hill Cottages, Springhill Cottages, Fosseway Cottage, Brickyard Cottages, Manor Farm and Manor Farm Cottages, on Village Street in Offchurch and in Cubbington. Views from a number of public rights of way and local roads will also be affected. During operation the River Leam viaduct, Offchurch auto-transformer station and the Grand Union Canal embankment will continue to affect views in the local area. The visual effects of the project will reduce over time as planting matures.

Sound, noise and vibration
Measures in the draft CoCP will be implemented to manage noise and vibration during construction, including the use of quiet and low-vibration equipment and screening along the edge of the construction worksites, where necessary. Tall screening will be used adjacent to properties at Welsh Road, eastern Cubbington, the eastern quadrant of the B4455 Fosse Way and Welsh Road crossroads, the edge of the southbound carriageway of Hunningham Road, the eastern edge of the proposed River Leam Embankment, the B4453 Rugby Road to the north east of Cubbington and the edge of the northbound carriageway of Coventry Road near Weston Wood.

Potential significant adverse effects from construction are reported for the commercial property at Metcalfe Timber Ltd in Cubbington.

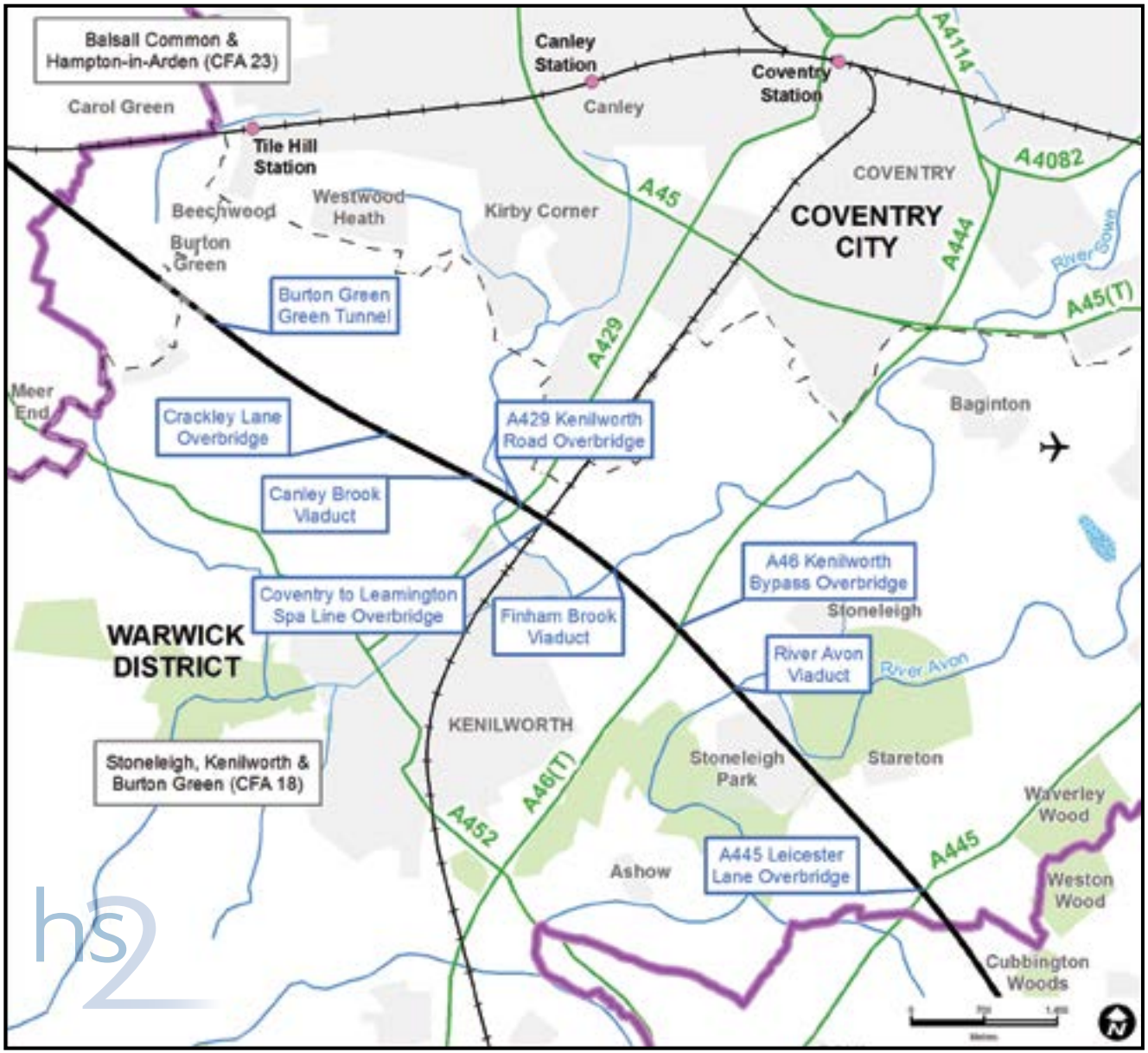
Traffic and transport
Construction traffic in this area will affect pedestrians and cyclists crossing and using roads including the B4455 Fosse Way, Hunningham Road and Welsh Road/Long Itchington Road junction.

User enjoyment of two footpaths will be temporarily affected during the construction of the project as a result of construction traffic operating alongside the public right of way and the need for Ridgeway Lane users to cross a road utilised by construction traffic. User enjoyment of the diverted National Cycle Route 41 will also be affected where this passes the main construction compound.

One public right of way will be temporarily affected and pedestrians will be diverted during the construction period with an increased walking distance. Two public rights of way will be permanently realigned with significant increases in journey times.

Water resources and flood risk assessment
The permanent loss of Burnt Firs reservoir, a winter storage reservoir used for irrigation, is an adverse effect.

Figure 31: Stoneleigh, Kenilworth and Burton Green area context map



8.18 Stoneleigh, Kenilworth and Burton Green

Overview

The Stoneleigh, Kenilworth and Burton Green area is mainly rural in character, and includes Stoneleigh Park. The main settlement is Kenilworth with smaller villages at Stoneleigh, Ashow and Burton Green. A number of roads and railway lines pass through the area including the A46, the A429, the A452 and the Coventry to Leamington Spa Line.

The project

The route will pass beneath the A445 Leicester Lane and Stoneleigh Road, then pass through the eastern part of Stoneleigh Park, crossing the River Avon on viaduct before passing beneath the A46, the Coventry to Leamington Spa railway and the A429 in cutting to the north-east of Kenilworth (see Figure 31). Crossing over Finham Brook and the realigned Canley Brook on viaduct, the route will then enter tunnel, following the route of the dismantled Kenilworth to Balsall railway through Burton Green, entering a cutting to the north of Burton Green tunnel. The route will then pass under the B4101 Waste Lane before leaving the area. There will be an auto-transformer feeder

station at Burton Green and auto-transformer stations located north of the A445 Leicester Lane and north of A429 Coventry Road.

The project will require the demolition of 10 dwellings and Burton Green village hall. One main construction site compound will be located adjacent to the Kenilworth bypass. Nineteen satellite construction site compounds will be required in the area. Eleven roads will be diverted (nine permanent and two temporarily). A number of utilities, including electricity, gas and water mains, will need to be diverted.

Landscape planting and ecological mitigation have been included within the project at a number of locations. For example, areas of woodland will be created in the vicinity of Crackley Wood and between Broadwells Wood and Burton Green, including planting adjacent to Broadwells Wood.

Residual effects

Construction and operation of the project in this area are not likely to result in any adverse residual effects on air quality, land quality or water resources and flood risk. Similarly, no likely adverse residual effects have been identified as arising during operation for agriculture, forestry and soils or socio-economics.

Agriculture, forestry and soils

Construction of the project will result in land take from 16 agricultural holdings. It is likely that two holdings, Dalehouse Farm and Crackley Farm, would cease to operate. Approximately 171ha of agricultural land will be permanently lost including 169ha of high quality land.

Community

Five dwellings at the East Gate entrance to Stoneleigh Park will need to be demolished. The project will require land from part of the Stoneleigh Park Estate and from within the Stoneleigh Park showground.

The 'Connect2Kenilworth' public right of way, Sustrans national cycle network route number 52, Kenilworth Greenway and the Millennium Way public right of way will be re-routed. Three properties at Cromwell Lane and the village hall at Burton Green will be demolished. The construction works associated with reconstructing the Cromwell Lane Bridge and significant pedestrian severance at Hob Lane/Cromwell Lane will give rise to isolation effects on the community and in particular those pupils attending Burton Green Primary School and Hedgerow Nursery. The amenity of residents at a group of properties at Kenilworth Road, Cromwell Lane, Hodgett's Lane and B4101 Waste Lane will be affected by construction traffic and visual effects.

Similarly the amenity of users of the Kenilworth Greenway at Burton Green, Waste Lane and Two Oaks Day Nursery will be affected by construction traffic, noise and visual effects.

During operation, occupiers of nine dwellings at Red Lane and 10 dwellings at Hodgett's Lane will experience noise and visual effects.

Cultural heritage

Archaeological assets will be permanently removed including prehistoric cropmark sites, earthworks south of Dale House Farm and at Kingswood, areas of ridge and furrow, portions of deserted medieval settlements at Hurst and Millburn, a Romano-British site at Crewe Farm, a possible early castle site north of Stoneleigh, and a former windmill. Non-designated farmstead buildings at Gilberts Spinney will be demolished.

The project will pass through the Grade II* listed Stoneleigh Abbey Registered Park and Garden. Part of an important hedgerow south of Broadwells Wood will be permanently removed, as will portions of three ancient woodlands.

During operation the project will affect the setting of the Stare Bridge Scheduled Monument, the Grade II listed Stonehouse Farm and several non-designated buildings and groups of buildings.

View looking towards the proposed line of route from public right of way near Stoneleigh

The noise and visual effects will affect the setting of the Stoneleigh Abbey Park, the Stare Bridge, the Stonehouse Farmhouse, several non-designated buildings and groups of buildings, and areas of ancient woodland at Crackley Wood, Roughknowles Wood, and Broadwells Wood.

Ecology

Approximately 3.8ha of ancient woodland habitat will be lost in the area at Broadwells Wood, Black Waste Wood, Crackley Wood North and Roughknowles Wood will be lost. There will be a permanent beneficial effect on woodland habitats due the increased area of secondary broadleaved woodland planting and woodland connectivity within this area.

Landscape and visual assessment

The presence of construction works and changes to the existing landform and vegetation patterns will significantly affect the character and appearance of the local landscape. During operation, the effect of the project on the character and appearance of the local landscape will substantially reduce over time as mitigation planting matures. Significant effects will remain in some parts of the local landscape due to the presence of the River Avon viaduct, the Canley Brook viaduct, the Finham Brook viaduct and the Burton Green auto-transformer feeder station.

The presence of construction works will cause temporary effects on views within the area, including at Leicester Lane Cottages, Furzen Hill Cottages, Dale House Farm, properties along Highland Road and properties in Rye Meadow, Cromwell Road and Red Lane. Views from Kenilworth Golf Club and a number of public rights of way will also be affected. During operation the River Avon viaduct, the Canley Brook viaduct, the Finham Brook viaduct and the Burton Green auto-transformer feeder station will continue to affect views in the area. The visual effects of the project will reduce over time as planting matures.

Socio-economics

The project will require the demolition of a number of structures towards the north-east of Stoneleigh Park, resulting in permanent loss of some economic

activity and employment. During construction, customers may be discouraged from using Stoneleigh Park as a result of construction activity.

It is estimated that the project will result in the displacement or possible loss of approximately 100 jobs within this area. Taking into account the availability of alternative premises and the total employed within the district (approximately 40,000), the displacement or possible loss of jobs is considered to be modest compared to the scale of economic activity and opportunity in the area.

Sound, noise and vibration

Measures in the draft CoCP will be implemented to manage noise and vibration during construction, including the use of quiet and low-vibration equipment and screening along the edge of the construction worksites. Tall screening will be used adjacent to the residential community areas at Stoneleigh Park and Burton Green and along A445 Leicester Lane, B4113 Stoneleigh Road near Stareton, Dalehouse Lane, A429 Kenilworth Road and B4101 Waste Lane.

Noise from construction is likely to result in significant adverse effects on residential areas closest to the construction works on Hodgetts Lane, Cromwell Lane and Red Lane in Burton Green. Potential significant adverse effects are reported for Two Oaks Day Nursery in Burton Green and commercial properties and an ambulance station to the north-east of Stoneleigh Park. Noise from construction traffic is likely to affect residential properties along Waste Lane, where it passes through the outskirts of Catchems Corner.

A number of mitigation measures have been included in the design of the project to mitigate noise effects during operation, including the use of screening on Finham Brook viaduct to further reduce adverse noise effects around Crackley.

The occupiers of eight dwellings - located at Four Winds, Dale House and Dale House Farmhouse on Dalehouse Lane, South Hurst Cottage and Eskasoni on Crackley Lane and Little Beanit Farm on Waste Lane - have been assessed to be significantly affected by noise from the operation of the railway. For dwellings which satisfy the applicable qualifying criteria, HS2 Ltd will offer noise insulation. If noise insulation is accepted by the owner, this will help to reduce or avoid these effects.

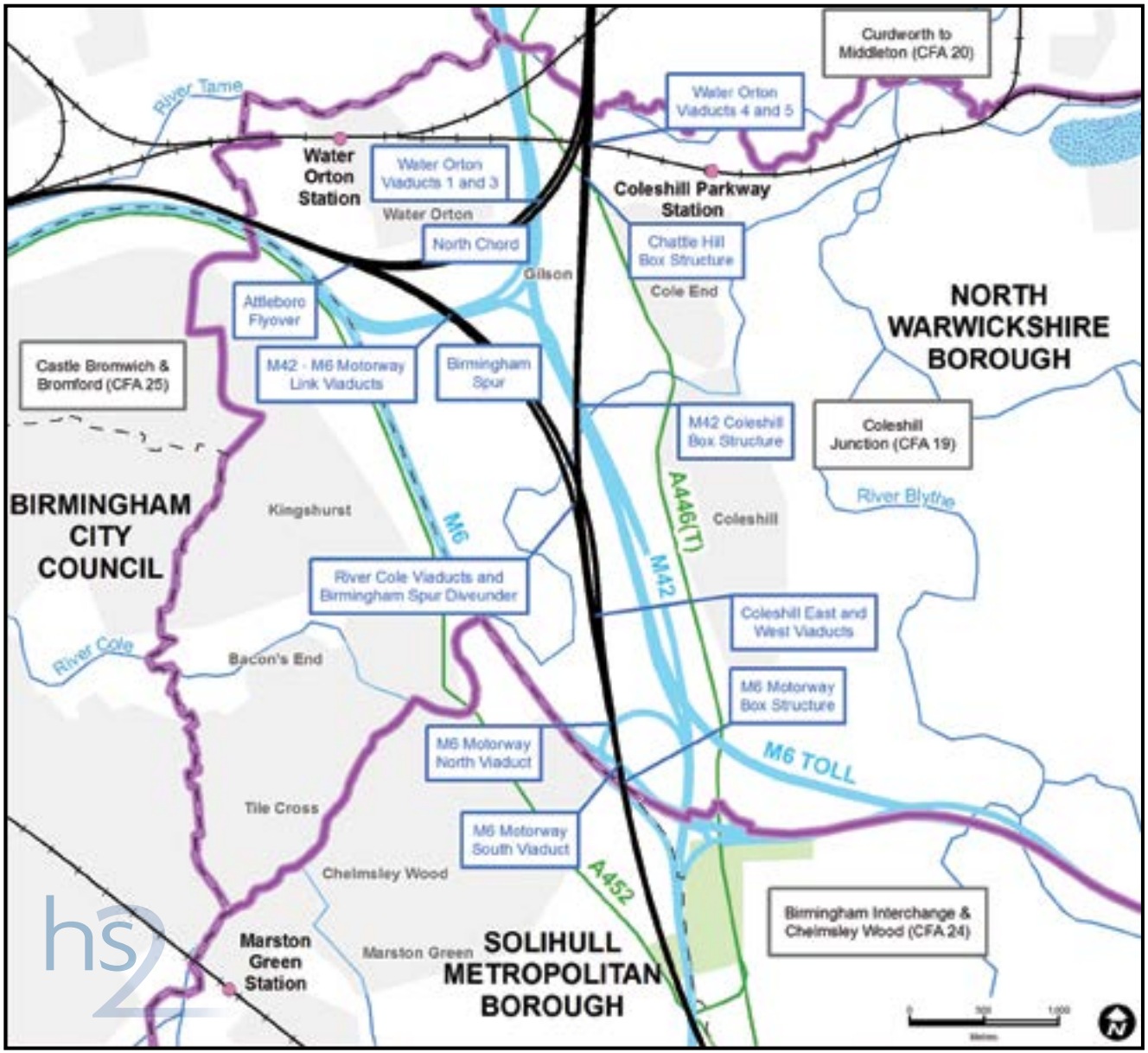
Operation of the railway has been assessed as likely to result in increases in external noise that are considered significant for residential areas closest to the route at Eastgate in Stoneleigh, Red Lane and Cromwell Lane in Burton Green and Waste Lane, Old Waste Lane and Hodgett's Lane in Beechwood. Commercial property in Stoneleigh Park is also likely to be affected.

Traffic and transport

The increase in traffic during construction will lead to congestion and delays for road users, including on the A452 Kenilworth Road/B4101 Waste Lane junction; A452 Kenilworth Road/B4115 Coventry Road junction; A452 Leamington Road/ Bericote Road junction; Bericote Road/Westhill Road/B4113 Stoneleigh Road; A45 Birmingham Road/A452 Kenilworth Road junction; and the A46 Kenilworth Bypass/A452 Leamington Road junction. Construction traffic in this area will affect pedestrians and cyclists crossing and using local roads in the vicinity of the works.

One public right of way will be temporarily affected and pedestrians will be diverted during the construction period, resulting in an increased walking distance. The user enjoyment of five public rights of way will be affected due to the construction of the project. Seven public rights of way will be diverted, increasing journey times for pedestrians, cyclists and horse riders.

Figure 32: Coleshill Junction area context map



8.19 Coleshill Junction

Overview

The Coleshill Junction area is predominantly urban in character, separated by strips of open space and agricultural land that flank the major roads and motorways that run through the area. The main settlements are Coleshill, Gilson and Water Orton, as well as the densely developed districts of Smith's Wood and Kingshurst. The M42, M6 and M6 Toll run broadly north to south through the area. Water Orton and Coleshill Parkway railway stations provide access to rail services to Birmingham and Nuneaton.

The project

The project through this area comprises three sections of railway that form a triangular junction (known as the 'delta' junction). It includes the main through lines to the north, lines passing into Birmingham from the south and lines to connect Birmingham to the north (see Figure 32). The main line heading north towards Manchester and Leeds will proceed on embankment and viaduct, apart from a cutting near Gilson. The Birmingham connecting lines will leave the main line south of Coleshill Hall Farm and will pass over the River Cole and M6/M42 link on a combination

of viaducts and embankments to the south of Water Orton and continue west towards central Birmingham. From Birmingham, lines will be provided to connect with the north passing south of Water Orton, rising over the M42/M6 Toll and the Birmingham to Nuneaton Line, before joining the main line as it passes out of the area. An auto-transformer station will be located to the east of the route in the vicinity of Gilson Road.

The project will require the demolition of 20 dwellings in this area. There will be temporary realignments on four roads and permanent realignments and diversions on two roads. One main construction site compound will be located at Coleshill Heath Road. Nineteen satellite construction compounds will be required.

Landscape planting and ecological mitigation have been included within the project at a number of locations. For example, habitat compensation will include creation of new grassland habitats along the River Cole and woodland planting to increase connectivity of existing woodlands in the vicinity of Coleshill Park Belt Local Wildlife Site. There will also be areas of planting adjacent to the B4117 Watton Lane and the M42/M6 Toll.

Residual effects

Construction and operation of the project in this area are not likely to result in any adverse residual effects on air quality, land quality, socio-economics or water resources and flood risk. Similarly, no likely adverse residual effects have been identified as arising during operation for agriculture, forestry and soils or ecology.

Agriculture, forestry and soils

Construction of the project will result in land take from 11 agricultural holdings. Of these, four (land lying to the south of Vicarage Lane, to the south-west of Coleshill Road Water Orton, the south of Gilson Road and Newlands Farm) are likely to cease to operate. Approximately 187ha of agricultural land will be permanently lost, of which approximately 136ha is good quality.

Community

Construction of the project will result in the loss of eight properties known as Board Cottages and Coleshill Cottages, to the north of Coleshill and nine properties from Attleboro Lane in Water Orton. Land will be required permanently at the Old Saltleians Rugby Football Club.

Occupiers of approximately 10 properties at Gilson Drive in Gilson; 17 properties in the centre of Gilson; and seven properties at Attleboro Lane, Water Orton will be affected by noise and visual effects from the construction of the project. The amenity of the users of Grimstock Country House Hotel, Gilson will be affected by construction.

Construction works, increased journey times and congestion on the local road network and diversions on public rights of way will all contribute to isolation effects for residents of Gilson and Water Orton, as well as the pupils and staff of Water Orton Primary School.

The occupiers of approximately 16 residential properties on the B4117 Gilson Road and Meadowbank Drive will be affected by views of and noise from the operation of the project.

Cultural heritage

The Grade II listed Coleshill Hall Farmhouse and non-designated buildings at Capitol Joinery timber yard will be demolished. Archaeological assets will be permanently removed including earthworks and archaeological remains associated with a moat and former Hall at Coleshill Hall Farm, palaeo-channels and field boundaries within the

View looking towards the proposed line of route from sports pitches near Coleshill

former Coleshill Park. The project will sever and remove a historic hedgerow at Coleshill Park.

During operation, the project will affect the setting of the Grade II listed Coleshill Hall Hospital and Grade II listed Gilson Hall.

Noise and visual effects of the project will affect the setting of the former Coleshill deer park, Coleshill Hall Hospital and attached coach house and stable block (now Coleshill Manor Office Campus), Gilson Hall, and other non-designated buildings and groups of buildings.

Ecology

Viaducts crossing the River Tame will result in shading of the river which will lead to a loss of vegetation and habitat and will also affect aquatic macro-invertebrates and fish.

Landscape and visual assessment

The presence of construction works and changes to the existing landform and vegetation patterns will significantly affect the character and appearance of the local landscape. During operation, the effect of the project on the character and appearance of the local landscape will substantially reduce over time as mitigation planting grows and matures. Significant effects will remain in some parts of the local landscape due to the presence of a series of embankments and viaducts including Coleshill viaducts and Water Orton No. 3 viaduct.

The presence of construction works will cause temporary effects on views within the area including those at the B4117 Coventry Road, Coleshill Hall Cottages, properties in Gilson and on the B4118 Birmingham Road/Water Orton Road. Views from Water Orton Primary

School and a number of public rights of way will also be affected. During operation a series of embankments and viaducts including Coleshill viaducts and Water Orton No. 3 viaduct will continue to affect views in the local area. The visual effects of the project will reduce over time as planting matures.

Sound, noise vibration

Measures in the draft CoCP will be implemented to manage noise and vibration during construction, including the use of quiet and low-vibration equipment and screening along the edge of the construction worksites. Tall screening will be used adjacent to the residential community areas at Gilson, either side of the A446 Lichfield Road, at Water Orton Primary School and Attleboro Lane.

Noise from construction is likely to result in significant adverse effects on residential areas closest to the construction works at Gilson and the western edge of Water Orton. Potential significant adverse effects are reported for commercial properties on the western edge of the Coleshill Industrial Estate, including the offices at Bromwich Court and Highway Point. Noise from construction traffic is likely to affect adjacent residential properties on Gilson Drive.

A number of mitigation measures have been included in the design of the project to mitigate noise effects during operation, including the use of noise screening where appropriate.

The occupiers of 1-3 New Cottages on Birmingham Road have been assessed to be significantly affected by noise from the operation of the railway. For dwellings which satisfy the applicable qualifying criteria, HS2 Ltd will offer noise insulation. If noise insulation is accepted by the owner, this will help to reduce or avoid these effects.

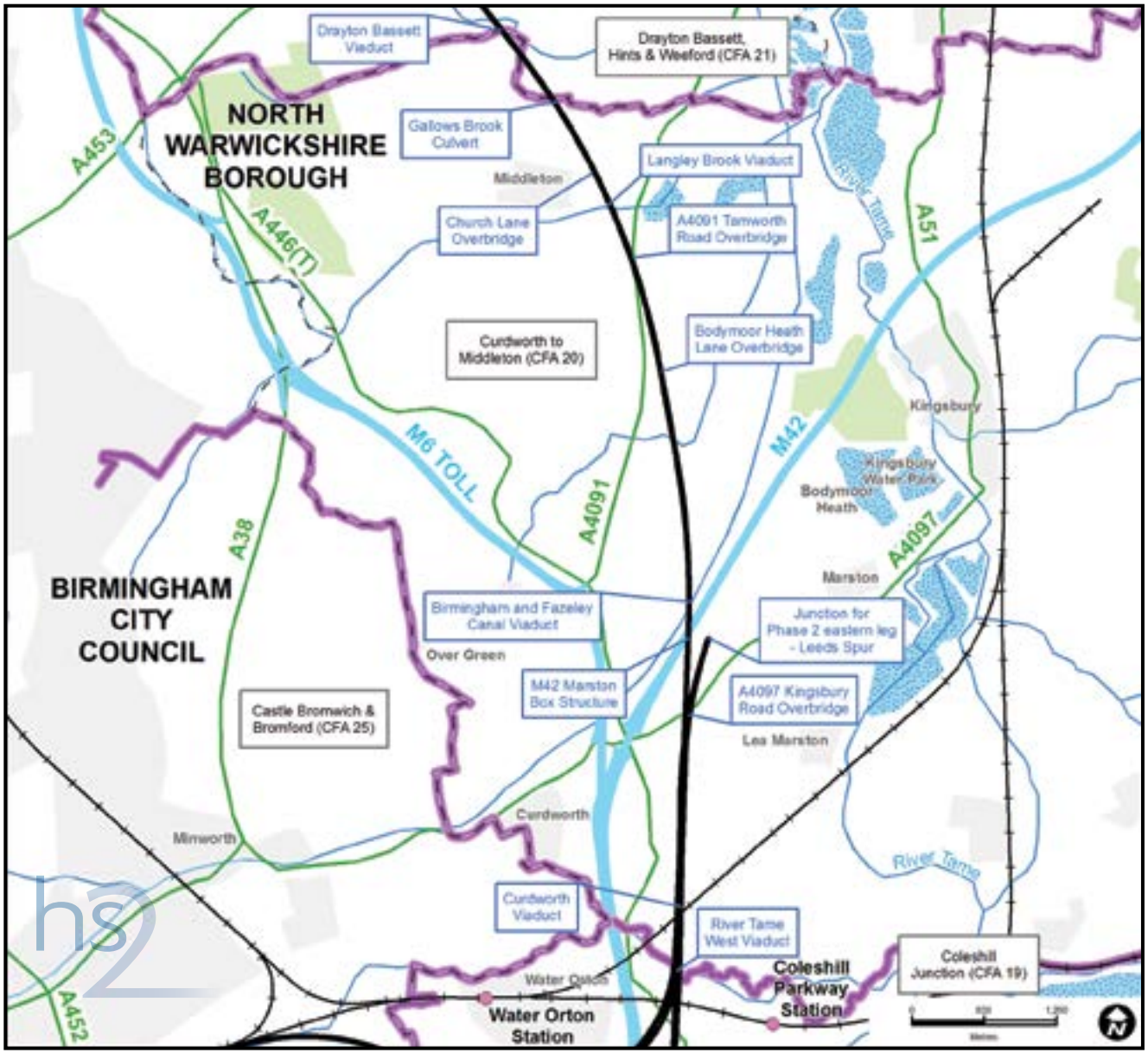
Operation of the railway has been assessed as likely to result in increases in external noise for residential areas closest to the route at Gilson. When this effect is combined with minor levels of vibration from the railway, the effect on this residential area is considered to be significant. The offices at Bromwich Court and Highway Point that are located closest to the route are also likely to be similarly affected.

Traffic and transport

The increase in traffic during construction will lead to congestion and delays on the wider road network including the junctions between the M6/A446 Stonebridge Road; A446 Lichfield Road/B4117 Gilson Road; and A446 Lichfield Road/B4117 Watton Lane. Construction will require a period of traffic management and temporary night-time and weekend closures on the M42/M6/M6 Toll to enable safe construction of parts of the project. The M42/M6 Toll southbound lanes will be reduced from four to three for approximately 40 days. The project will also require diversions on a number of roads, including Coleshill Heath Road, B4114 Birmingham Road and Manor Drive. Construction traffic in this area will affect pedestrians and cyclists using roads including Coleshill Heath Road between Yorkminster Drive and the A446 Stonebridge Road and B4117 Gilson Road between Gilson Drive and the A446 Stonebridge Road. Construction vehicles will pass alongside a footpath, affecting pedestrians due to increased noise.

During operation, a new bridleway link will be provided between Attleboro Lane and Watton Lane and five public rights of way will be permanently realigned or diverted, increasing travel distance for users. A public right of way will be closed and pedestrians will be diverted to the realigned Attleboro Lane. A public right of way will be partly closed with pedestrians diverted to a realigned public right of way.

Figure 33: Curdworth to Middleton area context map



8.20 Curdworth to Middleton

Overview

The southern part of the Curdworth to Middleton area is urbanised and characterised by industrial development, including Hams Hall Distribution Park, whilst further north the area becomes increasingly rural in nature. There are a number of roads and railway lines in the area including the A4091, M6 Toll, the M42, the A446, the A4097 and the Birmingham and Derby railway.

The project

The route through this area will commence at the crossing of the River Tame and the Birmingham and Derby railway line, east of Curdworth (see Figure 33). It will proceed north onto embankment and then into cutting where the route will split to provide a stub for the Phase Two route of HS2 towards Leeds. The route will run north-west crossing over the M42 and Birmingham and Fazeley Canal on viaduct and under Bodymoor Heath Lane, the A4091 Tamworth Road and Church Lane. Passing east of Middleton village, it will continue north-west, crossing Langley Brook on viaduct. An auto-transformer station will be located north of the Birmingham and Fazeley Canal.

The project will require the demolition of eight dwellings in this area. One main construction site compound will be located off Dunton Island on Kingsbury Road and the Kingsbury Road railhead will be located to the east of the route between Kingsbury Road and the M42. The railhead will be used as the delivery location for bulk rail-borne materials, such as ballast, rails and sleepers. Fifteen smaller construction compounds will be required. Two roads will be temporarily diverted and six will be permanently diverted. A number of utilities, including electricity and gas mains and sewers, will be diverted.

Landscape planting and ecological mitigation have been included within the project at a number of locations. For example, woodland creation adjacent to the westerly section of North Wood will link to the woodland around Cuttle Mill Fishery. There will also be woodland planting near to Dunton Wood, Walker's Spinney and close to Pool House Farm.

Residual effects

Construction and operation of the project in this area are not likely to result in any adverse residual effects on air quality, socio-economics or water resources and flood risk. Similarly, no likely adverse residual effects have been identified as arising during operation for agriculture, forestry and soils, community, ecology or land quality.

Agriculture, forestry and soils

Construction of the project will result in land take from 22 agricultural holdings. Of these, seven holdings are likely to cease to operate. Approximately 189ha of agricultural land will be permanently lost including 169ha of high quality land.

Community

Eight residential properties in the A4097 Kingsbury Road area, on the edge of Lea Marston and Marston will be demolished. During construction, Church Lane will be realigned, causing noise and visual effects that will affect the amenity of five properties on the east side of Middleton.

The additional construction traffic generated by the project will cause effects on the road network to the north of Coleshill and minor congestion to the south-east of Curdworth. Daily journey delays to secondary schools and other community facilities at Coleshill will result in an isolation effect on residents of Curdworth and Wishaw.

Cultural heritage

Archaeological assets will be lost, including cropmarks of a probable prehistoric enclosure and a prehistoric ring ditch; areas of ridge and furrow at North Wood and north of Cocksparrow Farm; archaeological remains associated with linear ditches west of a scheduled moat; earthworks; and linear cropmarks. Assets affected in part due to the construction of the project include ridge and furrow at Birch Wood, medieval to post-medieval charcoal-burning platforms, a possible deserted medieval settlement and parts of Dunton Hall Garden. The non-designated Mullensgrove Farm and ancillary buildings and parts of the Middleton House Farm complex will be demolished.

Elements of the historic landscape will be severed by the route, including a section of important hedgerow at the Parish boundary north of Middleton. Part of the ancient woodland at North Wood and a minimal part of the ancient woodland at Sych Wood will be permanently removed. During operation, the project will affect the setting of the moat at North Wood (a scheduled monument), the Grade II listed buildings at Dunton Hall, Barn and Pigeonhouse, the Grade II* listed buildings at Middleton Hall historic building complex and several non-designated buildings and groups of buildings.

Ecology
Approximately 2.3ha of ancient woodland at North Wood and Sych Wood will be lost. Four areas of lowland mixed deciduous woodland will be planted to support existing habitat in this area.

Land quality
With the application of the measures contained within the draft CoCP, no adverse impacts are anticipated with respect to contaminated land. The Cocksparrow Farm historical landfill will be disturbed by construction of the Leeds spur. Any contamination encountered will be removed or remediated, reducing potential impacts to the underlying groundwater and people and nearby properties.

The project will cross two preferred sand and gravel resource sites which will not be available after construction of the project. Possible extraction of the sand and gravel in advance of the works will be discussed with the relevant mineral planning authority.

Landscape and visual assessment
The presence of construction works and changes to the existing landform and vegetation patterns will significantly affect the character and appearance of the local landscape. During operation, the effect of the project on the character and appearance of the local landscape will substantially reduce over time as mitigation planting grows and matures. Significant effects will remain in some parts of the local landscape due to the presence of engineered landforms, infrastructure and overhead line equipment.


View looking towards the proposed line of route from public right of way, Marston Lane

The presence of construction works will cause temporary effects on views within the area including at Newlands Farm, Grange Farm Cottages, Middleton House Farm and properties in Middleton. Views from Reindeer Park Lodge Caravan Park, Cuttle Mill Fishery, Bodymoor Heath Training Grounds and a number of public rights of way will also be affected.

During operation the Birmingham and Fazeley Canal and Langley Brook viaducts and the North Wood embankment will continue to affect views in the local area. The visual effects of the project will reduce over time as planting matures.

Sound, noise and vibration

Measures in the draft CoCP will be implemented to manage noise and vibration during construction, including the use of quiet and low-vibration equipment and screening along the edge of the construction worksites. Tall screening will be used adjacent to the residential communities at A4097 Kingsbury Road in the Dunton Wood area, Lock House Lane to the east of Curdworth, Dunton Hall, the southern edge of the A446 Lichfield Road, Bodymoor Heath Lane, south east of Middleton and the Church Lane/Crowberry Road area in eastern Middleton. Taller screening will also be used adjacent to the industrial areas at Edison Road (Hams Hall area) and Cuttle Mill Fishery.

Noise from construction is likely to result in significant adverse effects on residential areas closest to the construction works at Church Lane in Middleton. Potential significant adverse effects are reported for commercial properties at Dunton Hall in Curdworth.

A number of mitigation measures have been included in the design of the project to mitigate noise effects during operation, including the use of screening on the Langley Brook viaduct to reduce adverse effects at Middleton.

The occupiers of Orchard Bungalow and Newlands Farm on Newlands Lane, the Bungalow at Middleton Farm and three residential buildings at Dunton Hall, Dunton Stables and 254 Lock House Lane in Curdworth have been assessed to be significantly affected by noise from the operation of the railway. For dwellings which satisfy the applicable qualifying criteria, HS2 Ltd will offer noise insulation. If noise insulation is accepted by the owners, this will help to reduce or avoid these effects.

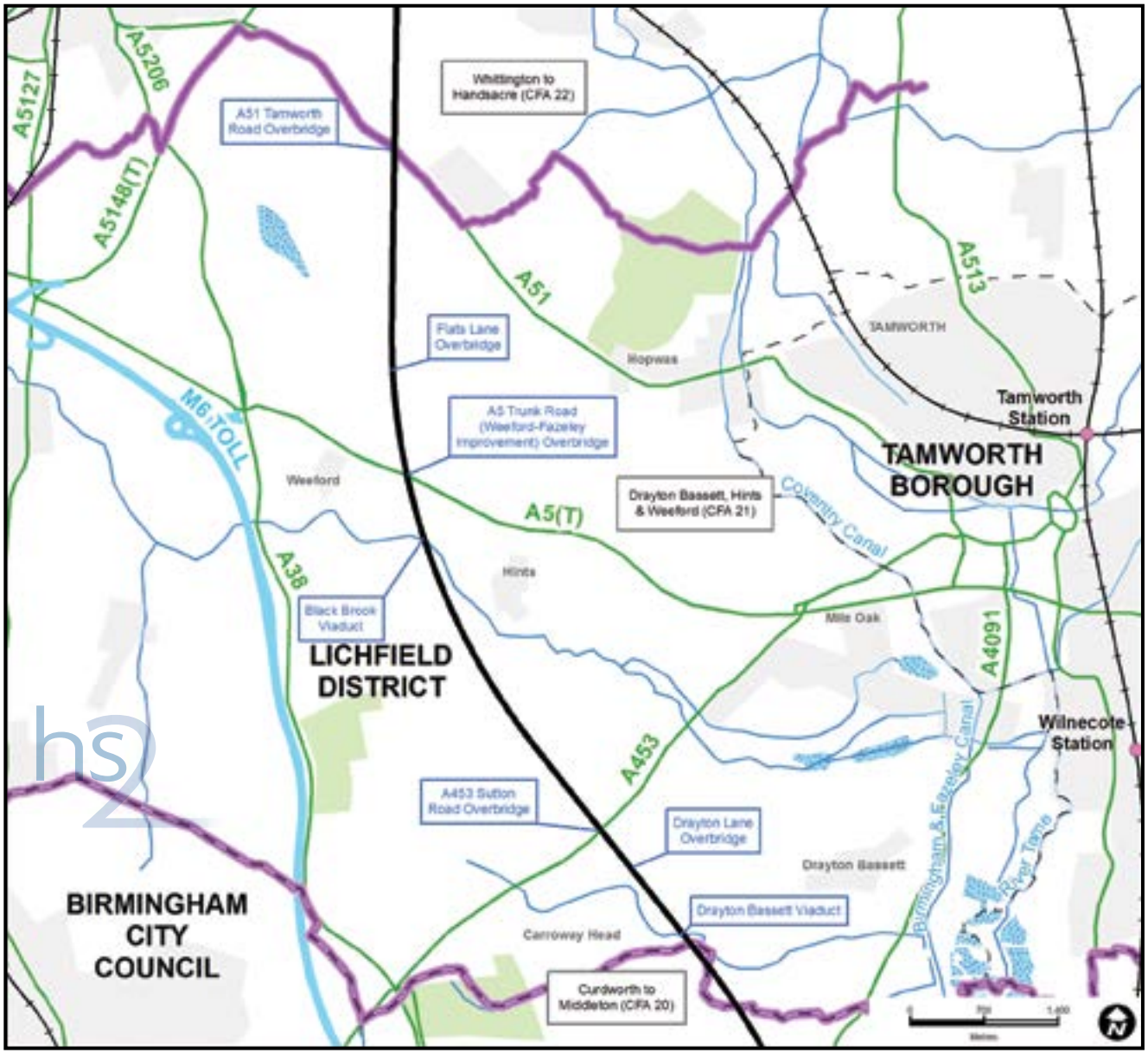
Commercial buildings at Dunton Hall and the Middleton House Farm bed and breakfast in Tamworth are likely to be affected by noise from operation of the railway.

Traffic and transport

The increase in traffic during construction will lead to congestion and delays for road users on the A446 Lichfield Road/Faraday Avenue/Marsh Lane junction and A4091 Tamworth Road/A446 Lichfield Road junction. Construction traffic in this area will affect pedestrians, cyclists and equestrians crossing and using Church Lane, the A446 Lichfield Road, the A446 Lichfield Road, the A446 Lichfield Road/Faraday Avenue junction, the A446 Lichfield Road/A4097 Kingsbury Road junction, the A4091 Tamworth Road/Park Lane junction, and the A4091 Tamworth Road/A446 Lichfield Road junction. There will be minor adverse effects on pedestrians and cyclists due to increased travel distances for three public rights of way.

Three public rights of way will be closed for a period of nine years during the construction and operation of the Kingsbury Road railhead. User enjoyment of five public of rights of way will be temporarily affected due to construction vehicles operating alongside or across the public right of way. Six public rights of way (footpaths, byways and bridleways) will be permanently realigned with significant increases in journey times for pedestrians, cyclists and equestrians.

Figure 34: Drayton Bassett, Hints and Weeford area context map



8.21 Drayton Bassett, Hints and Weeford

Overview

The area is mainly rural in character, and includes the villages of Drayton Bassett, Hints and Weeford. The A5 and Watling Street are the key transport routes connecting Hints and Weeford with the nearby settlements of Lichfield, Shenstone and Tamworth.

The project

The route will enter the area crossing Gallows Brook to the north of Middleton and proceed in a north-westerly direction over Gallows Brook floodplain on viaduct to the west of Drayton Bassett (see Figure 34). The route will enter a cutting crossing under Drayton Lane and the A453. The route will then curve to the west of Hints, crossing over Black-Bourne Brook floodplain on viaduct. The route will then pass under Watling Street and the A5 before heading north and passing under Flats Lane. It will leave the area passing under the A51, adjacent to the Whittington Arms public house. An auto-transformer station will be located to the south of Oak Dairy Farm, Drayton Lane and another station will be located north of the A5, off Flats Lane.

The project will require the demolition of eighteen dwellings and part of Packington Moor Farm. Fifteen satellite construction compounds will be required in the area. Five roads will be realigned or diverted. A number of utilities, including electricity, gas, water mains and sewers, will be diverted.

Landscape planting and ecological mitigation have been included within the project at a number of locations. For example, habitat creation measures include creation of a mosaic of grassland, scrub and ponds near to Gallows Brook and new heathland near Whittington along with areas of woodland and grassland creation.

Residual effects

Construction and operation of the project in this area are not likely to result in any adverse residual effects on air quality, socio-economics, land quality or water resources and flood risk. Similarly, no likely adverse residual effects have been identified as arising during operation for agriculture, forestry and soils, community or ecology.

Agriculture, forestry and soils

Construction of the project will result in land take from 13 agricultural holdings. Of these, three (Cranebrook, Oak Dairy Farm and Hudson's Equestrian Unit) will be likely to cease to operate. Approximately 166ha of agricultural land will be permanently lost including approximately 134ha of high quality land.

Community

Construction of the project will result in the demolition of 13 residential properties at a small hamlet on the junction of Knox's Grave Lane and Flats Lane. The remaining occupiers will experience amenity effects during construction, due to noise and visual effects. Packington Moor Farm will be partly demolished, resulting in the permanent loss or displacement of its wedding and café facilities. Users of the Heart of England Way, which passes through Drayton Bassett will be affected as a result of noise and visual effects and increased traffic associated with construction.

In the Hints area, residents of Brockhurst Lane will be subject to an isolation effect during the construction period due to the temporary closure of the road connecting the area to the rest of the Hints community and to schools at Whittington and Lichfield. In the Weeford area, construction works at Watling Street will give rise to a temporary amenity effect on the residents of five properties, as a result of increases in construction traffic and views of construction activities.

Cultural heritage

Archaeological assets will be permanently removed including prehistoric cropmark sites and Romano-British settlement remains near Watling Street (Roman road). A number of non-designated built heritage assets, including Barn Cottage and Moor Cottage will be demolished, and partial demolitions at Buck's Head Farmhouse and Packington Moor Farm will occur. Some historic landscape features will be severed and permanently removed including hedgerows at the Middleton Estate boundary and ancient woodland, primarily at the Rookery and Roundhill Wood.

During operation, noise and visual effects will affect the setting of Hints Village, Horsley Brook Farm, Buck's Head Farm, Ingleyhill Farm, Roundhill Wood.

Ecology
Ancient woodland will be lost at the Rookery (1.3ha); and at Roundhill Wood, sites of borough importance (2ha) will be lost. Approximately 14.6ha of woodland will be created near Hints to the west of the route.

Landscape and visual assessment
The temporary presence of construction works and changes to the existing landform and vegetation patterns will significantly affect the character and appearance of the local landscape. During operation, the effect of the project on the character and appearance of the local landscape will substantially reduce over time as mitigation planting matures. Significant effects will remain in some parts of the local landscape due to the presence of engineered landforms, infrastructure and overhead line equipment.

The presence of construction works will cause temporary effects on views within the area including at the edge of Drayton Bassett and the edge of Hints, at Watling Street, Flats Lane and Jerry's Lane. Views from a number of public rights of way will also be affected. During operation the Hints cutting, Milditch Wood embankment and the Gallows Brook and Black Brook viaducts will continue to affect views in the local area. The visual effects of the project will reduce over time as planting matures.

Sound, noise and vibration
A number of mitigation measures have been included in the design of the project to mitigate noise effects during operation.

The occupiers of Mill House on Bangley Lane and Packington Moor Farm on Jerry's Lane have been assessed to be significantly affected by noise from the operation of the railway. For dwellings which satisfy the applicable qualifying criteria, HS2 Ltd will offer noise insulation. If noise insulation is accepted by the owner, this will help to reduce or avoid these effects.

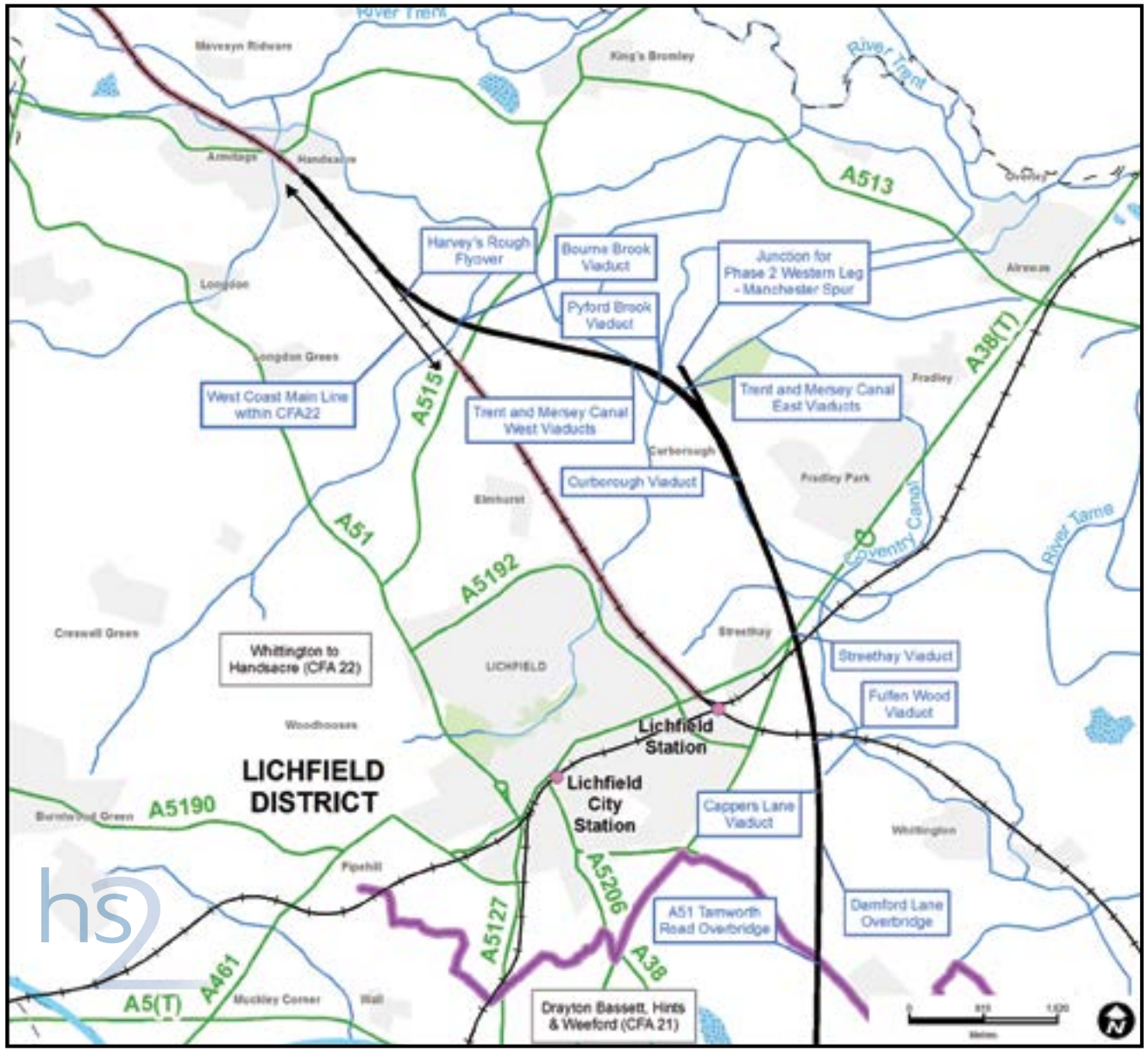
Commercial buildings at Packington Moor Farm are likely to be affected by noise from operation of the railway.

Traffic and transport
An increase in traffic during construction will lead to additional congestion and delays at the junctions of the A38 London Road/A453 Tamworth Road/A446 London Road, the A38/A5148/A5206 London Road and the A5/A5127 Birmingham Road/A5148.

During construction, increases in traffic will affect pedestrians, cyclists and horse riders using some local roads including Drayton Lane, Watling Street, the A453 and Flats Lane. Two public rights of way will be temporarily diverted. Construction vehicles will operate alongside four public rights of way which will affect the enjoyment of these routes.

Nine public rights of way will be permanently realigned, causing increases in journey times.

Figure 35: Whittington to Handsacre area context map



8.22 Whittington to Handsacre

Overview

The Whittington to Handsacre area is mainly rural in character with agriculture being the main land use, with the exception of Fradley Business Park. Settlements in the area include Whittington, Lichfield, Fradley, Streethay and Handsacre. There are a number of main roads and railway lines in the area including the A38, the A515, the A51, the West Coast Main Line and South Staffordshire Line.

The project

The route will cross Whittington Heath Golf Club and proceed in a northerly direction (see Figure 35). It will curve to the west, passing over the West Coast Main Line, the South Staffordshire Line and the A38, to the east of Lichfield. Passing west of Fradley Business Park, the route will split to provide a spur for Phase Two of HS2 to Manchester, which will continue to just north of the Trent and Mersey Canal. The Phase One route will curve to the west, twice crossing over the Trent and Mersey Canal on viaduct, then Curborough Brook and through Ravenshaw Wood. The route will then pass over the existing A515, before connecting with the West Coast Main Line to the south of Handsacre. An auto-transformer station will be located adjacent

to Capper's Lane and one will be located south-east of the Trent and Mersey Canal.

The project will require the demolition of seven dwellings and Whittington Heath Golf Club in this area. Three main construction site compounds will be located at Cappers Lane, A515 Lichfield Road and Handsacre. Twenty satellite construction compounds will be located in the area. Streethay construction sidings will receive bulk excavated material by rail and transfer onto vehicles for movement into the required locations for construction of the project. Four roads will be diverted or realigned. A section of Shaw Lane will be closed permanently. A number of utilities, including gas, water, telecommunications and electricity will be diverted.

Landscape planting and ecological mitigation have been included within the project at a number of locations. For example, habitat creation will include a number of new woodlands to create linkage between existing woodland habitats adjacent to retained sections of Ravenshaw Wood, Black Slough and the Slaish.

Residual effects

Construction and operation of the project in this area are not likely to result in any adverse residual effects on air quality, land quality, socio-economics or water resources and flood risk. Similarly, no likely adverse residual effects have been identified as arising during operation for agriculture, forestry and soils.

Agriculture, forestry and soils

Construction of the project will result in land take from 23 agricultural holdings. Of these, three (Hill Farm Streethay, Streethay Farm and Black Slough Farm) are likely to cease to operate. Approximately 165ha of agricultural land will be permanently lost including 137ha of high quality land.

Community

Construction of the project will result in the loss of Whittington Heath Golf Club. The Moors Course at the Darnford Moors Golf Club will be closed temporarily. The use of Lichfield Cruising Club's car park at Cappers Lane will prevent access to the Club's slipway and boat maintenance area during construction. During operation, siting of one of the piers for the Cappers Lane viaduct will affect activities at the club.

Six residential properties at Streethay will be demolished. Land will be temporarily required from the Horsepower Equestrian Centre at Streethay Farm. Works to construct the viaduct structures over the Trent and Mersey Canal will require the temporary closure of approximately 15 moorings in the vicinity of Wood End Lock.

Occupiers of a limited number of dwellings on the western outskirts of Whittington will experience a reduction in amenity due to noise and visual effects from the operation of the project.

Cultural heritage

Archaeological assets will be permanently affected including several prehistoric sites and areas of remains at Mare Brook, Bourne Brook, Brokendown Wood, Wood End, archaeological remains from the medieval period at Streethay, Bunyan's Mill and Ravenshaw Wood; and areas of ridge and furrow. Built heritage assets lost to the project include Hill Farm at Streethay, Whittington Heath Golf Course clubhouse, Rough Stockings, Hanchwood House, Field Cottage, Streethay Cottage and Elverceter.

Historic landscape features severed and permanently removed include areas of ancient woodland at Ravenshaw Wood and John's Gorse and the enclosure at Curborough. During operation, the project will affect settings of the scheduled and listed Streethay Manor House and moated site, the Trent and Mersey Canal conservation area and associated listed buildings, the Whittington Heath Golf Club and several non-designated buildings and groups of buildings.

Ecology
Approximately 5.4ha of ancient woodland will be lost within Ravenshaw Wood, John's Gorse and Hanchwood House woodlands, and Vicar's Coppice. Approximately 21ha of lowland mixed deciduous woodland will be planted to support existing habitat in this area

Landscape and visual assessment
The presence of construction works and changes to the existing landform and vegetation patterns will significantly affect the character and appearance of the local landscape. During operation, the effect of the project on the character and appearance of the local landscape will substantially reduce over time as mitigation planting grows and matures. Significant effects will remain in some parts of the local landscape due to the presence of engineered landforms, infrastructure and overhead line equipment.

The presence of construction works will cause temporary effects on views within the area including at Cappers Lane (Fulfen Cottages), Burton Old Road, Wood End Lane near Vicar's Coppice, Chestnut Close and Bridge Road and views from several public rights of way. During operation the series of embankments and viaducts including the Cappers Lane viaduct and Fulfen Wood south embankment and viaducts crossing the Trent and Mersey Canal, will continue to affect views in the local area. The visual effects of the project will reduce over time as planting matures.

Sound, noise and vibration
A number of mitigation measures have been included in the design of the project to mitigate noise effects during operation, including noise barriers along the edge of the Streethay viaduct.

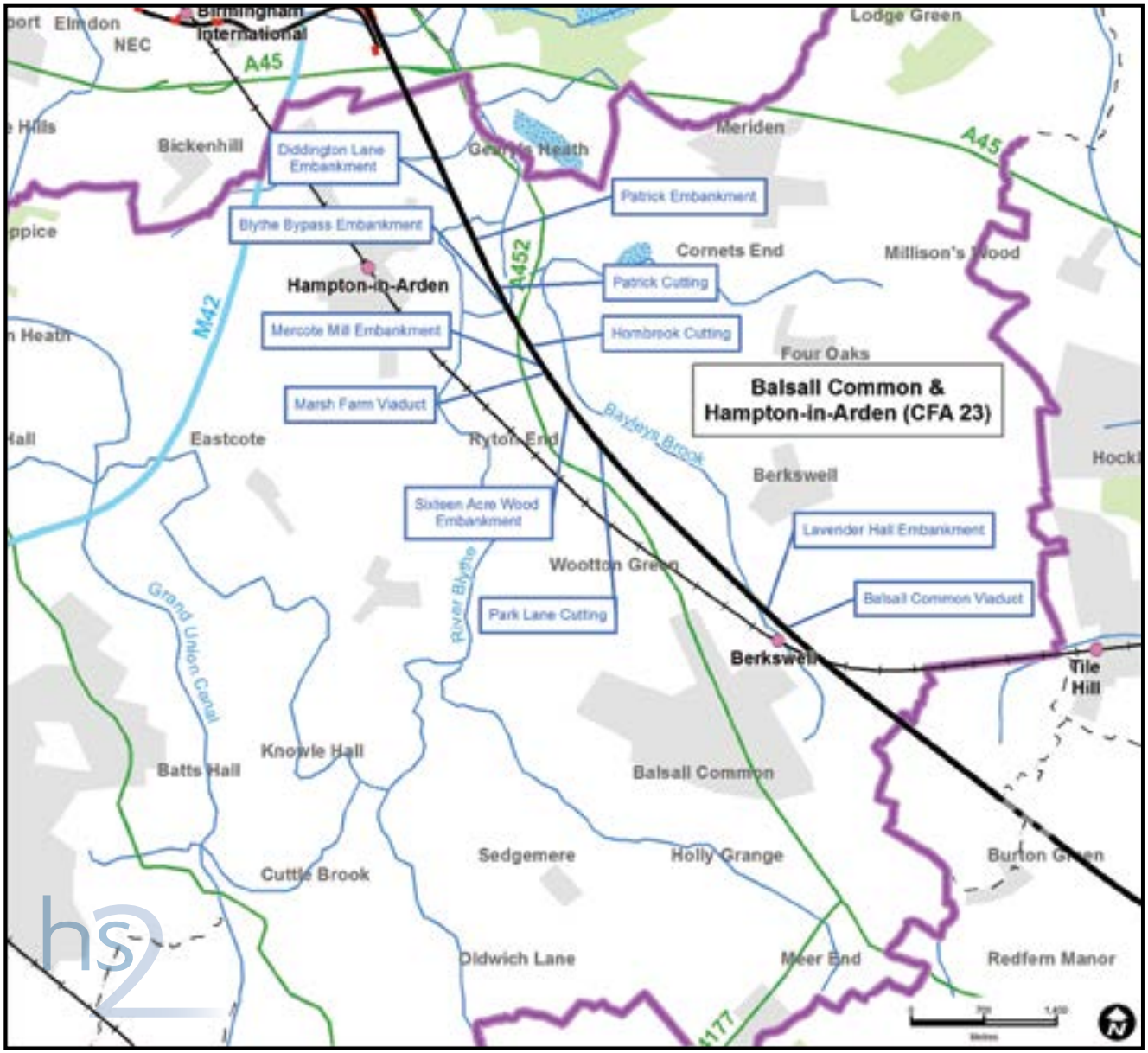
The occupiers of four dwellings - located at the Manor in Streethay, Streethay Farm on the Burton Road, Mill Farm at Lichfield and at Ravenshaw House at Curborough - have been assessed to be significantly affected by noise from the operation of the railway. For dwellings which satisfy the applicable qualifying criteria, HS2 Ltd will offer noise insulation. If noise insulation is accepted by the owners, this will help to reduce or avoid these effects.

Operation of the railway has been assessed as likely to result in increases in external noise that are considered significant for residential areas around the south of Handsacre closest to the West Coast Main Line and at Whittington in the vicinity of Darnford Lane, Marsh Lane and Lichfield Road and on Handsacre Primary School, resulting in an adverse effect.

Traffic and transport
During construction, increases in traffic will affect pedestrians, cyclists and horse riders using the A38 between its junction with the A5 to the south of Lichfield and its junction with Wood End Lane at Hilliards Cross; Cappers Lane from its junction with Austin Cote Lane eastwards to just beyond Mill Farm; Broad Lane from its junction with Cappers Lane eastwards to just past the West Coast Main Line; and Wood End Lane from its junction with the A38 at Hilliards Cross to the junction with Nanscawen Road in Fradley Park. During construction, users of four public rights of way in the area will be affected by noise associated with construction vehicles and a part-closure of a footpath.

Part of Shaw Lane will be permanently closed and traffic will be diverted to other roads, which will cause increases in journey times. Two footpaths will be permanently realigned resulting in increases in journey times for pedestrians.

Figure 36: Balsall Common and Hampton-in-Arden area context map



8.23 Balsall Common and Hampton-in-Arden

Overview

The primary land use in the Balsall Common and Hampton-in-Arden area is agriculture. The area includes the settlements of Balsall Common, Berkswell and Hampton-in-Arden. Transport routes in the area include the A452 Kenilworth Road, the A45 Coventry Road, the M42 and the Rugby to Birmingham Line.

The project

The route will enter the area north-west of the B4101 Waste Lane, adjacent to the Kenilworth Greenway, then cross the Rugby to Birmingham line on a bridge, south-east of Berkswell station (see Figure 36). Continuing north-west the route will cross Truggist Lane, Bayleys Brook and several public rights of way. The route will continue parallel to the A452 Kenilworth Road which it will cross near to Marsh Lane nature reserve. The route will then cross the River Blythe, the B4102 Meriden Road and Diddington Lane leaving the area south-east of the A45 Coventry Road, near to Pasture Farm. An auto-transformer station will be located in the Bradnocks area.

The route will pass near Balsall Common to cross Bayleys Brook and the River Blythe on viaduct. Construction of the project will require the demolition of the clubhouse at Berkswell Clay Pigeon Club and three roads will be permanently realigned. A section of Diddington Lane will be permanently closed to vehicles. There will be a main construction site compound located off Park Lane. Ten satellite construction site compounds will be located in the area. A number of utilities, including gas and water mains and telecommunications, will need to be diverted.

Landscape planting and ecological mitigation have been included within the project at a number of locations. For example, species-rich hedgerow is proposed at Park Lane Cutting. Woodland habitat creation has been included in suitable locations to mitigate habitat loss or fragmentation, for example, woodland at Pasture Farm south of Diddington Cutting and adjacent to the Park Lane Cutting.

Residual effects

Construction and operation of the project in this area are not likely to result in any adverse residual effects on air quality, socio-economic or water resources and flood risk. Similarly, no likely adverse residual effects have been identified as arising during operation for agriculture, forestry and soils or land quality.

Agriculture, forestry and soils

Thirteen agricultural holdings will experience temporary adverse effects. Construction of the project will result in land take from five agricultural holdings. Of these, two holdings are likely to cease to operate. Approximately 58ha of agricultural land will be permanently lost including approximately 36ha of high quality land.

Community

Construction of the project will result in temporary effects on the amenity of residents at properties on Truggist Lane, Lavender Hall Lane, Park Lane and properties off the A452 Kenilworth Road, due to noise and visual effects.

The partial closure of Diddington Lane during the construction period will result in an isolation effect on staff and pupils at the Island Project School at Diddington Hall. Staff and pupils at the Island Project School will also experience amenity effects during construction due to noise and visual disturbance. A noise barrier on Diddington Lane embankment and part of the Diddington cutting is proposed to reduce noise impacts on the school during operation.

Users of the Lavender Hall Fisheries and the re-routed Kenilworth Greenway will be affected during construction. Land will be required at Marsh Lane nature reserve, Berkswell Clay Pigeon Shooting Club and Heart of England Aeromodellers site.

The amenity of residents of properties on Truggist Lane, Old Waste Lane and Diddington Lane will be affected due to noise and visual effects.

Cultural heritage

Construction of the project will affect the settings of the Grade II* listed Ram Hall, the moat located at Ram Hall, the Grade II listed Barn at Ram Hall, the Grade II* listed Lavender Hall Farmhouse, the Grade II* listed Barn at Lavender Hall Farm, Berkswell Conservation Area, the Grade II* listed Diddington Hall, the Grade II* listed Diddington Farmhouse and the Grade II listed Pasture Farmhouse. A historic hedgerow, areas of ridge and furrow, a section of the medieval park associated with the Berkswell Estate and evidence of agricultural activity associated with the medieval period will be permanently removed for construction of the project.

Operation of the project will affect the settings of the Grade II* listed Ram Hall, the Barn at Ram

Hall, the Grade II* listed Lavender Hall Farmhouse, the Grade II listed Barn at Lavender Hall Farm and the Grade II* listed Diddington Farmhouse.

Land quality
With the application of the measures contained within the draft CoCP, no adverse impacts are anticipated with respect to contaminated land.

The project will cross three preferred sand and gravel resource sites which will not be available once construction is complete. Possible extraction of the sand and gravel in advance of the works will be discussed with the relevant mineral planning authority.

Landscape and visual assessment
Construction works and changes to the existing landform and vegetation patterns will affect the character and appearance of the local landscape. During operation, the effect of the project on the character and appearance of the local landscape will substantially reduce over time as mitigation planting matures. Significant effects will remain in some parts of the local landscape due to the presence of the project, including the Balsall Common viaduct.

The presence of construction works will cause temporary effects on views within the area including those at Old Waste Lane, Ridings Hill, Barrett's Lane, Baulk Lane, Lavender Hall Lane, Bradnocks Marsh Lane and Diddington Lane. Views from several public rights of way and the A452 Kenilworth Road and the B4102 Meriden Road will also be affected. During operation, the project including the Balsall Common viaduct, will continue to affect views in the local area. The visual effects of the project will reduce over time as planting matures.

Sound, noise and vibration
Measures in the draft CoCP will be implemented to manage noise and vibration during construction, including the use of quiet and low-vibration equipment and screening along the edge of the construction worksites. Tall screening will be used adjacent to the residential communities at Truggist Lane, Lavender Hall Lane, Park Lane, Marsh Farm, Mercote Lodge, Patrick Farm and Pasture Farm.

Noise from construction is likely to result in adverse effects on a limited number of residential areas closest to the construction works at Truggist Lane and Lavender Hall Lane in Berkswell and on the A452 Kenilworth Road north of Balsall Common. Potential adverse effects are reported for the Island Project School, Bibury House guest house, the British Legion Club in Balsall Common and commercial properties at Patrick Farm.

A number of measures have been incorporated in the design of the project to mitigate noise effects during operation. These include screening along the proposed route near Hampton-in-Arden and on the Balsall Common viaduct to reduce adverse noise effects at Balsall Common.

The occupiers of 11 dwellings have been assessed to be significantly affected by noise from the operation of the railway. For dwellings which satisfy the applicable qualifying criteria, HS2 Ltd will offer noise insulation. If noise insulation is accepted by the owners, this will help to reduce or avoid these effects. The affected dwellings are located at Wellmont House and Cherry Tree Cottage on Truggist Lane, Patricks Farm on B4102 Meriden Road, Marsh Farm, Marsh Cottage and Mercote Cottage on A452 Kenilworth Road, Pasture Farm House on A45 Coventry Road and Pandora, Beech Lawn, Truggist Hill and Truggist Hill Farm on Truggist Lane.

Operation of the railway has been assessed as likely to result in increases in external noise that are considered significant around the residential areas closest to the route at Beechwood (Waste Lane, Old Waste Lane and Truggist Lane), Berkswell (Truggist Lane and Baulk Lane) and Hampton-in-Arden (Diddington Lane).

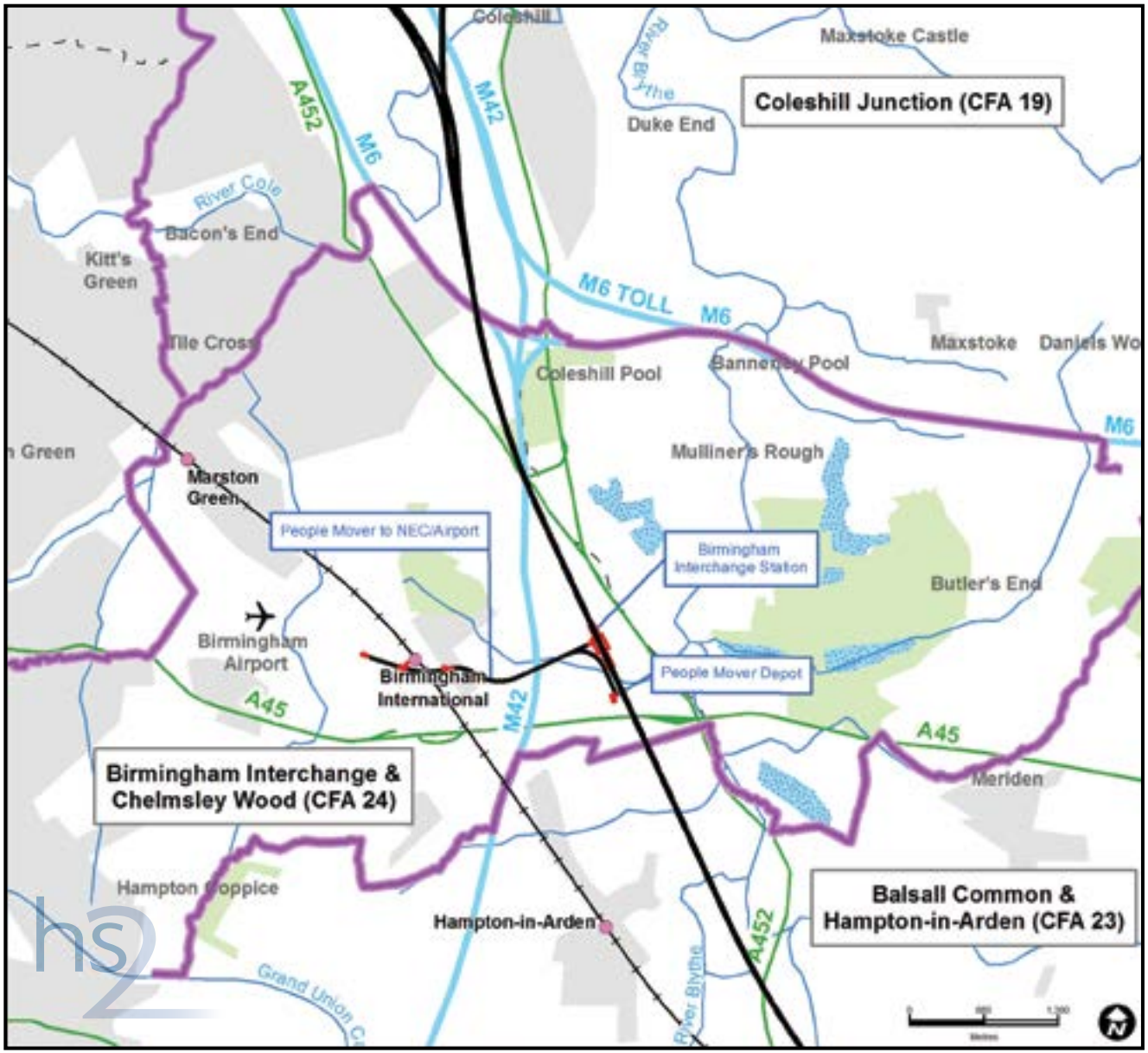
Visualisation of the Balsall Common viaduct

Traffic and transport

Construction vehicles will use some local roads to access construction worksites and compounds. During the most intense periods of construction this will cause increased congestion and journey times for those travelling on the A452 Kenilworth Road, Park Lane, Truggist Lane and Spencer Lane. Increases in traffic will affect pedestrians and cyclists using the A452 Kenilworth Road, the B4101 Kelsey Lane/Waste Lane, Windmill Lane, Park Lane, Diddington Lane and Hob Lane. Lavender Hall Lane will be temporarily closed and vehicular traffic, pedestrians and cyclists will be diverted, increasing journey times. Nine public rights of way and Kenilworth Greenway will be temporarily diverted, increasing distance and journey times for those using the alternative routes.

During operation, the proximity of Birmingham Interchange station will have beneficial effects for residents and businesses in this area travelling between Birmingham and London. The partial closure of Diddington Lane to motor vehicles and reconfiguration of the A452 Kenilworth Road/ Marsh Lane junction will result in increased journey times for current users of these routes. There will be an increase in traffic associated with people travelling to and from Birmingham Interchange station through this area. Seven public rights of way and three roads (A452 Kenilworth Road, Park Lane and Lavender Hall Lane) will be realigned, which for some routes will extend journey times. The section of Diddington Lane that will be closed for motor vehicles will be reinstated as a public bridleway.

Figure 37: Birmingham Interchange and Chelmsley Wood area context map



8.24 Birmingham Interchange and Chelmsley Wood

Overview

Land use in the Birmingham Interchange and Chelmsley Wood area is mainly agriculture and is largely within the Packington Estate and the Coleshill Estate. The urban areas relate to Chelmsley Wood (a large residential estate) Birmingham Business Park, Birmingham Airport, Birmingham International station and the National Exhibition Centre. The main highways in the area include the A452 Chester Road, the A45 Coventry Road, the A446 Stonebridge Road, the M42, and the M6.

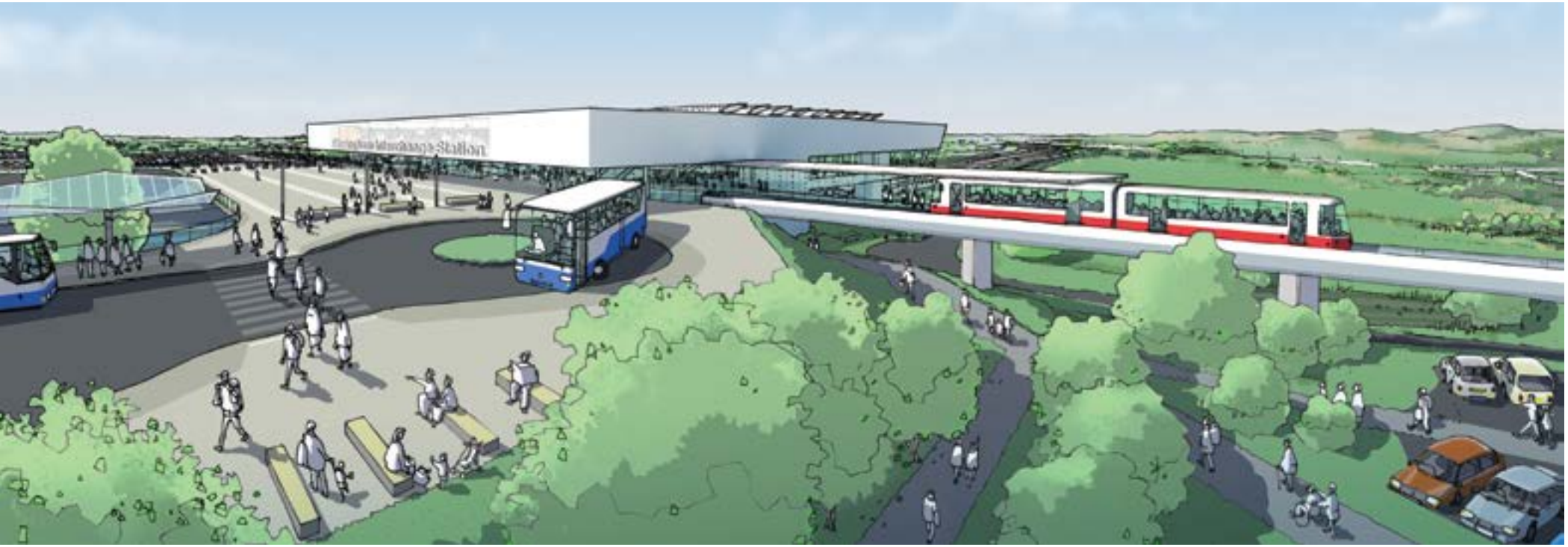
The project

The route will enter the area south of the A45 Coventry Road in Hampton-in-Arden and then proceed north-west into a triangular area bordered by the A452 Chester Road to the east, the M42, Birmingham Airport and the National Exhibition Centre to the west and the A45 Coventry Road to the south (see Figure 37). Within this triangular site, Birmingham Interchange station will be constructed together with a people mover and depot which will provide connections between the new station, the National Exhibition

Artist impression - view of Birmingham Interchange station from the north-west

Centre, Birmingham International railway station and Birmingham Airport. The new station will have four platforms. The route will continue north-west, crossing over the M42 on viaduct, then the M6 on a box structure. The route will leave the area close to the M42/M6 intersection.

An auto-transformer station will be located north-east of the A452 link road. The project will require the demolition of two structures and three properties in the area. There will be a number of road diversions. A main construction site compound will be located between Middle Bickenhill Lane and the M42 within the site of the Birmingham Interchange. Twenty-two smaller construction site compounds will be required. Construction of the project will require the demolition of one dwelling and Olympia Motorcycle Track. A number of utilities, including electricity, gas and water mains, will need to be diverted.



Artist impression - view of Birmingham Interchange station from the south-east

Landscape planting and ecological mitigation have been included within the project at a number of locations. For example, marshy grassland planted around Hollywell Brook. Woodland habitat creation has been included in suitable locations to mitigate habitat loss.

Policy

The Command Paper *'High Speed Rail: Investing in Britain's Future - Decisions and Next Steps'* confirmed the location of Birmingham Interchange station close to Birmingham Airport, Birmingham International station on the West Coast Main Line, the M6 and M42.

The *'Solihull Unitary Development Plan 2006'* seeks to integrate transport with development across the Solihull area, aiming to promote sustainable transport choices. The plan seeks to encourage proposals for transport interchanges at key locations across the Solihull Metropolitan Borough, to support an improved local and national transport network. The *'Solihull Draft Local Plan 2012'* recognises that HS2 could play a key role in the future of the Solihull Metropolitan Borough.

Residual effects

Construction and operation of the project in this area are not likely to result in any adverse residual effects on air quality, land quality or water, resources and flood risk assessment. Similarly, no likely adverse residual effects have been identified as arising during operation for community or socio-economics.

Agriculture, forestry and soils

Four agricultural holdings will be significantly affected during construction, of which three, Park

Farm, land west of Middle Bickenhill Lane and Bogs Farm West, will experience permanent land loss. Approximately 93ha of agricultural land will be permanently lost including approximately 80ha of high quality land.

Community
During construction, land will be required from the National Motorcycle Museum. Recreational amenity at Heath Park will be affected by the presence of construction works. Residents at Middle Bickenhill Lane, Park Farm and Common Farm will experience isolation effects as a result of reduced accessibility and the presence of construction activities.

The National Motorcycle Museum and Heath Park will be permanently affected due to land required for the construction and operation of the project; however, they will be able to continue to operate. The Olympia Motorcycle Track will be permanently lost.

Cultural heritage
Construction works will affect the setting of Common Farm and the Grade II* listed Park Farmhouse. Archaeological assets will be permanently removed, including the remains of medieval field systems, roads and trackways, and the sites of former buildings.

The project and traffic associated with Birmingham Interchange station will affect the rural setting of Common Farm and the Grade II* listed Park Farmhouse.

Landscape and visual assessment
Construction works and changes to the existing landform and vegetation patterns will significantly affect the character and appearance of the local landscape. During operation, the effect of the project on the character and appearance of the local landscape will substantially reduce over time as mitigation planting grows and matures. Significant effects will remain in some parts of the local landscape due to the presence of the Birmingham Interchange station and associated highway and car parking infrastructure, the people mover.

Construction works will cause temporary effects on views within the area including at Middle Bickenhill Lane, Bluebell Drive/Lyecroft Avenue and Foxland Close and users of Eastway, A452 Chester Road, Solihull Parkway, A446 Stonebridge Road and Coleshill Heath Road. During operation Birmingham Interchange station and the associated people mover will continue to affect views in the local area. The visual effects of the project will reduce over time as planting matures.

Socio-economics
The construction of the project will create approximately 360 full-time-equivalent jobs in the area. Approximately 100 new HS2 permanent jobs will be created by the project at Birmingham Interchange. Jobs will also be created in relation to the operation of the people mover linking the HS2 station with the National Exhibition Centre/ Birmingham Airport complex.

In June 2013 Solihull Metropolitan Borough Council published the UK Central (formerly known as M42 Economic Gateway) Masterplan which considers opportunities for new commercial development around the proposed station. While those plans are still being developed, HS2 Ltd will continue to work closely with Solihull Metropolitan Borough Council and other stakeholders, to explore the potential for new opportunities associated with the station. This area is considered to have the potential to generate 63,000 jobs.

It is estimated that the construction of the project will result in displacement or possible loss of approximately 30 existing jobs within this area. Taking into account the availability of alternative premises and the total employed within the district (approximately 97,000), the displacement or possible loss of jobs is

considered to be relatively modest compared to the scale of economic activity and opportunity in the area.

Construction of the people mover may discourage customers from using the Hilton Birmingham Metropole Hotel for a period of up to nine months.

Sound, noise and vibration

Measures in the draft CoCP will be implemented to manage noise and vibration during construction, including the use of quiet and low-vibration equipment and screening along the edge of the construction worksites. Tall screening will be used adjacent to the residential properties on Middle Bickenhill Lane and the residential and commercial premises at Park Farm and Common Farm.

Potential significant adverse effects from construction are reported for commercial buildings closest to the people mover at the National Exhibition Centre, the Crowne Plaza Birmingham NEC, Hilton Birmingham Metropole, Novotel, Ibis and Etap hotels and the Diamond House office building.

A number of measures have been included in the design of the project to mitigate noise effects during operation, including the use of noise screening where appropriate.

Occupiers of Common Farm on A452 Chester Road have been assessed to be significantly affected by noise from the operation of the railway. For dwellings which satisfy the applicable qualifying criteria, HS2 Ltd will offer noise insulation. If noise insulation is accepted by the owners, this will help to reduce or avoid these effects.

Operation of the railway has been assessed as likely to result in a significant increase in external noise for two office buildings at Birmingham Business Park and at the Holiday Inn Express at Birmingham National Exhibition Centre.

Traffic and transport

The project will have a beneficial effect on rail users as a result of the reduction of crowding on local rail services and the opportunity for the West Coast Main Line to operate additional services. The project will provide high capacity and fast and efficient interchange via the people mover to the National Exhibition Centre, Birmingham International station, Birmingham Airport, and business parks in the area.

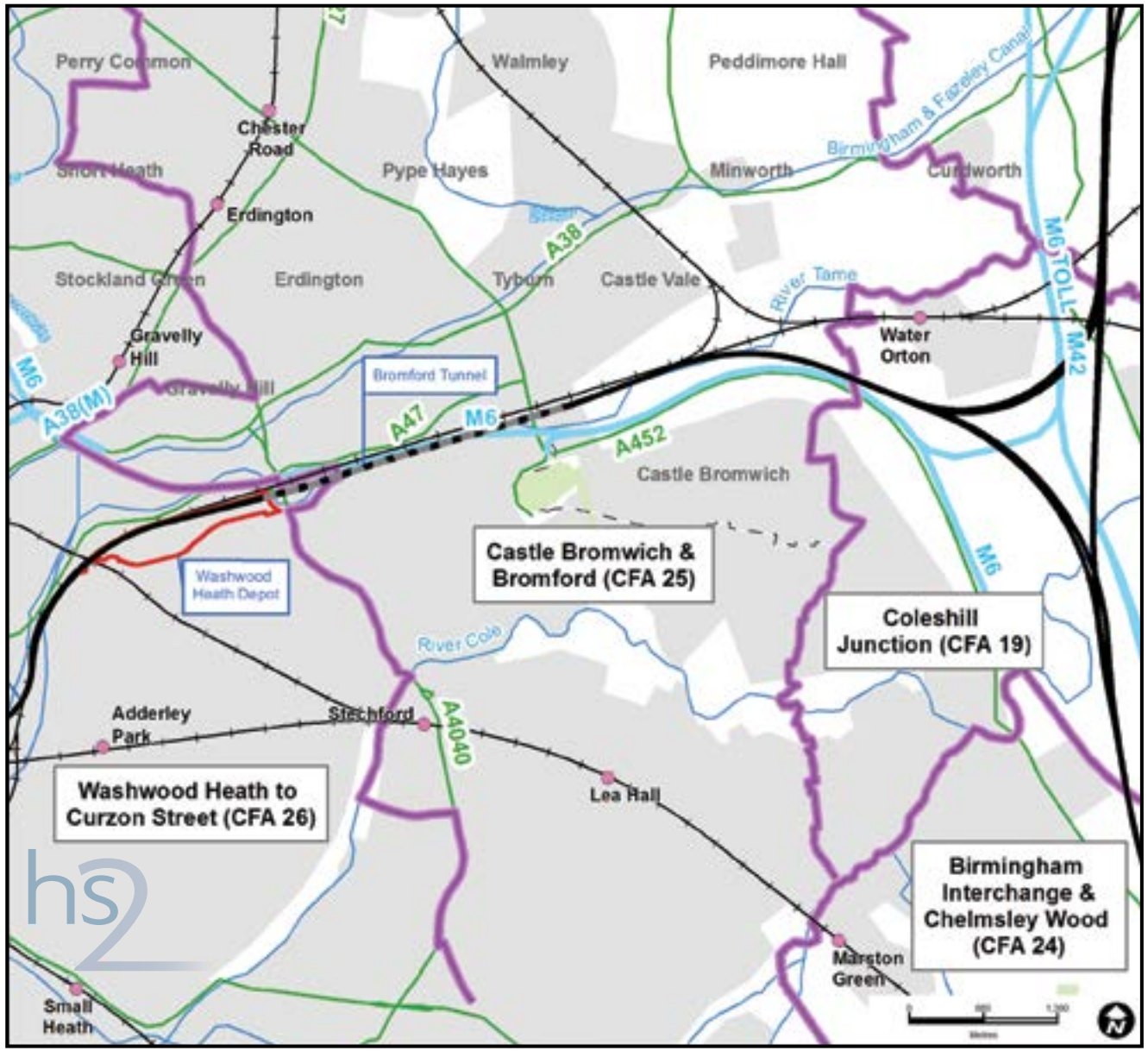
Increases in traffic during construction will lead to congestion and delays on the wider road network including the M42, between junction 5 and the M6 on-slip roads; A446 Stonebridge Road between M6 junction 4 and Stonebridge Island and A452 Chester Road, between Packington Lane and Stonebridge Island and the A45 Coventry Road.

There will be a temporary loss of car parking at Birmingham International station, the Melbicks Garden and Leisure centre and Birmingham Airport (including car hire spaces). There will be a permanent loss of taxi spaces at Birmingham Airport, and car parking spaces at the National Motorcycle Museum.

The closure of Middle Bickenhill Lane will require a diversion increasing journey times and travel distances. The reconfiguration of roads at the A452 Chester Road/A446 Stonebridge Road/ Solihull Parkway will result in increased travel times for motor vehicles, pedestrians and cyclists.

There will be an increase in traffic associated with the Birmingham Interchange station which will affect pedestrians and cyclists using the A446 Stonebridge Road between the M6 junction 4 and the A452 Chester Road/ A446 Stonebridge Road roundabout; the B4438 Bickenhill Parkway between North Way and Damson Parkway.

Figure 38: Caste Bromwich and Bromford area context map



8.25 Castle Bromwich and Bromford

Overview

The Castle Bromwich and Bromford area is predominantly urban, dominated by industrial and commercial land use on its eastern edge and encompassing Park Hall nature reserve on the rural fringe. The main settlements in the area include Castle Bromwich, Castle Vale and Bromford. The main transport links in the area include the M6, the A452, the A452 Chester Road, the A47 Fort Parkway and the Birmingham and Derby Line.

The project

The route will enter the area just south of the B4118 Birmingham Road, north of Chelmsley Wood (see Figure 38). It will then cross the realigned River Tame on viaduct at Park Hall nature reserve and then will run on embankment parallel to the Birmingham and Derby Line. From here it will enter cutting and then tunnel, east of the A452 Chester Road in the Castle Bromwich Business Park. The route will pass in tunnel beneath Chester Road, the River Tame, the M6 and Bromford Drive, before leaving the area. An

auto-transformer station will be located at the eastern end of Castle Bromwich Business Park.

No road diversions are currently anticipated in the area. One main construction site compound will be located at Castle Bromwich Business Park. Five satellite compounds will be located in the area. A number of utilities works will be required, including the diversion of a National Grid overhead power line, repositioning of three pylons, and a fuel pipeline through Park Hall nature reserve.

Landscape planting and ecological mitigation have been included within the project. For example, native broadleaved woodland and marshy grassland within Park Hall Site of Importance for Nature Conservation alongside the diverted River Tame.

Residual effects

Construction and operation of the project in this area are not likely to result in any adverse residual effects on air quality, land quality or water resources and flood risk. Similarly, no likely adverse residual effects have been identified as arising during operation for agriculture, forestry and soils, community, cultural heritage, ecology, socio-economics or sound, noise and vibration.

Agriculture, forestry and soils

Construction of the project will result in land take from three agricultural holdings. One holding (land north of B4118 Birmingham Road) is likely to cease to operate.

Community

Park Hall nature reserve will be affected by the loss of land required during construction. Farnborough Road Park will be affected due to construction traffic and visual effects. Some residents at Blenheim Way, Cadbury Drive, Berwood Court Care Home and the Gypsy and Traveller site, at Castle Bromwich Business Park, will experience amenity effects due to the proximity of construction works, resulting in noise and visual effects. Residents at the Gypsy and Traveller site at Castle Bromwich Business Park will also experience temporary isolation effects due to surrounding construction works.

Cultural heritage

Archaeological assets will be permanently removed including an area of the former Park Hall Deer Park, buried linear features associated with the former Castle Bromwich airfield and WWII military factories, remains of the Great House of Park Hall, including its agricultural outbuildings and the site of a dovecote. The remains of the walled garden and a bridge at Park Hall will be removed.

The project will lead to the loss of elements of the historic landscape including Parkhall Wood and wood bank, Langley Hill Wood and Parkhill Wood and wood bank. Elements of ridge and furrow which contribute to the setting of historic settlements and buildings such as Park Hall will be removed.

Ecology

At Park Hall Site of Importance for Nature Conservation there will be a loss of 0.7ha of ancient broad-leaved and 2.7ha of semi-natural woodland, 11.4ha of species-rich grassland, 1.4ha of swamp vegetation and reed bed, 265m of ditch habitat and 17 ponds. The loss of swamp vegetation and reed bed will affect a small population of grasshopper warbler. These effects will be offset in part by the creation of approximately 16.6ha of marshy grassland.

Land quality

With the application of the measures contained within the draft CoCP, no adverse impacts are anticipated with respect to contaminated land. The remediation of potentially contaminated

sites such as Castle Bromwich Waste Treatment Site landfill and Castle Bromwich Business Park, resulting in a beneficial effect.

Landscape and visual assessment
The presence of construction works will significantly affect the character and appearance of the existing local urban area. The new viaduct at Park Hall, the embankment, the river diversions, cutting and tunnel portal and associated infrastructure will be designed to integrate with the character and appearance of the urban area. The incorporation of planting and landscaping will further integrate these elements as part of the urban setting.

The presence of construction works will cause temporary effects on views within the area including at the B4118 Birmingham Road, Farnborough Road, Javelin Avenue, Blenheim Way and Cadbury Drive. Views from Castle Vale Nature Conservation Area and Farnborough Road Park, several local roads will also be affected. During operation, the Park Hall viaduct will continue to affect views in the local area.

Socio-economics
Local employment opportunities are likely to arise at the proposed Washwood Heath depot and Birmingham Interchange and Curzon Street stations.

The project will require the demolition of commercial properties within the Castle Bromwich Business Park. These properties are located to the north of the business park, next to the existing railway.

It is estimated that the project will result in the displacement or possible loss of approximately 220 jobs within this area. Taking into account the availability of alternative premises and the total employed within the district (approximately 97,000), the displacement or possible loss of jobs is considered to be relatively modest compared to the scale of economic activity and opportunity in the area.

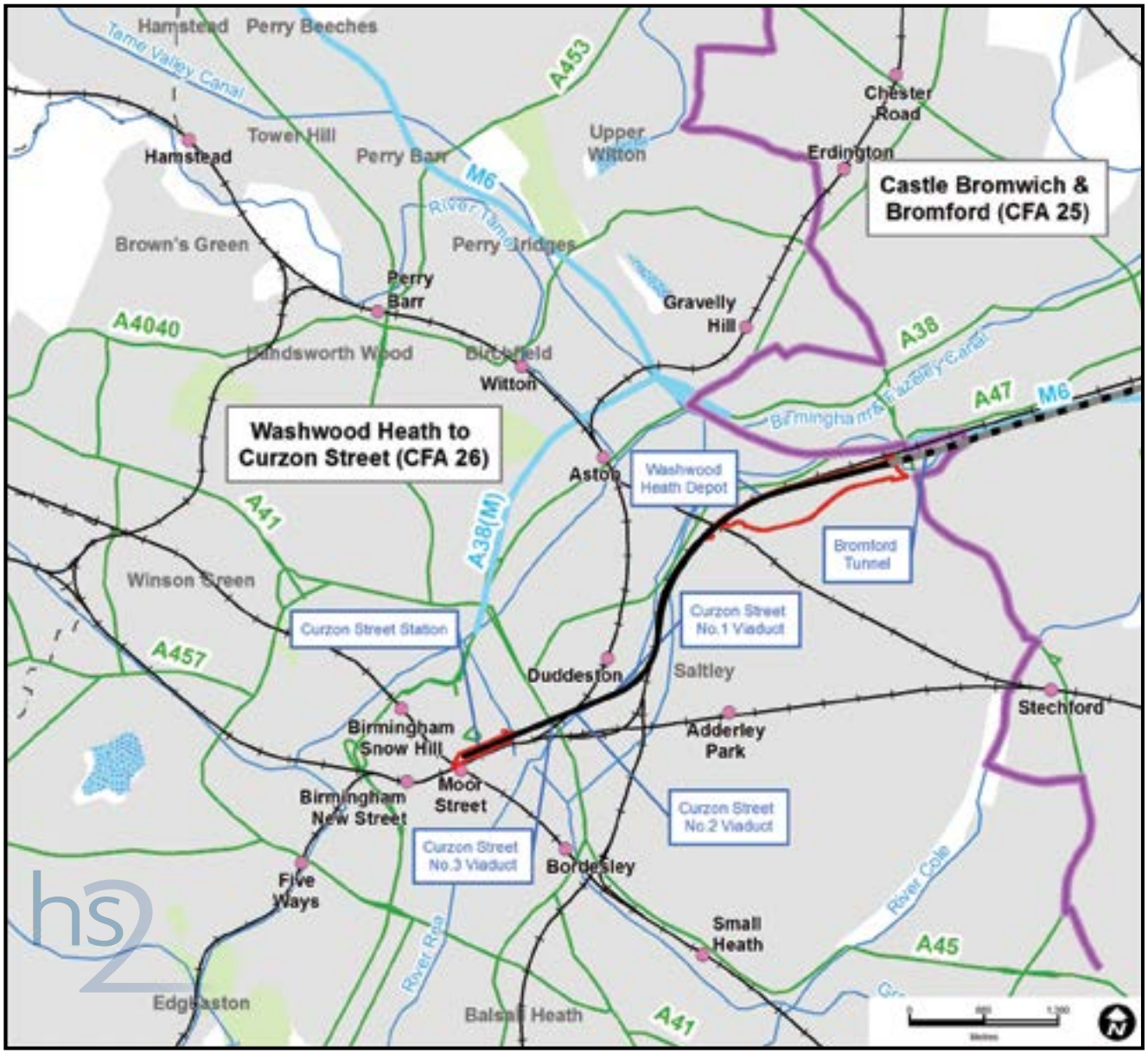
Sound, noise and vibration
Measures in the draft CoCP will be implemented to manage noise and vibration during construction, such as the use of quiet and low-vibration equipment and screening along the edge of the construction worksites. Tall screening will be used in two locations: between the Bromford tunnel east portal works and the commercial/industrial premises and the traveller site in Castle Bromwich Business Park, and in the vicinity of the Twisted Oak Riding stables, on the edge of Water Orton.

Noise from construction is likely to result in significant adverse effects closest to the worksites at the residential areas at Blenheim Way and Cadbury Drive in Castle Vale and Wanderer Walk and Chillinghome Road in Bromford. Potential significant adverse effects are reported for some buildings in Castle Bromwich Business Park, Berwood Court Care Home, the Air Training Corps building on Cadbury Drive and Tame Valley Academy.

Traffic and transport
Due to the proximity of Curzon Street station and Birmingham Interchange, rail users in this area will benefit from improved journey times and lower crowding levels on trains to and from Euston station as a result of increases in train frequencies.

During the most intensive periods of construction there will be an increase in traffic which will affect pedestrians and cyclists crossing Tameside Drive and Langley Drive.

Figure 39: Washwood Heath to Curzon Street area context map



8.26 Washwood Heath to Curzon Street

Overview

The Washwood Heath to Curzon Street area to the east of Birmingham city centre comprises industrial and commercial land uses through Washwood Heath, Nechells, Saltley and Vauxhall Green. The nearest main residential areas are Bromford, Washwood Heath and Saltley. The main transport infrastructure in the area includes the A47 Heartlands Parkway, the A4040 Bromford Lane, the A4540 Lawley Middleway, the Birmingham to Rugby branch of the West Coast Main Line and the Birmingham and Derby Line.

The project

The route will be in tunnel as it enters the area approximately 500m east of the A4040 Bromford Lane (Figure 39). Heading westwards towards Curzon Street, the tunnel will pass beneath the River Tame, Bromford Lane and the River Tame again. It will then rise up to ground level and emerge next to the HS2 rolling stock maintenance depot that will be at Washwood Heath. The route passes under two bridges, allowing the Stechford and Aston railway and Aston Church Road to cross the route, over the Grand Union Canal and under

the B4114 Saltley Viaduct. Immediately south of the viaduct, the route will pass over the Derby to Birmingham rail line and a number of roads before fanning out, on viaduct, to create the approach tracks into the proposed Curzon Street station.

Curzon Street station will include seven platforms, including one with international capacity. An entrance at its western side will front onto Moor Street Queensway at ground level, with a pedestrian link to Moor Street station. An eastern entrance is also proposed close to the existing Grade I listed former Curzon Street station building, from New Canal Street and Curzon Street. Auto-transformer stations will be required at the Washwood Heath depot and Curzon Street.

Public realm improvements around Curzon Street station will integrate the building into its surroundings. The design of the public realm encompasses the area north of the station from the Digbeth Branch canal along Curzon Street and across Eastside to the Moor Street Queensway frontage. The design of the public realm will also provide dedicated access to the Gun Barrel Proof House.

The rolling stock maintenance depot at Washwood Heath will be approximately 1.6km long and 400m wide. It will be located at land west of A4040 Bromford Lane and the River Tame, north of Warren Road and Drews Lane, south of the Birmingham and Derby line and east of the Stechford and Aston line. The network control centre will also be located at Washwood Heath. It will operate as the hub for high speed rail maintenance and operation, supporting both Phase One and Phase Two.

There will be two main construction compounds in the area, one in Washwood Heath, accessed from Wolseley Drive, and one at Curzon Street station site accessed from Curzon Street. Eleven satellite construction compounds will be required in the area. Construction of the project will require the demolition of 12 dwellings, the Arya Samaj Vedic Mission and the Fox and Grapes public house.

There will be permanent road closures affecting seven roads around Curzon Street to allow construction of Curzon street station. There will be temporary closures of several local roads during construction. The Washwood Heath Brook will be permanently diverted within the proposed Washwood Heath depot and the River Rea will be temporarily modified to support construction of the Bromford tunnel. A number of utilities including electricity, water and communications will need to be diverted.

Landscape planting and ecological mitigation have been included within the project - for example, species-rich hedgerow along the southern boundary of the project adjacent to Saltley Business Park and grassland on the banks of the southern side of the area surrounding the proposed Washwood Heath depot.

Policy

National and regional policies support the location of the Birmingham terminus station for HS2 at Curzon Street in the city centre. In January 2012 the Government confirmed Curzon Street as the site for the terminus station that will best serve passenger requirements, being closely integrated with existing transport networks, and offer regeneration benefits in the area. The Washwood Heath depot was selected as supporting both the project and the proposed Phase Two of HS2.

The '*West Midlands Local Transport Plan 2011-2026'* identifies HS2 as having significant potential to improve the Birmingham area's competitiveness and productivity.

Birmingham City Council's '*Eastside Masterplan 2011'* recognises the important role that a terminus at Curzon Street will play in enabling regeneration, stating that it will transform Eastside into a key destination, unlocking

development opportunities and linking this area with retail and office developments within the city centre. The masterplan states that Curzon Square, adjacent to the proposed terminus, has the potential to become a cultural village, encouraging artistic and creative activities, forming an international visitor attraction.

The Birmingham Development Plan Options Consultation 2012 states that HS2 will help to build upon the success of other improvements to transport infrastructure including the continued expansion of Birmingham Airport and new and improved routes to connect residential area and employment opportunities.

Birmingham City Council are currently preparing a development framework for the Washwood Heath depot site to ensure that following the construction of the depot, economic growth and employment opportunities are maximised in the local area.

Residual effects

Construction and operation of the project in this area are not likely to result in any adverse residual effects on air quality, ecology, land quality and water resources and flood risk assessment. Similarly, no likely adverse residual effects have been identified as arising during operation for community, cultural heritage or socio-economics.

Community

The construction of the project will result in the demolition of 12 dwellings on Common Lane in Washwood Heath, Curzon Gateway student accommodation, Curzon Street and the Arya Samaj Vedic Mission building community facility at Erskine Street.

Construction of Curzon Street station will result in the loss of public open space at Park Street Gardens. Land will be required for the construction and operation of the project at Eastside City Park and the West Midlands Fire Service headquarters. Millennium Point will experience isolation effects due to construction works.

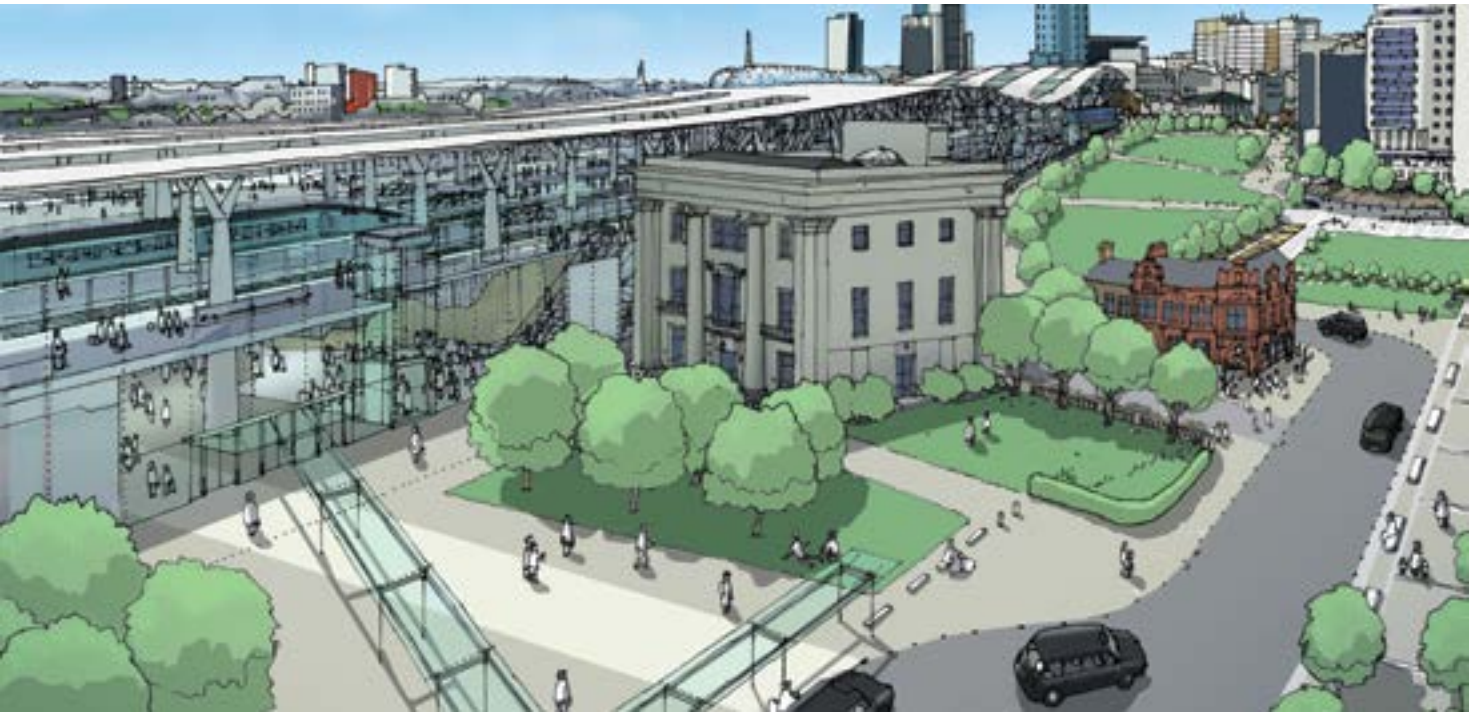
During construction the amenity of residential occupiers on Common Lane, Warren Road, Northumberland Street, Vauxhall Grove, Vauxhall Road, Curzon Gateway, Masshouse Hive, Etna Street and Bordesley Street will be affected as a result of noise and visual effects. Future residential developments at Eastside Locks, Typhoo Wharf, Masshouse Hive and Masshouse Plot 7 would also experience a loss of amenity due to noise and visual effects.

During construction the amenity of staff and pupils at the Leigh Junior, Infant and Nursery School, Hasanat College and the Parkside Building, the users of Masjid Ali Mosque, Eastside City Park, Think Tank Museum Science Garden and the Polish Centre will be affected by noise and increased traffic. The staff and students at the existing and proposed new teaching facilities at Birmingham City University in Eastside would also experience a loss of amenity during construction.

Cultural heritage

Construction of the project will result in the loss of the former railway depot buildings at Washwood Heath, the burial ground at Park Street Gardens, the Grade II listed Fox and Grapes public house, post medieval archaeological deposits associated with the former Curzon Street station and medieval remains at Freeman Street. Incorporation of the locally listed Eagle and Tun public house into the design of Curzon Street station will affect its setting.

Curzon Street station will restore the historic railway setting of the Grade I listed British Rail Goods Office (the former Curzon Street Station building) and affect its setting. Viaducts and the new station will affect the setting of the Lawley Street Railway Viaduct, the Woodman public house, Ashted Canal Locks and the 1838 section of bridge into Curzon Street station over Digbeth Branch Canal.



Artist impression - view of Curzon Street station from the north, adjacent to Curzon Street

Ecology
Washwood Heath Brook and the River Rea Overflow Channel will be diverted. Consideration will be given to the incorporation of soft banks and shelves in these diversions to encourage vegetation, resulting in beneficial effects for both watercourses.

Land quality
No adverse impacts are anticipated with respect to contaminated land. The remediation of potentially contaminated sites such as those within the footprint of the Washwood Heath depot, including the 'Land rear of Freight Rover Works' historical landfill site and the former LDV factory site, will result in a beneficial effect.

Landscape and visual assessment
The presence of construction works will significantly affect the character and appearance of the existing local urban area. Curzon Street station and the rolling stock maintenance depot and associated facilities will be designed to integrate with the character and appearance of the urban area. The incorporation of planting and landscaping will further integrate these elements as part of the urban setting. Significant visual effects will remain as a result of the new viaduct approach to Curzon Street station.

Construction activities will affect views in the local area, including at Drews Lane, Common Lane, Warren Road, Alum Rock Road, Great Francis Street, Hindlow Close, Northumberland Street, Felsted Way, Barrack Street, Vauxhall Road, the proposed Typhoo Wharf development, Millennium Point, Grosvenor Street, the proposed Masshouse Plot 7 development and the Rotunda. Views from Garrison Lane Park, the Digbeth Canal and Grand Union Canal towpaths and Hotel La Tour will also be affected. During operation, the viaducts and Curzon Street station will continue to affect views in the local area.

Socio-economics
The construction of the project in this area will create approximately 610 full-time equivalent jobs within the area. Approximately 200 new permanent jobs will be created by the project in relation to the operation of Curzon Street station and approximately 500 new jobs at Washwood Heath depot.

Artist impression - view of Curzon Street station

The Eastside Masterplan 2011 recognises the important role the proposed station will play in enabling regeneration. The plan seeks to re-integrate this area into the city centre through large-scale, mixed-use development, capable of supporting 15,000 new jobs.

The project will require demolitions or closures within: Heartlands Parkway; Vauxhall Road, Erskine Street and Inkerman Street; Network Park Industrial Estate; and Saltley Business Park, which may materially impact the local economy. Construction will result in the isolation of businesses within the Saltley Business Park, the Network Park industrial estate and businesses located between Vauxhall Road and the Freightliner Terminal Depot. During construction, customers may be discouraged from using the Hotel La Tour off Albert Road/Curzon Street.

It is estimated that the project will result in the displacement or possible loss of approximately 2,600 jobs within this area. Due to the general availability of premises, there is a reasonable probability that businesses will be able to relocate to places that will still be reasonably close to the area. However, there could still be a number of cases where alternative locations are difficult to find and unlikely to be replaced. The displaced or possible lost jobs are considered to be of relative importance in terms of employment within the local economy, though it is anticipated that most of these jobs will be relocated given the wider regeneration plans for the city centre area.

Sound, noise and vibration

Measures in the draft CoCP will be implemented to manage noise and vibration during construction, including the use of quiet and low-vibration equipment and screening along the edge of the construction worksites. Tall screening will be used adjacent to properties along the eastern and southern boundaries of the Bromford tunnel west portal and Washwood Heath depot works, along the route between Erskine Street and A4540 Lawley Middleway and around the proposed Curzon Street station.

Noise from construction is likely to result in significant adverse effects closest to the worksites at the residential areas closest to the Washwood Heath depot and Curzon Street station and along the route. Potential significant adverse effects are reported for Leigh Junior, Infant and Nursery School and Hasanat College, the Masjid Ali Project Mosque, Carrs Lane Church, St Michael's Church and a number of commercial

and industrial buildings located close to the worksites. Noise from construction traffic is likely to affect residential areas and commercial premises on a number of roads in Washwood Heath, Vauxhall and Birmingham city centre, as well as Al-Huda school, Adderley Childrens Centre and the Madrasa Anjuman-I-Naqeeb-al-Islam and Nechells Green community centres. A temporary reduction in traffic noise is likely to beneficially affect some commercial properties in Washwood Heath and Bordesley Street.

A number of mitigation measures have been included in the design of the project to mitigate noise effects during operation, including the use of noise screening where appropriate. The Washwood Heath depot site will be designed to reduce noise at adjacent properties. Permanent changes in traffic patterns will result in a reduction in noise at the residential area on Bordesley Street between Park Street and Allison Street and a future development on Fazeley Street. Changes in traffic patterns will result in adverse effects that are considered significant on residential areas alongside sections of New Bartholomew Street and Allison Street.

Traffic and transport

Rail users will benefit from improved journey times between London and Birmingham, lower crowding levels on trains to and from Euston station as a result of increases in train frequencies and released capacity on other rail services easing pressure on the West Coast Main Line with resultant reliability benefits.

The most intensive peak periods of construction will cause congestion for road users, including at the junctions of the A47 Heartlands Parkway/ Aston Church Road, B4114 Washwood Heath Road/Aston Church Road, B4132 Duddeston Mill Road/B4132 Melvina Road, Sherlock Street/ Wrentham Street, Camp Hill Circus and Woodcock Street/Aston Street.

The temporary closure of Saltley road viaduct will increase journey times for road users and increase travel distances for non-motorised users due to the diversion required. Four roadside footways and the Digbeth Branch Canal towpath will be temporarily diverted. There will also be increased journey times on eleven bus routes and a limited number of bus stops will be relocated.

During operation, there will be an increase in traffic associated with travel demand to and from Curzon Street station and the closure of the B4114 Park Street and reconfiguration of New Canal Street. Closure of the B4114 Park Street will result in the relocation of bus stops and increased travel distances for users of seven bus routes.

Five roadside footways and two footpaths will be diverted (Viaduct Street, footpath between Banbury Street and Bartholomew Street, Banbury Street, Bartholomew Street, Fazeley Street, B4114 Park Street and footpath across Park Street Gardens).

There will be a temporary loss of car parking and/ or loading areas at the West Midlands Fire Service, Crown International, Betrex, Howell Group/CRH Transport Training Ltd, Mainstream Industrial Park, the Network Rail Signal Centre, Lookers and the Birmingham Museum Collection Centre. There will be a permanent loss of car parking and/ or loading areas at the West Midlands Fire Service, Freightliner, Crown International, Cosway (UK) Ltd, Serck, and Salts Medilink Distribution Centre.

Water resources and flood risk assessment

The opening up and increased natural light levels to Washwood Heath Brook will result in a beneficial effect.

View looking towards the proposed Wendover Dean viaduct from public right of way near Jones Hill Wood

9. Summary of route-wide environmental effects

9.1 Introduction

This section presents a summary of the likely residual significant 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 community forum area reports and for which a route-wide assessment is therefore appropriate. The route-wide effects identified include: effects on the Chilterns AONB; overall effects on agricultural, forestry and soil resources; ecology; greenhouse gas emissions; wider traffic and transport effects; effects associated with the generation of solid waste during construction and operation; and effects on ecological resources of national importance and protected species.

The socio-economic effects are summarised in Section 7.10 and the waste and material resources are summarised in Section 7.13 of the Environmental overview.

For some environmental topics, effects have been assessed as being no greater than local in extent. These are air quality; community; cultural heritage; land quality; landscape and visual assessment; and sound, noise and vibration.

9.2 Chilterns Area of Outstanding Natural Beauty

The Chilterns AONB is designated for its distinctive landscapes of steep chalk scarp slopes and clay vales, and contains the country's most extensive areas of beech woodland. The AONB covers more than 800km^2 (309 square miles), from Goring, Oxfordshire in the south-west to Hexton, Hertfordshire in the north-east.

The Phase One route will pass through the AONB between Chalfont St. Giles and Wendover, a distance of over 20km. The route will be in tunnel (the Chiltern tunnel) for 9.6km between Chalfont St. Peter and Hyde Heath. Within the AONB, the Chiltern tunnel will be served by ventilation shafts proposed at Chalfont St. Giles, Amersham and Little Missenden. Auto-transformer stations will be located adjacent to the ventilation shafts at Chalfont St. Giles and Little Missenden.

Beyond the Chiltern tunnel north portal, the route will comprise the following features as it runs northwards:

- the Chiltern tunnel north cutting (1.4km);
- the South Heath tunnel (1.2km);
- the South Heath cutting (3.1km) including the adjacent Hunt's Green Farm sustainable placement area, for the permanent storage of approximately 1,000,000m^3 of surplus excavated material approximately 5m high, 1.3km long and up to 450m wide;
- the Wendover Dean viaduct and adjacent earthworks (1.2km overall, including the approximately 500m long viaduct);
- the Small Dean viaduct and adjacent earthworks (2.1km overall, including the approximately 500m long viaduct);
- the Wendover tunnel (1.3km); and
- the Wendover north cutting which crosses the northern edge of the AONB after approximately 1km.

Approximately 3km^2 (300ha) of the landscape of the AONB (less than 0.5%) will be altered as a result of the surface changes associated with the operation of the project, through the introduction of rail infrastructure, highway infrastructure, balancing ponds and the Hunt's Green Farm sustainable placement area. In many instances, earthworks will be returned to agriculture, including those at the sustainable placement area, and will be perceived as part of the existing landscape. The most apparent changes to the character of the AONB will include:

- the presence of new engineered landforms cutting across the eastern side of the Misbourne Valley towards the Aylesbury Vale, east of the A413 and the Marylebone to Aylesbury Line;
- the presence of two new viaducts of approximately 18m and 12m in height and 500m each in length with associated infrastructure;
- the presence of noise fence barriers that will create man-made linear features;
- the permanent severance of land;
- the presence of new highway infrastructure in the rural environment, including road bridges;
- the presence of overhead line equipment;
- the presence of regular high speed trains; and
- the noticeable loss of vegetation, in particular at Mantle's Wood, Sibley's Coppice and Jones' Hill Wood, opening up the landscape and altering the vegetation pattern.

These effects will be limited to the Misbourne Valley, with the wider AONB essentially free from significant effects. In the first year of operation, the presence of the new railway will affect the character and setting of the area. The loss of woodland and the loss and severance of agricultural land will have an effect, although this will reduce over time as planting matures. By year 60 of operation, planting will have further matured and integrated the project into the AONB so that the effect will not be significant.

Construction of the project requires the removal of 15ha of woodland, of which 10.2ha is ancient woodland, from Mantle's Wood, Farthings Wood, Sibley's Coppice, and Jones' Hill Wood. Approximately 400ha of agricultural land and 40km of hedgerow vegetation will be affected by construction of the project. Construction requires the removal of up to 150m of the Grim's Ditch Scheduled Monument. Small sections of the historic sunken laneways at Leather Lane and Bowood Lane will be lost.

Approximately 50ha of woodland will be planted to integrate the project into the existing environment, to replace areas of lost woodland and to introduce areas of new woodland. Approximately 220ha of agricultural land will be returned to productive use. In order to reduce construction traffic movements on roads within the AONB, approximately 37ha of agricultural land will be used to construct the Hunt's Green Farm sustainable placement area, following which it will be returned to productive use. Measures to limit landscape effects during construction include the retention and protection of existing trees and vegetation where reasonably practicable.

The agricultural land and hedgerows lost to the project amount to a very small proportion of the agricultural land and hedgerow vegetation within the AONB. Woodland lost to the project represents a very small proportion (less than 0.1%) of the woodland in the AONB.

Overall, the assessment concludes that the project is unlikely to result in any significant adverse effects on the special characteristics of the Chilterns AONB.

9.3 Agriculture, forestry and soils

Overall, the agricultural land required for the project will amount to approximately 4,800ha, of which approximately 2,500ha will be high quality land. Whilst the temporary requirement of high quality agricultural land during construction is likely to be significant, it represents a very small percentage (about 0.07%) of the high quality land in England.

Following construction and restoration to agricultural land, the area of land that will remain permanently removed from agricultural use will be approximately 2,800ha, of which 1,500ha will be high quality land. This represents approximately 0.03% of the national total and is a likely significant effect.

650ha of woodland will be planted for landscape mitigation and ecological habitat creation or replacement. This will help to offset an area of approximately 250ha of forestry land that will be permanently lost.

9.4 Climate

The project will play a key part of the UK's future low-carbon transport system and will support the Government's overall carbon objectives. In comparison with most other transport modes, high speed rail offers some of the lowest carbon emissions per passenger kilometre, and significantly less than cars and planes.

As a yearly average, the project's carbon footprint over the course of the construction period will represent approximately 1.9% of the UK's annual construction carbon footprint (based on the UK's annual construction emissions in 2026).

The project's greenhouse gas emissions represent a small contribution to the UK's predicted annual emissions in 2030 (0.15%). Its operational emissions in 2030 will contribute the equivalent of only 2% of the UK's current operational rail emissions. These will decline in line with the continuing replacement of fossil fuel power stations to generate electricity by low carbon alternatives, in line with the UK's target of at least an 80% reduction in greenhouse gas emissions by 2050 (Climate Change Act 2008). It is estimated that within the 120 year design life of the project the overall carbon footprint (construction and operation of Phase One) may deliver a small saving.

Most of the greenhouse gas emissions from the construction and operation of the project will fall within the European Union Emissions Trading System (EU ETS). This is a system that sets a total limit on Europe's greenhouse gas emission each year. The limit is set to reduce year on year. This means that, overall, most of HS2's carbon emissions should not contribute to an increase in Europe-wide carbon emissions.

In addition, greenhouse gas emissions from journeys that are made by road and diesel train that are currently not included within the EU ETS cap and which in future will be taken by HS2 through mode shift, will fall under the EU ETS cap. Greenhouse gas emissions not regulated by the EU ETS will be managed through other policy tools as part of the Climate Change Act target of at least an 80% reduction in emissions by 2050.

HS2 Ltd's Sustainability Policy seeks to minimise the carbon footprint of the project as far as practicable and deliver low carbon, long distance journeys that are supported by low carbon energy.

9.5 Ecology

The Government is committed to halting overall loss in biodiversity by 2020. In line with Government policy, HS2 Ltd is seeking to achieve no net loss in biodiversity.

Designated sites

No sites designated as being of international value for nature conservation will be significantly affected by construction or operation of the project. Detailed consideration of the potential for effects on the South West London Waterbodies Special Protection Area and Ramsar site concluded that the project is not likely to have any significant effects on the conservation status of the features for which the site is designated. The assessment of the Chilterns Beechwoods Special Area of Conservation concluded that there will be no likely significant effects on its conservation status.

The project will result in habitat loss to, and fragmentation of, two Sites of Special Scientific Interest (SSSI): the Mid Colne Valley SSSI and Helmdon Disused Railway SSSI.

Mitigation and compensation measures to address impacts at the Mid Colne Valley SSSI will address potential adverse effects, including habitat loss and disturbance to breeding and wintering birds, such that residual effects are not likely to occur.

The effect of habitat loss and fragmentation on Helmdon Disused Railway SSSI will be addressed through creation of lowland calcareous grassland and scrub, such that a residual effect is not likely to occur.

Local Wildlife Sites (LWS) form an important component of ecological networks which help in maintaining the conservation status of a range of habitats and species. Where a significant adverse effect on the integrity of a LWS is likely, sufficient compensation will be provided to address effects on the habitats and species for which that LWS was designated. This compensatory habitat creation will seek to maintain and enhance existing ecological networks, by enhancing existing core areas, providing new core areas, and/or promoting links between remaining areas of habitat.

Habitats

Approximately 330ha of habitats of principal importance will be lost overall, including up to 195ha of lowland mixed deciduous woodland. This includes loss of 32ha of ancient woodland from 19 sites. Approximately 60ha of lowland meadows would also be lost. Where reasonably practicable, ecological compensation areas will be created to provide habitats of principal importance. A total of approximately 520ha of habitats of principal importance will be created, including approximately 280ha of lowland mixed deciduous woodland and 165ha of lowland meadow. Ancient woodland is an irreplaceable national resource and its loss is a significant adverse effect. It will be compensated through a range of measures, including translocation of soils to appropriate receptor sites and creating linkage between ancient woodland fragments to increase connectivity. Other measures, such as planting native tree and shrub species of local provenance, and translocation of coppice stools and dead wood, will be undertaken as appropriate.

Species

Thirteen of England's 17 resident bat species have been recorded along the route of the project, including Bechstein's bat - which is very rare in the UK - and the rare barbastelle bat.

At least three colonies of Bechstein's bat are associated with a network of woodlands (in the Calvert, Steeple Clayton, Twyford and Chetwode area and the Newton Purcell to Brackley area) that collectively form remnants of the former Bernwood Forest. Field survey has confirmed that the Bechstein's bat population flies both across and along the route. This Bechstein's bat population is of national value. Up to six barbastelle populations have been recorded at scattered locations along the route. However, the numbers of records are low in all cases, and there are no known barbastelle roosts in the vicinity of the project. With the implementation of measures such as provision of alternative roosts and creation of linkage using green bridges and underpasses, there will be no likely significant effects on the conservation status of the bat species concerned.

The route passes through areas within the core geographical range of great crested newt; other, more common, amphibians are widespread along it. In some areas, breeding ponds and terrestrial supporting habitat will be lost and/or fragmentation of habitat will occur. However, in the long term, for the majority of its length the project is not expected to act as a barrier to movement of great crested newt. Implementation of the measures proposed will ensure that the conservation status of the great crested newt and other amphibians will not be significantly affected by the project. Implementation of proposed mitigation measures will prevent any significant effects on the conservation status of populations of reptile species affected by the project.

Measures will be taken during construction to prevent adverse effects to otter populations as a consequence of disturbance of watercourses. Whilst significant adverse effects on dormouse and water vole are not likely, if adverse effects were to be identified then mitigation would be provided within the ecological compensation areas.

Mitigation measures including the provision of badger-proof fencing and replacement setts will prevent any significant effects on the conservation status of badgers.

Construction of the project is not likely to result in permanent adverse effects on the breeding and wintering populations of most birds because the habitats supporting these species will be recreated once construction is complete. However, temporary significant adverse effects on local populations of less common species are likely for the duration of construction. This could give rise to a temporary cumulative effect for yellow wagtail, which would be significant at the county/metropolitan level. There may be temporary adverse effects during construction on local populations of common breeding birds in more urban areas due to loss of railside land.

In rural areas along the route there are approximately 27 locations where barn owls are likely to be affected. The construction of the railway 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 to provide owl nesting boxes to help increase barn owl populations away from the route.

9.6 Traffic and transport

The project will result in significant benefits to commuters, business and leisure travellers.

New additional rail capacity will accommodate future growth in demand for rail travel. The passenger seating capacity for HS2 trains operating solely on the new high speed line will be up to 1,100 in the peak and 550 in the off-peak. This will result in a daily capacity of 39,600 passengers in each direction on the Phase One project route.

On services travelling north of Birmingham on both the high speed line and the West Coast Main Line, the seating capacity on each train is currently expected to be 550, with certain services being doubled to provide 1,100 seats per train. This will result in a daily HS2 capacity in each direction of 17,600 between Euston station and Liverpool; 26,400 between Euston station and Manchester; and 8,800 between Euston station and Glasgow.

Expected journey times and the comparison with existing times are shown in Table 2.

Table 2 Journey times between key destinations 'without' and 'with' the project in operation (Phase One)

Origin/destination	Journey time	
	Without the project (i.e. current)	With the project
Euston station - Birmingham Interchange/International	1 hour 14 minutes	38 minutes
Euston station - Birmingham Curzon Street	1 hour 24 minutes	49 minutes
Euston station - Manchester Piccadilly	2 hours 8 minutes	1 hour 40 minutes
Euston station - Liverpool Lime Street	2 hours 8 minutes	1 hour 50 minutes
Euston station - Glasgow Central	4 hours 8 minutes	4 hours

Table 2 shows that journey times between London and Birmingham are reduced by some 35 minutes, almost halving the current journey time. Similarly, journey time savings will also be achieved where the HS2 route will be used in combination with the West Coast Main Line to serve locations north of Birmingham, with the journey time between London and Manchester reducing by 28 minutes, a 22% reduction.

The introduction of the project will release capacity on the West Coast Main Line between London and Birmingham. This will allow West Coast Main Line trains running on the classic rail network to provide an increase in the service level and capacity at main line stations. For instance, with the timetable assumptions, daily stopping West Coast Main Line services at Watford will increase by some 20% and Milton Keynes will see stopping services increase by 6%. Also, the transfer of some passengers to HS2 trains will reduce loadings on classic rail services through these locations. These service enhancements and reduced loadings will provide net increases in capacity and help to reduce levels of crowding.

In particular, improvements to services on commuter routes into London will provide more capacity and stopping services on busy routes. Both enhancements will contribute to less congestion and reduced crowding.

Whilst there may be some reductions in service levels at a limited number of stations, these will generally reflect the reduced loadings on trains (either users of the station itself or through passengers from other origins) resulting from a number of the users transferring to HS2 services.

The project will also encourage changes in mode share from car and potentially air trips.

It is expected that at least an additional 10 train paths each way on the West Coast Main Line will be available for freight services running between London and the Midlands (each freight train path is equivalent to 50 heavy goods vehicles).

Despite the scale of works during construction, overall station capacity at Euston station will be maintained through efficient use of available platform space. Train service frequency will reduce only for a relatively short period. Construction activities will place pressure on available service capacity and have a potential impact on network performance on the West Coast Main Line. The proposed mitigation measures will prevent significant route-wide effects to rail users resulting from construction of the project. Traffic effects are considered in section 7.2.

9.7 Water resources and flood risk assessment

The project may give rise to a significant temporary adverse effect on public water supplies that depend on groundwater resources in the Chilterns and Colne Valley area. HS2 Ltd will agree a management strategy with the Environment Agency in consultation with the water company to manage this potential effect. If required, the strategy will cover mitigation, monitoring and the thresholds of water quality and flow at which actions are triggered, the nature of other intervention measures and the responsibilities for ensuring agreed actions are taken. No further route-wide or regional significant effects are likely for water resources or flood risk during either the construction or the operation of the project.

Visualisation of Old Oak Common station

10. Summary of off-route environmental effects

10.1 Introduction

The off-route effects assessment describes the likely residual effects associated with: off-route rail stations on the West Coast Main Line; modifications to the West Coast Main Line between Lichfield and Colwich; and the replacement of the Heathrow Express depot.

The off-route rail depot/stabling facilities described in Section 4.4 are existing facilities and do not require significant works for the purpose of the project. Operation of these facilities has been assessed as unlikely to give rise to residual effects.

Construction of the Old Oak Common station will require alternative stabling facilities for rolling stock that currently uses the First Great Western depot. The preferred option is to use the unused North Pole depot, which lies to the south of the Old Oak Common station site. Operation of the relocated depot will be in line with industry best practice for environmental management. Neither construction nor operation of the relocated depot has been assessed as likely to give rise to residual effects.

10.2 Off-route rail stations

Stations on the West Coast Main Line selected for assessment are those which 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 project. These stations are Northampton, Rugby, Wolverhampton, Stafford, Crewe, Wilmslow and Runcorn.

The project will give rise to changes in passenger numbers and increased traffic on local roads close to the stations. The assessment is limited to traffic and transport, sound, noise and vibration, and air quality. The project will not give rise to any likely residual air quality or sound, noise and vibration effects.

Traffic and transport

Increased traffic flows on roads close to Runcorn station (Shaw Street and Cavendish Street) and Wolverhampton station (Railway Drive and Fryer Street) will affect pedestrians and cyclists crossing these roads.

Daily numbers of passengers using Northampton, Rugby, Wolverhampton, Stafford, Crewe and Runcorn stations are predicted to increase. This has the potential to increase demand for car parking and drop-off facilities at these stations. In the absence of plans to manage these effects they have been assessed as significant.

10.3 Modifications to the West Coast Main Line between Lichfield and Colwich

The project requires modifications to the existing West Coast Main Line and its connections to the Chase Line and North Staffordshire Line between Lichfield Junction to Colwich Junction. The modifications will consist of works to the existing tracks, power supply and signalling and overhead line equipment.

The assessment concludes that likely residual effects are limited to temporary noise effects during construction. Although measures set out in the draft CoCP will be supplemented by the provision of enhanced noise screens along the edge of the construction site boundary, residential areas closest to the modification works at Handsacre, Rugeley and Colwich are predicted to experience temporary residual noise effects.

10.4 Heathrow Express depot relocation

The existing Heathrow Express depot, located in the Old Oak Common area, will need to be relocated.

The favoured location for a new depot site is to the east end of the North Pole depot, east of Scrubs Lane. The site is not currently occupied and was formerly a rail depot. To meet the HS2 operational standards, modifications will be required to the existing shed, tracks and access road.

Likely residual effects are limited to community, landscape and visual and sound, noise and vibration.

Community

Residential properties directly to the south of the site on Salters Road, Shrewsbury Street and Sunbeam Crescent will experience visual and noise effects for up to 18 months as a result of the construction activity associated with the site modifications.

Occupiers of these dwellings will experience visual effects, associated with lighting levels, and noise effects during the operation of the project. HS2 Ltd will continue to engage with the local residents/landowners to seek reasonably practicable measures to further reduce or avoid these effects.

Landscape and visual assessment

Measures have been incorporated into the draft CoCP to manage visual effects, including the use of hoardings and fencing and the appropriate maintenance of planting. Views of construction activity will affect the occupiers of dwellings to the south of the depot on Sutton Way, Dalgarno Way, Dalgarno Gardens, Sunbeam Crescent, Webb Close and Shrewsbury Street. This effect will be temporary for the duration of the modification works.

Low-level direction lighting will limit visual effects of the operation of the relocated depot on neighbouring residential occupiers; however, given the 24-hour operation of the depot, these effects will remain significant.

Sound, noise and vibration

Implementation of measures in the draft CoCP will limit noise from the modification works. These include the selection of noise-sensitive and low-vibration equipment. Temporary significant effects are likely to result from the construction of the train carriage washing equipment and toilet facilities at the depot. HS2 Ltd will work with those affected to further reduce or avoid noise effects from construction and operation of the project, where reasonably practicable.