High Speed Rail: HS2 Phase 2b Preferred Route

Sustainability Statement Update including Post Consultation Update

Appendix C3 – Biodiversity

A report by Temple-RSK for HS2 Ltd

TEMPLE
LEADERS IN ENVIRONMENT, PLANNING & SUSTAINABILITY.

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CONTENTS

1. INTRODUCTION

1.1.1. This report has been prepared to support the HS2 Phase 2b Sustainability Statement including Post Consultation Update report, which describes the extent to which the Government's preferred route for HS2 Phase 2b supports objectives for sustainable development. This document is a technical appendix which summarises the methodology for appraising biodiversity, and the key findings and conclusions that inform the Sustainability Statement main report. The Sustainability Statement places emphasis on the known key impacts only at this stage in the design, prior to commencing the Environmental Impact Assessment.

2. SCOPE AND METHOD

2.1. Scope of appraisal

2.1.1. The appraisal of the ecological resources present in the areas through which the preferred route passes, involved a desk study of the key features of international, national and regional importance that could potentially be affected by the presence of the preferred route.

2.1.2. **Appendix B** (Method and Alternatives) provides further explanation of the AoS methodology and the rationale behind it.

2.1.3. The appraisal was based initially on statutory sites of nature conservation importance, at a international and national level. More recent work has drawn upon other publicly available information on the geographic distribution and extent of habitats, including Ancient Woodland and Habitats of Principal Importance (HPI). Supplementary ecological information was derived from aerial photography.

2.1.4. The report draws on earlier stages of the AoS in which potential effects on sites of international and national nature conservation importance were identified. It also refers to Habitat Regulations Appraisal (HRA) screening and appraisal work that provides detailed information on likely effects on Natura 2000 sites and sets out measures to avoid significant adverse effects.

2.1.5. The purpose of this report is as follows:

- to summarise information on the potential effects on sites of international, and national importance; and
- review the possible effects on sites of regional importance: Local Nature Reserves (LNR), Ancient Woodland, HPI, and publicly accessible information on Wildlife Trust Reserves.

2.2. Designated sites and habitat inventories

2.2.1. A number of different nature conservation designations were drawn upon in carrying out the appraisal of the potential effects of the preferred scheme. The designated sites and habitat inventories reviewed as part of the appraisal are as follows, in order of importance:

- International and European Sites – Special Protection Areas (SPAs), Special Areas of Conservation (SACs) and Ramsar Sites[1];
- National Sites – National Nature Reserves (NNR), Sites of Special Scientific Interest (SSSI); and
- other important sites – Local Nature Reserves (LNR), Ancient Woodland and HPI, important at the regional level.

2.2.2. There are also a number of non-statutory, locally listed designations, information on which is held by a number of sources, notably the Wildlife Trusts and local data sources. Information on these sites is not always in the public domain or lacks detail.

2.2.3. The occurrence of particular species is not known at this stage, other than where they are mentioned within citations for protected sites. Surveys of protected species and consideration of locally designated sites will be addressed in due course as part of the Environmental Impact Assessment (EIA).

2.2.4. Habitat designations may overlap for the following reasons:

- all internationally important sites (SPA, SAC, Ramsar) are also SSSIs;
- SSSI sites wholly or partly designated for Ancient Woodland; and
- HPI often occur within or overlap with existing designated sites (e.g. SSSI) or Ancient Woodland.

2.2.5. Therefore, in these cases, the loss of the same area of habitat was considered in relation to each designation or other important site during the appraisal process and the likely significance of effects was made according to the geographic scale at which the site is valued.

2.3. Habitat clusters and corridors

2.3.1. Areas with relatively high concentrations of HPIs were identified as habitat clusters or corridors in order to provide an assessment of the effects of loss and fragmentation that may affect these features beyond the route. These tended to occur along large rivers, existing transport infrastructure and in proximity to designated sites.

2.4. Geographical scope

2.4.1. The appraisal considered the potential impacts of the preferred scheme on designated sites at varying distances, as follows:

- within 10km for international sites;

[1] The earlier stages of the AoS also considered effects on biosphere reserves, national geoparks, Biogenetic reserves, EU diploma sites and Sites of Community Importance SCI. None of these types of designated feature are present within 10km of the Manchester or Leeds leg.

- within 2km for national sites;
- within 50m for LNRs and Ancient Woodlands; and
- intersection by the preferred route for HPIs and Wildlife Trust sites.

2.5. Evaluation criteria

2.5.1. The criteria for appraising effects on the sites and habitats reflect the preliminary nature of the appraisal, and its purpose in guiding route selection rather than providing a detailed impact assessment. They were applied at the AoS stage to evaluate the magnitude of effects on specific receptors in a given route section and have not been used to evaluate route-wide effects, which are described in this report..

- major adverse effects are those that affect a high priority designation (nationally or internationally significant) and are of high magnitude, such as those which potentially permanently affect the integrity of a Natura 2000 site or a Ramsar site, and/or the special interest features of NNRs and SSSIs;
- moderate adverse effects are those, which potentially affect sites of national importance, that can be mitigated through scheme design. They also include loss from other sites considered to be of sufficient extent to undermine the regional resource;
- minor adverse effects are those, which potentially affect limited areas, permanently or temporarily, of other sites consisting of habitats that are widespread in the region;
- negligible effects are those which are not likely to affect site structure and function or potentially affect such small and isolated areas of HPI habitat, that they are unlikely to be significant; and
- no likely significant effect has been stated in relation to Natura 2000 sites where it is anticipated that impacts will cause no significant effect.

2.6. Reporting potential impacts

2.6.1. A precautionary approach has been adopted for sites of national value and below (which have not undergone previous assessment through the HRA). For example, the potential effects on qualifying or special interest features of SSSIs have generally been considered likely to affect integrity, as there is insufficient information for a more detailed appraisal at this time.

2.6.2. In addition to the potential direct effects of habitat loss, the following have been assessed for potential effects on ecological features where applicable:

- loss of supporting habitat;
- fragmentation of habitats;
- water-borne pollution;
- changes to ground and surface water flows;
- disturbance, and killing and injuring of species; and
- shading.

2.6.3. The potential for indirect effects on the hydrology of statutory designated sites, such as changes to ground and surface water flows and risk of water-borne pollution, have been assessed through identifying the sources and directions of flow for surface water and underlying groundwater. This information and the appraisal itself have been determined through consultation with the hydrologists responsible for appraised the scheme.

2.6.4. The appraisal considered the potential impacts of the preferred scheme on all designated sites to the distances noted **Section 2-4**. Following assessment of potential effects, those sites that were considered to be unaffected are not included in the summary of findings for the western and eastern legs provided in **Section 3 and 4**, listed south to north. The reasons for concluding that a site was unlikely to be affected were as follows:

- a lack of features considered likely to be affected by the preferred route; all geological SSSIs that are not intersected by the earthworks have been excluded on this basis;
- being too distant from the route for there to be an effect from airborne pollution or disturbance to habitats or species forming a reason for site designation;
- insufficient suitable intervening habitat to provide connectivity for movement of species forming a reason for site designation; and
- a lack of hydrological connectivity or absence of hydrologically dependent habitats.

2.7. Data sources

2.7.1. The main datasets used in this appraisal were:

- GIS Digital Boundary Datasets that are held and maintained by Natural England (NE). They cover all the principal statutory terrestrial nature conservation designations in the UK as well as some relevant non-statutory data such as Ancient Woodland and some HPIs. This digital information was sourced by HS2 Ltd from NE including a data refresh in 2014 in a GIS format, after it was updated by NE in January 2014;
- Joint Nature Conservation Committee or information on European sites including candidate sites from: http://www.jncc.gov.uk;
- Citations for NNRs and SSSIs obtained from Nature on the Map hosted by the Natural England website at: http://www.natureonthemap.org.uk;
- Citations for LNRs obtained from the Natural England website: http://www.english-nature.org.uk/Special/lnr/office.htm and from local authority websites; and
- Information about the Wildlife Sites Local Nature Reserves obtained from http://www.wildlifetrusts.org/.

2.8. Assumptions and limitations

2.8.1. Inevitably given the strategic nature of the AoS process, the appraisal is relatively high level and should not be confused with a full and detailed environmental impact assessment. The level of detail of the appraisal is commensurate with the data available and the strategic nature of the preferred route. Work has relied primarily on desk study supported by a number of site visits.

2.8.2. Due to limitations in the accuracy of the Natural England Single Habitat Layer (Priority Habitat Inventory) data, aerial photography has been used to provide additional verification on the likely type and extent of HPI habitat potentially affected by the route.

2.8.3. There is limited digital data on the connectivity of HPI habitats and habitat corridors. As a result these features were assessed primarily from aerial photographs, alongside the HPI datasets.

2.8.4. Potential indirect effects to statutory designated sites such as changes in groundwater flows, population fragmentation, or the off-site effects of pollution could not be judged accurately based on the information provided. Rather, these impacts have been assessed in terms of the risk of an effect.

2.8.5. The appraisal of the preferred route is based solely on available information on scheme

design provided by plan and profiles as well as information on potential effects on hydrology at statutory sites and Habitats Regulations Assessment Screening Reports.

2.8.6. The area of habitat loss during the appraisal process was derived from the preliminary likely extent of earthworks.

2.8.7. The next phase of detailed design will also consider any revisions to the environmental data available. To enable a consistent comparison of route options, the data sets used in the AoS have to be frozen at the start of each design stage. For the last design stage, the base data was frozen in January 2014 following consultation. It is recognised that Natural England provide regular updates to their data sets and as such some sites may have been designated (or amended) since this date. The appraisal is likely to change as further information on the ecology baseline and scheme design, particularly temporary land take, is made available during the EIA.

3. FINDINGS – WESTERN LEG

Feature	Site Status	Impact	Name and location	Route Geography	Narrative	Appraisal Evaluation
SSSI	Site of National Importance	Indirect Impact	Sandbach Flashes, south of Middlewich	Crewe to Golborne	The route would pass 1.3km to the west of the site. There is potential for obstruction to surface water flows to one unit of the SSSI from the west. Adverse effects could be avoided by scheme design. The magnitude of effects is likely to be negligible as the preferred route affects a small proportion of the catchment and is situated downstream of the site. Detailed design would ensure surface water flows are maintained.	Negligible
SSSI	Site of National Importance	Indirect Impact	Wimboldsley Wood, south-east of Winsford	Crewe to Golborne	The route would pass approximately 425m to the east of the site on embankment through the surface water catchment for the site. There is potential for changes in water flows from the west. The magnitude of effects is likely to be negligible as the preferred route affects a small proportion of the catchment and is situated downstream of the site. Detailed design would ensure water flows are maintained. It is expected the impacts of waterborne pollution would be effectively mitigated through application of the Code of Construction Practice (CoCP).	Negligible
HPI	Other sites	Direct Impact	South-east of Winsford	Crewe to Golborne	One deciduous woodland is bisected by the preferred Crewe North Rolling Stock Depot.	Negligible
HPI	Other sites	Direct Impact	Bostock Green	Crewe to Golborne	Two deciduous woodland HPIs are bisected by the preferred route in association with the River Dane and canal.	Minor
HPI	Other sites	Direct Impact	Higher Shurlach	Crewe to Golborne	Deciduous woodland HPI is peripherally intersected by the preferred route along its eastern boundary.	Negligible

Feature	Site Status	Impact	Name and location	Route Geography	Narrative	Appraisal Evaluation
SSSI	Site of National Importance	Indirect Impact	Plumley Lime Beds, east of Lostock Gralam	Crewe to Golborne	The route would pass approximately 450m to the west of the site on embankment and cutting. There is potential for changes in water flows from the west. The magnitude of effects is likely to be negligible as the preferred route affects a small proportion of the catchment and is situated downstream of the site. Detailed design would ensure water flows are maintained. It is expected the impacts of waterborne pollution would be effectively mitigated through application of the CoCP.	Negligible
Ancient Woodland	Other sites	Direct Impact	Winnington Wood, near Lostock Gralam	Crewe to Golborne	Ancient semi-natural woodland crossed by the route on viaduct, which will result in habitat loss, shading and fragmentation. The route passes through the centre of the woodland from south to north, and, as such, would result in moderate adverse effects.	Moderate
Ancient Woodland	Other sites	Direct Impact	Leonard's and Smoker Woods, near Higher Wincham	Crewe to Golborne	Ancient semi-natural woodland crossed by the route on viaduct and associated approach embankment, which will result in habitat loss, shading and fragmentation and as such, would result in moderate adverse effects.	Moderate
HPI	Other sites	Direct Impact	Leonard's and Smoker Woods, near Higher Wincham	Crewe to Golborne	Five contiguous deciduous woodland HPIs are bisected by the preferred route. Two overlap with Ancient Woodland (see above) whilst three represent other contiguous woodland habitat. Collectively they form a concentration of HPIs that will be fragmented as a result of the route alignment.	Moderate
SSSI	Site of National Importance	Indirect Impact	Tabley Mere, north-east of Plumley	Crewe to Golborne	The route would pass approximately 1.2km to the west of the site. There is potential for changes in water flows from the west. The magnitude of effects is likely to be negligible as the preferred route affects a small proportion of the catchment or is situated downstream of the site. Detailed design would ensure water flows are maintained. It is expected the impacts of waterborne pollution would be effectively mitigated through application of the CoCP.	Negligible

Feature	Site Status	Impact	Name and location	Route Geography	Narrative	Appraisal Evaluation
HPI	Other sites	Direct Impact	East of High Legh	Crewe to Golborne	One deciduous woodland HPI is bisected by the preferred route.	Negligible
Ramsar	Site of International Importance	Indirect Impact	Midlands Meres and Mosses Phase 1, near Mere	Crewe to Golborne	Group of meres and mosses within the Cheshire Plain. The route would pass east of The Mere, Mere SSSI, a constituent of the Ramsar site with potential impacts through changes in hydrology and waterborne pollution. No impact on the Ramsar site (or SSSI) is likely if design measures are implemented to ensure groundwater flows feeding the site are maintained, as agreed with the Environment Agency and Natural England. It is expected the pollution impacts would be effectively mitigated through application of the CoCP.	No likely significant effect[2]
Ramsar	Site of International Importance	Indirect Impact	Rostherne Mere	Crewe to Golborne	Also designated as a NNR and SSSI. The route would pass to the west of the site and the Manchester Spur would pass to the north. There is potential for impacts through changes in hydrology and waterborne pollution. No impact on the site is likely if design measures are implemented to ensure groundwater flows to the site are maintained, as agreed with the Environment Agency and Natural England. It is expected the pollution impacts would be effectively mitigated through application of the CoCP.	No likely significant effect[2]
HPI	Other sites	Direct Impact	East of Heatley	Crewe to Golborne	One deciduous woodland and one lowland meadow polygon is peripherally intersected by the preferred route. Aerial photographs indicate that the lowland meadow HPI is located to the south and not affected.	Negligible

[2] *As assessed in the relevant Habitats Regulations Assessment. These are subject to review as scheme detail progresses.*

Feature	Site Status	Impact	Name and location	Route Geography	Narrative	Appraisal Evaluation
Ancient Woodland	Other sites	Direct Impact	Coroners Wood, Partington	Crewe to Golborne	Ancient semi-natural woodland crossed by the preferred route on viaduct, resulting in habitat loss, and shading and fragmentation of a small portion of remaining woodland to the west of the route. Although the loss of habitat is small, in combination with the impacts of shading and fragmentation, the overall adverse effects are considered to be of moderate severity.	Moderate
HPI	Other sites	Direct Impact	East of Rixton	Crewe to Golborne	Two deciduous woodland HPIs are peripherally intersected by the route which overlap with Coroner's Wood Ancient Woodland. Highlighted in the main report through associated Ancient Woodland.	Moderate
HPI	Other sites	Direct Impact	North east of Rixton	Crewe to Golborne	One deciduous woodland HPI is bisected by the preferred route.	Negligible
SSSI	Site of National Importance	Indirect Impact	Holcroft Moss, north of Glazebrook	Crewe to Golborne	Area of lowland raised bog comprising three sites. The route would pass within approximately 65m to the west of one of the sites - Holcroft Moss - leading to potential impacts through changes in hydrology. HS2 Ltd will continue to work closely with Natural England and the Environment Agency to ensure the moss would be unaffected by the scheme. This will include agreement over measures such as suitable foundation works, track construction techniques and a design which does not affect the drainage characteristics around the site.	No likely significant effect[2]
HPI	Other sites	Direct Impact	West of Holcroft Moss SAC, near Glazebrook	Crewe to Golborne	A large polygon containing smaller areas of lowland fen and lowland raised bog is crossed by the preferred route but aerial photographs indicate that these habitats will not be affected.	Negligible
HPI	Other sites	Direct Impact	West of Holcroft Moss SAC, near Glazebrook	Crewe to Golborne	A narrow polygon containing smaller areas of lowland raised bog and deciduous woodland HPIs will be bisected by the route and bog habitat is likely to be affected. An area of deciduous woodland is also affected.	Moderate
HPI	Other sites	Direct Impact	Culcheth Linear Park	Crewe to Golborne	Two linear areas of deciduous woodland HPI are bisected by the route.	Negligible

Feature	Site Status	Impact	Name and location	Route Geography	Narrative	Appraisal Evaluation
HPI	Other sites	Direct Impact	Lowton	Crewe to Golborne	One large polygon containing smaller areas of deciduous woodland is bisected by the preferred route. Aerial photographs identifies that the HPI is not present along the route alignment. A large lowland fen polygon is also bisected by the route but again aerial photographs indicate that this HPI will not be affected.	Negligible
SSSI	Site of National Importance	Indirect Impact	Abram Flashes, south of Abram	Crewe to Golborne	The northern section of the route crosses a small proportion of the southern part of the surface water catchment for the site. Any potential impacts would be mitigated through scheme design to ensure surface water flows to the site are maintained.	Moderate
HPI	Other sites	Direct Impact	Abram	Crewe to Golborne	One deciduous woodland HPI polygon is peripherally intersected by the route. Adjacent, is a large polygon containing smaller areas of deciduous woodland and lowland fen that is also peripherally intersected by the route. However, aerial photographs indicate that neither HPI are present along the alignment of the route.	Negligible
SSSI	Site of National Importance	Indirect Impact	Bryn March & Ince Moss, west of Wigan	Crewe to Golborne	The route passes the west of the site and through a small proportion of its surface water catchment. Any potential impacts would be mitigated through scheme design to ensure surface water flows to the site are maintained.	Minor
HPI	Other sites	Direct Impact	East of Stubshaw Cross	Crewe to Golborne	One large polygon containing smaller areas of lowland fen and deciduous woodland is peripherally intersected by the route. Aerial photographs identify vegetation that could be lowland fen to potentially be affected. Further to the north another large polygon containing smaller areas of reed bed is peripherally intersected by the route. Aerial photographs suggest that if this habitat is present it is likely to be limited in extent.	Moderate
HPI	Other sites	Direct Impact	East of Moston	Spur to Manchester	One deciduous woodland HPI is peripherally intersected by the route.	Negligible

Feature	Site Status	Impact	Name and location	Route Geography	Narrative	Appraisal Evaluation
Wildlife Trust Reserve	Other sites	Direct Impact	Sean Hawkins Meadow, North of Moston	Spur to Manchester	A non-statutory local nature reserve could be directly affected by the preferred route, but its precise location and extent is uncertain.	Minor
Ancient Woodland	Other sites	Direct Impact	Hancock's Bank	Spur to Manchester	Ancient semi natural woodland and ancient replanted woodland crossed by the route by a combination of cutting, at grade and on viaduct. This will result in habitat loss and fragmentation. The route passes through a considerable proportion of the woodland from west to east, and, as such, would result in moderate adverse effects.	Moderate
HPI	Other sites	Direct Impact	Hancock's Bank	Spur to Manchester	Two deciduous woodland HPIs overlapping Ancient Woodland (see above). Highlighted in the Volume 1 main report through associated Ancient Woodland.	Moderate
HPI	Other sites	Direct Impact	Ashley	Spur to Manchester	Two deciduous woodlands are peripherally intersected by the route.	Negligible
HPI	Other sites	Direct Impact	West of Thorns Green	Spur to Manchester	One lowland meadow is peripherally intersected by the route earthworks only. Two linear deciduous woodlands are bisected by the route, adjacent to the River Bollin habitat corridor.	Moderate
HPI	Other sites	Direct Impact	Manchester Airport	Spur to Manchester	The Manchester Airport High Speed Station bisects three areas of deciduous woodland HPI. The larger impact effects a woodland located either side of Glad Brook.	Minor

4. FINDINGS – EASTERN LEG

Feature	Site Status	Impact	Name and location	Route Geography	Narrative	Appraisal Evaluation
HPI	Other sites	Direct Impact	Marston, River Thame	Marston to Kegworth	On the River Thame and part of a habitat corridor one large deciduous woodland polygon is peripherally intersected by the route.	Minor
HPI	Other sites	Direct Impact	Birchmoor	Marston to Kegworth	Five small discrete deciduous woodland polygons are peripherally intersected by the route.	Negligible
SSSI	Site of National Importance	Indirect Impact	Alvecote Pools, east of Tamworth	Marston to Kegworth	The route passes approximately 180m east of the site on viaduct. There is potential for disturbance and waterborne pollution. There would also be a limited loss of supporting habitat and increased risk of bird strike. The potential for disturbance and bird strike are both limited by the M42 which is situated on embankment and viaduct between the site and route. The site will be most vulnerable to waterborne pollution during the construction phase when there will be a large amount of construction traffic within the surface-water catchment of the site. However, it is expected the pollution impacts would be effectively mitigated through application of the CoCP.	Minor
HPI	Other sites	Direct Impact	East of Alvecote Poolls SSSI	Marston to Kegworth	An area of coastal and floodplain grazing marsh associated with the River Anker habitat corridor, is bisected by the route adjacent to an existing motorway. Three deciduous woodlands are peripherally intersected and a fourth is bisected by the route.	Minor

Feature	Site Status	Impact	Name and location	Route Geography	Narrative	Appraisal Evaluation
SAC	Site of European Importance	Indirect Impact	River Mease, near Measham	Marston to Kegworth	The site (also an SSSI) is crossed by the route on viaduct. A draft Appropriate Assessment was prepared for the 2013 consultation route, which concluded that through design development there would be no adverse effect on the SAC. This preliminary conclusion was agreed with Natural England and the Environment Agency. Since the 2013 consultation route, the route has been realigned further to the east and entails a lower, longer viaduct. The screening report and Appropriate Assessment undertaken in 2013 have been reviewed and updated in 2016. These reports will be finalised prior to submission of the hybrid Bill and the design will be developed to ensure that there is no adverse effect on the SAC.	No likely significant effect[2]
HPI	Other sites	Direct Impact	Adjacent to the River Mease	Marston to Kegworth	Five deciduous woodlands contiguous with the River Mease are bisected by the preferred route.	Moderate
HPI	Other sites	Direct Impact	Packington	Marston to Kegworth	Two contiguous areas of lowland meadow HPI are bisected.	Moderate
HPI	Other sites	Direct Impact	Coleorton Hall	Marston to Kegworth	One large wood pasture and parkland (WPP) HPI is bisected by the route. Interpretation of data and aerial photographs indicate that scattered mature trees and open habitat is closely associated with the property away from the route alignment. Six deciduous woodlands are intersected by the route within the WPP boundaries. Aerial photographs identify the majority of this woodland to be plantation and less likely to be semi-natural.	Minor

Feature	Site Status	Impact	Name and location	Route Geography	Narrative	Appraisal Evaluation
SSSI	Site of National Importance	Indirect Impact	Lount Meadows, north of Ashby-de-la-Zouch	Marston to Kegworth	The route passes approximately 90m from the site on embankment. There is potential for impacts on Units 2 and 3 through changes to surface water flows, and both waterborne and airborne pollution. However, it is expected the pollution impacts would be effectively mitigated through application of the CoCP, and detailed design would ensure surface water flows are maintained.	Negligible
HPI	Other sites	Direct Impact	Breedon on the Hill	Marston to Kegworth	Two deciduous woodlands are peripherally intersected by the route and a further one is bisected. These represent discrete and isolated impacts.	Negligible
SSSI	Site of National Importance	Indirect Impact	Breedon Cloud Wood & Quarry, north-east of Worthington	Marston to Kegworth	The route passes approximately 95m north-west of the site. However adverse effects are unlikely as the wooded part of the site is separated from the route by an intervening watercourse and the quarry that also forms a reason for designation. It is expected the risk of pollution impacts would be effectively mitigated through application of the CoCP.	Negligible
SSSI	Site of National Importance	Indirect Impact	Lockington Marshes, north of Ratcliffe on Soar	Kegworth to Heath	The route passes approximately 265m east of the site on viaduct. There is limited potential for disturbance to the assemblage of overwintering wildfowl, which would be minor adverse at most. There is not likely to be significant effects on groundwater flows towards the SSSI due to the presence of an intervening watercourse and the distance between the footings of the viaduct and the tunnelling being located outside of the superficial aquifer related to the site. The SSSI will be potentially vulnerable to waterborne pollution arising from construction traffic in the surface water catchment, but it is expected these impacts would be effectively mitigated through application of the CoCP.	Minor

Feature	Site Status	Impact	Name and location	Route Geography	Narrative	Appraisal Evaluation
HPI	Other sites	Direct Impact	East of Lockington Marshes SSSI	Kegworth to Heath	A small area of coastal and floodplain grazing marsh located on the River Anker is bisected by the route. Four deciduous woodland HPIs are peripherally intersected by the route, part of which overlaps with a wood pasture and parkland HPI at Thrumpton Hall. Interpretation of data and aerial photographs indicate that scattered mature trees and open habitat is closely associated with the property away from the route alignment.	Minor
SSSI	Site of National Importance	Indirect Impact	Attenborough Gravel Pits, south of Beeston	Kegworth to Heath	The route passes approximately 1.3km west of the site. Adverse effects on the site's hydrology are unlikely as the route crosses the River Trent upstream of the site on viaduct. The potential for adverse effects from waterborne pollution will be avoided by implementing the COCP.	Negligible
HPI	Other sites	Direct Impact	Long Eaton	Kegworth to Heath	Five deciduous woodlands are peripherally intersected by the route and East Midlands Hub station construction boundary. Three coastal and floodplain grazing marsh polygons associated with a habitat corridor along the River Erewash and canal are peripherally intersected to the north.	Minor
Local Nature Reserve	Other sites	Direct Impact	Nottingham Canal	Kegworth to Heath	Canal intersected by the route on embankment, which would result in habitat loss and would fragment a small section between the route and the motorway.	Minor
SSSI	Site of National Importance	Indirect Impact	Robbinetts, east of Cossall	Kegworth to Heath	The route passes approximately 830m east of the site in cutting. There is potential for impacts on surface water flows to the site from the stream originating on the eastern side of the M1, the headwater of which will be close to the route. Surface water flows will need to be maintained under the route through detailed design. The site will also be vulnerable to waterborne pollution during the construction phase when a large amount of construction traffic will pass through its surface water catchment. However, it is expected the pollution impacts would be effectively mitigated through application of the CoCP.	Minor

Feature	Site Status	Impact	Name and location	Route Geography	Narrative	Appraisal Evaluation
HPI	Other sites	Direct Impact	Strelley Hall	Kegworth to Heath	One large WPP HPI is bisected by the route. Aerial photographs suggest mature scattered trees are present along the route alignment. A large lowland meadow HPI is also located within the boundary of the WPP and is bisected by the route. One contiguous deciduous woodland HPI is also peripherally intersected.	Moderate
SSSI	Site of National Importance	Indirect Impact	Sellers Wood, north of Nuthall	Kegworth to Heath	The route passes approximately 120m west of the site (also an LNR) partly in cutting and partly at grade between the M1 and the site's western edge. There is potential for impacts through changes to surface water flows, and both waterborne and airborne pollution. However, it is expected the pollution impacts would be effectively mitigated through application of the CoCP, and detailed design would ensure surface water flows are maintained.	Negligible
Ancient Woodland	Other sites	Direct Impact	New Farm Wood, Bulwell	Kegworth to Heath	Ancient semi-natural woodland crossed by the route partly in cutting and partly at grade, which will result in habitat loss and fragmentation. The route passes through the middle of the woodland from south to north removing a considerable proportion of the habitat, and, as such, would result in moderate adverse effects.	Moderate
HPI	Other sites	Direct Impact	New Farm Wood, Bulwell	Kegworth to Heath	One large deciduous woodland, which partly overlaps with Ancient Woodland (see previous) at the same location, is bisected by the route. The HPI extends further to the south increasing loss to woodland habitat. Highlighted in the main report through associated Ancient Woodland.	Moderate

Feature	Site Status	Impact	Name and location	Route Geography	Narrative	Appraisal Evaluation
SSSI	Site of National Importance	Indirect Impact	Bulwell Wood, north of Nuthall	Kegworth to Heath	The route passes approximately 35m west of the site on embankment. Surface water movement to a stream feeding the pond within the site would have to be maintained to avoid adverse effects. There is also potential for both waterborne and airborne pollution. However, it is expected the pollution impacts would be effectively mitigated through application of the CoCP, and detailed design would ensure surface water flows are maintained.	Negligible
Ancient Woodland	Other sites	Direct Impact	Watnall Coppice, Hucknall	Kegworth to Heath	Ancient semi-natural woodland crossed by the route on embankment, which will result in habitat loss and fragmentation. The route passes through the middle of the woodland from south to north removing a considerable proportion of the habitat, and, as such, would result in moderate adverse effects.	Moderate
HPI	Other sites	Direct Impact	Watnall Coppice, Hucknall	Kegworth to Heath	A large deciduous woodland, which overlaps with Ancient Woodland (see above) at the same location is bisected by the route. Highlighted in the main report through associated Ancient Woodland.	Moderate
Future potential SPA	Site of European Importance	Direct Impact	Park Forest, Hucknall	Kegworth to Heath	A future potential SPA for nightjar and woodlark, for which a draft Shadow HRA Report (that follows the Habitats Regulations Assessment procedure) was prepared in 2016. The strategic conclusions have been discussed with Natural England. This work will need to be reviewed as the design detail progresses and the EIA is carried out following a route announcement. This will require ongoing liaison with Natural England. The assessment will be finalised prior to submission of the hybrid Bill and the design will be developed to ensure there would be no adverse effect on any future potential SPA.	No likely significant effect[2]
HPI	Other sites	Direct Impact	Park Forest, Hucknall	Kegworth to Heath	Five large deciduous woodland polygons, are mostly peripherally intersected by the route. However, they form a high concentration of contiguous HPI and conifer woodland, forming a habitat cluster extending north and south.	Moderate

Feature	Site Status	Impact	Name and location	Route Geography	Narrative	Appraisal Evaluation
SSSI	Site of National Importance	Indirect Impact	Bagthorpe Meadows, north of Bagthorpe	Kegworth to Heath	The route passes approximately 1km north-east of the site and is in cutting near the source of the Middle Brook. As such, the site is potentially vulnerable to changes in hydrology and waterborne pollution. However, although species requiring damp soil are noted, their presence is due to ridge and furrow. Therefore, the effects of the scheme on the hydrology of the site are likely to be negligible. It is expected the pollution impacts would be effectively mitigated through application of the CoCP.	Negligible
SSSI	Site of National Importance	Direct Impact	Bogs Farm Quarry, east of Selston	Kegworth to Heath	The route crosses the western edge of the site on embankment resulting in minor loss of wet woodland habitat from the periphery of the site. The route also intersects the surface water catchment for the site and could therefore affect surface water flows into the site. Detailed design would ensure groundwater flows to the site are maintained.	Moderate
SSSI	Site of National Importance	Indirect Impact	Annesley Woodhouse Quarries, south of Kirkby	Kegworth to Heath	The route passes approximately 345m west of the site on a combination of embankment, at grade and sections of cutting through the existing mine dump. Construction of the route may remove terrestrial habitat likely to be used by the site's population of great crested newt, although any adverse effects are likely to be mitigable. There is also potential for impacts through changes to surface water flows. Detailed design would ensure surface water flows to the site are maintained.	Negligible
HPI	Other sites	Direct Impact	Pinxton	Kegworth to Heath	One lowland meadow and one deciduous woodland HPI are peripherally intersected by the route. Further north two more deciduous woodland polygons are bisected by the route. A wood pasture and parkland is bisected by the route at Brookhill Hall. Aerial photographs identify scattered mature trees in open habitat along the route alignment.	Moderate

Feature	Site Status	Impact	Name and location	Route Geography	Narrative	Appraisal Evaluation
HPI	Other sites	Direct Impact	Hilcote	Kegworth to Heath	Three large polygons containing smaller areas of deciduous woodland are bisected by the route and mainline connection to the west. Aerial photographs identify that the HPI is only present in small areas along the alignment. However, a review of aerial photographs indicates other habitat of nature conservation interest may be present (e.g. open mosaic habitat on previously developed land and/or acid grassland).	Negligible
Ancient Woodland	Other sites	To be confirmed[3]	Padley Wood, Morton	Kegworth to Heath	Ancient semi-natural woodland passed by the route in cutting immediately adjacent to its western edge. Given the close proximity of the route there is potential for peripheral habitat loss.	Moderate
HPI	Other sites	Direct Impact	Stonebroom, Mainline connection	Kegworth to Heath	Four deciduous woodlands are bisected by the route, one of which is contiguous and extends south of Padley Wood Ancient Woodland.	Negligible
HPI	Other sites	Direct Impact	Tibshelf, Stanley and Stainsby	Kegworth to Heath	Approximately 10 deciduous woodland HPIs are intersected by the route. These represent linear polygons associated with woodland along existing transport infrastructure.	Minor
Wildlife Trust Nature Reserve	Other sites	Direct Impact	Carr Vale Flash, Bolsover	Heath to Barnburgh	This site is located close to the scheme near New Bolsover and comprises areas of open water, marsh, wet and dry grassland and scrub. The extent of the reserve and therefore distance to the route is not currently known and the effects on the site will be confirmed at the EIA stage.	Minor
HPI	Other sites	Direct Impact	West of Carr Vale Flash	Heath to Barnburgh	One deciduous woodland polygon containing smaller areas of lowland meadow is peripherally intersected by the route. These habitats are contiguous with Carr Vale Flash Nature Reserve and a high concentration of HPI along the River Doe Lea habitat corridor.	Minor

[3] not a direct impact but given the proximity, some peripheral loss of Ancient Woodland habitat would be expected.

Feature	Site Status	Impact	Name and location	Route Geography	Narrative	Appraisal Evaluation
HPI	Other sites	Direct Impact	Barlborough, Woodhall & Wales Bar	Heath to Barnburgh	Sixteen deciduous woodlands are intersected by the route. Several overlap with Ancient Woodland sites including High Wood, Nor Wood and Nicker Wood (see below), the HPIs providing connectivity between Ancient Woodland and other woodland along existing transport infrastructure.	Moderate
Ancient Woodland	Other sites	Direct Impact	High Wood, north of Barlborough	Heath to Barnburgh	Ancient semi-natural woodland crossed by the route on embankment at its eastern edge resulting in peripheral habitat loss.	Moderate
Ancient Woodland	Other sites	Direct Impact	Nor Wood, east of Killamarsh	Heath to Barnburgh	Ancient semi-natural woodland crossed by the route in two places along its eastern boundary (on viaduct and on embankment) resulting in peripheral habitat loss and shading of the remaining habitat.	Moderate
Ancient Woodland	Other sites	Direct Impact	Nicker Wood, south of Aston	Heath to Barnburgh	Ancient semi-natural woodland crossed by the route on viaduct along its western edge resulting in peripheral habitat loss and minor fragmentation.	Moderate
Ancient Woodland	Other sites	Direct Impact	Hooton Cliff, east of Hooton Roberts	Heath to Barnburgh	Ancient semi-natural woodland crossed by the route in cutting along its eastern edge resulting in peripheral habitat loss.	Moderate
HPI	Other sites	Direct Impact	Hooton Cliff, east of Hooton Roberts	Heath to Barnburgh	One deciduous woodland, which overlaps Hooton Cliff Ancient Woodland (see above), is peripherally intersected by the route.	Moderate
HPI	Other sites	Direct Impact	Old Denaby	Heath to Barnburgh	One large deciduous woodland is bisected by the route. It is also in close proximity to Old Denaby Wetland LNR and the River Don habitat corridors.	Moderate
Local Nature Reserve	Other sites	Direct Impact	Old Denaby Wetland, Don Valley	Heath to Barnburgh	The site would be crossed by the route on viaduct, resulting in habitat loss and shading. Construction of the viaduct may also affect surface and groundwater flows in and around the site upon which the habitats for which the site is designated are dependent. There is also potential for impacts due to waterborne pollution. However, it is expected the pollution impacts would be effectively mitigated through application of the CoCP.	Moderate

Feature	Site Status	Impact	Name and location	Route Geography	Narrative	Appraisal Evaluation
HPI	Other sites	Direct Impact	River Don Valley	Heath to Barnburgh	One large reed bed polygon containing smaller areas of deciduous woodland overlaps with Old Denaby Wetland LNR and is bisected by the route. Aerial photographs identify the HPIs to occur in small areas only along the route alignment. Two further deciduous woodlands are bisected to the north but these also contain only small amounts of the HPI. These HPIs form part of the River Don habitat corridor.	Moderate
HPI	Other sites	Direct Impact	River Dearne Valley	Heath to Barnburgh	Three large polygons containing smaller areas of lowland fen, reed bed, deciduous woodland and coastal and floodplain grazing marsh are bisected by the route. Aerial photographs identify that only small areas of these habitats are likely to be affected.	Minor
HPI	Other sites	Direct Impact	Barnburgh & Hickleton	Barnburgh to Church Fenton & Leeds	Four deciduous woodlands are intersected by the route. One of which is contiguous with Wratchley Crag Wood Ancient Woodland, although the Ancient Woodland is not directly affected. A large polygon containing smaller areas of deciduous woodland is also bisected but the HPI is not located along the route alignment.	Minor
HPI	Other sites	Direct Impact	New Crofton	Barnburgh to Church Fenton & Leeds	Nine deciduous woodlands are intersected by the New Crofton depot construction boundary.	Minor
HPI	Other sites	Direct Impact	Kirkthorpe	Barnburgh to Church Fenton & Leeds	Four deciduous woodlands associated with existing transport infrastructure are bisected by the route.	Minor
HPI	Other sites	Direct Impact	River Calder floodplain	Barnburgh to Church Fenton & Leeds	Two large deciduous woodlands located on the River Calder floodplain are bisected by the route. Aerial photographs identify the HPI occupy only small areas along the route alignment.	Minor
HPI	Other sites	Direct Impact	Methley	Barnburgh to Church Fenton & Leeds	Six deciduous woodland HPIs are intersected by the route, which form part of a high concentration of HPIs that the route bisects. HPIs are also contiguous with Moss Carr Wood Ancient Woodland, although the Ancient Woodland is not directly affected.	Moderate

Feature	Site Status	Impact	Name and location	Route Geography	Narrative	Appraisal Evaluation
HPI	Other sites	Direct Impact	Route into Leeds, River Aire valley	Barnburgh to Church Fenton & Leeds	Three linear deciduous woodland polygons associated within existing transport infrastructure are peripherally intersected by the route. These are located along the River Aire habitat corridor.	Negligible
HPI	Other sites	Direct Impact	River Aire Valley	Barnburgh to Church Fenton & Leeds	Six contiguous polygons containing deciduous woodland, lowland fen and good quality semi-improved grassland are bisected by the route along the River Aire habitat corridor.	Moderate
HPI	Other sites	Direct Impact	Garforth	Barnburgh to Church Fenton & Leeds	Four discrete deciduous woodland HPIs are bisected by the route.	Minor
HPI	Other sites	Direct Impact	Micklefield	Barnburgh to Church Fenton & Leeds	One large deciduous woodland is peripherally intersected by the route. This is contiguous with Ringhay Wood Ancient Woodland, although the Ancient Woodland is not directly affected.	Minor
SSSI	Site of National Importance	Indirect Impact	Kirkby Wharfe, west of Ulleskelf	Barnburgh to Church Fenton & Leeds	The route passes approximately 760m east of the site and crosses the contributing surface water catchment of the site on viaduct and embankment. There is potential for impacts through changes to surface water flows and waterborne pollution. However, it is expected the pollution impacts would be effectively mitigated through application of the CoCP, and detailed design would ensure surface water flows are maintained.	Negligible
HPI	Other sites	Direct Impact	Church Fenton	Barnburgh to Church Fenton & Leeds	Two coastal floodplain grazing marsh HPIs are bisected by the route which uses existing rail infrastructure.	Negligible

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