

**High Speed Rail: Consultation on the route from the  
West Midlands to Manchester, Leeds and beyond**

# **Sustainability Statement**

**Non-technical summary**

A report by Temple-ERM for HS2 Ltd



**July 2013**



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## 1. INTRODUCTION

- 1.1.1. This document summarises the Sustainability Statement, which describes how the proposed new high speed railway from the West Midlands to Manchester and to Leeds would support objectives for sustainable development. It describes the proposed route at this stage of development, how sustainability issues have been considered and incorporated to assist decision making, and highlights the key sustainability impacts - both beneficial and adverse - that are envisaged at this stage.
- 1.1.2. The Sustainability Statement supplements and supports the main consultation document, High Speed Rail: Investing in Britain's Future - Consultation on the route from the West Midlands to Manchester, Leeds and beyond. These and other supporting documents are all available on-line at the [HS2 Phase Two document library](#)<sup>1</sup>.

## 2. HS2 AND SUSTAINABILITY

- 2.1.1. Sustainability has been a fundamental consideration in the way the Phase Two proposed scheme has been selected and designed. The sustainability team has worked closely with the engineers over nearly three years to develop route, station and depot proposals that fit as well as possible with the environment and communities they pass. As a result, the proposed scheme has emerged from several hundred options (comprising well over 10,000 miles of possible railway) as the one considered overall to best meet objectives for sustainability, alongside those of passenger demand, build cost, engineering complexity and journey time.
- 2.1.2. The potential impacts described here reflect the design of the scheme at this stage in the process. Further changes to the scheme will be adopted, where necessary, following public consultation. The project will then enter the next stage of design, informed by a more detailed Environmental Impact Assessment (EIA). This will involve an in-depth assessment of the preferred scheme, taking account of a wider range of environmental information obtained from consultation and a programme of environmental field surveys. The need for specific mitigation, such as noise barriers, landscape planting, habitat creation and compensation, and watercourse protection, will also become clearer at that stage. The Phase One proposals are at this later stage of development. The findings of the Phase One EIA will be reported within an Environmental Statement, expected at the end of 2013.

## 3. PHASE TWO PROPOSED SCHEME FOR CONSULTATION

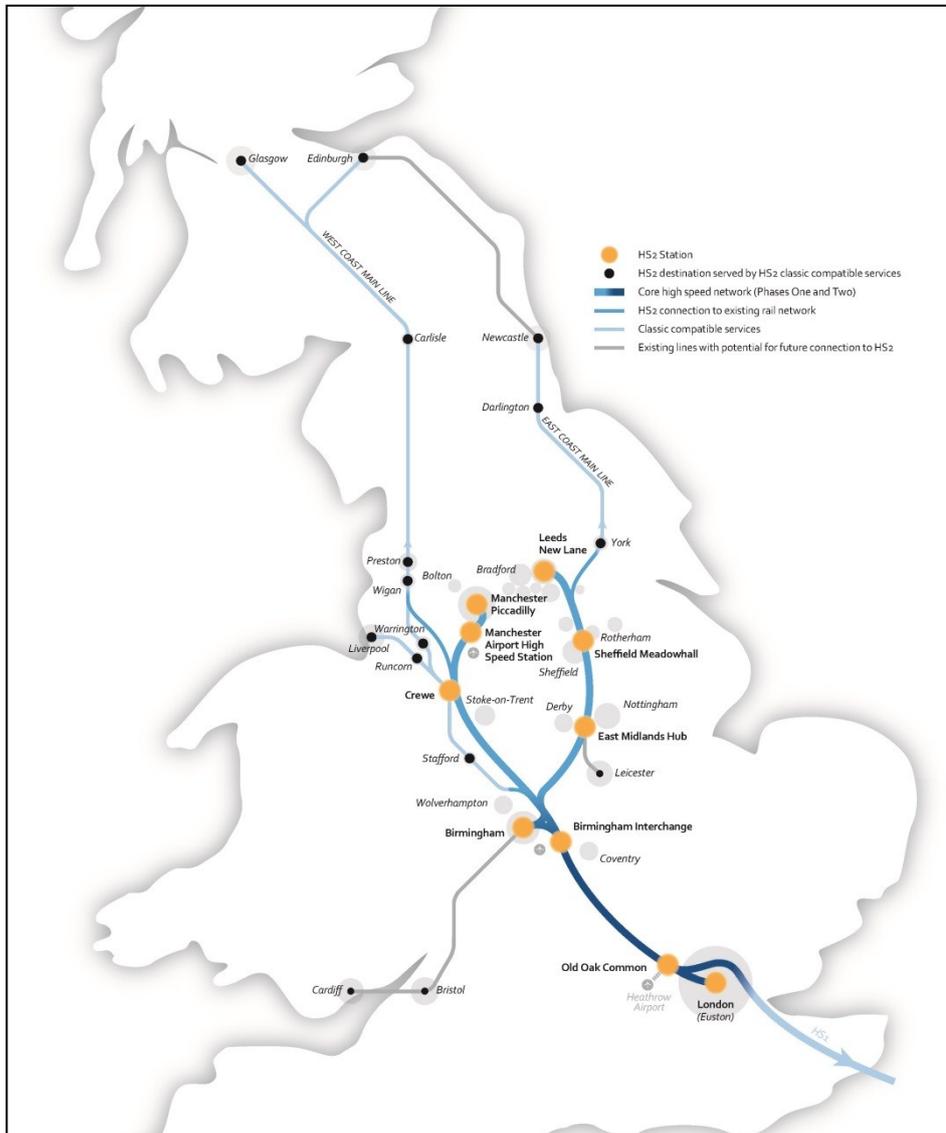
- 3.1.1. The western leg would commence from the Phase One route in the West Midlands and connect with the West Coast Main Line (WCML) near Golborne (north of Warrington), which would allow onward journeys to Scotland on the existing line. It would include a station in Manchester city centre, as well as an interchange station at Manchester Airport. Tunnels would take it beneath Crewe and Manchester. It would have two depots, one at Golborne for servicing and parking trains and one at Crewe for maintaining the railway. A second connection with the WCML at Crewe would enable links along the existing railway with cities such as Liverpool.

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<sup>1</sup> <http://www.hs2.org.uk/phase-two/route-consultation/document-library>

- 3.1.2. The eastern leg would commence from the Phase One route in the West Midlands and connect to the existing railway which connects with the East Coast Main Line (ECML) south-west of York, enabling links with stations further north, such as Newcastle and Edinburgh. It would have a new station in Leeds city centre, as well as intermediate stations comprising the East Midlands Hub at Toton west of Nottingham, and at Sheffield Meadowhall. Like the western leg, it would have two depots, one south of New Crofton for servicing and parking trains and one at Staveley for maintaining the railway.

### The HS2 network, Phase One and Two

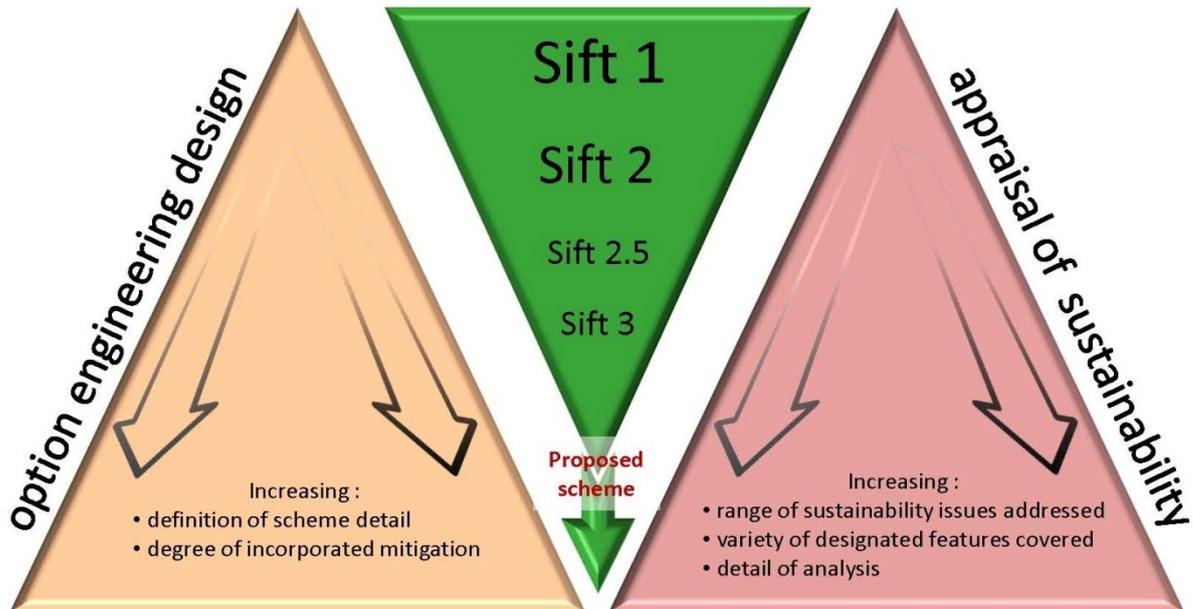


## 4. APPRAISAL OF SUSTAINABILITY PROCESS

- 4.1.1. The Appraisal of Sustainability (AoS) is a process that was devised as a way of independently and consistently appraising how HS2 options would support or conflict with objectives for sustainable development. The AoS informed engineers and HS2 Ltd of particular sustainability constraints and opportunities and how to avoid or lessen potential adverse impacts. It provided information at the decision-making stages by outlining the sustainability advantages and disadvantages of different options, and the consequence of

potential impacts. It also enabled the independent reporting of the sustainability impacts of the options at each stage.

- 4.1.2. The AoS approach was first established to assist in the appraisal and development of the Phase One proposals and has continued through Phase Two to form a key part of the overall method used to sift options and designs. It was designed as an adaptive tool that could introduce an increasing depth of appraisal detail, as the number of options reduced, and the detail of their design increased.



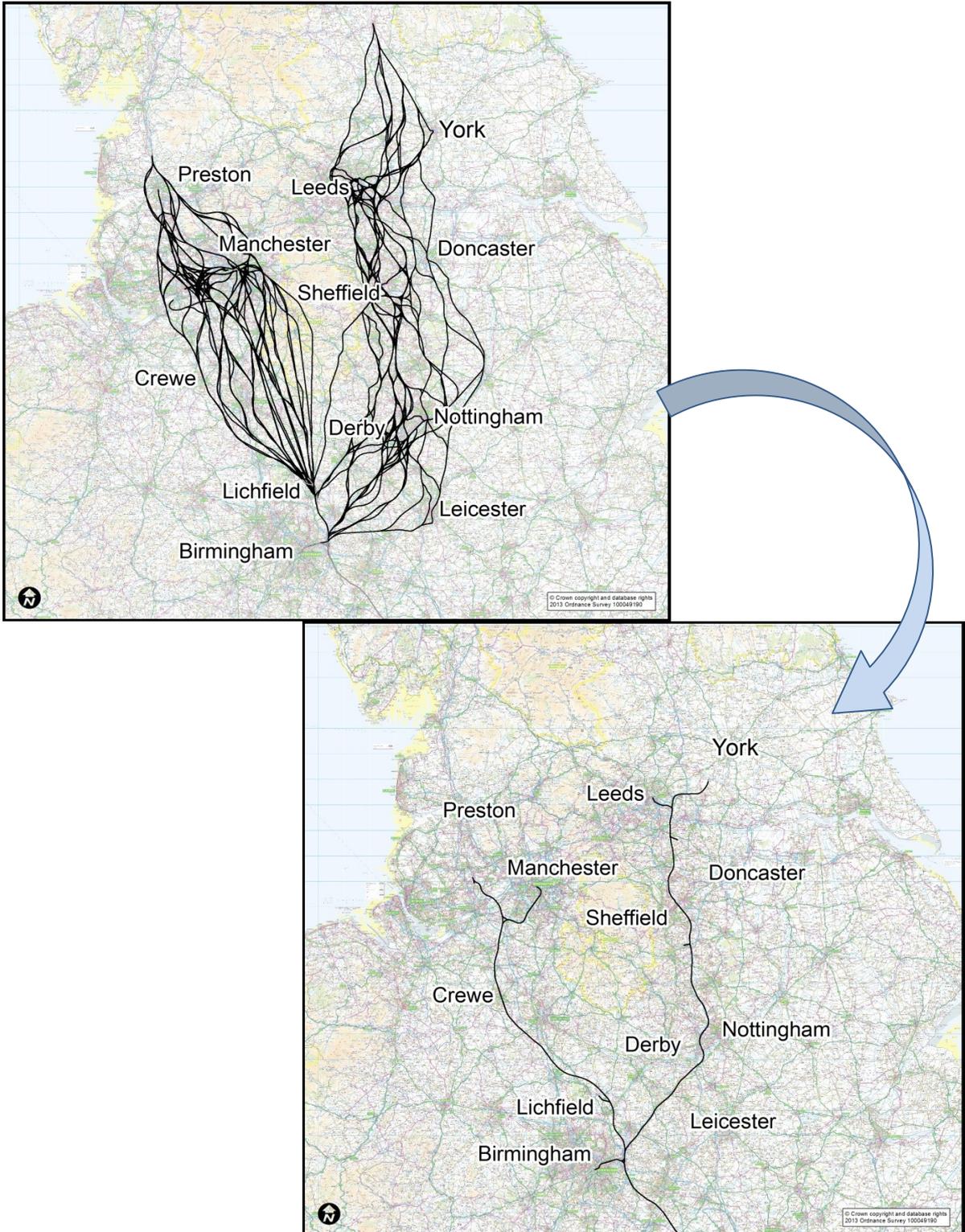
- 4.1.3. The AoS was based on an overarching framework containing almost 80 different evaluation criteria, which were applied at different stages or sifts. The framework was linked with a computerised mapping system that allowed a range of sustainability features to be compared for different options.

## 5. EVOLUTION OF THE PHASE TWO PROPOSALS

- 5.1.1. At the outset of work on Phase Two in autumn 2010, the focus was on route and station selection. From initial long lists, many options were rejected due to, amongst other things, their potential sustainability impacts. Once a short list of favoured options was in place, the emphasis changed to making refinements to the alignments and, where necessary, building up engineering detail to better understand how potential impacts could be avoided or reduced. This has helped to address possible impacts on settlements and properties, as well as on important environmental features, such as protected habitats and historic features. The scheme development has included preliminary discussions with Government's advisory bodies including Natural England, the Environment Agency and English Heritage. Station options were discussed with relevant local councils and transport organisations, who provided context on wider transport and planning proposals.
- 5.1.2. By March 2012, a relatively small number of options remained, and these were presented to the Government. The Secretary of State for Transport met with council leaders to discuss station options, and separately visited areas affected by the proposals. As a result, some changes were made and an initial preferred scheme was announced by Government in January 2013. This was described within the command paper, *High Speed Rail: Investing in Britain's Future - Phase Two: The route to Leeds, Manchester and beyond*. Its

sustainability impacts were described within *HS2 Phase Two Initial Preferred Scheme, Sustainability Summary*.

- 5.1.3. Following the announcement, ministers then met with MPs affected by this scheme, while HS2 Ltd spoke with local authorities along the route, as well as with key organisations in the affected cities and the main environment and heritage organisations. This in part led to some refinements to the design and the proposals that are now the subject of public consultation, and this report. The way that the proposed route has emerged from the vast number of possible options is illustrated here.



## **6. MITIGATION AND CONTINUED SCHEME DEVELOPMENT**

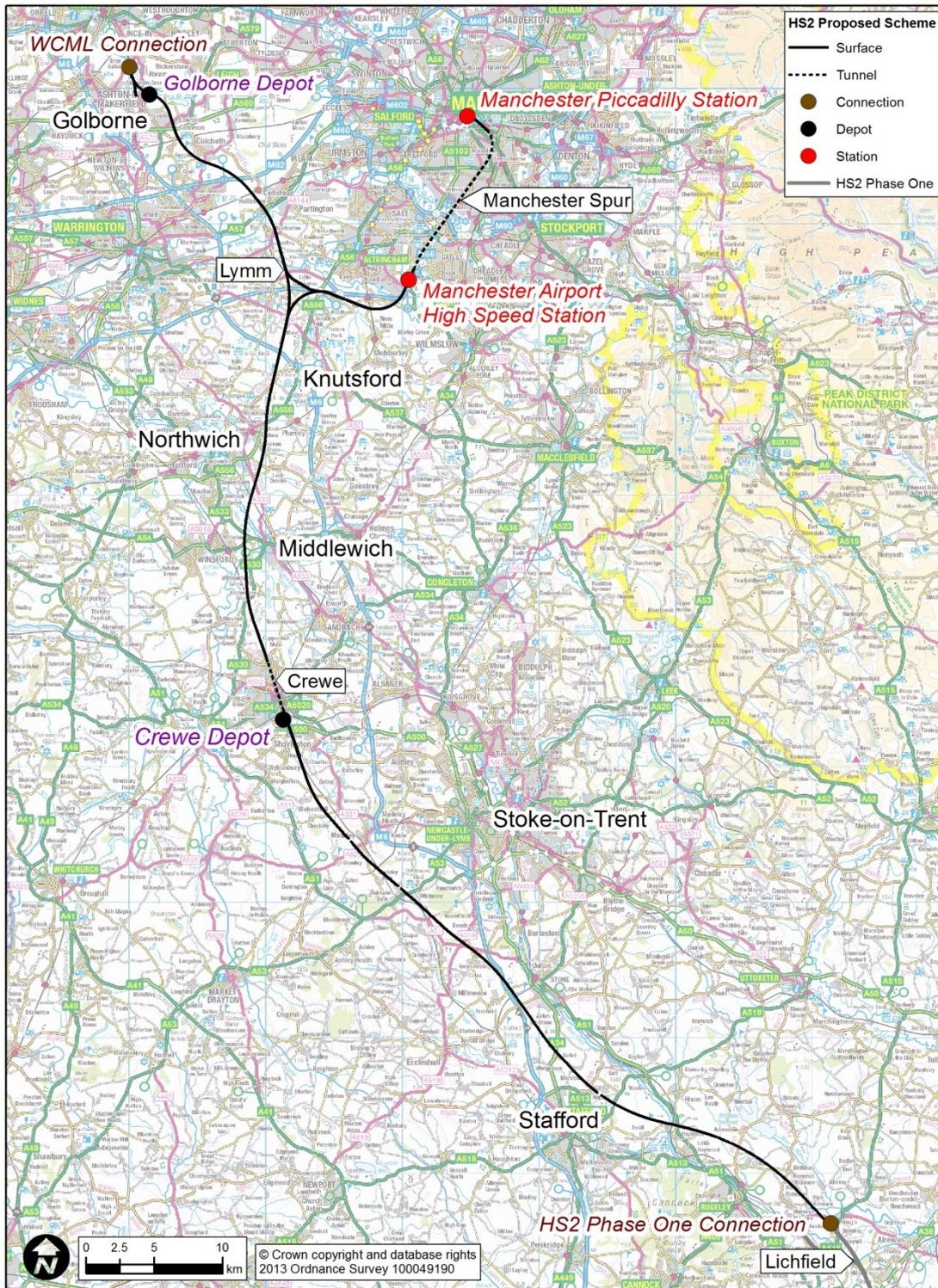
- 6.1.1. Mitigation of potential impacts has been a key focus of the project from the outset. Through the selection of options and particular alignments, many potential adverse impacts have been avoided or reduced. As the scheme progresses, more specific mitigation proposals will be developed. Mitigation principles will include the introduction of physical features, such as noise barriers and landscaped mitigation. More specific measures will be developed for each topic as necessary. This approach is already well advanced on the Phase One scheme, and proposed mitigation measures have been included within the current proposals.
- 6.1.2. The Phase Two AoS has concentrated on the potential long term and permanent effects of the proposed scheme, resulting from landtake and operation of the railway and its infrastructure. Certain associated works, such as road re-alignments, tunnel ventilation shaft sites and power infrastructure requirements, are yet to be determined in detail. Similarly, plans for constructing the proposed scheme are not yet defined. These associated works and the impacts that will occur temporarily over the construction period will be addressed in due course by the Phase Two EIA. Mitigation of construction impacts would be provided through the application of a Code of Construction Practice (CoCP).

## **7. WESTERN LEG, SUMMARY OF IMPACTS ALONG THE PROPOSED ROUTE**

### **7.1. Western Leg: Lichfield to Crewe**

- 7.1.1. The western leg would connect with Phase One to the north-east of Lichfield. It would cross the wide Trent Valley on viaduct, affecting character and views within this landscape. It would then drop into cutting for most of the way to the north-east outskirts of Stafford. The alignment was devised to avoid impacts on the European protected Pasturefields Salt Marsh Site of Special Scientific Interest (SSSI) and Special Area of Conservation (SAC), as well as on Hopton Battlefield and the Cannock Chase Area of Outstanding Natural Beauty. A short tunnel was introduced to help minimise potential impacts at Hopton. The alignment through this area would occasionally emerge from cutting to cross over watercourses and roads and these sections could be prominent. For example, an embankment would affect the landscape between the villages of Colton and Stockwell Heath; and where the route crosses the Trent for the second time, noise and visual impacts would affect some residents at Great Haywood and users of its local marina.
- 7.1.2. From Stafford, the route would remain in cutting for most of the way northwards to Stone, where a bridge crossing over the M6 would give rise to visual impacts at Swynnerton. North of Swynnerton, a series of refinements were introduced to both simplify engineering and reduce potential environmental impacts. At Whitmore Heath a tunnel was introduced to minimise impacts on the village. Further north towards Madeley, the route was moved west and lowered to include a tunnel to reduce potential demolitions at Madeley, as well as noise and visual impacts on its Conservation Area. This change also avoided direct impacts on Hey Sprink Ancient Woodland, the Grade II Listed Hey House and a cemetery south of Madeley.

### Proposed scheme: western leg



7.1.3. The route would come alongside the WCML to the west of Madeley and this would help to limit environmental impacts through this area. However, the valley landscape north-west of Whitmore would be affected by landtake from much of the prominent and ecologically important Whitmore Wood Ancient Woodland. The crossing of a strategic abstraction point for public drinking water would require measures to ensure that this water supply is preserved.

- 7.1.4. Approaching Crewe, the proposed depot would be adjacent to the existing Basford sidings. Together with the elevated cross-over of the WCML, this would affect the local landscape character. Residents in the area north of Chorlton would be subject to noise and visual impacts, albeit within an area already influenced by the WCML and from a revised design, which has seen the scheme moved to the far side of this existing railway. The route would then enter tunnel beneath Crewe, ensuring that potential impacts are minimised.

#### **Aerial view looking north across Whitmore Heath and Whitmore Wood**



## **7.2. Western Leg: Crewe to Lymm**

- 7.2.1. Having emerged from tunnel through the northern outskirts of Crewe, the route would affect the setting of the Scheduled medieval moat at Minshull Vernon, although the route would still be alongside the WCML at this point. It would then diverge from the WCML and head northwards between Winsford and Middlewich across the open flat landscape of the Cheshire Plain. A viaduct, necessary to cross the River Dane and historic Trent and Mersey Canal, would affect their character and setting to some degree. A cutting immediately north of this would pass through the Bostock landfill, necessitating careful design and construction to ensure contamination and other risks are addressed.
- 7.2.2. The route would remain on embankment as it passes east of Northwich. However, the area is quite sparsely settled and noise and visual impacts would be limited to small settlements such as Lostock Green and Lostock Gralam. Winnington Wood and Leonard's and Smoker Wood are both Ancient Woodlands in the valleys east of these villages that would be directly affected, as would Wincham Brook, potentially requiring some diversions to the river channel.

- 7.2.3. Passing west of the Mere SSSI (part of the Midland Meres and Mosses Ramsar site), the design has been devised to ensure impacts are avoided on this internationally significant habitat.
- 7.2.4. A spur to Manchester (see below) would diverge from the main route at this point. The delta junction and routes northwards would result in impacts on the landscape in this area, and would affect views for residents in Hoo Green and Hulseheath. The setting of the Grade II Listed Ovenback Cottage near High Legh would be affected.

### 7.3. Western Leg: Lymm to Golborne and the WCML

- 7.3.1. The alignment northwards was carefully selected to avoid impacts on the historic parkland and setting of Dunham Massey. The route would be within cutting as it enters the Bollin Valley, and it would continue in cutting for some way northwards. It would then rise onto a viaduct around 30m above the Manchester Ship Canal in order to maintain its navigability. The viaduct and embankments either side would greatly affect the landscape character of the area, as well as the views of residents in villages such as Hollins Green and Glazebrook. Noise impacts are predicted around Hollins Green.
- 7.3.2. Passing south of Holcroft Moss SSSI (part of Manchester Mosses SAC), the route has been designed to avoid impacts on this European protected habitat. The route would then cross the edge of Risley landfill site, again necessitating careful design and construction to ensure contamination and other risks are addressed.

#### **Aerial view south from Bamfurlong, with the proposed Golborne Depot site located left (east) of the WCML**



- 7.3.3. The route would enter cutting for much of its remaining passage south of Culcheth and on to Lowton, helping to minimise risks of noise and visual impacts. The route would pass through the Taylor Industrial Estate south of Culcheth, demolishing an estimated 17 properties. The Grade II Listed Old Rectory on Newchurch Lane would be demolished. Continuing through a gap between Lowton and Lowton Common, east of Golborne, the route would result in five residential demolitions as well as visual impacts.
- 7.3.4. The route would pass west of Pennington Flash Country Park and, with the proposed train depot at Golborne, would result in visual impacts for users of the park and the Leeds and Liverpool Canal, as well as local residents. The open countryside between Golborne and Abram would become fragmented. Early design work within this environmentally sensitive location has ensured that direct impacts on Abrams Flashes SSSI would be avoided, although the risk of disturbance or pollution at the site would need to be carefully monitored and mitigated. The Grade II\* Listed Lightshaw Hall would sit within the depot footprint and although direct impacts would be avoided, the building's setting would be greatly changed, as would that of the nearby Grade II Listed Byrom Hall.

#### 7.4. Western Leg: The Manchester spur

- 7.4.1. Having diverged from the main route, the Manchester spur would cross over the A556 and then pass close to the north of Rostherne Mere National Nature Reserve and Ramsar site. Careful design would ensure that impacts on this internationally significant habitat are avoided; further measures to minimise the risk of bird disturbance could be integrated through landscaping in the area. The southern edge of Hancocks Bank Ancient Woodland would be crossed by the scheme.

**Aerial view southwards along the A556, with M56 running left to right and Rostherne Mere in the background**



- 7.4.2. The route would remain just south of the M56, avoiding impacts on the historic Tatton Park. It would then turn northwards under the M56 to pass west of Manchester Airport. The route and a new HS2 station would result in an estimated 15 residential demolitions, as well as visual impacts. The Grade II Listed Buckhall would be demolished, although the existing setting of this building has become degraded. The area around the airport is likely to be developed over future years, and HS2 would support this growth, enhancing the employment opportunities in the area. It would also greatly enhance accessibility within the region by linking with existing transport, including rail, the Metrolink, roads, as well as the airport itself.
- 7.4.3. Potential impacts through much of Manchester would be avoided as the route passes into tunnel for several miles beneath Wythenshawe, Northenden, Withington, Rusholme and Longsight. It would emerge at West Gorton and although within an existing rail corridor, it would necessitate some 22 residential demolitions. However, a proposed housing development may affect the number of demolitions required. This will be determined when design details of the housing scheme and Phase Two are developed.
- 7.4.4. The new HS2 station at Manchester Piccadilly would provide substantial opportunities to support growth and development within the centre of Manchester: it is estimated that between about 30,000 and 43,000 jobs could be supported by HS2 owing to the transport opportunities it would bring to an area with abundant space for development. The station would require the demolition of 48 residential properties, but in the long term it could support between about 3,000 and 4,000 new houses. The Government and HS2 Ltd will work with Manchester City Council to ensure the plans for a new station maximise the opportunities for this part of the city and the wider area.

**Aerial view south-eastwards from Piccadilly Station towards West Gorton**



- 7.4.5. Visually the new station would be expected to fit well alongside the existing Piccadilly Station, although there would be some impact on the Grade II Listed train shed at the station and on the character of the station and Whitworth Street Conservation Area.

## **8. WESTERN LEG, SUMMARY OF IMPACTS BY TOPIC**

### **8.1. Planning and development**

- 8.1.1. The route would pass through or near to several major development sites, which could introduce large new areas of proposed housing or other development (including new infrastructure) projects between now and the time HS2 would be in operation. These developments may be directly affected, although those around stations could well benefit from the proximity of HS2.
- 8.1.2. For each of the development sites potentially affected, HS2 Ltd would work with relevant local authorities and the affected developers or promoters to determine how potential impacts might best be managed and how potential opportunities could be maximised.

### **8.2. Property and community integrity**

- 8.2.1. The western leg could result in the demolition of an estimated 139 dwellings. The majority of these would be associated with the spur into Manchester and the terminus station: an estimated 48 dwellings would be demolished at Manchester Piccadilly, with a further 22 dwellings demolished in West Gorton by the portal structure and tunnel approach at West Gorton.
- 8.2.2. The proposals would also require the demolition of one community facility, 99 commercial properties and two industrial properties.

### **8.3. Employment and housing**

- 8.3.1. The introduction of an HS2 station could have a positive effect on the surrounding area, as people and businesses realise the opportunities of living and working close to the high speed network. The AoS estimated the likely number of additional jobs and houses potentially supported by HS2 around proposed stations.
- 8.3.2. HS2 could support up to an estimated total of 43,600 jobs and 4,100 homes, largely around the Piccadilly terminus. The employment figure takes account of jobs displaced by demolitions, although it is expected that the majority of these would be able to relocate in the local area or region.

### **8.4. Access issues**

- 8.4.1. Both Manchester stations would provide an important interchange hub with other transport systems, including roads, railways, airports, cycleways and footpaths. The HS2 terminus would be alongside the existing Piccadilly station. This already offers good rail connections with various destinations across the city and region and Network Rail's Northern Hub proposals at the station will further enhance this connectivity. The HS2 station would be served by Manchester's Metrolink light rail system as well as by good bus services.
- 8.4.2. The HS2 Manchester Airport High Speed Station would have a direct connection with Manchester Airport and its existing railway station that links the airport with numerous

towns and cities locally and regionally. The HS2 station would have good access to the M56 and the A538.

- 8.4.3. The western leg would cross eight long distance paths. Access across the proposed railway is likely to be maintained through diversion, or re-instatement of crossing points, although details would need to be determined at a later stage in consultation with local authorities.

## 8.5. Noise and vibration

- 8.5.1. Since the publication of the Phase Two Sustainability Summary in January 2013, the noise appraisal proposed indicative noise mitigation along parts of the route. This has substantially reduced the number and extent of noise impacts reported at that earlier stage. The number of dwellings predicted to have noise impacts from HS2 along the western leg is estimated at 1,100, some 80% fewer than were predicted for the unmitigated scheme in January. Fewer than five dwellings would have high noise impacts of 73dB<sub>L<sub>Aeq</sub>18hr</sub> or more, and around 30 dwellings would be expected to qualify for noise insulation.
- 8.5.2. Later assessment as part of the EIA will provide a more in depth understanding of noise impacts along the route, including generation of sound contour maps. This will allow for more specific mitigation measures to be developed and incorporated into the design.

## 8.6. Air quality

- 8.6.1. The Manchester Airport High Speed Station and Manchester Piccadilly sites, as well as the Golborne Depot site, would overlap areas currently identified as having poor air quality. Any additional road traffic to these places, either during construction or operation of HS2, could exacerbate local pollution levels if no air quality improvements have been implemented by local authorities by that time. In developing scheme proposals, it would be necessary to comply with EU law on ambient air quality. This will be considered further as part of the EIA.
- 8.6.2. On a larger scale, HS2 could result in air quality improvements as people switch from cars to rail, although this has not been determined at this stage.

## 8.7. Health, well-being and equality

- 8.7.1. The AoS included separate appraisals on health and well-being, and on equalities. These studies each considered how impacts of the proposed scheme might affect certain groups of people more acutely than it would the population as a whole. The health appraisal matched general impacts from the scheme with areas of higher health deprivation. This revealed general areas around Manchester and Wigan with populations relatively more vulnerable both to potential negative health effects (for example due to displacement of jobs, noise and demolition of housing and community facilities); and potential positive health effects (for example due to improved access to employment, new housing and access to transport).
- 8.7.2. Separate equality analysis was undertaken to indicate the extent to which groups vulnerable to discrimination and social exclusion may be affected by the proposed scheme to a greater degree than the population in general. Different priority equality groups have been identified along the route.
- 8.7.3. Potential beneficial equality impacts were identified around Manchester Piccadilly Station as a result of new local jobs and housing. Potential adverse impacts were also identified around both Manchester Piccadilly Station and the Manchester Airport High Speed Station, as well as Culcheth, as a result of potential demolitions of housing and other properties.

## 8.8. Landscape and visual impacts

- 8.8.1. The western leg would have no direct impacts on nationally designated landscapes, such as the Cannock Chase Area of Outstanding Natural Beauty (AONB). Considerable parts of the route would have slight landscape or visual impacts, successfully avoiding important landscape and visual amenity resources. Examples include the section between Great Haywood and Marston; the sections north and south of Crewe; and the sections from Agden Bridge to Warburton and past Culcheth.
- 8.8.2. Key landscape and visual impacts are likely to affect:
- the landscape around Stockwell Heath and the valley landscape south and west of Madeley in Staffordshire;
  - the landscape of the Mersey valley between Warrington and Irlam, as well as views of local residents due to the new viaduct over the Manchester Ship Canal; and
  - the landscape of the Leeds and Liverpool Canal corridor near Pennington Flash Country Park, as well as views of many including recreational users and local residents, due to the Golborne Depot.
- 8.8.3. The proposed Manchester terminus station would be on the site of existing development adjacent to the existing Manchester Piccadilly Station, and would fit well with existing townscape.
- 8.8.4. These conclusions are based on a level of scheme design that does not yet include specific mitigation. As the design progresses, these and other potential impacts are likely to be reduced through the incorporation of a range of potential landscape mitigation measures.

## 8.9. Cultural heritage

- 8.9.1. The western leg has been selected and aligned so that it would have few impacts on known designated heritage assets. It would avoid physical impacts on all of the most significant designated features, including Scheduled Monuments, Registered Battlefields and Grade I and II\* Listed structures. The route has been aligned so that it avoids direct physical impacts on Registered Parks and Gardens, and effects on their settings would also be low. The majority of effects are expected to be negligible or minor at most.
- 8.9.2. Potentially greater impacts would include:
- effects on the setting of Minshull Vernon Scheduled Monument, north of Crewe;
  - demolition of Grade II Listed Old Rectory at Culcheth and Buckhall at Hale Barns, and alterations to Grade II Listed train shed Piccadilly station;
  - effects to the setting of the Grade II\* Listed Lightshaw Hall at Golborne; and
  - direct impacts on one Conservation Area, the Trent and Mersey Canal, which is crossed at two locations.

## Grade II\* Listed Lightshaw Hall at Golborne



### 8.10. Biodiversity and wildlife

- 8.10.1. The route would pass in close proximity to a number of habitats of international significance, including Pasturefields Salt Marsh, Midland Meres and Mosses (the Mere), Rostherne Mere and Manchester Mosses (Holcroft Moss). HS2 Ltd has worked closely with Natural England and the Environment Agency to identify alignments and provisional designs that would avoid adverse impacts on all of these areas.
- 8.10.2. No designated habitats of national importance would be directly affected. Although there is the potential for indirect impacts at a small number of SSSIs; these are likely to be mitigated through scheme design and best practice management of construction activities, using measures that will be set out in the CoCP.
- 8.10.3. The scheme would have direct impacts on an estimated 19 areas of key habitat, including five woods listed on the Ancient Woodlands Inventory.
- 8.10.4. As part of the later EIA work, a package of mitigation and enhancement measures will be developed to address the impacts on habitats and species. Such measures would seek to address both the direct impacts on designated sites, and to reflect the wider strategic ecological priorities of affected areas.

### 8.11. Water resources and flood risk

- 8.11.1. The proposed scheme would cross a network of watercourses of varying size. In a small number of cases this may necessitate a diversion or modification to the river channel. With a total of 121 separate watercourse and canal crossings expected along the western leg, in-channel works may be required to 12, with one more significant watercourse (Wincham

Brook) potentially affected. Further design will seek to avoid the need for diversions and to explore opportunities for environmental enhancement.

- 8.11.2. The proposed scheme could exacerbate flood risk where it crosses designated flood zones. In these cases, it has been assumed that viaducts would be used. However, at a later stage, each crossing will be examined in more detail to determine the most appropriate form of alignment.
- 8.11.3. South of Whitmore the proposed route would pass directly over the Whitmore abstraction point, which would require mitigation, for example by protecting the abstraction or introducing a new borehole nearby.

## **8.12. Land use resources**

- 8.12.1. High level agricultural land classification maps show that some 900m of Grade 1 agricultural land would be crossed by the route. In addition, some 20km of the route would be through land shown as Grade 2. More in-depth assessment of the impact on farm holdings will take place in due course, as part of the EIA.
- 8.12.2. Of the various active (operational) and disused (non-operational) landfill sites that would be close to the proposed route, higher risks were identified for two operational sites and four of the disused sites, based on the type and length of crossing, the size of the landfill and its recorded contents. The design of the route through these areas would need to ensure that potential impacts from possibly contaminated materials are fully mitigated.

## **8.13. Construction waste and material use**

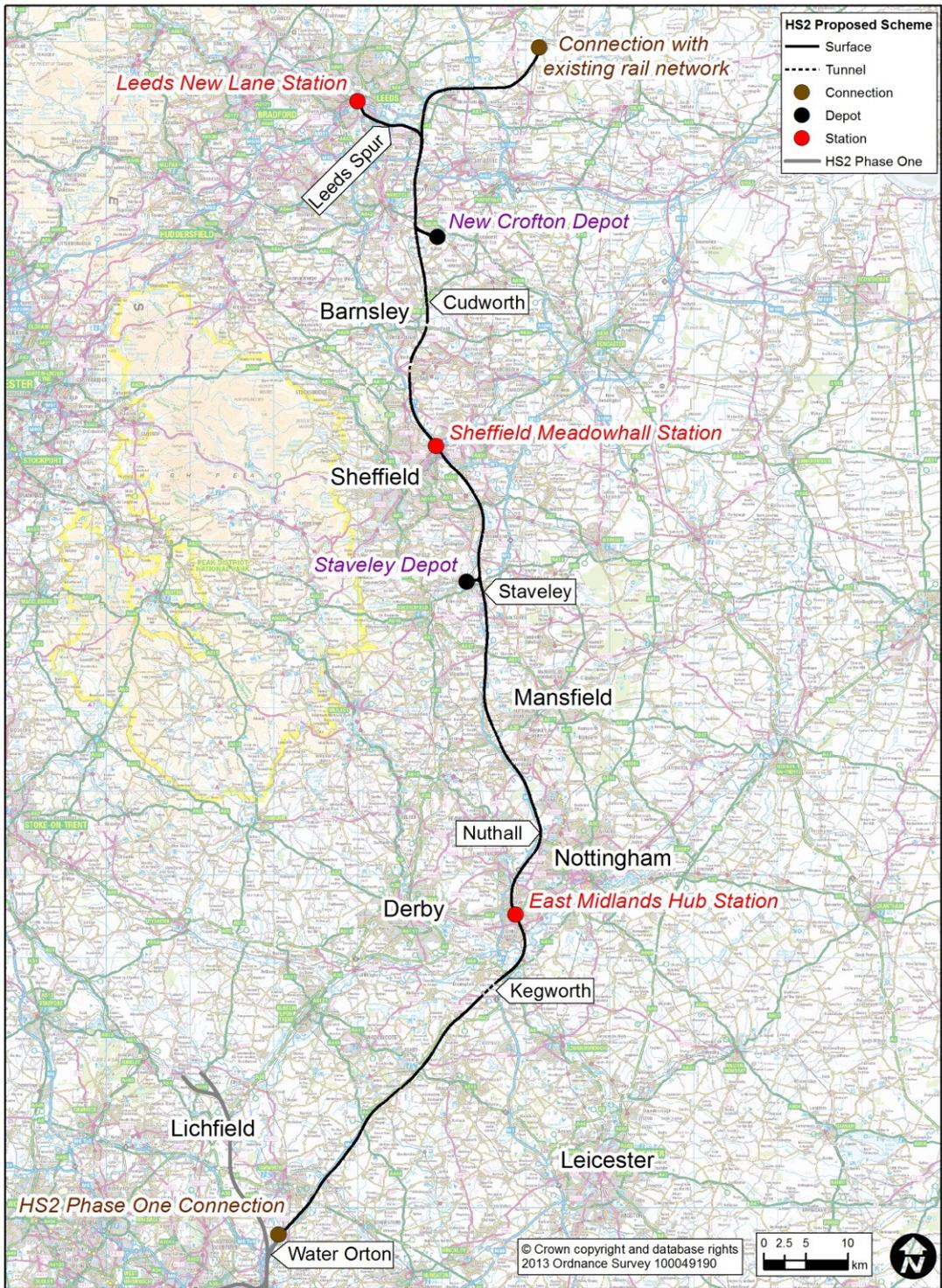
- 8.13.1. The current estimate for excavated material arising on the western leg is 16.7 million cubic metres, although this does not take account of the probable high proportions of materials likely to be incorporated within the scheme for the creation of embankments, landscaping and bunding.
- 8.13.2. The estimated quantities of bulk building material required for the scheme would comprise about 323,000 tonnes of steel and about 3.1M tonnes of concrete.

# **9. EASTERN LEG, SUMMARY OF IMPACTS ALONG THE PROPOSED ROUTE**

## **9.1. Eastern Leg: Water Orton to Kegworth**

- 9.1.1. The eastern leg would diverge from Phase One to the east of Water Orton. The route would come alongside the M42 and remain within this transport corridor, largely within cutting, for the next 25 miles, so helping to limit potential impacts. However, noise impacts are likely to affect residents at villages along the route including Kingsbury, while an estimated six dwellings would need to be demolished at Whateley.
- 9.1.2. River crossings would require an elevated alignment, and at these locations impacts would be more likely. For example, the crossing of the Tame Valley near Kingsbury and of the Anker Valley near Polesworth would result in some visual impacts at country parks in these locations, although the route was aligned here to ensure that direct impacts on Alvecote Pools SSSI would be avoided.

Proposed scheme: eastern leg



9.1.3. Further north near Measham, the route would bridge the River Mease, a European protected habitat. Extensive consultation with Natural England and the Environment Agency has helped produce a design that avoids impacts on this river and its key species. The Grade II Listed Meer Bridge at Measham may be demolished. Further design is likely to ensure that viaduct piers avoid this structure, although its setting would be adversely affected by the viaduct passing over it. Noise impacts would affect residents at Measham. The proposed viaduct over Gilwiskaw Brook at Packington may require channel works to ensure its flows are properly maintained.

## River Mease



- 9.1.4. The route would remain alongside the A42 as far as the village of Worthington, at which point a bridge would carry the railway over the road. South of Tonge, the embanked route would affect the landscape setting of the historic village and would affect views from local roads towards Breedon on the Hill. The route would continue west of Diseworth before entering tunnel to go under East Midlands Airport. The tunnel has been lengthened from earlier designs to avoid the proposed East Midlands Gateway: Strategic Rail Freight Interchange development.

## 9.2. Eastern Leg: Kegworth to Nuthall

- 9.2.1. Having emerged from tunnel, the route would rise onto a long viaduct to carry it over the Soar Valley. This would affect the landscape character of the valley, although within a context already affected by roads and power lines. The route would pass through Red Hill between the Soar and Trent valleys. The below-ground remains of a Scheduled Roman site would be directly affected, and prior investigation would be required to determine how physical impacts could be avoided or minimised. A direct impact on the prominent wooded riverside bluffs at Thrumpton would affect the setting of its Conservation Area, and intrude into skyline views from the Trent Valley. The long viaduct across the valley would exacerbate the landscape impact and would need to be carefully designed.
- 9.2.2. The route would descend from viaduct along the Erewash Valley, between Long Eaton and Beeston, giving rise to noise impacts, as well as a number of residential and commercial demolitions: an estimated six dwellings would be demolished at Long Eaton, with a further six south-west of Toton. The proposed (East Midlands Hub) station would be located immediately north of this. HS2 could support between 1,500 and 1,600 jobs around the station, but could initiate greater local economic growth. The station is designed to incorporate existing rail services ensuring good local links with Nottingham, Derby and Leicester; and growth of the Nottingham tram network is likely to see extensions of the tram to the high speed station in the future. The approach to the East Midlands Hub would lie partly within Flood Zone 3 and may require flood defences.
- 9.2.3. At Sandiacre, just north of the station, the proposed viaduct would intrude into a traditional floodplain landscape of open meadows and woodland. The route would then align along the

east side the M1 and would remain largely within this transport corridor for the next 38km. Noise impacts would affect some residents at Sandiacre and Stanton Gate. At Strelley, careful routing and a cut and cover tunnel would limit potential landscape and visual impacts, and while cutting would affect the setting of a Scheduled medieval moat and fishpond, the alignment would help preserve its character and links with Strelley Hall and the church. The route past Nuthall would result in an estimated five residential demolitions, as well as noise impacts.

### 9.3. Eastern Leg: Nuthall to Staveley

- 9.3.1. North of Nuthall, the alignment would remain alongside the M1 to avoid direct impacts on Sellers Wood and Bulwell Wood SSSIs, although Ancient Woodland at New Farm Wood and Watnall Coppice would be crossed by the scheme. East of Selston the crossing of Bogs Farm Quarry on viaduct would be the scheme's only direct impact on a SSSI. Further design work would seek mitigation through avoiding landtake and hydrological impacts, although shading impacts may remain. The setting of a group of Scheduled medieval fishponds south of Annesley Woodhouse would be affected as the scheme passes on embankment.
- 9.3.2. The route would diverge temporarily from the M1 near Pinxton, South Normanton and Huthwaite and there would be a high viaduct crossing of the River Erewash. Visual impacts are possible in this area, although otherwise, the route would be generally in cutting and well-separated from the main settlements. Seven residential demolitions would be required at Langton Hall.
- 9.3.3. Proposals through the historic landscape past Hardwick Hall, Stainsby, Heath, Sutton Scarsdale and Bolsover have been extensively re-worked to ensure the proposed scheme's close association with the landform and the M1 motorway. However, the amalgamation of prominent historic features and landscapes makes the area sensitive to change, and some impacts would prevail, including effects on the setting of the Scheduled Monument at Stainsby, demolition of the remains of the Grade II Listed Heath Old Church and loss of character to the Registered parkland around Hardwick Hall and setting of Hardwick Old Hall.
- 9.3.4. Diverging from the M1, the proposed route would follow the Rother Valley up to Sheffield within a valley that already provides a pathway for linear infrastructure. The route would pass through the edge of Erin landfill site, which would require careful design to ensure contamination risks are addressed.
- 9.3.5. The proposed depot at Staveley and viaducts across the River Doe Lea would be prominent features around Staveley resulting in visual impacts for users of Canal Marina and some local residents. However, east of Staveley, the wooded valley would help to prevent wider impacts from the viaducts required for the spur connections to the mainline. The more southern of two viaducts within the Doe Lea floodplain may require small diversions of the river at two crossing points.
- 9.3.6. Noise impacts from the proposed scheme as it passes east of Staveley, would affect some residents at Poolsbrook, Netherthorpe, Woodthorpe and Mastin Moor.

### 9.4. Eastern Leg: Staveley to Cudworth

- 9.4.1. Passing along the densely settled corridor of the Rother Valley, there would be a need to demolish an estimated nine dwellings at Renishaw, and noise impacts would affect some residents in Renishaw, Killamarsh and Beighton. The attractive flood meadow landscape on the eastern edge of Eckington and Renishaw Park Conservation Area would be bisected by

an embankment, although the park itself, with good screening from trees at its edge, would not be greatly affected by views.

- 9.4.2. Between Renishaw and Catcliffe the River Rother would be crossed at a number of locations, particularly between Beighton and Treeton, where some river diversions could be required. In addition, a stream at Beighton may need to be realigned, and crossings of the Chesterfield Canal, which is undergoing restoration over a nine mile stretch, may require realignment of the canal in some places.
- 9.4.3. North of Beighton, noise impacts from the proposed scheme would affect some residents at Swallownest, Woodhouse and Treeton.
- 9.4.4. Entering the southern outskirts of Sheffield, the elevated route would converge with the M1. It would give rise to visual impacts for some residents facing the route, and noise impacts would affect some residents at Tinsley, Wincobank, Blackburn and Shiregreen.
- 9.4.5. Much of the valley through this area is earmarked for future development, with schemes associated with the Sheffield Enterprise Zone, the Waverley New Community south of Catcliffe, and the Meadowhall Quadrant masterplan around the proposed HS2 station. The route and station would cross some of these proposed areas, but by close working between HS2 Ltd and stakeholders, there could be opportunities for HS2 to support some of these developments. With this in mind, it is estimated that HS2 could support between 4,000 and 5,400 jobs around the station, as well as between 250 and 300 new homes by improving links with other cities, and integrating with existing transport schemes in Sheffield and across the region. However, an estimated 60 residential demolitions (comprising 49 at South Tinsley and 11 at Wincobank) would be required in order to locate HS2 in this area.
- 9.4.6. Sheffield Meadowhall Station may require some channel works to the River Don and would largely occupy Flood Zone 3; vehicle access to the station would be impaired during flood events, although the elevated line and platforms would be unaffected.
- 9.4.7. North of the proposed station, the route would require some channel and bank works, and possible diversions to Blackburn Brook. The route would bear east in cutting, passing through several blocks of Ancient Woodland east of Chapelton, and resulting in both landscape and ecological impacts. It would pass beneath the M1 and continue in deep cutting before passing in tunnel beneath Hoyland.
- 9.4.8. North of Hoyland the route has been aligned to avoid impacts on the Scheduled Monument at Wombwell. But cuttings through the hills and woodland on the slopes of the Dove Valley near Worsbrough would cause ecological impact, and a viaduct over the river would affect the character of the landscape and result in local visual impacts. Noise impacts would affect some residents on the valley slopes east of Barnsley.
- 9.4.9. The route would cross the edge of Stairfoot landfill, necessitating careful design and construction to minimise contamination and other risks. A tunnel would take the route beneath Ardsley before it emerges across the wooded Dearne Valley. The proposed embankment across Cudworth Dyke would require diversion of this watercourse. Some visual and noise impacts are likely for residents overlooking the route in Cudworth and the north-east edge of Barnsley. The route would require the demolition of a Grade II Listed chimney, although this now sits in a much degraded setting.

## **9.5. Eastern Leg: Cudworth to Ulleskelf and the ECML**

- 9.5.1. The route would use a mixture of cutting and embankment through the undulating terrain north of Cudworth as far as the edge of Wakefield. Elevated route sections are likely to

cause noise impacts at dwellings facing the route in Royston, although refinements to the route through this area have lessened potential impacts at Royston. Landscape impacts would be likely where the route passes between the reservoirs at Cold Hiendley, and visual impacts would affect recreational users.

### Winterset reservoir



- 9.5.2. The proposed train depot at New Crofton and elevated rail connections to it would give rise to some landscape and visual impacts, but in an area already strongly affected by railway lines. Noise impacts are predicted at Crofton.
- 9.5.3. Passing east of Wakefield, the route would cross the Welbeck landfill site, again necessitating careful design and construction to minimise contamination and other risks. Crossing the Calder Valley, the route would be quite distant from most viewpoints, although visual impacts would affect residents at Methley Lanes where the route bridges the M62. The viaduct and embankments across the Aire Valley would be prominent but landscape and visual impacts would tend to be localised within a generally wooded area.
- 9.5.4. Local landscape impacts would affect the small river valley west of Swillington and the attractive wooded farmland landscape near Garforth. However, by closely following the M1 between Swillington and Micklefield, largely in cutting, potential impacts have been greatly reduced.
- 9.5.5. East of the A1(M), the route would be generally well-accommodated within the undulating wooded farmland, and few impacts are likely. The route alignment was moved south to avoid a number of potential impacts on people and environmental features, including Towton Battlefield. A small number of residents on the western and northern outskirts of Church Fenton would have visual impacts.

## 9.6. Eastern Leg: The Leeds Spur

- 9.6.1. The spur into Leeds would diverge from the main route just south of the Aire Valley. A Grade II Listed road bridge over the Aire and Calder Navigation at Swillington would be demolished, although it is likely that further refinement in design could avoid this. The route would be on viaduct passing alongside and across the River Aire, potentially requiring

diversions to the river in two places at Woodlesford. The viaduct would be a prominent structure that would affect the landscape character of the valley and give rise to visual and noise impacts on residents in Woodlesford who overlook the valley to the north and east, as well as to recreational users of the valley (including the Rothwell Country Park) and the Aire and Calder Navigation.

- 9.6.2. The route would pass beneath the M1 into the industrial eastern fringe of Leeds and impacts would be relatively few along this section. Farnley Wood Beck would need to be diverted.
- 9.6.3. Given the excellent transport links provided by the high speed services and other regional connections, as well as the availability of development land, HS2 would be expected to support between about 13,000 and 20,000 jobs and between 1,700 and 2,400 homes around the proposed station. In addition, an HS2 station located close to the city centre could support regeneration in this area. The Government and HS2 Ltd will work with Leeds City Council to ensure the plans for a new station maximise the opportunity to regenerate this part of the city.
- 9.6.4. The new station building would be broadly in keeping with the larger existing buildings in the area and visual impacts would be generally limited. However, the proposed high level pedestrian link from the new station to the existing Leeds City Station would give rise to visual impacts and could disrupt the townscape of the Granary Wharf waterside area which forms part of the Canal Wharf Conservation Area. The setting of the Grade II\* Listed river lock and retaining walls and the former Leeds and Liverpool Canal and Company Warehouse, as well as the Grade II Listed Victoria Bridge would be affected. Detailed design would seek to resolve these concerns and integrate the link with the historic townscape.

**Aerial view of Leeds City Centre**



## 10. EASTERN LEG, SUMMARY OF IMPACTS BY TOPIC

### 10.1. Planning and development

- 10.1.1. The route would pass through or near to several major development sites, which could introduce large new areas of proposed housing or other development (including new infrastructure) projects between now and the time HS2 is operating. These developments may be directly affected, although those around stations could well benefit from the proximity of HS2.
- 10.1.2. Since the announcement of the initial preferred scheme in January 2013, the scheme has been modified to avoid impacts on the East Midlands Gateway: Strategic Rail Freight Interchange, adjacent to East Midlands Airport.
- 10.1.3. For each of the development sites potentially affected, HS2 Ltd would work with relevant local authorities and the affected developers or promoters to determine how potential impacts might best be managed and how potential opportunities could be maximised.

### 10.2. Property and community integrity

- 10.2.1. The eastern leg could result in the demolition of an estimated 139 dwellings, including six at Whateley, six at Long Eaton, six west of Toton, five at Nuthall, seven at Langton Hall, nine at Renishaw, 49 at South Tinsley and 11 at Wincobank.
- 10.2.2. The proposals would also require the demolition of an estimated three community facilities (including a bingo hall near Leeds New Lane Station), 128 commercial properties and nine industrial properties.

### 10.3. Employment and housing

- 10.3.1. The introduction of HS2 stations could have a positive effect on the surrounding areas, as people and businesses realise the opportunities of living and working close to the high speed network. The AoS estimated the likely number of additional jobs and houses potentially supported by HS2 around proposed stations.
- 10.3.2. HS2 could support up to an estimated total of up to 26,700 jobs and 3,500 homes around the three stations on the eastern leg. The employment figure takes account of jobs displaced by demolitions, although it is expected that the majority of these would be able to relocate in the local area or region.

### 10.4. Access issues

- 10.4.1. The HS2 stations would provide an important interchange hub with other transport systems, including railways, trams, roads, airports, cycleways and footpaths. The East Midlands Hub would include platforms for conventional rail services allowing direct transfer of passengers for connections with Nottingham, Derby and Leicester. The proposed HS2 station at Meadowhall would be integrated with the existing rail station allowing connections with Sheffield city centre, as well as numerous local and regional stations. The HS2 station in central Leeds would allow connections with the existing rail network via a pedestrian link to the current Leeds station.
- 10.4.2. The eastern leg would cross 14 long distance paths, some of which would be crossed at more than one location. Access along all public rights of way is likely to be maintained

through diversion or re-instatement, although details would need to be determined at a later stage in consultation with local authorities.

## 10.5. Noise and vibration

- 10.5.1. Since the publication of the Phase Two Sustainability Summary in January 2013, the noise appraisal has proposed indicative noise mitigation along parts of the route. This has substantially reduced the number and extent of noise impacts reported at that earlier stage. The number of dwellings predicted to have noise impacts from HS2 along the eastern leg is estimated at 7,800, some 80% fewer than were predicted for the unmitigated scheme in January. Fewer than 15 dwellings would have high noise impacts of 73dB<sub>L<sub>Aeq</sub>18hr</sub> or more, and around 200 dwellings would be expected to qualify for noise insulation.
- 10.5.2. Later assessment as part of the EIA will provide a more in depth understanding of noise impacts along the route, including generation of noise contour maps. This will allow for more specific mitigation measures to be developed and incorporated into the design.

## 10.6. Air quality

- 10.6.1. Sheffield Meadowhall Station and the East Midlands Hub would be located within or near to areas currently identified as having poor air quality. Other areas of poor air quality are located in the vicinity of the M1. Any additional road traffic to these places, either during construction or operation of HS2, could exacerbate local pollution levels if no air quality improvements have been implemented by local authorities by that time. In developing scheme proposals, it would be necessary to comply with EU law on ambient air quality. This would be considered further as part of the EIA.
- 10.6.2. On a larger scale, HS2 could result in air quality improvements as people switch from cars to rail, although this has not been determined at this stage.

## 10.7. Health, well-being and equality

- 10.7.1. The AoS included separate appraisals on health and well-being, and on equalities. These studies each considered how impacts of the scheme might affect certain groups of people more acutely than it would the population as a whole. The health appraisal matched general impacts from the scheme with areas of higher health deprivation. This revealed general areas in and around Nottingham, Barnsley, Wakefield and Leeds with populations relatively more vulnerable both to potential negative health effects (for example due to displacement of jobs, noise and demolition of housing and community facilities); and potential positive health effects (for example due to improved access to employment, new housing and access to transport).
- 10.7.2. Separate equality analysis was undertaken to indicate the extent to which groups vulnerable to discrimination and social exclusion may be affected by the proposed scheme to a greater degree than the population in general. Different priority equality groups were identified along the route.
- 10.7.3. Potential beneficial equality impacts were identified around Sheffield Meadowhall and Leeds New Lane stations as a result of new local jobs and housing. Potential adverse impacts were also identified around these stations, as well as at Wincobank and Shiregreen (near Sheffield Meadowhall) and at Nuthall (north of the East Midlands Hub) as a result largely of potential demolitions to housing.

## 10.8. Landscape and visual impacts

10.8.1. The eastern leg would have no direct or indirect impacts on nationally designated landscapes. Considerable parts of the route would have only slight landscape or visual impacts, successfully avoiding important landscape and visual amenity resources. Examples include many parts of the route between Water Orton and Tonge; much of the alignment from Nuthall to Tibshelf; Rother Valley Country Park; the Calder Valley; Swillington to Micklefield; and the approach into Leeds Station between the M1 and Hunslet.

### Key landscape and visual impacts are likely to affect:

- views from Pooley Country Park and the Coventry Canal;
- the landscape of the Trent Valley south of Long Eaton and views near Trentlock affecting recreational users in the Erewash Valley;
- the flood meadow landscape on the eastern edge of Eckington and Renishaw Park;
- the Dove Valley landscape near Worsbrough, south of Barnsley;
- the landscape of the River Aire corridor near Woodlesford, and views of residents and recreational users in the valley; and
- the historic townscape and views around the Granary Wharf waterside area, due to the new Leeds station.

### View of the Aire and Calder Navigation looking east from the A642



10.8.2. These conclusions are based on a level of scheme design that does not yet include specific mitigation. As the design progresses, these and other potential impacts are likely to be reduced through the incorporation of a range of landscape mitigation measures.

## 10.9. Cultural heritage

- 10.9.1. The eastern leg has been selected and aligned so that it would have few impacts on designated heritage assets. It would avoid physical impacts on most of the more significant designated features, including Registered Battlefields and Grade I and II\* Listed structures. The route has been aligned so that it avoids all Registered Parks and Gardens, and effects on the settings of those it passes would be generally low.
- 10.9.2. The majority of effects are expected to be negligible or minor at most. Potentially greater impacts would include:
- direct impacts on the below ground remains of the Scheduled Roman site at Ratcliffe on Soar, and impacts on the settings of three other Scheduled sites.
  - possible demolition of five Grade II Listed structures, although three of these are likely to be preserved through further more detailed design.
  - direct impacts on six Conservation Areas.

### Aerial view across Red Hill and Thrumpton Park, southwards along the Soar Valley



- 10.9.3. Many of these potential impacts would occur over several kilometres north of Tibshelf. Given the historic sensitivity of this area, the route has been closely aligned with the M1, and this would be instrumental in helping to limit the potential impacts of the scheme, although further focus will need to be applied to the design through this area.

## 10.10. Biodiversity and wildlife

- 10.10.1. The route would pass over the River Mease, a European protected Special Area of Conservation and a SSSI. HS2 Ltd has worked closely with Natural England and the Environment Agency to determine an alignment and provisional design that would avoid adverse impacts on this site.
- 10.10.2. The route would pass through the narrowest part of Bogs Farm Quarry SSSI, east of the M1 at Selston. Design work will continue to seek effective mitigation by minimising landtake and hydrological impacts at this site. The proposed scheme would also pass near several other SSSIs, although it is most probable that careful design and construction would effectively mitigate potential impacts.
- 10.10.3. The scheme would have direct impacts on an estimated 43 areas of key habitat, including nine woods listed on the Ancient Woodlands Inventory. Three Local Nature Reserves would be directly affected.
- 10.10.4. As part of the later EIA work, a package of mitigation and enhancement measures will be developed to address the impacts on habitats and species. Such measures would seek to address both the direct impacts on designated sites, and to reflect the wider strategic ecological priorities of affected areas.

## 10.11. Water resources and flood risk

- 10.11.1. The proposed scheme would cross a network of watercourses of varying size. In a small number of cases this may necessitate a diversion or modification to the river channel. With a total of 146 separate watercourse and canal crossings expected along the eastern leg, in-channel works may be required to 27, with eight more significant watercourses potentially affected, including the River Doe Lea, the River Rother the River Don and the River Aire. Further design will seek to avoid the need for diversion and to explore opportunities for environmental enhancement.
- 10.11.2. The proposed scheme could exacerbate flood risk where it crosses designated flood zones. Where it does, it has been assumed that viaducts would be used. However, at a later stage, each crossing will be examined in more detail to determine the most appropriate form of alignment. In addition, there would be flood risks associated with Sheffield Meadowhall Station, Leeds New Lane Station and Staveley Depot, as well as with the approach to the East Midlands Hub Station.

## 10.12. Land use resources

- 10.12.1. High level agricultural land classification maps show that no Grade 1 agricultural land would be directly affected by the eastern leg. An estimated 30km of the route would be through Grade 2 agricultural land. More in-depth assessment of the impact on farm holdings will take place in due course, as part of the EIA.
- 10.12.2. Of the various active (operational) and disused (non-operational) landfill sites that would be close to the proposed route, higher risks were identified for three operational sites and 12 of the disused sites, based on the type and length of crossing, the size of the landfill and its recorded contents. The design of the route through these areas would need to ensure that potential impacts from possibly contaminated materials are fully mitigated.

## 10.13. Construction waste and material use

- 10.13.1. The current estimate for excavated material arising on the western leg is 12.4 million cubic metres, although this does not take account of the probable high proportions of materials likely to be incorporated within the scheme for the creation of embankments, landscaping and bunding.
- 10.13.2. The estimated quantities of bulk building material required for the scheme would comprise about 409,000 tonnes of steel and about 3.6 million tonnes of concrete.

## 11. ROUTE WIDE ISSUES

### 11.1. Carbon emissions

- 11.1.1. The carbon assessment will be completed in due course, as it relies on data from the economic case, work on which is underway at the time of writing. The assessment of potential carbon dioxide emissions from HS2 (both Phase One and Phase Two) will take account of emissions resulting from HS2's construction and operation over its lifetime, compared with any reductions in emissions due to people switching to high speed rail services from other, more carbon polluting, transport modes. Calculation of this net carbon footprint will rely on a host of factors and assumptions, a great number of which are outside the immediate influence of HS2, such as the way power for the trains is generated.
- 11.1.2. In advance of the full carbon report, a number of points are clear at this stage:
- The greenhouse gas emissions from HS2 will be a fraction of those from the transport sector as a whole, and from the UK in general.
  - Rail transport, and high speed rail in particular, is known to be one of the most carbon efficient forms of transport when measured per passenger kilometre.
  - A large share of the carbon emissions from HS2 would fall within the EU Emissions Trading System, which caps greenhouse gas emissions from many sources across the EU. This means much of the HS2 carbon footprint may not contribute to a net increase in emissions in the EU, as they would be offset elsewhere.
  - There is scope for HS2 to reduce its carbon footprint by integrating low carbon materials and technologies into the way it is built and operated.

### 11.2. Climate resilience

- 11.2.1. Consideration of the resilience of the proposed scheme to the wider effects of climate change will be addressed in due course as part of the EIA. However, HS2 Ltd is committed to ensuring this resilience is considered within the design: one of the seven themes of its Sustainability Policy is to: "Build a network which is resilient for the long term and seek to minimise the combined effect of the project and climate change on the environment".

### 11.3. Safety and security

- 11.3.1. The safety appraisal will be completed in due course, as it relies on data from the economic case. HS2 could have a positive impact on safety, as relatively more dangerous journeys by car are replaced by much safer rail journeys on HS2 potentially resulting in a lowering of fatalities. Rail travel statistics also show significantly lower major injury rates compared to roads. The net change in injury levels would be a balance between any potential reduction in injury due to people switching to from road to rail and potential increase in injury due to

new long distance high speed rail journeys by passengers who do not currently make that journey by road.

## 11.4. Wider economic issues

11.4.1. HS2 would represent a major transformation in the UK rail network and capacity, and a significant public investment in national infrastructure. Such projects have the capacity to transform areas, driving longer-term shifts in economic performance and potentially altering the shape of economic geography.

11.4.2. The potential benefits from HS2 would result from:

- Improved access to markets, with businesses having better access to a wider range of potential customers, suppliers and labour.
- Increased trade and competition, with new opportunities for increased trade and competition between local and regional markets, as well as for wider export.
- Change in business behaviour leading to potential efficiency gains.
- Improved employment opportunities, by giving more people access to a wider range of jobs.

## 12. CUMULATIVE IMPACTS

12.1.1. To provide an understanding of the sustainability performance of HS2 as a whole, the Sustainability Statement includes a summary of the potential combined impacts for Phase One and Phase Two, focusing on the appraisal categories that can be more easily quantified. It is based on current designs for both phases, which have each been worked to different levels of detail and assessment. Some of the details will change as further refinements and mitigation are introduced. The table below presents a selection of the appraisal categories; other topics are covered in the full cumulative impact table, contained in the Sustainability Statement.

12.1.2. As summarised in this document, the Phase Two scheme would have no direct impacts on AONBs, Registered Battlefields, Grade I and Grade II\* structures, Registered Parks and Gardens and Natura 2000 sites.

	Phase One total	Phase Two Manchester	Phase Two Leeds	Phase Two total	Total
Route length	220.5	150.4	184.8	335.2	555.7
Dwellings demolished	338	139	139	278	616
Total demolitions	528	241	279	520	1048
Jobs supported	30,000	30,000-43,600	18,700-26,700	48,700-70,300	78,700-100,300
People affected by noise (WebTAG annoyance) (mitigated scheme)	~900 <sup>(2)</sup>	~250	~1,400	~1,600 <sup>3</sup>	2,500~

<sup>2</sup> Figure reflects baseline surveys and use of more accurate prediction method .

<sup>3</sup> Figure rounded according to Technical Report E6 – Noise and Vibration

	Phase One total	Phase Two Manchester	Phase Two Leeds	Phase Two total	Total
AONB crossed at surface (km)	8.9	0	0	0	8.9
Scheduled Monuments directly affected	1	0	1	1	2
Listed structures directly affected	19	3	5	8	27
SSSIs directly affected	3	0	1	1	4
Ancient Woodlands directly affected	18	5	9	14	32
Key river diversions	7	0	5	5	12
Excavated material (Mm <sup>3</sup> )	~4 <sup>(4)</sup>	16.65	12.35	29.00	33.00
Concrete used (M.tonnes)	6.56	3.11	3.66	6.77	13.33
Steel used (M.tonnes)	0.67	0.32	0.41	0.73	1.40

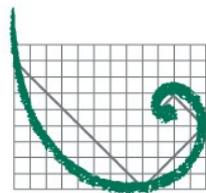
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<sup>4</sup> Phase One uses a net figure for surplus material assuming current re-use estimates within scheme design. Equivalent figures for Phase Two are prior to any mitigation considerations.





**TEMPLE**



**ERM**