

Review of HS2 London to West Midlands Appraisal of Sustainability

A report to
Government by
HS2 Ltd

January 2012

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List of acronyms

AONB	Area of Outstanding Natural Beauty
AoS	Appraisal of Sustainability
BAP	Biodiversity Action Plan
CAAV	Central Association of Agricultural Land Valuers
CLA	Countryside Landowners Association
CoCP	Code of Construction Practice
CRN	Calculation of Railway Noise
dB	Decibel
DECC	Department of Energy and Climate Change
Defra	Department for Environment, Food and Rural Affairs
DfT	Department for Transport
EIA	Environmental Impact Assessment
ES	Environmental Statement
EU	European Union
L_{Aeq}	Equivalent continuous sound level
LNR	Local Nature Reserve
NFU	National Farmers Union
NO ₂	Nitrogen dioxide
PPS	Planning Policy Statement
RSPB	Royal Society for the Protection of Birds
SA	Sustainability Appraisal
SEA	Strategic Environmental Assessment
SINC	Sites of Interest for Nature Conservation
SPA	Special Protection Area
SPP	Statement of Public Participation
SSSI	Site of Special Scientific Interest
TSI	Technical Specification for Interoperability

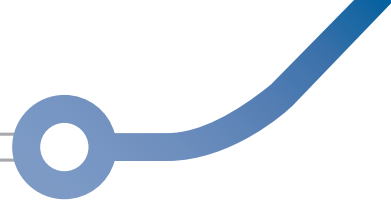
Executive summary

1. This is HS2 Ltd's advice to Government on the outcomes of the review of responses to the consultation regarding the *Appraisal of Sustainability (AoS) for HS2 London to West Midlands*. The *High Speed Rail: Investing in Britain's Future* consultation was launched on 28th February 2011 with a closing date for responses of 29th July 2011. That consultation covered both the Government's strategy for high speed rail, and the line of route for phase one from London to the West Midlands.
2. This report considers:
 - general comments about the approach to environment and sustainability;
 - energy, greenhouse gas emissions, combating climate change and issues of modal shift in relation to the consultation route;
 - air quality;
 - natural and cultural resources: protection and enhancement of the environment in relation to the consultation route;
 - specific impacts to species and habitats;
 - community related route impacts;
 - jobs and regeneration; and
 - monitoring.
3. If a decision is taken to proceed with HS2 London to West Midlands we would undertake a full Environmental Impact Assessment (EIA) necessary to accompany the hybrid bill required to authorise the proposals.
4. The EIA would follow the requirements of the Parliamentary Standing Orders including the development of a scope and methodology for the assessment, the determination of significant environmental effects to be brought before the decision makers through the Parliamentary process and identification of relevant mitigation measures. This would be presented as the project's Environmental Statement (ES). The process of developing the EIA and mitigation would include a plan of engagement and consultation with local people and relevant authorities. A Statement of Public Participation (SPP) would form part of the ES considered through Parliamentary scrutiny.
5. We have carefully considered the views expressed including criticisms of the AoS in consultation responses. In a number of cases these have identified areas that would require further investigation and the development of mitigation as part of the EIA mentioned above. In a number of locations, in response to issues raised during consultation, we have recommended changes to the line of route to mitigate environmental impacts. These are set out in the *Review of possible refinements to the proposed HS2 London to West Midlands Route* report.

6. Consultation responses did not identify an alternative approach that we would consider to be appropriate for the project. Having analysed consultation responses we are confident that the approach we took to examining the impacts on the environment and sustainability through the AoS is an appropriate one for the stage of development of the proposals. We consider our appraisal represents a sound basis on which the Secretary of State can make a decision.

1. Introduction

- 1.1.1 This is HS2 Ltd's advice to Government on the outcomes of the review of responses to the consultation regarding the *Appraisal of Sustainability for HS2 London to West Midlands*.
- 1.1.2 The *High Speed Rail: Investing in Britain's Future* consultation was launched on 28th February 2011, with a closing date for responses of 29th July 2011. That consultation covered both the Government's strategy for high speed rail, and the line of route for phase one from London to the West Midlands.
- 1.1.3 The consultation asked seven questions:
- Do you agree that there is a strong case for enhancing the capacity and performance of Britain's inter-city rail network to support economic growth over the coming decades?
 - Do you agree that a national high speed rail network from London to Birmingham, Leeds and Manchester (the Y network) would provide the best value for money solution (best balance of costs and benefits) for enhancing rail capacity and performance?
 - Do you agree with the Government's proposals for a phased roll-out of a national high speed rail network, and for links to Heathrow Airport and to the High Speed 1 line to the Channel Tunnel?
 - Do you agree with the principles and specification used by HS2 Ltd to underpin its proposals for new high speed rail lines and the route selection process that HS2 Ltd undertook?
 - Do you agree that the Government's proposed route, including the approach proposed for mitigating its impacts, is the best option for a new high speed line between London and the West Midlands?
 - Do you wish to comment on the Appraisal of Sustainability of the Government's proposed route between London and the West Midlands that has been published to inform this consultation?
 - Do you agree with the options set out to assist those whose properties lose a significant amount of value as a result of any new high speed line?



- 1.1.4 Almost 55,000 consultation responses were submitted. These were analysed by an independent response analysis company.¹ If a decision is taken to proceed with HS2 we would use the outputs of consultation to support preliminary design and inform the development of mitigation measures through the EIA. This would be the subject of further stakeholder engagement as the project develops.
- 1.1.5 In response to issues raised during consultation, we have undertaken a number of studies to consider options for mitigating impacts and enhancing the line of route to support a decision from the Secretary of State. The outcomes of these studies are available in the *Review of possible refinements to the proposed HS2 London to West Midlands Route* report.
- 1.1.6 Issues covering potential changes to the consultation route, a review of the Technical Specification for HS2 and an update to the Economic Case are covered in our other advice.²

1 See *High Speed Rail: Investing in Britain's Future Consultation Summary Report*

2 See *Review of the Technical Specification for High Speed Rail in the UK and Economic Case for HS2: Updated appraisal of transport user benefits and wider economic impacts*

2. Summary of consultation views

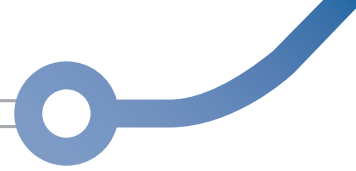
2.1.1 This report sets out the outcomes of our review of the AoS in response to key issues and matters raised during consultation. Broadly speaking, these covered:

- general comments about the approach to environment and sustainability;
- energy, greenhouse gas emissions, combating climate change and issues of modal shift in relation to the consultation route;
- air quality;
- natural and cultural resources, protection and enhancement of the environment in relation to the consultation route;
- specific impacts to species and habitats;
- community related route impacts;
- jobs and regeneration; and
- monitoring.

2.1.2 In preparing this review, we have taken into account the consultation responses. Many of the issues raised are valid considerations for the next phase of the project and, should the project proceed, would be appropriately addressed in an EIA when a more detailed analysis would be made in light of a further developed route design. We have considered whether the AoS was appropriate for the stage of project development, and conclude this to be sufficiently robust and accurate to enable Government to make an informed decision about HS2 London to West Midlands.

2.1.3 The content of this report must be considered alongside previously published reports and the updated environmental information regarding the route in our other advice.³ Many of the consultation responses that raised alternative options for refinements to the route are addressed in the content of these reports. An EIA would build on the consultation comments received, and be subject to further stakeholder engagement.

³ See *Review of possible refinements to the proposed HS2 London to West Midlands Route* and *Review of HS2 London to West Midlands Route Selection and Speed*



3. Our approach to environment and sustainability

3.1.1 Consultation responses expressed the view that a Strategic Environmental Assessment (SEA) should have been carried out and that the AoS was not compliant with European requirements for SEA. Views were also expressed that the AoS was insufficiently detailed, and that more studies should have been undertaken. Similar views suggested that an EIA should have been undertaken at this stage, with detailed results available to inform the consultation.

3.1.2 The SEA Directive requires an assessment of likely significant effects on the environment from implementing a proposed plan or programme. As part of this assessment, consideration must be given to reasonable alternatives that are available, taking into account the objectives and geographical scope of the plan or programme.

3.1.3 The AoS was intended to be compliant with the principles of SEA⁴ although the proposed scheme would not qualify as a plan or programme under the terms of the Directive. Article 2 of the SEA Directive states that it applies to plans and programmes:

- which are subject to preparation and/adoption by an authority at national, regional or local level or

which are prepared for adoption, through a legislative procedure by Parliament or Government; and

- which are required by legislative, regulatory or administrative provisions.

3.1.4 For any plan or programme to be subject to the requirements of the Directive, it must satisfy both these conditions. For the Directive to apply, plans or programmes prepared or adopted under administrative provisions must be required by them, as is the case with legislative or regulatory provisions. It is our view that neither of these conditions is satisfied in relation to the Government's proposals on high speed rail.

3.1.5 The AoS provides a strategic appraisal of key impacts relating to the proposals for high speed rail between London and the West Midlands. The approach was devised to meet relevant planning requirements and to determine the extent to which HS2 London to West Midlands would support objectives for sustainable development. It was developed and strengthened in dialogue with a Technical Challenge Group and an AoS Reference Group consisting of a number of Government departments and agencies including Defra, Natural England, the Environment Agency and English Heritage. To confirm that our approach was fully compliant with the principles of SEA

4 See Booz & Co (UK) Ltd and Temple Group Ltd, 2011, *HS2 London to the West Midlands Appraisal of Sustainability*, <http://highspeedrail.dft.gov.uk/library/appraisal-sustainability>

and legally robust, we also sought advice from a commissioner of the Infrastructure Planning Commission with specialisation in Sustainability Appraisal (SA) and SEA.

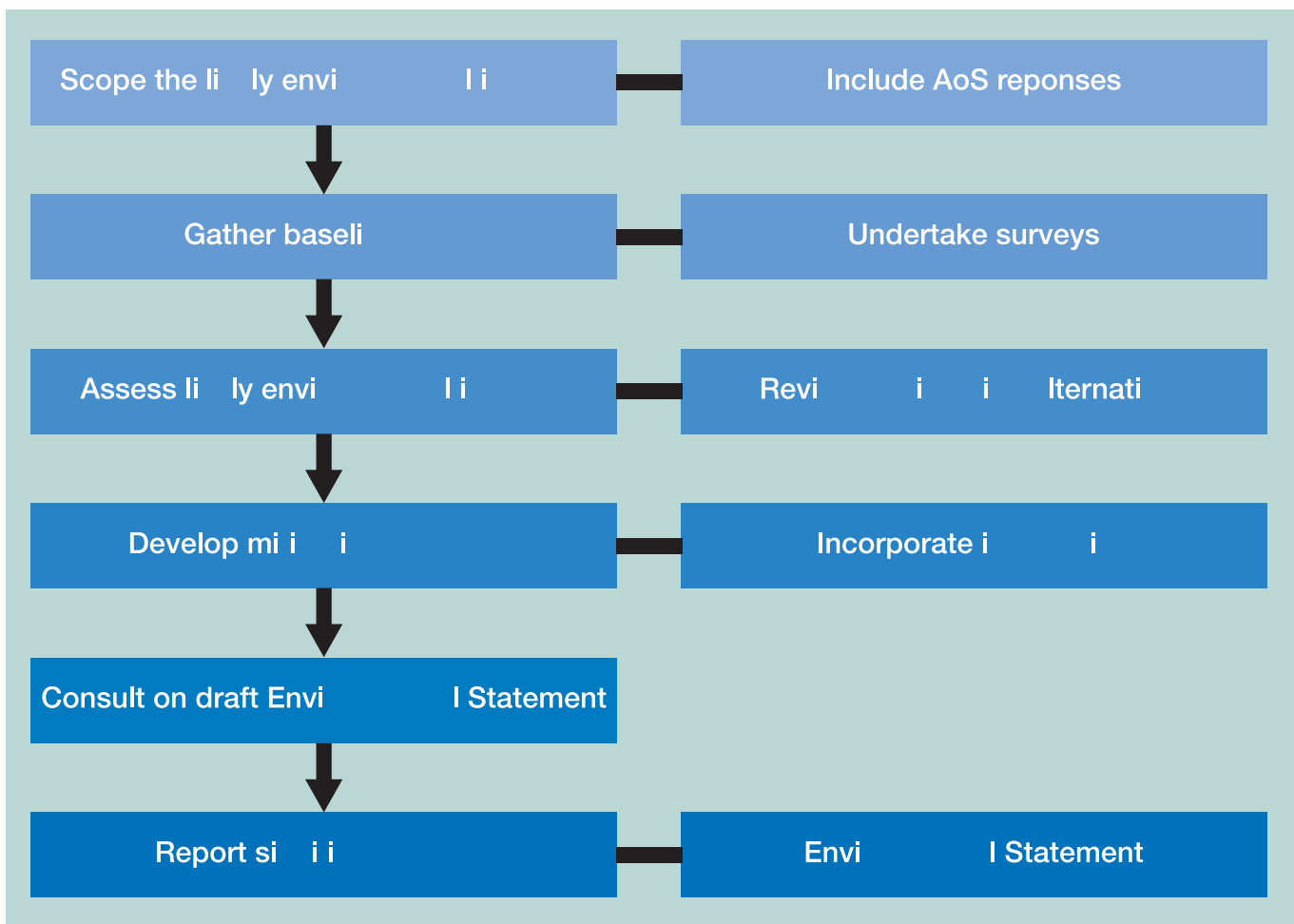
3.1.6 As for any large development project, an EIA would be submitted in support of the proposal when seeking approval for HS2 London to West Midlands. The EIA is the process for identifying, predicting, evaluating and mitigating the likely significant effects on the environment from a proposed project and for making this information public. This ensures that the importance of the predicted effects, and the scope for reducing them, are properly

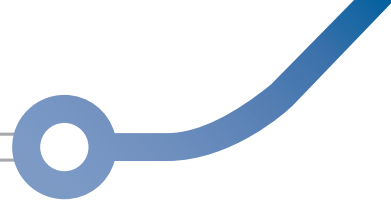
understood by the community and the decision maker, before a decision is taken on whether to authorise the scheme to be built. As part of the preparation of the EIA, we would comply with relevant legislation and government guidance or policies.

3.1.7 The plan for the development of the EIA would be envisaged to follow the steps outlined in Figure 1.

3.1.8 The EIA would follow the requirements of the Parliamentary Standing Orders including the development of a scope and methodology for the assessment, the determination of significant environmental effects to be

Figure 1 – The proposed Environmental Impact Assessment (EIA) process





brought before the decision makers through the Parliamentary process and identification of relevant mitigation measures. This would be presented as the project's ES. The process of developing the EIA and mitigation would include a plan of engagement and consultation with local people and relevant authorities and a SPP would form part of the ES considered through Parliamentary scrutiny.

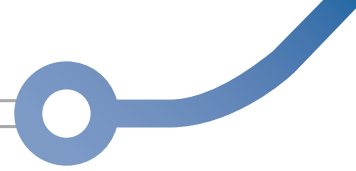
- 3.1.9 To undertake an EIA, and to enhance the quality and depth of assessment this would need, would require a committed route and more developed design than is currently available. It would also require natural and historic environment datasets and on-site surveys. In some instances this would require local private land access, which can only begin once a Government decision has been made on whether to proceed with HS2. It would therefore not have been possible or appropriate to conduct an EIA before the public consultation and subsequent Government decision.
- 3.1.10 Consultees including the National Farmers Union (NFU) have commented that the AoS did not include an assessment of the impact on agriculture, such as the implications for food production, beyond the likely impact on Grade 1 and Grade 2 agricultural land. As part of an EIA, when more detailed information would be available, we would consider more locally specific impacts such as access to irrigation and we would also include an assessment of the effect on all grades of agricultural land. We consider our approach

was appropriate for this stage of the project's development and would continue to work with NFU, the Countryside Landowners Association (CLA), and the Central Association of Agricultural Valuers (CAAV) to ensure that their members' interests would be represented in the development of mitigation measures.

- 3.1.11 Respondents also described their concern about whether the proposals for HS2 would result in the closure of the public rights of way network and open access land where these fall in proximity to or are crossed by the proposed route. As appropriate to this stage of project design, a broad assessment was undertaken which considered "strategic" or "promoted" county level routes. At the time of consultation we announced a commitment to avoid stopping-up the rights of way network and to ensure continued public access across the railway. At this initial stage of development we have already designed a number of green tunnels to maintain access across the railway line. As part of any further development of the project we would begin further design and would work with relevant authorities, landowners and bodies such as the Ramblers, British Horse Society and local people who enjoy these rights of way.
- 3.1.12 Overall, while we understand the desire for more information, we are satisfied that the approach we took to examining the impacts on the environment and sustainability in the AoS was appropriate for the stage of development of the proposals, a

view expressed by the Environment Agency in their consultation response. More information, as was requested in consultation responses, would be available at future stages in the process.





4. Energy, greenhouse gas emissions and combating climate change

4.1.1 A range of views were expressed during consultation on the carbon case presented for HS2, including that it was flawed and that the proposals would not support the principles of combating climate change or contribute to the UK's plans to reduce greenhouse gas emissions. Included within these comments were criticisms that figures were vague, misleading and speculative, and as a result provided no case for building high speed rail on carbon emission grounds and that the service would not be carbon neutral. Modal shift estimates were challenged, and it was suggested that mode shift from short haul flights to HS2 would open up runway slots for more carbon intensive long-haul flights. Embedded carbon (carbon that is generated from construction) was also raised as an issue, with the view expressed that the AoS does not properly account for emissions relating to construction machinery, concrete use, materials and waste.

4.1.2 We recognise a number of the concerns raised during consultation regarding the carbon calculations. The appraisal of carbon in the AoS sought to assess the overall carbon emissions from HS2 over a 60-year-period, which is the period consistently used throughout the project for appraisal purposes. The AoS approach considered both embedded carbon

and operational carbon. We presented the results in accordance with relevant Government guidance, using methods and techniques consistent with the UK Greenhouse Gas Emissions Inventory and international reporting standards for greenhouse gas emissions.⁵ Given the current stage of the proposals and the long term horizon being considered, there is inevitably uncertainty in some aspects of the assessment, and we therefore presented a range.

4.1.3 The appraisal included estimates of the carbon emissions from a number of sources, each directly or indirectly related to construction and operation of HS2. Some could be predicted with greater confidence than others, but all estimates contained varying degrees of uncertainty. For example, the approach recognised one critical factor would be how many people would choose HS2 rather than air travel, given that per passenger emissions from air

5 See Climate Change Act 2008; *UK Greenhouse Gas Emissions Inventory* www.ghgi.org.uk/index.html; Department for Energy and Climate Change, 2009, *UK Low Carbon Transition Plan: National Strategy for Climate and Energy* and Department of Energy and Climate Change, 2009, *Carbon Valuation in UK Policy Appraisal: A Revised Approach*, http://www.decc.gov.uk/publications/basket.aspx?FilePath=What+we+do%5cA+low+carbon+UK%5cCarbon+Valuation%5c1_20090715105804_e_%40%40_CarbonValuationinUKPolicyAppraisal.pdf&filetype=4#basket

travel are higher when compared to other modes. Based on transport modelling, we predicted that a number of passengers who would have chosen to fly would change instead to long distance rail services using HS2. We considered different possible consequent changes in the number of flights. However, given that Heathrow in particular is already operating close to capacity, we also considered what would happen in the event that freed runway slots were replaced by new long-haul flights which would emit more carbon.

4.1.4 This approach to assessment provides a range of possible outcomes and we factored all of these into our AoS assessments. The published appraisal therefore presents both best and worst-case scenarios in acknowledgement of these known uncertainties. This resulted in a range of outcomes, with HS2 London to West Midlands increasing carbon emissions in some scenarios, and reducing them in others. In either case, however, it would only be a change of around 0.3% of total annual domestic transport emissions.

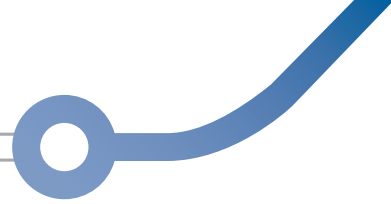
4.1.5 If a decision is taken to proceed with HS2, we would undertake further assessment to more clearly define both the range and detail of greenhouse gas variables and scenarios. With increasing clarity on wider carbon initiatives in the UK, for example the Government's endorsement of the independent Committee on Climate Change's ambitious fourth carbon budget in May 2011, and *The Carbon Plan*:

Delivering our low carbon future 2011,⁶ further refining of the carbon appraisal would occur. The next stage of design would provide the necessary detail to determine more precisely the carbon footprint from the construction of the scheme.

4.1.6 The UK emissions factor and value for carbon figures used for HS2 modelling and carbon assessments are based on figures provided by the Department of Energy and Climate Change (DECC). The Department releases new figures on a regular basis and any further assessments of carbon would utilise these figures.

4.1.7 In terms of developing a design which can adapt to climate change, we adopted Environment Agency data to consider areas of flood risk and our engineers have used this data for indicative specification for viaducts as shown in project Plan and Profile Maps. Further work, relating to the resilience of HS2 to adverse and extreme weather events, would be possible from site specific assessments as part of the EIA and would be factored into final design stages. In addition to avoiding flood risk, and reflecting consultation comments, we would establish an approach to seek opportunities that might arise from the construction of HS2 to provide additional benefits for flood protection where existing risk is recognised as being a threat to communities.

6 See Department of Energy and Climate Change, 2011, *The Carbon Plan: Delivering our low carbon future*, <http://www.decc.gov.uk/assets/decc/11/tackling-climate-change/carbon-plan/3702-the-carbon-plan-delivering-our-low-carbon-future.pdf>



- 4.1.8 Our conclusion therefore is that, in line with a number of consultation responses, carbon is an issue that we would need to address and we would continue to do this as part of the more detailed assessments that would be made in the next stage of the project, should the scheme proceed. At this stage our approach is based on current guidance and practice and is appropriate for the AoS.
- 4.1.9 In addition to climate change, flood risk would be considered as part of the assessment we would undertake to comply with the relevant legal requirements, principally the EU *Water Framework Directive*,⁷ which sets out future objectives and prevents deterioration in surface and ground water bodies.

⁷ See European Parliament, 2000, *Directive 2000/60/EC of the European Parliament and of the Council of 23 October 2000 establishing a framework for Community action in the field of water policy*, http://ec.europa.eu/environment/water/water-framework/index_en.html and see *The Water Environment (Water Framework Directive) (England and Wales) Regulations 2003*, <http://www.legislation.gov.uk/ukxi/2003/3242/contents/made>

5. Air quality

5.1.1 Concerns were expressed during consultation about the implications of the construction phase and train operation for air quality. It was expressed that the Euston area would be in breach of legal EU air quality limits, as set out in the EU *Ambient Air Quality Directive*⁸ and implemented by the *Air Quality Standards Regulations 2010*,⁹ and that HS2 would exacerbate this problem. The area around Euston is recognised as having air quality problems, largely as a direct result of existing high localised levels of nitrogen dioxide (NO₂) from local traffic and resulting in the Euston area currently falling within a zone of exceedence.

5.1.2 The AoS appraisal of an operational Euston Station providing high speed rail services indicated a likelihood that activity could add to local emissions. At the time of consultation, the AoS recognised this issue but did not propose any specific or substantive measures for a solution.

5.1.3 Following consultation responses we have reviewed air quality with reference to the Department for Environment, Food and Rural Affairs' (Defra) recent public submission to the European Commission.¹⁰ This provides a suitable indication of when air pollution compliance would be achieved in those areas at or beyond approved levels. This shows that compliance in the UK, including the London zone and Euston, is currently expected to be achieved before 2025.

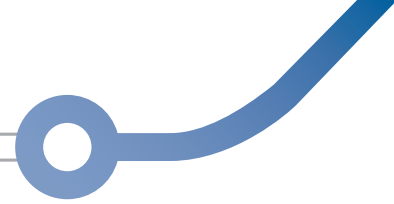
5.1.4 HS2 London to West Midlands is planned to open in 2026 and would be electric powered and so not a direct source of local pollutants. This would be in line with Government objectives for electrification of vehicles and HS2 may assist overall air quality as a result of mode shift with people using trains in preference to other forms of transport.

5.1.5 We would work with the London Borough of Camden, Transport for London and other relevant agencies to develop detailed plans to address the direct and indirect effects of our proposals for the construction and operation of HS2 London to West Midlands.

8 See European Parliament, 2008, *Directive 2008/50/EC of the European Parliament and of the Council of 21 May 2008 on ambient air quality and cleaner air for Europe*, http://ec.europa.eu/environment/air/quality/legislation/existing_leg.htm

9 See *The Air Quality Standards Regulations 2010*, <http://www.legislation.gov.uk/ukxi/2010/1001/contents/made>

10 Department for Environment, Food and Rural Affairs, 2011, *Air quality plans for the achievement of EU air quality limit values for nitrogen dioxide (NO₂) in the UK*, http://ukair.defra.gov.uk/library/no2ten/documents/110921_UK_overview_document.pdf



5.1.6 We have recognised that with construction forecast to begin in 2017, there is an increased likelihood that at least part of this would fall into a period when the area may be in breach of air quality limits. In response to the consultation responses we would therefore ensure that air quality is addressed in the development of our Code of Construction Practice (CoCP) for HS2 London to West Midlands in consultation with local authorities and other relevant agencies. The CoCP would set out how the contractor would manage construction to minimise adverse impacts, using environmental management plans for different subject areas, for example air quality, traffic management and noise.

5.1.7 The CoCP and the subsidiary plans would set out how environmental performance would be monitored and controlled throughout the construction period. For example, the timing of vehicle deliveries would be managed through a traffic management plan in order to reduce emissions from queuing vehicles. Best practicable measures would be used to ensure emissions from construction equipment were minimised.

5.1.8 We recognise that, as raised in consultation responses, air quality is an important issue that we would need to address carefully as part of the EIA. This does not change our overall assessment that redeveloping Euston over a single level is the most appropriate solution for a London terminus for HS2. We are confident that air quality issues around the station do not fundamentally undermine the sustainability of the proposals, or the selection of Euston as the location for the London terminus. Our approach to assessing and dealing with air quality issues at Euston would inform the approach we would take for all station options. Further consideration of the selection of station locations is provided in our other advice.¹¹

11 See *Review of HS2 London to West Midlands Route Selection and Speed*

6. Natural and cultural resources: protection and enhancement

6.1 Introduction

6.1.1 The issues raised during consultation relating to this topic concerned the likely broad impacts on biodiversity, landscape and countryside, heritage features and local hydrology, including aquifers and increasing flood risk. Specific comments were also made regarding local wildlife sites, ancient woodlands and particular species. We recognise that many of the issues raised by consultees about the impacts are relevant to the project, however these would be appropriately addressed through the usual EIA process.

6.1.2 In a number of cases we have sought to address specific issues raised during consultation through recommending changes to the route. These can be found in our other advice.¹²

6.2 Biodiversity impacts

6.2.1 A number of the consultation responses presented options for mitigating potential impacts. Any large strategic development project would be likely to result in impacts to natural and cultural resources. Nonetheless, railway lands are also recognised as being able to provide important, varied and secure environments for wildlife habitats. Harbury Spoilbank Site of

Special Scientific Interest (SSSI) near Southam, Warwickshire and Great Stukeley Railway Cutting SSSI, near Huntingdon, provide good examples of operational railway sites providing refuge for plant, butterfly and bird communities.

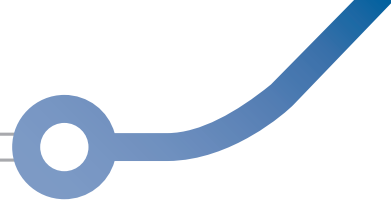
6.2.2 The initial approach to route options, as described in the AoS,¹³ informed the identification of likely key impacts. This approach to assessment provided an important step for considering mitigation, but this would need to be further developed in detail through a full EIA with ongoing dialogue and engagement with relevant stakeholders.

6.2.3 A number of consultation responses, for example from the Forestry Commission, recognise that the initial proposals for HS2 have the potential for delivering biodiversity objectives. We believe that HS2 could also provide important contributions to locally agreed Biodiversity Action Plans (BAP) and associated Opportunity Area targets.

6.2.4 Much of the work to identify mitigation and enhancement opportunities would be undertaken through EIA, and could include, for example, converting

12 See *Review of possible refinements to the proposed HS2 London to West Midlands Route*

13 See Booz & Co (UK) Ltd and Temple Group Ltd, 2011, *HS2 London to the West Midlands Appraisal of Sustainability*, A report for HS2 Ltd and the Department for Transport, <http://highspeedrail.dft.gov.uk/library/appraisalsustainability>



existing land possessing poor quality biodiversity values to a more natural resource with potential wildlife benefits. This idea has been further developed to recognise the opportunity for establishing a strategic “green corridor” along the railway corridor. This would be developed further with local enhancements and direct intervention through, for example, the extensive planting of two million trees for screening, landscaping and new woodland creation or extension. Our approach would consider contributions to landscape scale projects and “biodiversity offsetting”.

6.3 Heritage assets

6.3.1 A number of consultation responses raised issues about heritage assets. Many historical features and artefacts are protected through a range of designations defined by policy and law, for example scheduled monuments such as Grim’s Ditch or the Roman villa at Edgcote. These assets have been an important consideration in refining HS2 London to West Midlands proposals. At this stage of the project we did not seek to establish undesignated or potential archaeology. We used in general terms, buffers to identify those areas in which impacts on the setting of features were likely. As a result the route development incorporated alignment changes to minimise direct impacts on the setting of Edgcote House and to the registered Parks and Gardens of both Hartwell House and Shardeloes. We developed this approach in dialogue with English Heritage, who maintains dialogue with local authority

representatives and other stakeholders through meetings of their HS2 Historic Environment Technical Working Group.

6.3.2 If a decision is taken to proceed with HS2 London to West Midlands, we would undertake detailed assessment work during the EIA phase to further assess and minimise local effects where sites and features and their settings are likely to be significantly affected. This would be accompanied by appropriate levels of assessment and engagement and we would continue to work with local agencies, stakeholders and specialist groups to develop options further. The HS2 Historic Environment Technical Group has been able to advise HS2 Ltd on specification of lidar and hyperspectral surveys for the collection of data in formats suitable for use to predict historic environment features. We would establish relevant forums to continue dialogue and engage locally in relation to mitigation and developing opportunities.

6.3.3 Given our approach outlined above, and the future measures we would follow in light of consultation responses, we conclude that our approach to considering natural and cultural resources and their protection and enhancement in the AoS is appropriate for a project at this stage of development. While consultation responses have identified areas that require further investigation, for example the Royal College of General Practitioners at Euston or Edgcote, the evidence presented does not change the position we have adopted. In response to consultation we have,

however, made recommendations for a number of changes to the line of route which would, amongst other things, reduce impacts on important heritage sites such as Shardeloes and Edgcote.

6.4 Specific impacts to species or habitats

6.4.1 Responses to consultation raised a number of issues relating to specific habitats, sites or species. In particular, the consultation route would cross the Mid-Colne Valley SSSI on a viaduct and would be around 400m from Broadwater Lake, which is known to support internationally important numbers of over-wintering birds. It is possible that certain species may also use the South West London Waterbodies Special Protection Area (SPA), around eight miles (13km) further south. Although our senior ecologists consider the likelihood of a significant effect on the SPA to be very low, Natural England has suggested that further assessment would be necessary to confirm this. This would require an increased level of scheme design, as well as more detailed noise modelling and bird surveys.

6.4.2 Should the scheme proceed to the next stage of design, under the *Conservation of Habitats and Species Regulations 2010*¹⁴ we would confirm prior to a consent decision whether there was likely to be a significant effect on the South West London Waterbodies SPA and if necessary,

undertake an Appropriate Assessment to confirm whether there would be an impact on the integrity of the site.

6.4.3 The EIA would consider all relevant designated sites including European, national and local including for example, SSSIs, Sites of Interest for Nature Conservation (SINCs), Local Nature Reserves (LNRs), BAP habitats and Local Wildlife and Geological Sites.

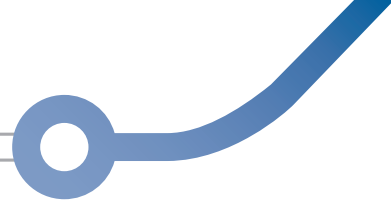
6.4.4 Consultation responses also indicated that the consultation route falls within proximity of an area of ancient woodlands important to Bechstein's bats. We acknowledge that consideration would need to be given to possible impacts which could result from the construction and operation of HS2 London to West Midlands. Under the *Conservation of Habitats and Species Regulations 2010* and the *Wildlife and Countryside Act 1981*,¹⁵ as amended, bats and certain other species receive statutory protection and we would comply with the requirements of this legislation.

6.4.5 We would continue to consult with Natural England and take advice on species protected by law as explained in Part IV and Annex A of *Government Circular 06/2005 Biodiversity and Geological Conservation: Statutory Obligations and their Impact within the Planning System*.¹⁶ We would agree appropriate surveys, management and

14 See *Conservation of Habitats and Species Regulation 2010*, <http://www.legislation.gov.uk/ukxi/2010/490/contents/made>

15 See *Wildlife and Countryside Act 1981*, <http://www.legislation.gov.uk/ukpga/1981/69>

16 See Office of the Deputy Prime Minister, 2005, *Government Circular: Biodiversity and geological conservation – statutory obligations and their impact within the planning system*, <http://www.communities.gov.uk/publications/planningandbuilding/circularbiodiversity>



monitoring plans for relevant species to enable effective environmental impact assessment and determine appropriate mitigation strategies. We would intend to complete this while working with expert groups as part of the EIA preparation.

6.5 Landscape and visual effects

6.5.1 Effects on landscape, particularly the visual impacts, were raised during consultation, with reference also given in relation to the Chilterns Area of Outstanding Natural Beauty (AONB).

6.5.2 Any new large infrastructure project, especially road and railway routes, will have impacts on landscape. In this respect we have already incorporated a large number of changes along the route that have been driven by an approach to minimise the impacts we have recognised through our appraisal of HS2 London to West Midlands. Our approach has included lowering viaducts and embankments and extensive use of cuttings, bunds and other landscaping to help blend into, or screen the railway within, the landscape. To look at reducing the impacts further, we would undertake a Landscape and Visual Impact Assessment as part of the requirements for preparing the ES.

6.5.3 Significant efforts have been made to avoid effects on the landscape by following the existing contours of the land and in many areas of the route we would also incorporate natural screening of the railway with the use of trees, hedgerows and other planting.

We are already committed to planting at least two million trees as a means of providing habitat and landscape benefits.

6.5.4 The Chiltern Hills form a long chalk escarpment lying on a direct line between London and the West Midlands, much of which is designated as an AONB. Specific concerns raised during consultation relating to the AONB asked whether it was appropriate for such a development to impact on the landscape designation and associated features. Reference was made to policy and regulations in this respect and concerns were raised that HS2 Ltd did not give specific regard to the protected designation during the route option stages and AoS process.

6.5.5 Section 85 of the *Countryside and Rights of Way Act 2000*¹⁷ requires public bodies to give regard to the special qualities of the AONB and specific planning policies are set out in Planning Policy Statement (PPS) 7¹⁸ and are summarised further in the *Draft National Planning Policy Framework*.¹⁹

6.5.6 These policies determine that major developments should not take place

17 See *Countryside and Rights of Way Act 2000*, <http://www.legislation.gov.uk/ukpga/2000/37/contents>

18 Department of Communities and Local Government, 2011, *Planning Policy Statement 7: Sustainable Development in Rural Areas*, <http://www.communities.gov.uk/documents/planningandbuilding/pdf/147402.pdf>

19 Department of Communities and Local Government, 2011, *Draft National Planning Policy Framework*, <http://www.communities.gov.uk/publications/planningandbuilding/draftframework>

in these designated areas, except in exceptional circumstances.

This includes major development proposals that raise issues of national significance. Due to the serious impact that major developments may have on these areas of natural beauty, and taking account of the recreational opportunities that they provide, applications for all such developments should be subject to the most rigorous examination. Major development proposals should be demonstrated to be in the public interest before being allowed to proceed. Consideration of such applications should therefore include an assessment of the issues outlined below.²⁰

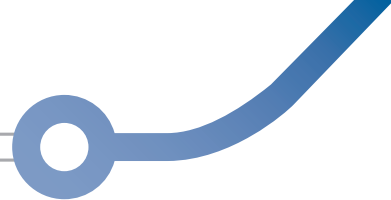
- 6.5.7** *The need for the development, including in terms of any national considerations, and the impact of permitting it, or refusing it, upon the local economy* – The authorisation of HS2 London to West Midlands which could affect the AONB would be through primary legislation established through the hybrid bill process and by its very nature would determine the project to be of national importance. The impact of permitting it, or refusing it, upon the local economy would be subject to Parliamentary approval.
- 6.5.8** *The cost of, and scope for, developing elsewhere outside the designated area, or meeting the need for it in some other way* – For HS2 London to West Midlands proposals the cost of,

and scope for, developing elsewhere outside the designated area has been the subject of considerable analysis and reporting of the main alternatives for a high speed line compared to the consultation route. In all instances significant additional cost would be incurred by adopting an alternative. The need for high speed rail has been established by the Department for Transport (DfT) following examination of other transport modes and conventional rail upgrade alternatives.

- 6.5.9** *Any detrimental effect on the environment, the landscape and recreational opportunities, and the extent to which that could be moderated* – The Government's consultation route was determined through a staged development process that considered the key principles of sustainability as part of the overall decision making process. A considerable number of route options were examined and gradually reduced by applying progressively more detailed appraisal at each development stage. Unfavoured options were parked in favour of the better performing options and a balance of cost, economic viability, sustainability and railway performance was established. As a result environmental mitigation is inherent within the design and choice of route. The best overall performing route was adopted by Government and its sustainability performance was established through the AoS published for consultation.

- 6.5.10** The AoS provides a foundation for the EIA and the ES which would be

20 See page 14 section 22, Department of Communities and Local Government, 2011, *Planning Policy Statement 7: Sustainable Development in Rural Areas*, <http://www.communities.gov.uk/documents/planningandbuilding/pdf/147402.pdf>



required to be prepared to accompany the hybrid bill that would be scrutinised by Parliament. The more detailed aspects of the scheme's impact and the positive and negative significant effects that could arise together with proposals for avoiding, minimising or mitigating such effects would be considered. These would form part of that documentation, scheme design, planning regime and environmental minimum requirements of the proposals.

6.5.11 We have considered the AONB during the route development and options that would have avoided or resulted in shorter routes through the Chilterns AONB were designed. We have also considered alternative routes, especially following motorway corridors, in response to issues raised during consultation. Our conclusion is that alternative routes for a high speed line that avoid the AONB boundary, such as a longer route broadly following the M1, would either affect a greater number of people or, to avoid this, would have substantially higher costs. The consideration of alternatives was published and explained in *HS2 London to the West Midlands Appraisal of Sustainability*, specifically in Appendix 6.²¹ Further information is contained in our other advice.²²

6.5.12 On the basis that a route would need to span the AONB the focus moved to options that would reduce the impacts through tunnelling, cutting and by following transport corridors. We undertook appraisal at a level of detail commensurate with a strategic assessment, allowing us to understand in broad terms where impacts would be and what form they would generally take. This approach allowed further route revisions to be made during 2010, which sought to reduce the scale of potential impacts, although, as the AoS makes clear, adverse impacts would remain.

6.5.13 In response to issues raised during consultation we have already sought to reduce the impacts on the AONB as far as practicable, notably through additional tunnelling. Although tunnelling can substantially reduce surface impacts, it does not remove them completely and a number of surface impacts would still occur for example through the requirement of ventilation shafts. It also presents a range of technical challenges such as the need to avoid aquifers and to meet regulation and safety requirements for emergency access and ventilation. The construction period for green tunnels has additional impacts at surface level, but the landscape can be restored after construction. Overall we are satisfied that the requirements for exceptional circumstances, as set out in legislation and Government policy, are met by the proposals for HS2 London to West Midlands.

21 See Booz & Co (UK) Ltd and Temple Group Ltd, 2011, *HS2 London to the West Midlands Appraisal of Sustainability, Appendix 6 March 2010 preferred scheme and main alternatives AoS information*, A report for HS2 Ltd and the Department for Transport, <http://highspeedrail.dft.gov.uk/library/documents/appraisal-sustainability>

22 See *Review of HS2 London to West Midlands Route Selection and Speed*

6.5.14 Should the scheme continue, the next part of the project would include a full EIA. This would include a more detailed assessment of the landscape and visual impacts with particular reference to the AONB. This would consider how people's visual amenity would be affected by views of the railway and its infrastructure. It would also detail the proposals for mitigating these effects. Consequently, the EIA will provide a fully detailed consideration of impacts as part of the documentation of the hybrid bill that would be put forward to Parliament for approval.

7. Community impacts

7.1 Introduction

7.1.1 Consultation responses expressed concern about general impacts on communities along the line of route which could arise during the construction and operation of the railway. In particular, views were expressed that our appraisal of noise and the methodology used was inadequate, for example there were criticisms of the use of Noise Equivalent Continuous Sound Level (L_{Aeq} - HS2 operational daytime noise level) to describe the impacts. Views were also expressed that noise contour mapping would present a more appropriate way to describe impacts. Issues were also raised over the amount of spoil that would be created during the construction phase and the impact that vehicles removing waste material would have on local communities and road congestion and safety.

7.1.2 In a number of cases we have sought to address specific issues and concerns through recommending changes to the route alignment. The outcome of this work can be found in our other advice.²³

7.2 Appraisal of airborne noise

7.2.1 Noise attracted a significant number of comments in response to the consultation, in particular the predicted noise levels and the prediction methods.

7.2.2 We are aware of the concern communities that are alongside the proposed route for HS2 have regarding noise. We are actively involved in reducing the potential impacts. Our other advice published alongside this report outlines proposed changes that would further reduce the number of properties affected.²³

7.2.3 The AoS provided a strategic appraisal of airborne noise impacts on dwellings at a level of detail commensurate with the design of the project at this stage of development. The appraisal provided an approximation of the potential noise impacts and indicative mitigation measures. The noise model approximates values for noise impacts based on national standard methods for calculating railway noise, which are accepted and commonly used since publication in 1995 by UK experts in railway noise assessment.

7.2.4 The view was expressed in response to the AoS that the assumption that a three decibel (dB) reduction in train noise level could be achieved compared with today's high speed

²³ See *Review of possible refinements to the proposed HS2 London to West Midlands Route*

trains was not reasonable. We believe that this assumption is valid because it is consistent with the recommended limits for new rolling stock bought after 2010 contained in the current High Speed Rolling Stock Technical Specification for Interoperability (TSI).²⁴ Further technology currently available in the industry indicates this is achievable. In common with all input assumptions, the train noise level will be revisited and checked for suitability as the input to the more detailed EIA, should the project be taken forward.

7.2.5 The issue of the assessment of noise from the train pantograph was also raised, in particular with reference to the height of the source compared with noise barriers. The pantograph is a consideration in the assessment of the noise impact and the AoS took this into account by making appropriate changes to the relative height of train source and barrier when considering mitigation. While noise from the pantograph does need to be considered, and will be reviewed at the time of the EIA, its significance is often overstated. The wheel-rail interface will remain the most significant part of the noise from the train, even at high speed.

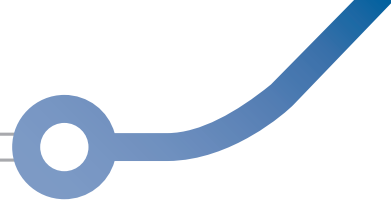
7.2.6 Another issue raised was with the number of trains used for the noise

24 European Parliament, 2008, 2008/163/Ec: Commission Decision of 20 December 2007 concerning the technical specification of interoperability relating to safety in railway tunnels in the train-European conventional and high-speed rail system (notified under document number C(2007) 6450) (Text with EEA relevance), http://eur-lex.europa.eu/smartapi/cgi/sga_doc?smartapi!celexplus!prod!DocNumber&lg=en&type_doc=Decision&an_doc=2008&nu_doc=163

predictions. The AoS presented results for 14 trains in each direction during the peak hour of the day, which is the service frequency for the London to West Midlands scheme, but also presented results of a sensitivity study if the Y network was in operation (18 trains in each direction during the peak hours of the day). Candidate areas for mitigation were selected based on the assumption of the Y network being in operation in order to provide a provision for the possible extension of high speed services further north.

7.2.7 Concerns were raised regarding the use of the equivalent continuous sound level, L_{Aeq} , to describe the possible noise impacts in the AoS. In the UK and the EU, regulations, standards and policy all adopt this indicator to describe railway noise for both conventional and high speed lines. The equivalent continuous sound level is defined as the constant level of sound which, over a period of time, has the same total sound energy as the actual varying sound over the same time period. The L_{Aeq} indicator therefore takes into account the noise from all events within a defined period of time, including the maximum noise level from every event, such as a train passing by, during the measurement period. The L_{Aeq} is the standard and most proven single indicator for determining noise impact of transport schemes and was therefore appropriate for the appraisal of HS2.

7.2.8 We also received requests during consultation to provide noise contour maps. However, given the strategic nature of this stage of route design,



it was not considered appropriate to publish noise contour maps due to the risk of misleading the public on noise levels at specific properties, given that we have not performed detailed baseline noise surveys to verify our predictions of the existing background noise environment. Instead, the noise maps that are incorporated into the AoS have been prepared to identify clusters of properties that could be affected by the proposal. If proposals for the route are taken forward, the EIA would undertake more detailed and localised assessment of noise and this could allow for the production of detailed noise analysis and detailed recommendations for future noise mitigation.

7.3 Construction spoil and spoil transportation

- 7.3.1** Comments raised during consultation regarding spoil included general concern about the volume of spoil generated and its disposal, and identified an error in spoil calculation.
- 7.3.2** At this stage of development estimates of spoil generated are no more than an indication of the likely imbalance between cut and fill along the line of route. The figures we presented in the AoS are indicative figures for spoil created by tunnelling and relate to material that could not be re-used for railway construction.
- 7.3.3** An error in estimates of tunnelled spoil was identified through consultation. The error was due to the use of an incorrect tunnel specification. The estimate was recalculated and

an erratum published in July 2011 during the consultation period. This concluded that the new figure for offline tunnel spoil would be almost three million cubic metres of spoil compared to almost two million cubic metres published for the consultation in February 2011.

- 7.3.4** We would intend to minimise the waste produced as a result of the project through the use of the Waste Hierarchy²⁵ and our general approach to waste was supported by the Environment Agency. This would include complying with the *Waste (England and Wales) Regulations 2011*.²⁶ As part of this approach we would include waste minimisation as one of the design aims for the next stage of the project.
- 7.3.5** Spoil is increasingly expensive to dispose of and strategic projects aim to produce as little waste as possible for both financial and environmental reasons. Proposals for construction include the need to use as much as is reasonable within the designated scheme. Such material can be used to form embankments alongside the railway, to integrate the route within existing topography, as well as to create bunds and landscaping to reduce noise and screen views.

25 Department of Environment, Food and Rural Affairs, 2001, *Guidance on applying the Waste Hierarchy*, <http://www.defra.gov.uk/publications/files/pb13530-waste-hierarchy-guidance.pdf>

26 See Environment Agency, 2011, *Waste (England and Wales) Regulations 2011*, <http://www.environment-agency.gov.uk/business/topics/waste/128153.aspx>

- 7.3.6 In terms of material transportation and the use of local roads, the standard approach to road and railway construction is to use a “haul road” (a road within the construction corridor used mainly by trucks during construction projects) along the railway footprint or “trace”. This is designed to minimise the use of local roads and avoid unnecessary impacts to communities where possible.
- 7.3.7 It is important to balance the spoil created against the benefits that these tunnels and cuttings would bring to communities, the landscape and environment by reducing the visual and noise impacts of the line. Having reviewed comments in relation to local impacts we conclude that our approach and considerations are consistent for a project at this stage of development.



8. Jobs and regeneration

8.1.1 Comments were made on the figures presented within the AoS for regeneration and job opportunities, generally expressing views that figures were either inflated, or that the real benefits have not been properly accounted for.

8.1.2 The AoS²⁷ recognised the regeneration and growth opportunities relating to high speed rail. We recognise that HS2 stations have the potential to support job creation and identified the potential for local employment opportunities to increase at the station locations. Beyond this we recognise that there are wider benefits to be realised from high speed rail and independent studies have been undertaken to demonstrate this.

8.1.3 In moving forward and in response to consultation comments we would seek to work in partnership with local authorities and key stakeholders to prepare planning frameworks for the station locations. This approach would seek to address issues specifically associated with each location, and to enable regeneration and growth opportunities to be realised beyond the footprint of the current HS2 proposals.

27 See Booz & Co (UK) Ltd and Temple Group Ltd, 2011, *HS2 London to the West Midlands Appraisal of Sustainability*, <http://highspeedrail.dft.gov.uk/library/appraisal-sustainability>

9. Monitoring

9.1.1 During consultation, concern was expressed that aspects of the project may not be adhered to.

9.1.2 We would develop design aims based on the knowledge gained through the AoS. These would be applied and monitored in the next phase of the development work. This would include objectives, targets and indicators to manage and further avoid or minimise the potential environmental effects of the proposals. Monitoring would occur first through the duties imposed by the EU *Environmental Impact Assessment Directive*,²⁸ the EU *Habitats Directive*²⁹ and under the *Countryside and Rights of Way Act 2000*.³⁰ That process would continue in the Parliamentary Select Committee process and into the construction and operation phases.

9.1.3 The EIA would further identify the likely environmental effects and determine options for further mitigation that would include monitoring provisions as necessary. Environmental plans would be formulated to manage environmental issues during the design, construction and operation of HS2. These would include, for example, a CoCP, which would set out the principles for the management and monitoring of the environmental aspects arising out of construction and ensure such effects are minimised. This could include specific measures such as noise and water quality monitoring.

9.1.4 Beyond construction, guidance would be set to ensure the effectiveness of mitigation determined through the legislation authorising HS2 and appropriate management plans, monitoring and remedial response plans would be established as required for the new railway. As part of this process we would work with the relevant responsible authorities to develop the monitoring and management plans.

28 See European Parliament, 2009, *Directive 2009/31/EC of the European Parliament and of the Council of 23 April 2009 on the geological storage of carbon dioxide and amending Council Directive 85/337/EEC*, European Parliament and Council Directives 2000/60/EC, 2001/80/EC, 2004/35/EC, 2006/12/EC, 2008/1/EC and Regulation (EC) No 1013/2006, <http://ec.europa.eu/environment/eia/eia-legalcontext.htm>

29 See European Parliament, 1992, *Council Directive 92/43/EEC of 21 May 1992 on the conservation of natural habitats and of wild fauna and flora*, http://ec.europa.eu/environment/nature/legislation/habitatsdirective/index_en.htm

30 See *Countryside and Rights of Way Act 2000*, <http://www.legislation.gov.uk/ukpga/2000/37/contents>



10. Conclusion

- 10.1.1 Having carefully considered and examined consultation responses, we have identified a number of areas which would need to be addressed further in the next stage, when an EIA would be undertaken.
- 10.1.2 In advance of that, however, in response to issues raised during consultation we have recommended a number of changes to the line of route to mitigate sustainability impacts.
- 10.1.3 For the current stage of the project, we conclude that our approach to examining the impacts on the environment and sustainability through the AoS is appropriate. If a decision is taken to proceed with HS2 London to West Midlands we would, however, undertake a full EIA necessary to accompany a hybrid bill required to authorise the proposals.

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