HS2

October 2018

High Speed Rail (Crewe to Manchester and West Midlands to Leeds)

Working Draft Environmental Statement

Volume 2: Community Area report

LA01: Lea Marston to Tamworth

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Department for Transport

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

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Contents

List of figures

List of tables

Preface

The working draft Environmental Statement

This report forms part of Volume 2 of the working draft Environmental Statement (ES) for Phase 2b of High Speed Two (HS2). The purpose of the working draft ES is to provide the public and other stakeholders with an opportunity to review and comment on preliminary environmental information for Phase 2b of HS2, which is based on a stage in the ongoing design development and environmental assessment process. Nothing included at this stage is intended to limit the form of the final scheme that will be presented in the hybrid Bill and formal ES in light of further scheme development and the ongoing discussions with stakeholders such as Transport for the North and Midlands Connect. Consultation on the working draft ES is being undertaken to help inform the ongoing design and environmental assessment in advance of producing a statutory formal ES. The formal ES will accompany the deposit of the hybrid Bill for Phase 2b of HS2.

Phase 2b comprises the section of the proposed HS2 rail network, from Crewe to Manchester (and a connection onto the West Coast Main Line (WCML)) (the western leg), and from the West Midlands to Leeds (and a connection onto, and part electrification of, the Midland Main Line (MML) and a connection onto the East Coast Main Line (ECML)) via the East Midlands and South Yorkshire (the eastern leg). Collectively, this is referred to in this working draft ES as the 'Proposed Scheme'. The working draft ES describes the Proposed Scheme and reports its likely significant environmental effects and the measures proposed to mitigate those effects, based on a stage in the ongoing design and environmental assessment.

The hybrid Bill for Phase One of the HS2 network, between London and the West Midlands, was the subject of an ES deposited in November 2013, followed by ESs deposited with Additional Provisions to that Bill in 2014 and 2015. The Phase One hybrid Bill received Royal Assent in February 2017 and pre-construction work on Phase One commenced in July 2017.

The hybrid Bill for Phase 2a of the HS2 network, between the West Midlands and Crewe, was the subject of an ES deposited in July 2017, followed by a subsequent ES deposited with an Additional Provision to that Bill in March 2018. The Phase 2a Bill is expected to receive Royal Assent in 2019.

Consultation on the working draft Environmental Statement

The public has an opportunity to comment on this working draft ES. The period of public consultation is taking place during October 2018 – December 2018; the first day of the consultation period being the date the Secretary of State for Transport formally announces the consultation and the publication of the working draft ES documents on www.gov.uk/hs2.

Structure of the HS2 Phase 2b Working Draft Environmental Statement

This report forms part of Volume 2 of the working draft ES for Phase 2b of HS2. The working draft ES describes the design of the Proposed Scheme and reports the likely significant environmental effects of the construction and operation of the Proposed Scheme and proposed mitigation and monitoring measures, based on a stage in the ongoing design and environmental assessment process. The report will be updated for the formal ES to reflect further work on the design, assessment and mitigation and monitoring measures between now and when the hybrid Bill is deposited. The structure of the working draft ES is shown in Figure 1.

This working draft ES has been prepared by persons who have sufficient expertise to ensure the completeness and technical quality of the statement.

The working draft ES comprises the following documents:

Non-technical summary

This provides a summary in non-technical language of the following, identified at a stage in the ongoing design and environmental assessment:

- the Proposed Scheme and the reasonable alternatives studied;
- the likely significant beneficial and adverse effects of the Proposed Scheme;
- the means to avoid or reduce likely significant environmental effects; and
- an outline of the monitoring measures to manage the effects of construction and the effectiveness of mitigation post construction, as well as appropriate monitoring during operation.

Glossary of terms and list of abbreviations

This contains terms and abbreviations, including units of measurement, used throughout the working draft ES.

Volume 1: Introduction and methodology

This provides:

- a description of HS2, the environmental impact assessment (EIA) process and the approach to consultation and engagement;
- details of the permanent features of the Proposed Scheme and general construction techniques, based on a stage in the ongoing design;
- a summary of the scope and methodology for the environmental topics;
- an outline of the general approach to mitigation;
- an outline of the approach to monitoring, including measures to manage the effects of construction, the effectiveness of mitigation post construction, as well as the approach to monitoring during the operational phase, based on a stage in the ongoing design; and

- a summary of the reasonable alternatives studied (including local alternatives studied prior to the Government's announcement of the preferred route in July 2017). Local alternatives studied post July 2017 are reported in the relevant Volume 2: Community area reports.

Volume 2: Community area reports and map books

These cover the following community areas:

- western leg: MA01 Hough to Walley's Green; MA02 Wimboldsley to Lostock Gralam; MA03 Pickmere to Agden and Hulseheath; MA04 Broomedge to Glazebrook; MA05 Risley to Bamfurlong; MA06 Hulseheath to Manchester Airport; MA07 Davenport Green to Ardwick; MA08 Manchester Piccadilly Station; and
- eastern leg: LA01 Lea Marston to Tamworth; LA02 Birchmoor to Austrey; LA03 Appleby Parva to Ashby-de-la-Zouch; LA04 Coleorton to Kegworth; LA05 Ratcliffe-on-Soar to Long Eaton; LA06 Stapleford to Nuthall; LA07 Hucknall to Selston; LA08 Pinxton to Newton and Huthwaite; LA09 Stonebroom to Clay Cross; LA10 Tibshelf to Shuttlewood; LA11 Staveley to Aston; LA12 Ulley to Bramley; LA13 Ravenfield to Clayton; LA14 South Kirkby to Sharlston Common; LA15 Warmfield to Swillington and Woodlesford; LA16 Garforth and Church Fenton; LA17 Stourton to Hunslet; and LA18 Leeds Station.

The reports provide the following information for each area, as identified at a stage in the ongoing design and environmental assessment:

- an overview of the area;
- a description of the construction and operation of the Proposed Scheme within the area;
- a summary of the local alternatives considered since the Government's announcement of the preferred route in July 2017;
- a description of the environmental baseline;
- a description of the likely significant beneficial and adverse effects of the Proposed Scheme;
- the proposed means of avoiding, reducing or managing the likely significant adverse effects; and
- where possible, the proposals for monitoring, including measures during and post construction, and during the operational phase.

The maps relevant to each community area are provided in a separate Volume 2: Community area map book. These maps include the location of the key environmental features (Map Series CT-10), key construction features (Map Series CT-05) and operation features (Map Series CT-06) of the Proposed Scheme. There are also specific maps showing proposed viewpoint and photomontage locations (Map Series LV-00, LV-02, LV-03, and LV-04, to be read in conjunction with Section 11, Landscape and visual of the Volume 2: Community area reports), operational sound contour maps (Map Series SV-01, to be read in conjunction with Section 13, Sound, noise and vibration of the Volume 2: Community area reports) and maps showing key surface water and groundwater features (Map Series WR-01 and WR-02, to be read in conjunction with Section 15, Water resources and flood risk of the Volume 2: Community area reports).

In addition to the community areas detailed above, reports are provided for community areas within which electrification of a section of the MML is proposed: MML01 Danesmoor to Brierley Bridge and MML02 Unstone Green to Sheffield Station. These reports are provided at an earlier stage of the design and environmental assessment process, following the amendment of the route of the Proposed Scheme to include the electrification of a section of the MML between Clay Cross and Sheffield Midland Station. This would enable high speed trains to connect to Chesterfield and Sheffield as part of the Proposed Scheme. They include for each area:

- an overview of the area;
- a description of the proposed works within the area, based on a stage in the ongoing design;
- an outline of potential effects; and
- an overview of stakeholder engagement and consultation to be carried out as part of the EIA process.

Mitigation measures have not been identified at this stage of the design and environmental assessment process in relation to the likely effects arising from construction and operation of the Proposed Scheme for the MML01 Danesmoor to Brierley Bridge and MML02 Unstone Green to Sheffield Station areas. Any required mitigation measures will be reported in the formal ES. In addition, any required environmental monitoring during operation of the Proposed Scheme will be reported in the formal ES.

Volume 3: Route-wide effects

This describes the effects that are likely to occur at a geographical scale greater than the community areas described in the Volume 2: Community area reports, based on a stage in the ongoing design and environmental assessment.

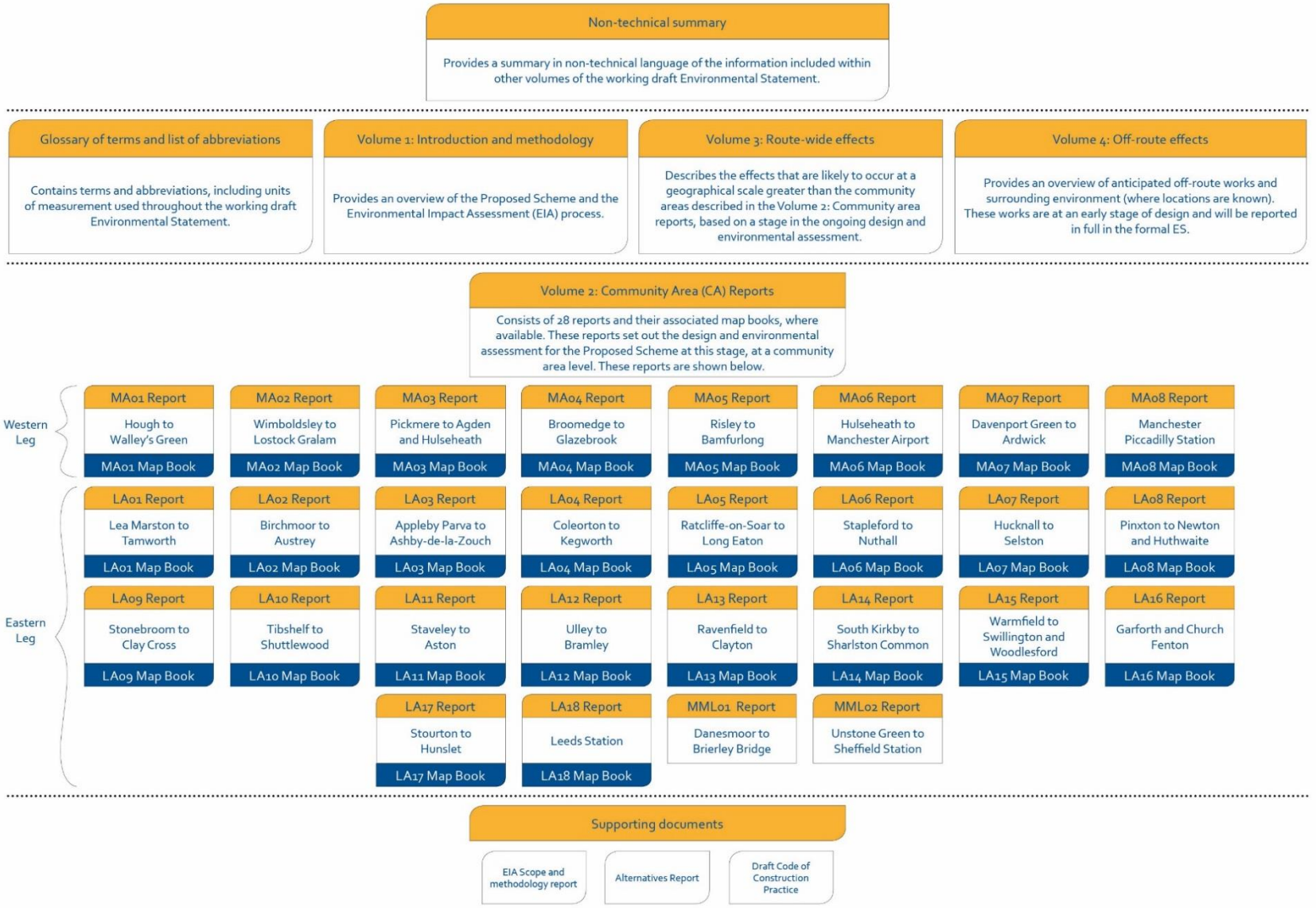
Volume 4: Off-route effects

This provides an overview of anticipated off-route works and surrounding environment (where locations are known). These works are at an early stage of design and will be reported in full in the formal ES.

Supporting documents

- EIA Scope and Methodology Report: this outlines the scope and methodology adopted for the EIA.HS2 Ltd consulted on a draft of the EIA Scope and Methodology Report (SMR) between July and September 2017. This updated version takes into consideration comments received, where appropriate, in addition to changes required as a result of updates to legislation or industry best practice guidance.
- Alternatives report: this describes the evolution of the Proposed Scheme and the reasonable alternatives considered at this stage of the design, at the strategic, route-wide, route corridor and local levels.
- Draft Code of Construction Practice (CoCP): this sets out measures and standards to provide effective planning, management and control of potential impacts on individuals, communities and the environment during construction.

Figure 1: Structure of the working draft Environmental Statement



1 Introduction

1.1 Introduction to HS2

1.1.1 High Speed Two (HS2) is a new high speed railway proposed by the Government to connect major cities in Britain. Stations in London, Birmingham, Leeds, Manchester, East Midlands and South Yorkshire will be served by high speed trains running at speeds of up to 360 kilometres per hour (kph) (225 miles per hour (mph)).

1.1.2 HS2 will be built in phases. Phase One comprises the first section of the HS2 network of approximately 230km (143 miles) between London and the West Midlands that will commence operations in 2026. It was the subject of an Environmental Statement (ES) deposited with the High Speed Rail (London - West Midlands) Bill in November 2013. Subsequent ESs were deposited with Additional Provisions to that Bill in 2014 and 2015. The High Speed Rail (London - West Midlands) Bill received Royal Assent in February 2017 and pre-construction work on Phase One commenced in 2017.

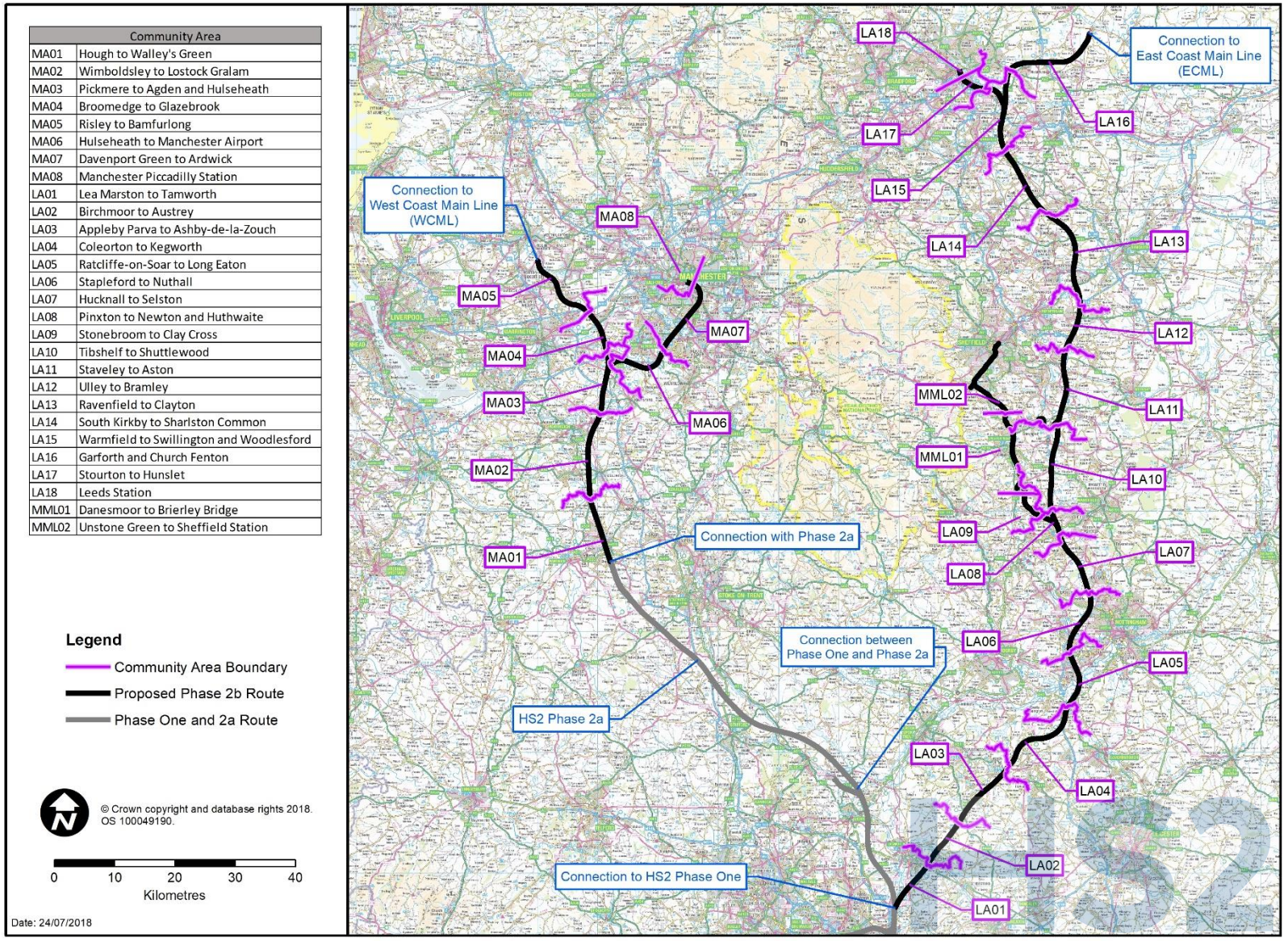
1.1.3 Phase Two of HS2 will extend the route from Phase One in the West Midlands to the north-west to Manchester (approximately 80km (50 miles) with connections to the West Coast Main Line (WCML) at Crewe and Golborne, and to the north-east to Leeds with a connection to the Erewash Valley Line and Midland Main Line (MML) south-east of Chesterfield and the East Coast Main Line (ECML) approaching York (approximately 198 km (123 miles)), completing what is known as the 'Y network'.

1.1.4 Phase Two of HS2 is being taken forward in two stages, referred to as Phase 2a and Phase 2b. Phase 2a of HS2 includes the section of the route between the West Midlands and Crewe. The High Speed Rail (West Midlands - Crewe) Bill, together with an ES, was prepared for the Phase 2a proposals and deposited in Parliament in July 2017. A subsequent ES was deposited with Additional Provisions to that Bill in March 2018.

1.1.5 Phase 2b (the Proposed Scheme), the subject of this working draft ES, comprises the route from Crewe to Manchester (and connections into the WCML) (referred to as the 'western leg'), and from the West Midlands to Leeds (and connections into the Midland Main Line (MML and the ECML)) via the East Midlands and South Yorkshire (referred to as 'the eastern leg'). The connection to and electrification of an approximately 30km (19 miles) section of the existing MML would enable high speed trains to connect to Chesterfield and Sheffield. Construction of the Proposed Scheme would commence in 2023, with operation planned to start in 2033.

1.1.6 For environmental assessment and community engagement purposes, the Proposed Scheme has been divided into 28 community areas (CA). These are shown in Figure 2. This CA report relates to the Lea Marston to Tamworth area (CA number LA01) which is located on the eastern leg of the Proposed Scheme.

Figure 2: The HS2 Phase 2b route and community areas



1.2 Purpose of this report

1.2.1 This working draft ES sets out the preliminary environmental information and the key features of a point in time design for the Proposed Scheme. It provides a description of the design of the Proposed Scheme, environmental baseline information, and the likely impacts (and where practicable, the significant effects) of the construction and operation of the Proposed Scheme on the environment within the Lea Marston to Tamworth area. The report also describes the proposed mitigation measures that have been identified, at this stage, to avoid, reduce or manage the likely significant adverse effects of the Proposed Scheme on the environment within the area, along with proposed monitoring measures.

1.2.2 The design development and environmental assessment process is ongoing. Consultation on the working draft ES is being carried out to assist early engagement with those potentially affected by the Proposed Scheme and to help inform the design and assessment of the Proposed Scheme. Parliamentary Standing Orders do not require a working draft ES. Developing a working draft ES and consulting on it in advance of the formal ES means that consultees have the opportunity to comment on the Proposed Scheme earlier in the process.

1.2.3 As this is a working draft ES, where information is not available at this time, professional judgement and reasonable worst-case assumptions have been used to provide an indication of the likely impact to inform the consultation.

1.2.4 The likely significant environmental effects of the Proposed Scheme will be described in the formal ES to be deposited in accordance with the requirements of Parliamentary Standing Order 27A (SO27A) [1,2]. It is possible that the effects and mitigation described in the formal ES may differ from those presented in this working draft ES, due to the provisional nature of the environmental and design information that is currently available and as a result of consultation on the Proposed Scheme, as appropriate.

1.2.5 The working draft ES has been undertaken on the assumption that the policies adopted for Phase One and Phase 2a will also apply to Phase 2b. The assessment also assumes that any general mitigation measures required as a result of those policies are implemented appropriately in the delivery and operation of the Proposed Scheme. Where policies are referred to in this working draft ES it is on this basis.

1.3 Structure of this report

1.3.1 This report is divided into the following sections:

- Section 1: an introduction to HS2 and the purpose and structure of this report;
- Section 2: overview of the community area, description of the Proposed Scheme within the community area and its construction and operation, and a description of the local alternatives considered;

[1] *Standing Order 27A of the Standing Orders of the House of Commons relating to private business (environmental assessment)*, House of Commons
[2] House of Lords (2005), *Standing Orders of the House of Lords - Private Business*, The Stationery Office

- Section 3: consultation and stakeholder engagement; and
- Sections 4 to 15: an assessment of the following environmental topics:
  - agriculture, forestry and soils (Section 4);
  - air quality (Section 5);
  - community (Section 6);
  - ecology and biodiversity (Section 7);
  - health (Section 8);
  - historic environment (Section 9);
  - land quality (Section 10);
  - landscape and visual (Section 11);
  - socio-economics (Section 12);
  - sound, noise and vibration (Section 13);
  - traffic and transport (Section 14); and
  - water resources and flood risk (Section 15).

1.3.2 Each environmental topic section (Section 4 to 15) comprises:

- an introduction to the topic;
- a description of the existing environmental baseline within the community area;
- a description of the impacts or likely significant environmental effects identified to date arising during construction and operation of the Proposed Scheme; and
- a description of any proposed mitigation and monitoring measures that have been identified to date to address any significant adverse effects.

1.3.3 Environmental effects have been assessed in accordance with the methodology set out in Volume 1 and the EIA Scope and Methodology Report (SMR)[3].

1.3.4 The maps relevant to the Lea Marston to Tamworth area are provided in a separate corresponding document entitled Volume 2: LA01 Map Book, which should be read in conjunction with this report.

1.3.5 The Proposed Scheme described in this report is that shown on the Map Series CT-05 (construction) and CT-06 (operation) (Volume 2: LA01 Map Book). There is some flexibility during detailed design to alter the horizontal and vertical alignments and

[3] Supporting document: HS2 Phase 2b Environmental Impact Assessment Scope and Methodology Report

other details within the limits shown on the plans and sections submitted to Parliament and as set out in the Bill, and this flexibility is included within the scope of the environmental assessment. Further explanation is provided in Volume 1, Section 1.

1.3.6 In addition to the environmental topics covered in Sections 4 to 15 of this report, electromagnetic interference is addressed in Volume 1 and climate change, major accidents and natural disasters, and waste and material resources are addressed in Volume 3 on a route-wide basis.

2 Overview of the area and description of the Proposed Scheme

2.1 Overview of the area

General

2.1.1 The Lea Marston to Tamworth area covers an approximately 8.7km section of the Proposed Scheme passing through the parishes of Curdworth, Lea Marston, Kingsbury and Dordon, within the local authority areas of North Warwickshire Borough Council (NWBC), Tamworth Borough Council (TBC), Warwickshire County Council (WaCC) and Staffordshire County Council (SCC). The interface between Phase One and Phase 2b forms the boundary of this section in the south. The boundary between Dordon parish and Polesworth parish forms the boundary of this section in the north.

2.1.2 As shown in Figure 3, Phase One lies to the south and the Birchmoor to Austrey area (LA02) in Phase 2b lies to the north.

Settlement, land use and topography

2.1.3 The Lea Marston to Tamworth area is predominantly rural in character, with agriculture being the main land use. This is interspersed with woodland, settlements and a scattering of isolated dwellings, farmsteads and commercial and industrial land uses. Much of the area comprises undulating lowland and river valley landscapes with occasional floodplain pasture.

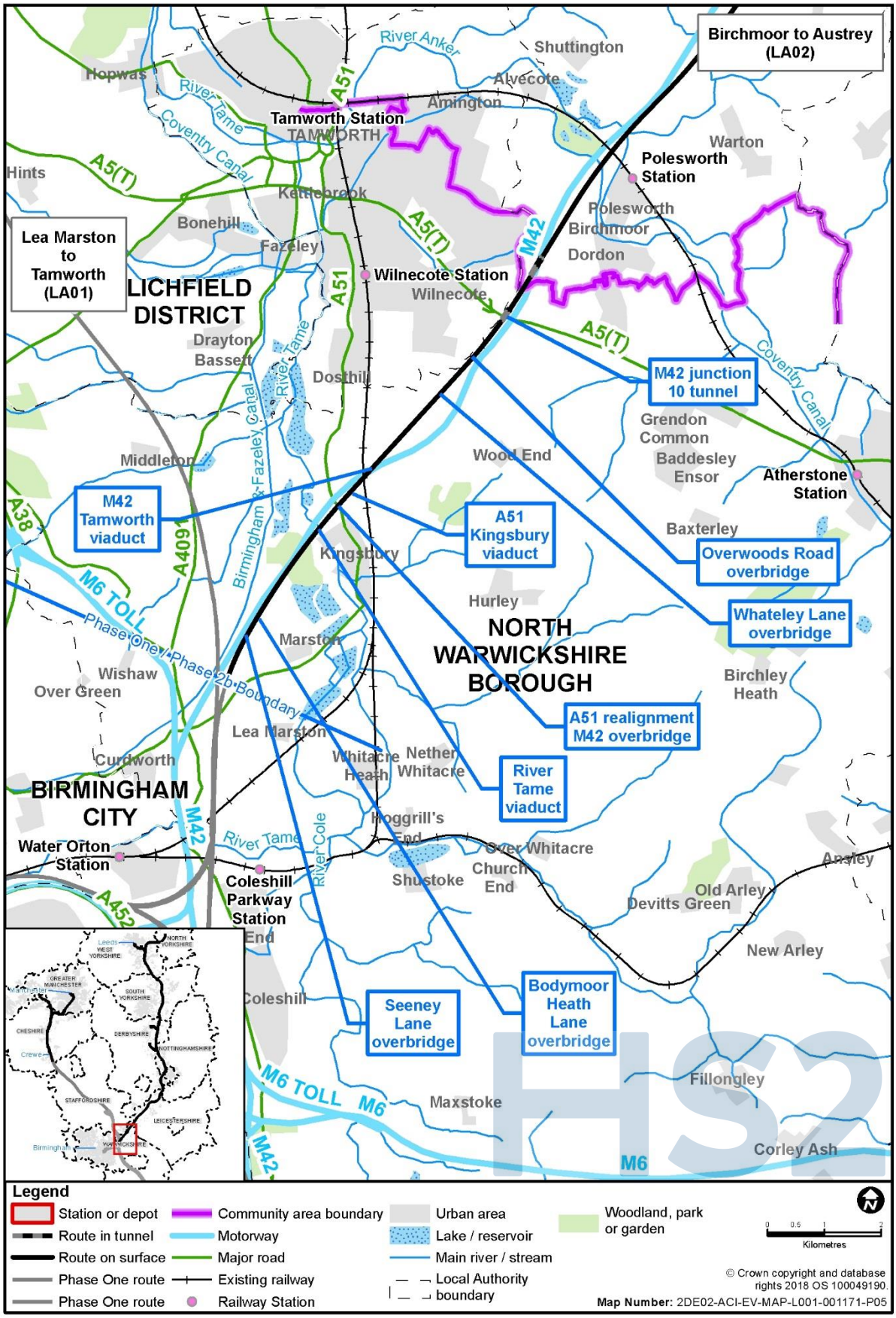
2.1.4 In the south of the Lea Marston to Tamworth area lie the settlements of Bodymoor Heath, Marston and Lea Marston. Kingsbury Water Park lies in the floodplain of the River Tame, with the river creating a natural boundary to the east of the park. The settlement of Cliff lies to the north of the River Tame and to the west of the M42. Kingsbury village lies north of the River Tame, east of the M42 and west of the Birmingham to Derby Railway.

2.1.5 East of the Birmingham to Derby Railway, the settlements of Piccadilly and Freasley lie to the east of the M42, and the settlement of Whateley, west of the M42. North of Piccadilly and Whateley are the suburban communities of Hockley and Wilnecote, both of which lie west of the M42. These communities are within the urban area of the district of Tamworth. Commercial and industrial land use adjoins the M42 junction 10 to the east of Tamworth and includes distribution warehouses, business units, offices and the Tamworth Services motorway service area.

2.1.6 In the north of the Lea Marston to Tamworth area is the suburban community of Stoneydelph to the west of the M42 and the village of Birchmoor to the east of the M42.

2.1.7 The River Tame valley is a dominant topographic feature within the area. The ground in the south of the area is at approximately 80m above Ordnance Datum (AOD), with the valley sloping to the River Tame at between 65m and 70m AOD.

Figure 3: Community area context map



2.1.8 North of the valley, the topography undulates between approximately 75m and 115m AOD, with typically gentle slopes.

Key transport infrastructure

2.1.9 The M42 passes through the Lea Marston to Tamworth area from the south-west to north-east. The route of the Proposed Scheme would broadly follow the alignment of the M42 from Marston to Stoneydelph, crossing over the M42 north of Kingsbury village. The A5 (connecting Holyhead to London) runs in an west-east alignment across the Lea Marston to Tamworth area, whilst other main transport routes include Bodymoor Heath Road and the A51 Tamworth Road, which connects Tamworth to Kingsbury village.

2.1.10 The Birmingham and Fazeley Canal passes through the Lea Marston to Tamworth area from south to north to the west of the M42. The Birmingham to Derby Railway runs through the area from the south to north and would be crossed by the Proposed Scheme to the north of Kingsbury village.

2.1.11 The Proposed Scheme would cross several public rights of way (PRoW) including local access roads, bridleways and public footpaths, which provide links between scattered dwellings and surrounding villages. In Kingsbury Water Park, the Warwickshire Footpath T25 (also known as the Heart of England Way), which is a promoted walking route[4], crosses the route of the Proposed Scheme on a west-east alignment.

Socio-economic profile

2.1.12 Within the NWBC area, there is a wide spread of business types reflecting a diverse range of commercial activities. The construction sector accounts for the largest proportion of business (12%), with the professional, scientific and technical sector the second largest (12%), followed by business administration and support services (10%).

2.1.13 According to the Annual Population Survey (2016)[5], the employment rate[6] within the NWBC area was 83% (32,400 people) and unemployment[7] in the NWBC area was 3%.

2.1.14 The survey also reports that 40% of NWBC residents aged 16-64 were qualified to National Vocational Qualification Level 4 (NVQ4) and above, while 6% of residents had no qualifications.

Notable community facilities

2.1.15 The main concentrations of community facilities are in the larger settlements of Kingsbury, Wilnecote and Stoneydelph. Whateley and Freasley are hamlets located close to the Proposed Scheme, and provide a smaller number of local services.

[4] Promoted PRoW refers to those PRoW which are 'promoted' destinations in their own right as a recreational resource.
[5] Annual Population Survey (2016), NOMIS. Available online at: http://www.nomisweb.co.uk.
[6] The proportion of working age (16-64 year olds) residents that is in employment.
[7] Refers to people without a job who were available to start work in the two weeks following their interview and who had either looked for work in the four weeks prior to interview or were waiting to start a job they had already obtained. As the unemployed form a small percentage of the population, the APS unemployed estimates within local authorities are based on very small samples so for many areas would be unreliable. To overcome this ONS has developed a statistical model that provides better estimates of total unemployed for unitary authorities and local authority districts (unemployment estimates for counties are direct survey estimates), NOMIS.

2.1.16 Kingsbury is a village made up of community facilities including places of worship, public houses, community, leisure and sport centres and medical and educational facilities (including one primary and one secondary school).

2.1.17 Wilnecote and Stoneydelph are both ward areas in the town of Tamworth. Community resources in Wilnecote and Stoneydelph include two schools, a nursery, a public house, allotment areas, a community centre and a retirement facility.

Recreation, leisure and open space

2.1.18 Being predominantly rural in character, the Lea Marston to Tamworth area has much open space, woodland and farmland. The area is crossed by several PRoW including three bridleways.

2.1.19 Kingsbury Water Park is a country park, which contains a number of pools and ponds and has a variety of recreational facilities including Echills Wood Railway (a miniature railway). The Heart of England Way is a national promoted recreational walking route that passes through Kingsbury Water Park from east to west on Warwickshire Footpath T25. The River Tame forms a natural boundary to the east of the water park and is used for recreational activities such as canoeing.

2.1.20 The Birmingham and Fazeley Canal is a navigable waterway now mainly used by pleasure craft for recreational activities. The towpath follows the east bank of the canal and is used as an off-road cycle route.

2.1.21 Open spaces include the Kettle Brook Local Nature Reserve (LNR) south of the M42 junction 10, which provides a green corridor for wildlife and people in Tamworth.

Policy and planning context

Planning framework

2.1.22 Volume 1 provides an overview of the policy case for HS2. Relevant development plan documents and policies have been considered in relation to environmental topics, as part of considering the Proposed Scheme in the local context.

2.1.23 The following local policies have been considered and referred to where appropriate to the assessment:

- saved policies of Warwickshire County Council's Minerals Local Plan (adopted 1995)[8], saved September 2007;
- the adopted Waste Core Strategy 2013-2028 for Warwickshire County Council (adopted July 2013)[9];
- third Warwickshire Local Transport Plan 2011-2026 (LTP3), (adopted April 2011)[10];

[8] Warwickshire County Council (1995), *Minerals Local Plan*. Available online at: https://www.warwickshire.gov.uk/mlp
[9] Warwickshire County Council (2013), *Waste Core Strategy*. Available online at: https://apps.warwickshire.gov.uk/api/documents/WCCC-680-279
[10] Warwickshire County Council (2011), *Warwickshire Local Transport Plan 2011-2026*. Available online at: https://apps.warwickshire.gov.uk/api/documents/WCCC-630-116

- the adopted Minerals Local Plan for Staffordshire 2015-2030 (adopted February 2017)[11];
- the adopted Staffordshire and Stoke-on-Trent Joint Waste Local Plan 2010-2026 (adopted March 2013)[12];
- the adopted Local Plan for Tamworth Borough Council 2006 - 2031 (2016)[13]; and
- Core Strategy (adopted 2014)[14] included in the saved policies of the North Warwickshire Local Plan (2006).

2.1.24 Emerging policies are not generally included within this report unless a document has been submitted to the Secretary of State for examination.

2.1.25 The North Warwickshire Local Plan Draft Submission November 2017[15] was submitted for examination on 27 March 2018.

Committed development

2.1.26 Committed developments are defined as developments with planning permission and sites allocated for development, or safeguarded for minerals in adopted development plans, on or close to the land required for the Proposed Scheme.

2.1.27 Where it is likely that committed developments will have been completed by 2023, these will be identified as 'future baseline' schemes and taken into account in the formal ES.

2.1.28 Where there are committed developments that are considered likely to be constructed between 2023 and 2033, i.e. at the same time as the Proposed Scheme, they would be considered as receptors for the operation of HS2, but also potentially to give rise to cumulative impacts with the Proposed Scheme during construction. Any cumulative impacts and likely significant effects will be reported in the formal ES.

2.1.29 Planning applications yet to be determined at the time of the formal ES and sites that are proposed allocations in development plans that have yet to be adopted, on or close to the Proposed Scheme, are termed 'proposed developments'. These will not be included in the assessment in the formal ES.

[11] Staffordshire County Council (2017), *Minerals Local Plan (adopted February 2017)*. Available online at: https://www.staffordshire.gov.uk/environment/planning/policy/thedevelopmentplan/mineralslocalplan/mineralsLocalPlan.aspx
[12] Staffordshire County Council (2013), *Waste Local Plan*. Available online at: https://www.staffordshire.gov.uk/environment/planning/policy/thedevelopmentplan/wastelocalplan/wasteLocalPlan.aspx
[13] Tamworth Borough Council (2016), *Tamworth Borough Council Local Plan 2006-2031*. Available online at: https://www.tamworth.gov.uk/sites/default/files/planning_docs/Local%20Plan%202006-2031%20FINAL%205.2.16.pdf
[14] North Warwickshire Borough Council (2014), *Core Strategy Forming part of the Local Plan for North Warwickshire*. Available online at: https://www.northwarks.gov.uk/downloads/file/5892/core_strategy_adopted_2014
[15] North Warwickshire Borough Council (2017), *North Warwickshire Local Plan Draft Submission*. Available online at: https://www.northwarks.gov.uk/downloads/file/6949/draft_submission_local_plan_consultation_document_December_2017

Interface with Phase One

2.1.30 The route of the Proposed Scheme would connect to HS2 Phase One at Marston Lane. The High Speed Rail (London - West Midlands) Bill received Royal Assent on 23 February 2017 and pre-construction work on Phase One commenced in 2017. It is therefore considered to be a committed development in the context of this assessment.

2.1.31 The Phase One scheme described within the Curdworth to Middleton area (CFA20) in the Phase One Environmental Statement16 overlaps with the Lea Marston to Tamworth area (LA01) south of Bodymoor Heath Road. This assessment assumes that the Phase One scheme has been implemented in this area including the demolitions that were identified in the Phase One Environmental Statement[17].

2.1.32 The significant environmental effects of the Phase One scheme were reported in the ES deposited with the HS2 Phase One Bill and subsequent Additional Provisions[18]. Where there is the potential for cumulative impacts to arise due to construction and operation of the Phase One scheme in combination with the construction and operation of the Proposed Scheme, these will be reported in Sections 4 to 15 of the formal ES for Phase 2b.

2.1.33 In addition, changes to the Phase One design may be required at the interface with Phase 2b. Any new or different significant environmental effects arising from these changes will be described in the relevant topic sections of the formal ES.

Ongoing design development

2.1.34 Design development continues on this section of route as further engineering and environmental baseline is collated, including from field surveys, and as part of ongoing consultation and stakeholder engagement. Any further changes resulting from this will be reported in the formal ES. The main areas of design development being considered include:

- the connection at the interface with HS2 Phase One at Marston Lane, to the south of Kingsbury;
- review of the proposed lengths and heights of viaducts and other river crossing structures and associated replacement floodplain storage areas;
- temporary and permanent utility diversions;
- refinement of the realignment of roads and PRoW crossings of the Proposed Scheme;
- refinement of drainage features required for rail and highways;

[16] HS2 Ltd (2013), *HS2 Phase One environmental statement*. Available online at: https://www.gov.uk/government/collections/hs2-phase-one-environmental-statement-documents
[17] Relevant demolitions identified in CFA20 comprise of Parklands Stud, Barn Covert, Cocksparrow House Farm and Cocksparrow Farmhouse.
[18] HS2 Ltd (2017), *Additional Provisions for the High Speed Rail (London to West Midlands) Bill*. Available online at: https://www.gov.uk/government/collections/additional-provisions-for-the-high-speed-rail-london-to-west-midlands-bill

- refinement of maintenance access routes and access to balancing ponds;
- additional environmental features required to mitigate likely significant environmental effects;
- access roads or tracks to land or property and crossings of the route for private means of access;
- refinement of construction compound locations and site haul routes; and
- refinement of auto-transformer station and auto-transformer feeder station locations.

2.2 Description of the Proposed Scheme

2.2.1 The following section describes the main features of the Proposed Scheme in the Lea Marston to Tamworth area, including the proposed environmental mitigation measures that have been identified to date. Further general information on typical permanent features is provided in Volume 1, Section 5. Similarly, a general description of the approach to mitigation is explained in Volume 1, Section 9.

2.2.2 Land required for operation of the Proposed Scheme is described in this section and is shown on Volume 2: Map Series CT-06. Land also required for construction is described in Section 2.3 and shown on Volume 2: Map Series CT-05.

Overview

2.2.3 The Proposed Scheme through the Lea Marston to Tamworth area would be approximately 8.7km long and lies within NWBC, TBC, WaCC and SCC areas. The route would extend from west of Marston in the south and travel north to Stoneydelph, via Kingsbury.

2.2.4 This section of route is illustrated on maps CT-06-401 to CT-06-407a in the Volume 2: LA01 Map Book.

2.2.5 All dimensions in the sections below are approximate.

2.2.6 In the Lea Marston to Tamworth area, the route of the Proposed Scheme would be carried on the following features:

- viaducts for a total length of 3.1km (River Tame viaduct, A51 Kingsbury viaduct and M42 Tamworth viaduct);
- cuttings for a total length of 3.6km (Marston cutting, Whateley cutting, Wilnecote cutting and M42 Stoneydelph cutting);
- embankments for a total length of 1.5km (Marston embankment, Piccadilly embankment and Freasley embankment); and
- tunnel for a total length of 500m (M42 junction 10 tunnel south portal, M42 junction 10 tunnel and M42 junction 10 tunnel north portal).

2.2.7 The Proposed Scheme is described in six separate sections below.

2.2.8 In general, features are described along the route of the Proposed Scheme from south to north and from west to east as they would cross the Proposed Scheme, as shown on Map Series CT-06 in the Volume 2: LA01 Map Book.

Connection to Phase One at Marston

2.2.9 The Proposed Scheme would connect to the Phase One scheme at the location of Marston Lane within the Marston cutting. Any changes to the permanent works associated with the interface of Phase One and Phase 2b and any design changes to Phase One and/or Phase 2b will be reported in the formal ES.

Marston cutting to start of Marston embankment

2.2.10 The Proposed Scheme would continue from HS2 Phase One north-east towards Kingsbury. This section would run in the Marston cutting up to the start of the Marston embankment.

2.2.11 This section of the Proposed Scheme is illustrated on the map CT-06-401 in the Volume 2: LA01 Map Book.

2.2.12 Key features of this 1.4km section would include:

- Marston cutting, 1.4km in length, up to 9m in depth and up to 69m in width, with associated landscape earthworks on the east side of the Proposed Scheme. Landscape earthworks would protect the cutting from surface water flows (see Volume 2: LA01 Map Book, Map CT-06-401, B5 to I5);
- areas of woodland habitat creation along the east side of the M42 adjacent to the Marston cutting, to provide ecological connectivity between existing fragmented habitats (see Volume 2: LA01 Map Book, Map CT-06-401, B4 to H5);
- a balancing pond for railway drainage, with surrounding grassland habitat creation, located east of the Proposed Scheme, 500m south of Seeney Lane, with access via Cocksparrow Farm access road off the A4097 Kingsbury Road (see Volume 2: LA01 Map Book, Map CT-06-401, C6);
- a balancing pond for land drainage, with surrounding grassland habitat creation, located east of the Proposed Scheme, 300m south of Cocksparrow Farm, with access via Cocksparrow Farm access road off the A4097 Kingsbury Road. The land drainage ditch would be culverted under the Kingsbury auto-transformer feeder station access culvert (see Volume 2: LA01 Map Book, Map CT-06-401, C7 to D7);
- Kingsbury auto-transformer feeder station, located to the east of the Proposed Scheme, 150m south of Cocksparrow Farm. Access would be provided via Cocksparrow Farm access road off the A4097 Kingsbury Road. An area of landscape mitigation planting to the east of the Proposed Scheme would help to integrate the Kingsbury auto-transformer feeder station and the balancing ponds into the surrounding landscape (see Volume 2: LA01 Map Book, Map CT-06-401, D5 to E6);

- Seeney Lane overbridge, 60m in length, up to 2m above ground level and up to 10m above track level to carry Seeney Lane and Warwickshire Bridleway M23a on their existing alignment over the route of the Proposed Scheme (see Volume 2: LA01 Map Book, Map CT-06-401, F4 to F5);
- realignment of Warwickshire Footpath M22 which would cross the Proposed Scheme on the Seeney Lane overbridge. It would then continue to the north-east for 450m, before re-joining its existing alignment, 300m east of the M42 (see Volume 2: LA01 Map Book, Map CT-06-401, F6 to H7); and
- two ecological mitigation ponds, 500m south of Bodymoor Heath Road and east of the route of the Proposed Scheme to provide replacement habitat, with surrounding wetland and landscape mitigation planting (see Volume 2: LA01 Map Book, Map CT-06-401, H7 to I6).

2.2.13 There would also be maintenance access routes and hedgerow planting throughout this section. There would also be utilities works within this section, which may include works to low voltage overhead or underground lines, gas pipes, sewers and telecommunication cables.

2.2.14 Construction of this section would be managed from the Kingsbury main compound and Kingsbury auto-transformer feeder station satellite compound, which are described in Section 2.3, and shown on Map CT-05-401 in the Volume 2: LA01 Map Book.

Marston embankment to start of River Tame viaduct

2.2.15 The route would continue onto Marston embankment, to the west of Marston, towards Kingsbury and the start of the River Tame viaduct.

2.2.16 This section of Proposed Scheme is illustrated in the Volume 2: LA01 Map Book, Map CT-06-401 to CT-06-402.

2.2.17 Key features of this 220m section would include:

- Marston embankment, 220m in length and up to 5m in height, (see Volume 2: LA01 Map Book, Map Series CT-06-401, I5 to J5);
- realignment of Bodymoor Heath Road, 465m south of its existing alignment on an embankment, 3km long and up to 11m in height. The realigned Bodymoor Heath Road would cross the route of the Proposed Scheme on Bodymoor Heath Road overbridge (see Volume 2: LA01 Map Book, Map CT-06-401, I10 to J4, CT-06-401-R1, I4 to J1 and CT-06-402, A10 to C2);
- Bodymoor Heath Road overbridge, 190m in length, up to 11m above ground level and up to 10m above track level. The connection of Warwickshire Footpath T26 to the west and east of the M42 would also be maintained via the Bodymoor Heath Road overbridge. Access to Kingsbury Water Park east of the Proposed Scheme would be maintained via the existing Bodymoor Heath Road. The existing Bodymoor Heath Road would be closed west and east of the River Tame viaduct. The future use of Bodymoor Heath Road will be reviewed for the formal ES (see Volume 2: LA01 Map Book, Map CT-06-401, I5

to I4 and CT-06-402, A6 to A5);

- Bodymoor Heath Road culvert, 250m south of Bodymoor Heath Road, for land drainage (see Volume 2: LA01 Map Book, Map CT-06-401, I7 and CT-06-402, A7);
- areas of woodland habitat creation and grassland habitat creation along the west and east of the Marston embankment and River Tame viaduct, to provide ecological connectivity between fragmented habitats (see Volume 2: LA01 Map Book, Map CT-06-401, I9 to J5,CT-06-401-R1, I2 to J1 and CT-06-402, A9 to B5);
- areas of landscape mitigation planting west and east of the Proposed Scheme, to help integrate the Proposed Scheme into the surrounding landscape (see Volume 2: LA01 Map Book, Map CT-06-401, I9 to I7, CT-06-401-R1, I1 to J1 and CT-06-402, A9 to C3);
- a balancing pond for the railway drainage would be located to the east of the Proposed Scheme with access via the realigned Bodymoor Heath Road. The land drainage ditch would be culverted under the Bodymoor Heath Road culvert north (see Volume 2: LA01 Map Book, Map CT-06-401, I7 to J6 and CT-06-402, A6 to A7);
- a balancing pond for highway drainage would be located to the east of the Proposed Scheme with access via the realigned Bodymoor Heath Road (see Volume 2: LA01 Map Book, Map CT-06-401-R1, I4); and
- a balancing pond for highway drainage would be located to the west of the Proposed Scheme with access via the realigned Bodymoor Heath Road (see Volume 2: LA01 Map Book, Map CT-06-402, C3).

2.2.18 There would also be maintenance access routes and hedgerow planting throughout this section. There would also be utilities works within this section, which may include works to low voltage overhead or underground lines, gas pipes, sewers and telecommunication cables.

2.2.19 Construction of this section would be managed from the Kingsbury main compound, which is described in Section 2.3, and shown on Map CT-05-401 in the Volume 2: LA01 Map Book.

River Tame viaduct to start of Piccadilly embankment

2.2.20 The route would continue onto the River Tame viaduct through Kingsbury Water Park, to the west of Kingsbury and east of Cliff. The route would then continue onto the A51 Kingsbury viaduct and then the M42 Tamworth viaduct.

2.2.21 This section of Proposed Scheme is illustrated in the Volume 2: LA01 Map Book, Map CT-06-401 to CT-06-404. Key features of this 3.1km section would include:

- River Tame viaduct, 2.3km in length and up to 5m in height to the south and up to 16m in height to the north. The River Tame viaduct would carry the route of the Proposed Scheme over Kingsbury Water Park, Warwickshire Footpath T25

(also known as the Heart of England Way) and the River Tame. On the east side of the viaduct there would be a noise fence barrier of 1.5km in length to provide acoustic screening to the community of Kingsbury. For the closest part of the barrier to Kingsbury this barrier would be 3m in height, with the remainder of the barrier being 2m in height (see Volume 2: LA01 Map Book, Map CT-06-401, J10, CT-06-402, B6 to J6;

- areas of woodland habitat creation to the west and east of the Proposed Scheme, both sides of Bodymoor Heath Road, to provide ecological connectivity between fragmented habitats (see Volume 2: LA01 Map Book, Map CT-06-401, J5 to J6 and CT-06-402, B5 to F6);
- areas of grassland habitat creation to the west and east of the Proposed Scheme, 415m north of Bodymoor Heath Road, to provide ecological connectivity between fragmented habitats (see Volume 2: LA01 Map Book, Map CT-06-402, E6 to G5);
- areas of landscape mitigation planting east of the Proposed Scheme, to help integrate the Proposed Scheme into the surrounding landscape (see Volume 2: LA01 Map Book, Map CT-06-402, F6);
- four ecological mitigation ponds, 900m north of Bodymoor Heath Road, west and east of the route of the Proposed Scheme to provide replacement habitat, with surrounding wetland habitat creation (see Volume 2: LA01 Map Book, Map CT-06-402, G6 to J5 and CT-06-403, A6 to C5);
- replacement floodplain storage areas to the west and east of the Proposed Scheme, adjacent to the north of the River Tame (see Volume 2: LA01 Map Book, Map CT-06-402, I5 to I6 and CT-06-403, A5 to A6);
- areas of landscape mitigation planting and grassland habitat creation to the east of the Proposed Scheme, to help integrate the Proposed Scheme into the surrounding area and provide ecological connectivity between fragmented habitats (see Volume 2: LA01 Map Book, Map CT-06-402, I7 to J6 and CT-06-403, A7 to C6);
- an area of landscape earthworks with landscape mitigation planting to the east of the Proposed Scheme to provide visual screening for properties in Kingsbury (see Volume 2: LA01 Map Book, Map CT-06-402, I7 to J8 and CT-06-403, A7 to C8);
- a balancing pond for railway drainage to the east of the Proposed Scheme, 280m south of the A51 Tamworth Road, with access via the realigned A51 Tamworth Road (see Volume 2: LA01 Map Book, Map CT-06-402, J6 and CT-06-403, B6);
- realignment of the A51 Tamworth Road for 2.7km, 85m north of its existing alignment, to pass under the route of the Proposed Scheme and over the M42 via the A51 realignment M42 overbridge (see Volume 2: LA01 Map Book, Map CT-06-403, C9 to F1 and CT-06-403-L1, E10 to F8);

- realignment of two sections of Thistlewood Brook; one section would be realigned south-east for 300m under the River Tame viaduct. A second section would be realigned south-west for 470m under the realigned A51 Tamworth Road via the Thistlewood Brook culvert (see Volume 2: LA01 Map Book, Map CT-06-403, C5 to F6);
- A51 Tamworth Road west culvert, 40m west of the M42 for land drainage under the realigned A51 Tamworth Road (see Volume 2: LA01 Map Book, Map CT-06-403, E4);
- A51 Tamworth Road east culvert, 150m north of A51 Tamworth Road for land drainage under a balancing pond access road (see Volume 2: LA01 Map Book, Map CT-06-403, E5);
- two balancing ponds for highway drainage would be located to the north of the A51 Tamworth Road with access via the realigned A51 Tamworth Road (see Volume 2: LA01 Map Book, Map CT-06-403, D6 and E1 to E2);
- a balancing pond for railway drainage would be located to the north of the A51 Tamworth Road with access via the realigned A51 Tamworth Road (see Volume 2: LA01 Map Book. Map CT-06-403 E6);
- an area of landscape earthworks with planting, to the east of the Proposed Scheme to provide visual screening for properties in Kingsbury (see Volume 2: LA01 Map Book, Map CT-06-403, D6 to F7);
- A51 Kingsbury viaduct, 440m in length and up to 16m in height. On the west and east side of the route of the Proposed Scheme there would be a noise fence barrier, 2m in height, running along the top of the viaduct. The barrier would provide acoustic screening for properties in Kingsbury (see Volume 2: LA01 Map Book, Map CT-06-403, E5 to G5);
- an area of landscape mitigation planting to the west of the Proposed Scheme, 135m to the north of the A51 Tamworth Road, which would integrate the Proposed Scheme into the surrounding landscape (see Volume 2: LA01 Map Book, Map CT-06-403, E5 to F5);
- M42 Tamworth viaduct, 352m in length and up to 16m in height to the south and up to 8m in height to the north. The viaduct would carry the Proposed Scheme over the Birmingham to Derby Railway and the M42 (see Volume 2: LA01 Map Book, Map CT-06-403, G5 to I5 and CT-06-404, A5);
- areas of woodland habitat creation and grassland habitat creation to the west and east of the Proposed Scheme, adjacent to the south and north of the Birmingham to Derby Railway, to provide ecological connectivity between fragmented habitats (see Volume 2: LA01 Map Book, Map CT-06-403, F7 to J4 and CT-06-404, A5 to C4); and
- diversion of Warwickshire Bridleway T67p, up to 120m south of its existing alignment for 550m. The bridleway would pass underneath the M42 Tamworth viaduct before being diverted to run parallel to the M42 to re-join its existing

alignment (see Volume 2: LA01 Map Book, Map CT-06-403, I5 to J6 and CT-06-404, A5 to B6).

2.2.22 There would also be maintenance access routes and hedgerow planting throughout this section. There would also be utilities works within this section, which may include works to low voltage overhead or underground lines, gas pipes, sewers and telecommunication cables.

2.2.23 Construction of this section would be managed from the Kingsbury main compound, A51 Tamworth Road satellite compound and M42 Tamworth viaduct satellite compound, which are described in Section 2.3 and shown on Map CT-05-402 and CT-05-403 in the Volume 2: LA01 Map Book.

Piccadilly embankment to start of M42 junction 10 tunnel south portal

2.2.24 The route would continue on Piccadilly embankment, then into Whateley cutting, onto Freasley embankment and into Wilnecote cutting to the west of Piccadilly and east of Whateley and Hockley.

2.2.25 This section of Proposed Scheme is illustrated in the Volume 2: LA01 Map Book, Map CT-06-403 to CT-06-405.

2.2.26 Key features of this 3.2km section would include:

- Piccadilly embankment, 998m in length and up to 7.3m in height, with associated landscape earthworks on the east side of the Proposed Scheme. Landscape earthworks would provide visual screening for Holt Hall Farm (see Volume 2: LA01 Map Book, Map CT-06-403, I5 to J5 and CT-06-404, A5 to F5);
- Piccadilly embankment culvert, 250m west of Slateley Hall for land drainage under the route of the Proposed Scheme (see Volume 2: LA01 Map Book, Map CT-06-403, I5 to I6 and CT-06-404, A5 to A6);
- an area of landscape mitigation planting to the west and east of the Piccadilly embankment, to integrate the Proposed Scheme into the surrounding landscape (see Volume 2: LA01 Map Book, Map CT-06-403, I6 to J5 and CT-06-404, A5 to C4 and A6 to D6);
- a balancing pond for railway drainage west of the Proposed Scheme with access via an unnamed track from Rush Lane (see Volume 2: LA01 Map Book, Map CT-06-404, D4);
- Whateley auto-transformer station located to the east of the Proposed Scheme, 60m north of Holt Hall Farm. Landscape mitigation planting around the auto-transformer station site would provide visual screening for Holt Hall Farm. Access would be provided via Holt Hall Farm Road off Trinity Road to the east (see Volume 2: LA01 Map Book, Map CT-06-404, F6);
- Whateley cutting, 1.6km in length, up to 12m in depth and up to 85m in width. Areas of woodland habitat creation to the west of the Proposed Scheme, to provide replacement habitat creation. Landscape earthworks to the west of the Proposed Scheme, 330m in length north of Overwoods Road, to provide

visual screening for properties in Hockley. On the west side of the route of the Proposed Scheme, for 400m at the northern end of Whateley cutting, there would be a noise fence barrier, 3m in height, at the bottom of the cutting. The barrier would provide acoustic screening for properties in Hockley (see Volume 2: LA01 Map Book, Map CT-06-404, F5 to J6 and CT-06-405, A6 to F6);

- Whateley Lane overbridge, 60m in length, up to 1m above ground level and up to 11m above track level over Whateley cutting. Landscape mitigation planting to the south of Whateley Lane, east of the Proposed Scheme, to help integrate the Proposed Scheme into the surrounding landscape (see Volume 2: LA01 Map Book, Map CT-06-404, H5 to I7 and CT-06-405, A7 to A8);
- two balancing ponds for highway drainage would be located north of Whateley Lane, with access via Whateley Lane (see Volume 2: LA01 Map Book, Map CT-06-404, H5 and I8 and CT-06-405, A9);
- diversion of Warwickshire Footpath T70 250m north-east of its existing alignment to run parallel to the east side of the Proposed Scheme for 250m, to connect with Whateley Lane (see Volume 2: LA01 Map Book, Map CT-06-404, F6 to H6);
- realignment of Warwickshire Footpath AE203 100m west of its existing alignment from Whateley Lane overbridge, to run parallel to the west side of the Proposed Scheme for 400m, and re-join its existing alignment at its connection with Warwickshire Footpath T77 (see Volume 2: LA01 Map Book, Map CT-06-404, H5 to J5 and CT-06-405, A6 to B6);
- closure of a section of Warwickshire Footpath T77 on the east side of the Proposed Scheme. Users would be diverted along Whateley Lane overbridge (see Volume 2: LA01 Map Book, Map CT-06-404, I8 to J5 and CT-06-405, A8 to B6);
- diversion of a short section of Warwickshire Footpath T170 90m east of its existing alignment, to run parallel to the east side of the Proposed Scheme for 100m, and connect with Overwoods Road overbridge (see Volume 2: LA01 Map Book, Map CT-06-405, D7);
- Overwoods Road overbridge, 60m in length, up to 3m above ground level and up to 10m above track level over Whateley cutting (see Volume 2: LA01 Map Book, Map CT-06-405, D5 to E7);
- a balancing pond for highway drainage would be located to the north of Overwoods Road, with access via Overwoods Road (see Volume 2: LA01 Map Book, Map CT-06-405, D6 to E6);
- Overwoods Road culvert would pass under Overwoods Road, for land drainage (see Volume 2: LA01 Map Book, Map CT-06-405, D6);
- areas of woodland habitat creation, to the west of the Proposed Scheme, adjacent to the north of Overwoods Road, to provide connectivity for fragmented habitats (see Volume 2: LA01 Map Book, Map CT-06-405, D6 to

F6);

- areas of grassland habitat creation, to the west and east of the route of the Proposed Scheme, to the north of Overwoods Road, to provide replacement habitat creation (see Volume 2: LA01 Map Book, Map CT-06-405, E7 to I6 and F6 to G4);
- Freasley embankment, 240m in length and up to 4m in height. On the west side of the route of the Proposed Scheme there would be a noise fence barrier, 3m in height, running along the top of the embankment. The barrier would provide acoustic screening for properties in Hockley (see Volume 2: LA01 Map Book, Map CT-06-405, F6 to G6);
- Staffordshire Bridleway Tamworth 79 which runs between Falcon and south of Centurion Way would be closed from south of Centurion Way to Warwickshire Bridleway AE56 and would be diverted to an existing unnamed footpath which links to Swallowhurst. Warwickshire Bridleway AE56, would be closed and be diverted along the proposed diversion of Staffordshire Bridleway Tamworth 79 (see Volume 2: LA01 Map Book, Map Series CT-06-405, F6 to H1);
- a balancing pond for railway drainage, west of the Proposed Scheme, 105m south of Centurion Park with access via an access road from Centurion Park. Kettle Brook would be culverted under this access road via the Kettle Brook culvert (see Volume 2: LA01 Map Book, Map CT-06-405, G5 to G6);
- areas of landscape mitigation planting, to the west of the Proposed Scheme, adjacent to Centurion Park, to provide visual screening for the properties at Hockley (see Volume 2: LA01 Map Book, Map CT-06-405, H5 to H1);
- realignment of Kettle Brook for 140m in a north-south direction, which would be culverted under the Freasley embankment in the Freasley culvert (see Volume 2: LA01 Map Book, Map CT-06-405, G6);
- areas of landscape mitigation planting, west and east of the Proposed Scheme, adjacent to the M42, to help integrate the Proposed Scheme into the surrounding landscape (see Volume 2: LA01 Map Book, Map CT-06-405, G7 to J6 and CT-06-406a, A6 to B5); and
- Wilnecote cutting, 330m in length, up to 7m in depth and up to 75m in width. On the west side of the route of the Proposed Scheme, for 100m at the southern end of Whateley cutting there would be a noise fence barrier, 3m in height, running along the bottom of the cutting. The barrier would provide acoustic screening for properties in Hockley (see Volume 2: LA01 Map Book, Map CT-06-405, G6 to I6 and CT-06-406a, A5 to A6).

2.2.27 There would also be maintenance access routes and hedgerow planting throughout this section. There would also be utilities works within this section, which may include works to low voltage overhead or underground lines, gas pipes, sewers and telecommunication cables.

2.2.28 Construction of this section would be managed from the M42 Tamworth viaduct satellite compound, Whateley auto-transformer station satellite compound, Whateley Lane overbridge satellite compound and the M42 junction 10 main compound, which are described in Section 2.3, and shown on Map CT-05-403, Map CT-05-404 and Map CT-05-405 in the Volume 2: LA01 Map Book.

M42 junction 10 tunnel south portal to M42 Stoneydelph cutting

2.2.29 The Proposed Scheme would continue north-east in a tunnel under the M42 junction 10 towards Stoneydelph, before passing into the M42 Stoneydelph cutting and continuing to the end of the Lea Marston to Tamworth area.

2.2.30 This section of Proposed Scheme is illustrated in the Volume 2: LA01 Map Book, Map CT-06-405 to CT-06-406a.

2.2.31 Key features of this 800m section would include:

- M42 junction 10 tunnel south portal, 150m in length, with a headwall 2.3m in height at the south end of the portal cutting (see Volume 2: LA01 Map Book, Map CT-06-405, I6 to J6 and CT-06-406a, A6 to B6);
- a tunnel portal building and rescue area at the south portal of M42 junction 10 tunnel. The rescue area would accommodate any emergency evacuation of passengers and also vehicular access for emergency services to these points. The tunnel portal building would house the control equipment for the tunnel and ventilation fans for rail tunnel operations (see Volume 2: LA01 Map Book, Map CT-06-405, I6 and CT-06-406a, A5);
- a surface water pumping station for railway drainage, to the west of the Proposed Scheme, which discharges to a balancing pond also located to the west of the Proposed Scheme with access via an access road from Centurion Park (see Volume 2: LA01 Map Book, Map CT-06-405, I5 to J6 and CT-06-406a, A5 to B5);
- a jacked box[19] section of the M42 junction 10 tunnel, 100m in length. The top of the jacked box structure would be up to 3m below ground level, with the track level up to 13m below ground level, continuing into the M42 junction 10 cut and cover tunnel[20] (see Volume 2: LA01 Map Book, Map CT-06-405, J6 and CT-06-406a, B6);
- a cut and cover section of the M42 junction 10 tunnel, 140m in length and up to 15m below ground level, continuing into the M42 junction 10 tunnel north portal (see Volume 2: LA01 Map Book, Map CT-06-406a, B6 to C6);
- permanent widening of M42 junction 10 roundabout (see Volume 2: LA01 Map Book, Map CT-06-405, J6 to J7 and CT-06-406a, B6 to C6);

[19] A concrete structure that can be installed horizontally using hydraulic jacks underneath an existing road or railway to avoid disruption to the road or railway during construction of, for example, an underpass
[20] A tunnel constructed by excavating a cutting constructing a box-type structure and reinstating the ground over the top to its original level

- areas of woodland habitat creation, to the east of the Proposed Scheme, within the M42 junction 10 roundabout, to provide replacement habitat creation see Volume 2: LA01 Map Book, Map CT-06-406a, B6 to C6);
- M42 junction 10 tunnel north portal, 150m in length, with a headwall 7.6m in height at the north end of the portal cutting (see Volume 2: LA01 Map Book, Map CT-06-406a, C6 to D6);
- areas of landscape mitigation planting and grassland habitat creation, to the west and east of the Proposed Scheme, west of the M42, to help integrate the Proposed Scheme into the surrounding landscape and provide replacement habitat creation (see Volume 2: LA01 Map Book, Map CT-06-406a, C5 to D6);
- a section of M42 Stoneydelph cutting, 286m in length and 134m in width and up to 18m in depth. The cutting would incorporate retaining walls at the north extent, for a length of 150m to the west and east of the route of the Proposed Scheme. The retaining wall to the west would be up to 3m in height and the retaining wall to the east up to 7m in height. This cutting would continue for 94m into the Birchmoor to Austrey area (LA02) (see Volume 2: LA01 Map Book, Map CT-06-406a, D6 to E6); and
- a balancing pond for highway drainage from the M42 temporary realignment, east of the Proposed Scheme with access provided from the east via Cockspur Street (see Volume 2: LA01 Map Book, Map Series CT-06-406a, E7).

2.2.32 There would also be maintenance access routes and hedgerow planting throughout this section. There would also be utilities works within this section, which may include works to low voltage overhead or underground lines, gas pipes, sewers and telecommunication cables.

2.2.33 Construction of this section would be managed from the M42 junction 10 main compound, which is described in Section 2.3, and shown on Map CT-05-405 and Map CT-05-406a in the Volume 2: LA01 Map Book. Works in this section would also be managed from the Stoneydelph satellite compound, which are described in Volume 2: Community area report LA02, Birchmoor to Austrey.

Demolitions

2.2.34 As set out in Volume 1, as the design develops, it is likely that not all the properties reported within the assessment would need to be demolished, for example where not all the land is required for permanent works.

2.2.35 At this stage of the design development, it is anticipated that demolition of 10 existing residential properties, 10 commercial/ business properties (including farm outbuildings) and four other structures would be required to construct the permanent features in the Lea Marston to Tamworth area. These could be needed for construction of the permanent features or, in some cases, to enable the construction works for the Proposed Scheme. Demolitions would be managed from the same construction compounds as the permanent features with which they are associated. The identified demolitions are listed in Section 2.3 under the relevant construction compounds.

2.3 Construction of the Proposed Scheme

2.3.1 This section sets out the key construction activities that are envisaged to build the Proposed Scheme in the Lea Marston to Tamworth area. The construction arrangements described in this section provide the basis for the assessment presented in this ES.

2.3.2 Details of the interface with HS2 Phase One construction works, the sources of excavated material that would be used to construct embankments, the construction timescales for works to PRoW and the construction timescales for works to watercourses will be reported.

2.3.3 Land used only for construction purposes would be restored as agreed with the owner of the land and the relevant planning authority once the construction works in that area are complete.

2.3.4 Land would be required permanently for the key features of the Proposed Scheme described in Section 2.2.

2.3.5 During the construction phase, public roads and PRoW routes would remain open for public use wherever reasonably practicable. Where such routes would cross the Proposed Scheme and require diversion, the alternative road or PRoW crossing the Proposed Scheme would be constructed prior to any closure of existing roads or PRoW wherever reasonably practicable. Where they would cross the Proposed Scheme in proximity to their existing alignment, a temporary alternative alignment may be required. In some instances, diverted or realigned roads or PRoW may need to pass through areas required for construction of the Proposed Scheme. Routes through these areas would be provided where it is safe and reasonably practicable to do so.

2.3.6 Volume 1, Section 5 and Section 6 provide details of the permanent features of the Proposed Scheme and typical construction techniques. For the purposes of the environmental assessment, standard construction techniques as provided in Volume 1, Section 6 have been assumed.

Code of Construction Practice

2.3.7 All contractors will be required to comply with a Code of Construction Practice (CoCP). In addition, Local Environmental Management Plans (LEMPs) will be produced for each local authority area. The CoCP and LEMPs will be the means of controlling the construction works associated with the Proposed Scheme, and set out monitoring requirements, with the objective of ensuring that the effects of the works on people and the natural environment are reduced insofar as reasonably practicable. The CoCP will contain generic control measures and standards to be implemented throughout the construction process. The LEMPs will set out how the project will adapt and deliver the required environmental and community protection measures within each area through the implementation of specific measures required to control dust and other emissions from activities in the area.

2.3.8 In addition, HS2 Ltd has produced a Community Engagement Framework[21] which sets out how HS2 Ltd and its contractors, as well as their sub-contractors, would undertake community engagement during the construction of the HS2 project. The framework is being implemented on Phase One of HS2 and is applicable to all phases of HS2.

2.3.9 The objectives of the framework include:

- to set out how HS2 Ltd and its contractors would undertake community engagement during the construction of the project;
- to provide clarity and reassurance to HS2 Ltd's stakeholders about how community engagement activity would be managed; and
- to help HS2 Ltd be a good neighbour to local communities, including by providing accurate and timely information about construction works and offering opportunities to influence them, where appropriate.

2.3.10 A draft CoCP has been prepared and is published alongside this document. It will remain a draft document through the Parliamentary process and the CoCP will be finalised by Royal Assent. The CoCP sets out measures to be implemented by the appointed construction contractor.

Overview of the construction process

2.3.11 Building and preparing the Proposed Scheme for operation will comprise the following general stages:

- advance works including: site investigations further to those already undertaken; preliminary mitigation works; preliminary enabling works;
- civil engineering works including: establishment of construction compounds; haul roads, site preparation and enabling works; main earthworks and structure works; site restoration; removal of construction compounds where the compound is not required for railway installation works; and associated utility diversions;
- railway installation works including: establishment of construction compounds; infrastructure installation; connections to utilities; changes to the existing rail network; and removal of construction compounds;
- site finalisation works; and
- systems testing and commissioning.

2.3.12 General information about the construction process is set out in more detail in Volume 1, Section 6, and the draft CoCP including:

- the approach to environmental management during construction and the role of the CoCP (Section 2);

[21] https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/625971/hs2_community_engagement_framework.pdf

- working hours (Section 5);
- management of construction traffic (Section 14); and
- handling of construction materials (Section 15).

Advance works

2.3.13 General information about advance works can be found in Volume 1, Section 6. Advance works will be required before the main construction works commence and typically include:

- further detailed site investigations and surveys for proposed construction compounds;
- further detailed environmental surveys;
- advance mitigation works including, where appropriate, contamination remediation, habitat creation and translocation, landscape planting and built heritage survey and investigation;
- advance site access works;
- site establishment with temporary fence construction; along with soil stripping and vegetation removal; and
- utility diversions and new utility connections for facilities associated with the Proposed Scheme.

Engineering works

Introduction

2.3.14 Construction of the Proposed Scheme would require the following broad types of engineering works along the entire length of the route, and within land adjacent to the route:

- civil engineering works, including earthworks such as embankments and cuttings and erection of bridges and viaducts; and
- works to install, test and commission railway systems, including track, overhead line equipment, communications and signalling equipment and traction power supply.

2.3.15 The construction of track and railway systems works in open areas would include the installation of track form, rails, infill material, minor drainage works, and installation of electrification, signalling and communication equipment.

2.3.16 The construction of the Proposed Scheme would be divided into sections, each of which would be managed from compounds. The compounds would act as the main interface between the construction work sites and the public highway, as well as performing other functions as described below. Compounds would either be main compounds or satellite compounds. Satellite compounds are generally smaller than main compounds. Compounds would either be used for civil engineering works, for railway installation works, or for both.

General overview of construction compounds

2.3.17 Main compounds would be used for core project management staff (i.e. engineering, planning and construction delivery) and commercial and administrative staff. These teams would directly manage some works and coordinate the works at the satellite compounds. In general, a main compound would include:

- space for the storage of bulk materials;
- space for the receipt, storage and loading and unloading of excavated material;
- an area for the fabrication of temporary works equipment and finished goods;
- fuel storage;
- plant and equipment storage including plant maintenance facilities; and
- office space for management staff, limited car parking for staff and site operatives, and welfare facilities.

2.3.18 Satellite compounds would be used as the base to manage specific works along a section of the route. Depending on the nature and extent of the works to be managed, these satellite compounds could include office accommodation for staff, local storage for plant and materials, car parking for staff and site operatives, and welfare facilities.

2.3.19 Two main construction compounds, the Kingsbury main compound and the M42 junction 10 main compound, would be located in the Lea Marston to Tamworth area. Kingsbury main compound would manage one satellite civil engineering compound and the M42 junction 10 main compound would manage two satellite civil engineering compounds in the Lea Marston to Tamworth area.

2.3.20 On completion of the civil engineering works, one civil engineering main compound and three of the civil engineering satellite compounds would remain and continue to be used as railway installation satellite compounds. All railway installation satellite compounds in the LA01 area would be managed from the Junction 13 main compound in the Appleby Parva to Ashby-de-la-Zouch area (LA03).Three satellite civil engineering compounds would be located in the Lea Marston to Tamworth area, one of which would continue to be used as a railway installation satellite compound following the completion of civil engineering works. There would also be two further satellite compounds for managing railway systems installation works only. The M42 junction 10 main compound would also continue to be used as a railway installation compound following completion of the civil engineering works.

2.3.21 Following the completion of the civil engineering construction phase, the satellite compounds and any main compound to be used for railway systems works would then be managed from Junction 13 main compound, located in the Appleby Parva to Ashby-de-la-Zouch area (LA03).

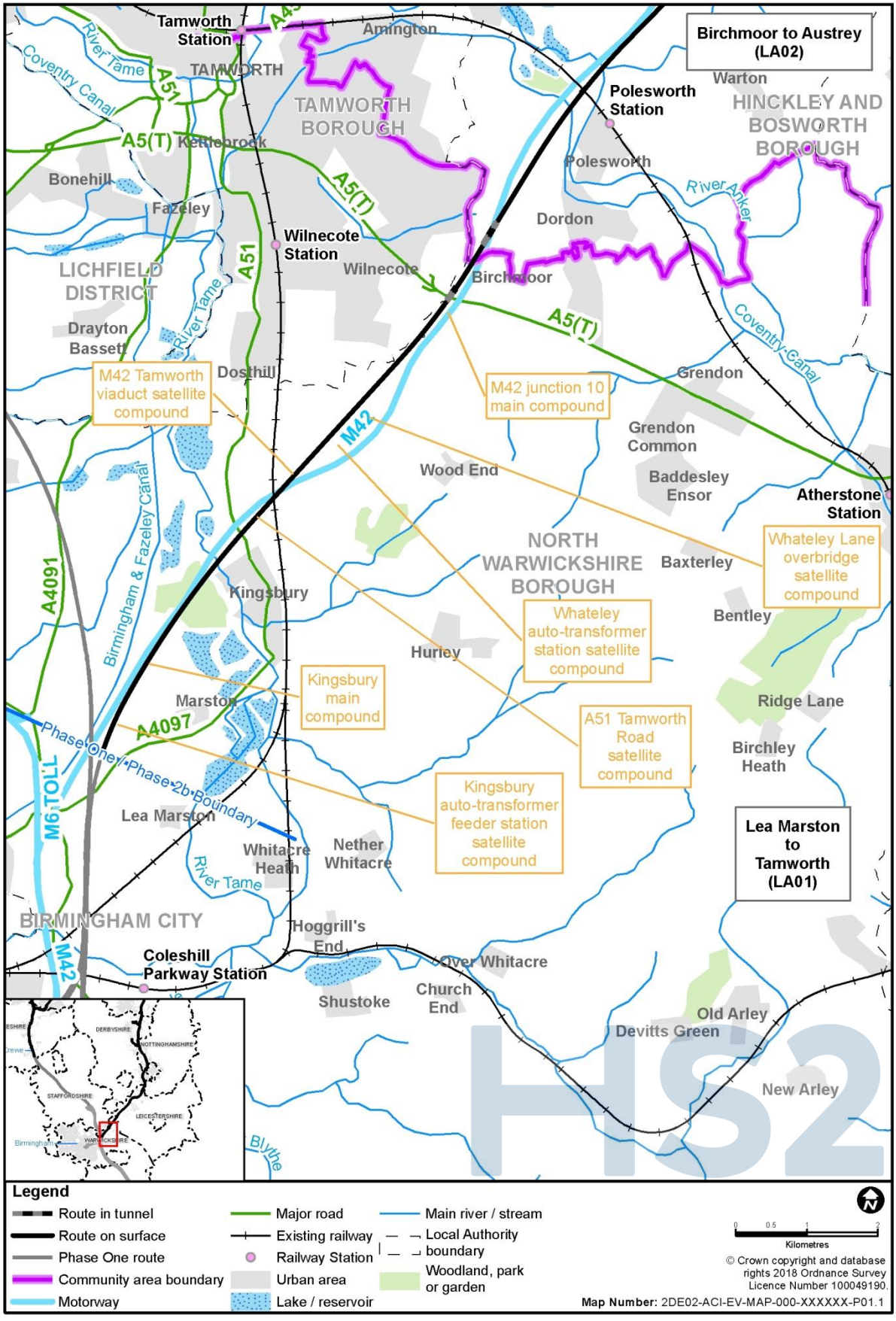
2.3.22 In addition to the compounds located in the Lea Marston to Tamworth area, Stoneydelph satellite compound in the adjacent Birchmoor to Austrey area (LA02)

would be used to manage the construction of the M42 junction 10 tunnel north portal which would be wholly located in the Lea Marston to Tamworth area.

2.3.23 The M42 Stoneydelph cutting and the M42 temporary realignment would lie across the boundary between the Lea Marston to Tamworth area and the Birchmoor to Austrey area (LA02). However, construction of these features would be managed from compounds in the Birchmoor to Austrey area. Construction of these works is described in detail in Volume 2: Community area LA02, Birchmoor to Austrey.

2.3.24 The location of construction compounds in the Lea Marston to Tamworth area is shown on Figure 4. Map Series CT-05 (in the Volume 2: LA01 Map Book) shows in detail the locations of the construction compounds described below.

Figure 4: Location of construction compounds in the Lea Marston to Tamworth area



2.3.25 Figure 5 shows the management relationship for civil engineering works compounds and Figure 6 for the railway installation works. Details of the works associated with individual compounds are provided in subsequent sections of this report.

2.3.26 Soil stripped as part of the works, prior to it being used when the land is reinstated, would be stored for the duration of construction. The location of topsoil storage areas would generally be adjacent to compounds and areas of construction activity. These areas are referred to as material stockpiles and those adjacent to compounds are shown on maps CT-05-401 to CT-05-406a, in the Volume 2: LA01 Map Book.

2.3.27 Further information on the function of compounds is provided in Section 6 of Volume 1 and Section 5 of the draft CoCP. This includes general provisions for the operation of compounds, such as security fencing, lighting, utilities supply, site drainage and codes of worker behaviour.

Construction traffic routes, site haul routes and transfer nodes

2.3.28 The movement of construction vehicles, whether to carry materials, plant, other equipment and workforce, or moving empty, would take place within the construction compounds, on public roads and between the compounds and working areas. Where reasonably practicable, movements between the construction compounds and the working areas would be on designated haul routes within the construction site, often along the line of the route of the Proposed Scheme or running parallel to it.

2.3.29 The construction compounds would provide the interface between the construction works and the public road or railway network. The likely road routes to access compounds in the Lea Marston to Tamworth area are described in the subsequent sections of this report.

2.3.30 It may be necessary to undertake minor works including a number of minor highways and junction improvements along public roads that would be used as construction traffic routes but are at a distance from the route of Proposed Scheme. These minor works will be reported in the formal ES.

2.3.31 Areas of land are also required for the storage, loading and unloading of bulk earthworks materials that are moved to and from the site on public roads. These areas would allow transfer of material between road vehicles and site vehicles during construction to balance traffic movements on the road network. These areas are referred to as transfer nodes.

Construction compounds

2.3.32 This section provides a summary of the works to be managed from the construction compounds in the Lea Marston to Tamworth area, as illustrated in Figure 5 and Figure 6. All dates and durations of activities and number of workers are indicative. All compounds would undertake initial site set-up works and, at the end of its use, finalisation works including site reinstatement, landscaping and planting (as necessary).

Figure 5: Construction compounds for civil engineering works

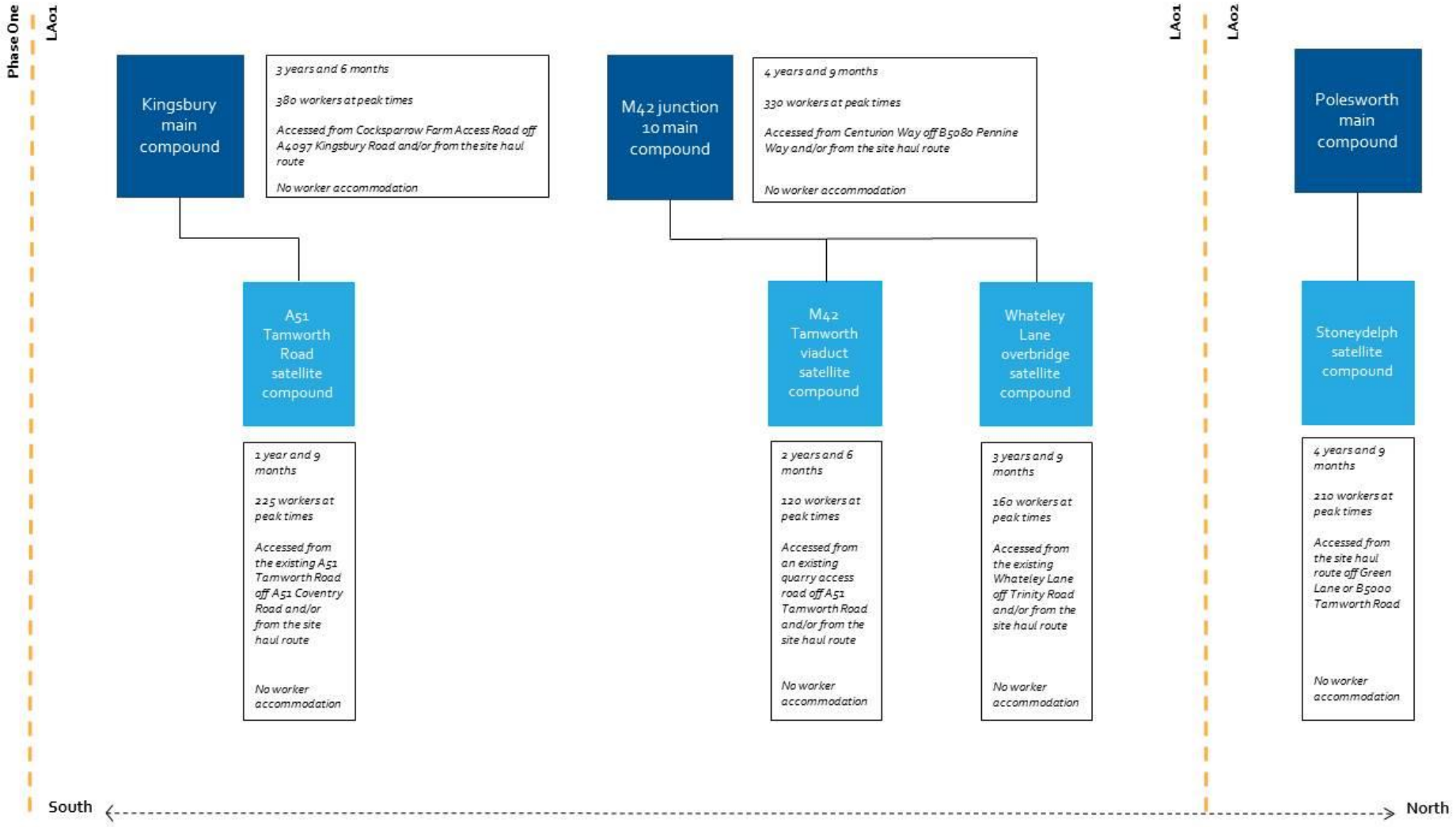
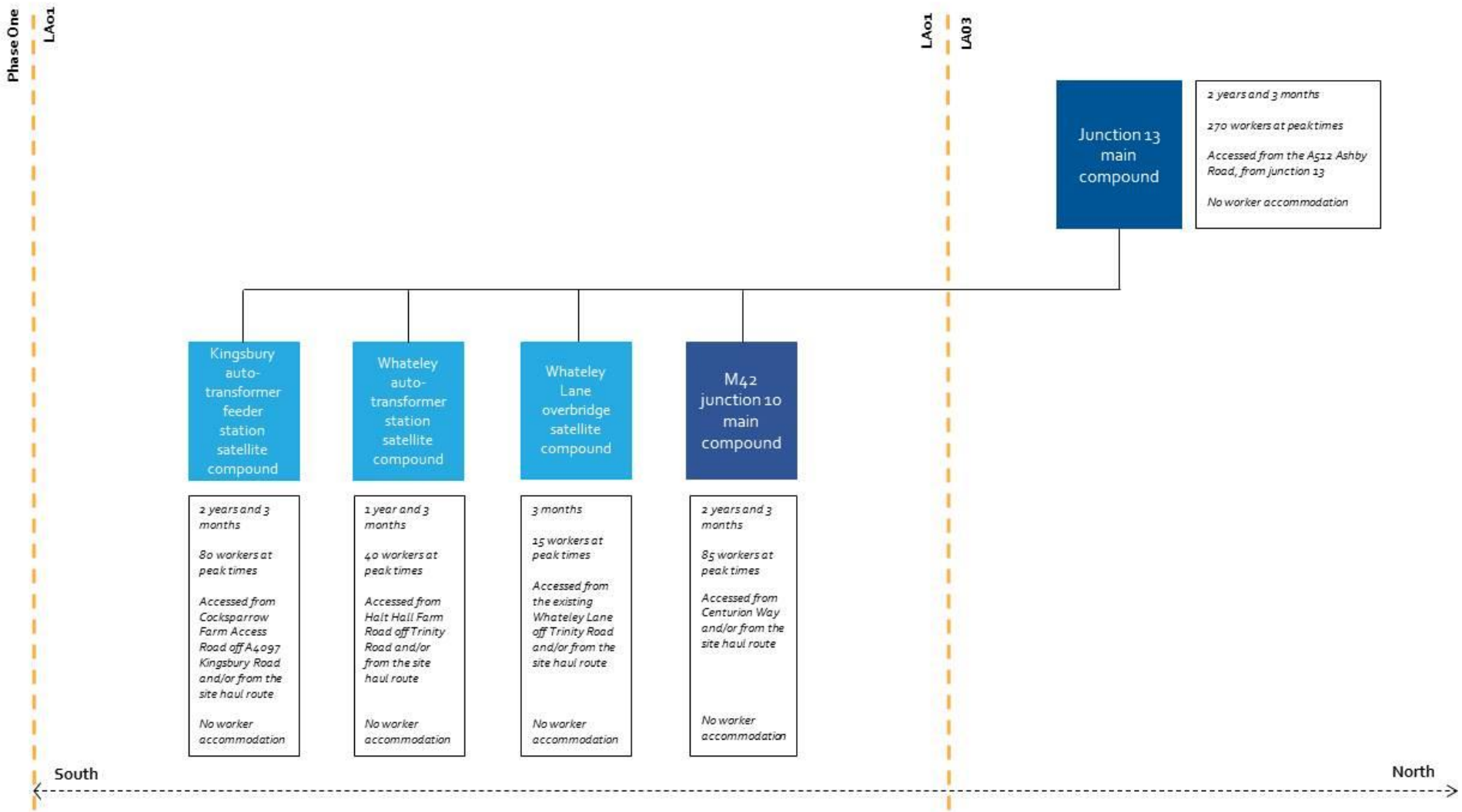


Figure 6: Construction compounds for railway systems works



Kingsbury main compound

2.3.33 This compound (see Map CT-05-401) would be used to manage civil engineering works and provide main compound support to one satellite compound in the Lea Marston to Tamworth area, as illustrated in Figure 5.

2.3.34 The works to be managed from this compound would require demolition of the following buildings and structures, as described in Table 1.

Table 1: Demolitions required as a result of the works to be managed from the Kingsbury main compound

Description	Location	Feature resulting in the demolition
Residential		
Residential property and associated outbuildings	The Bridge House, Dog Lane, Bodymoor Heath	Bodymoor Heath Road realignment
Commercial		
Commercial property and outbuildings at Quarry Works	Bodymoor Heath Lane, Bodymoor Heath	River Tame viaduct
Garden Centre and associated outbuildings	Tamworth Road, Kingsbury	River Tame viaduct
Services fuel station and associated outbuildings	Tamworth Road, Kingsbury	River Tame viaduct
Other		
Pumping station	Tamworth Road, Kingsbury	River Tame viaduct

2.3.35 The compound would be used to manage the construction of the following bridges and viaducts:

- Seeney Lane overbridge, which would take one year and six months to complete;
- Bodymoor Heath Road overbridge, which would take two years to complete;
- River Tame viaduct, which would take three years and three months to complete; and
- A51 Kingsbury viaduct, which would take two years to complete.

2.3.36 The compound would be used to manage the construction of the following earthworks:

- Marston cutting, which would take two years and three months to complete; and
- Marston embankment, which would take two years and six months to complete.

2.3.37 This compound would be used to manage the permanent realignment of Bodymoor Heath Road, 470m to the south of its existing alignment, which would take two years to complete and would be constructed offline[22]. On completion of construction, temporary lane restrictions and traffic management measures would be implemented for a period of approximately six weeks to enable connection between the realigned road and the existing road.

[22] Offline works are works which are generally constructed along or nearby existing routes, which will remain open during construction

2.3.38 The works to be managed from this compound would require the following works to PRoW:

- temporary realignment of Warwickshire Bridleway M23a to the east and west of the route of the Proposed Scheme. During construction, users would be diverted via alternative routes. On completion of construction, Warwickshire Bridleway M23a would be permanently reinstated along its existing alignment over the Seeney Lane overbridge;
- permanent realignment of Warwickshire Footpath M22, to the east of the route of the Proposed Scheme, to re-join its existing alignment at Seeney Lane overbridge; and
- temporary realignment of Warwickshire Footpath T25 to the east and west of the route of the Proposed Scheme. On completion of construction, Warwickshire Footpath T25 would be permanently reinstated along its existing alignment under the River Tame viaduct.

2.3.39 There would also be utilities works managed from this compound.

Kingsbury auto-transformer feeder station satellite compound

2.3.40 This compound (see Map CT-05-401) would be used to manage railway systems works in the Lea Marston to Tamworth area, as illustrated in Figure 6.

2.3.41 No demolitions would be required as a result of the works to be managed from this compound.

2.3.42 Key railway systems works to be managed from this compound would include the construction and installation of the Kingsbury auto-transformer feeder station, located 400m north of Marston Lane. The construction of the Kingsbury auto-transformer feeder station foundations and building would take six months to complete. The installation of the Kingsbury auto-transformer feeder station railway systems equipment would take two years and three months to complete. Construction works for the Kingsbury auto-transformer feeder station would be accessed from Cocksparrow Farm access road off the A4097 Kingsbury Road and/or from the site haul route.

2.3.43 There would also be utilities works managed from this compound.

A51 Tamworth Road satellite compound

2.3.44 This compound (see Map CT-05-403) would be used to manage civil engineering works in the Lea Marston to Tamworth area, as illustrated in Figure 5.

2.3.45 No demolitions will be required as a result of the works to be managed from this compound.

2.3.46 The compound would be used to manage the construction of the A51 Tamworth Road realignment, up to 90m to the north of its existing alignment, which would take one year and six months to complete and would be constructed online east of the route of the Proposed Scheme. The west of the Proposed Scheme will be constructed both offline and online to allow the road to remain open during construction, a temporary

realignment will be in place during this time. On completion of construction, temporary lane restrictions and traffic management measures would be implemented for approximately six weeks to enable connection between the realigned road and the existing road.

2.3.47 The works to be managed from this compound would require the permanent realignment of two sections of Thistlewood Brook. One section would be realigned for 300m under the River Tame viaduct. A second section would be realigned for 470m under the realigned A51 Tamworth Road via the Thistlewood Brook culvert.

2.3.48 There would also be utilities works managed from this compound.

M42 junction 10 main compound

2.3.49 This compound (see Map CT-05-405) would be used to manage civil engineering works and provide main compound support to two satellite civil engineering compounds in the Lea Marston to Tamworth area, as illustrated in Figure 5. The compound would also be used for railway systems installation works and to support two railway systems satellite compounds during the civil engineering construction phase, as illustrated in Figure 6.

2.3.50 The works to be managed from this compound would require demolition of the following buildings and structures, as described in Table 2.

Table 2: Demolitions required as a result of the works to be managed from the M42 junction 10 main compound

Description	Location	Feature resulting in the demolition
Residential		
Seven residential properties and outbuildings on Whateley Lane	Whateley Lane, Whateley, Tamworth	Whateley cutting
Two residential properties on Kinsall Green	Kinsall Green, Wilnecote, Tamworth	M42 junction 10 tunnel
Commercial		
Commercial garage and outbuildings	Kinsall Green, Wilnecote, Tamworth	M42 junction 10 tunnel
Office building	Kinsall Green, Wilnecote, Tamworth	M42 junction 10 tunnel
Commercial warehouse and outbuilding	Centurion Way, Wilnecote, Tamworth	Wilnecote cutting
Commercial warehouse	Centurion Way, Wilnecote, Tamworth	Wilnecote cutting
Other		
Pumping station	M42 junction 10, Tamworth	M42 junction 10 tunnel

2.3.51 The compound would be used to manage the construction of the Overwoods Road overbridge, which would take one year and three months to complete.

2.3.52 The compound would be used to manage the construction of the following earthworks:

- Piccadilly embankment, which would take two years to complete;
- Whateley cutting which would take three years to complete;
- Freasley embankment, which would take one year to complete; and
- Wilnecote cutting which would take two years and six months to complete.

2.3.53 The compound would be used to manage the construction of the following tunnel and associated infrastructure:

- M42 junction 10 tunnel south portal, which would take two years and nine months to complete; and
- M42 junction 10 tunnel, which would take four years and nine months to complete. The earthworks excavated for the M42 junction 10 tunnel would be reinstated over the top of the cut and cover section of the tunnel on completion of construction.

2.3.54 The works to be managed from this compound would require the following works to public roads:

- temporary realignment of 370m of Overwoods Road to the north of its existing alignment during construction of Overwoods Road overbridge for a period of one year and three months. Following the construction period, Overwoods Road would be reinstated along its existing alignment; and
- M42 Junction 10 roundabout would be permanently modified by widening the carriageway pavement and moving the running lanes eastwards, which would take three months to complete. It would be constructed through the use of temporary measures, which include traffic management and night-time closures. Temporary realignment of Green Lane at the M42 junction 10 during construction for a period of two years. During this time, the cut and cover section of the M42 junction 10 tunnel would be constructed. Following the construction period, Green Lane would be reinstated along its existing alignment.

2.3.55 The works to be managed from this compound would require the following works to PRoW:

- permanent realignment of Warwickshire Bridleway T67p to the east and west of the route of the Proposed Scheme, to run parallel to the M42 before passing beneath the M42 Tamworth viaduct and re-joining its existing alignment;
- permanent diversion of Warwickshire Footpath T70 to the east of the route of the Proposed Scheme, to run parallel to the Proposed Scheme and join Whateley Lane;
- permanent realignment of Warwickshire Footpath AE203 to the west of the route of the Proposed Scheme from Whateley Lane overbridge to re-join its existing alignment at its connection to Warwickshire Footpath T77;
- permanent closure of a section of Warwickshire Footpath T77 to the east of the route of the Proposed Scheme, with an alternative route provided by Whateley Lane overbridge;
- permanent diversion of Warwickshire Footpath T170 to the east of the Proposed Scheme to run parallel to the route of the Proposed Scheme up to Overwoods Road;
- Staffordshire Bridleway Tamworth 79 which runs between Falcon and south of Centurion Way would be closed from south of Centurion Way to Warwickshire Bridleway AE56 and would be diverted to an existing unnamed footpath which

links to Swallowhurst; and

- Warwickshire Bridleway AE56 would be closed and be diverted along the proposed diversion route of Staffordshire Bridleway Tamworth 79.

2.3.56 This compound would manage the construction of the following culverts:

- Freasley culvert for the permanent realignment of a section of Kettle Brook under the Freasley embankment, which would take six months to complete; and
- Kettle Brook culvert to carry a section of Kettle Brook under a balancing pond access road.

2.3.57 Key railway systems installation works to be managed from this compound would include the installation of crossover connections on the route of the Proposed Scheme and electrical portal building construction with fit-out, which would take two years and three months to complete. Construction works would be accessed from Centurion Way.

2.3.58 There would also be utilities works managed from this compound.

M42 Tamworth viaduct satellite compound

2.3.59 This compound (see Map CT-05-403) would be used to manage civil engineering works in the Lea Marston to Tamworth area, as illustrated in Figure 5.

2.3.60 No demolitions would be required as a result of the works to be managed from this compound.

2.3.61 The compound would be used to manage the construction of the M42 Tamworth viaduct, which would take two years and three months to complete.

2.3.62 The compound would be used to manage the construction of the Piccadilly embankment culvert, which would take three months to complete.

2.3.63 There would also be utilities works managed from this compound.

Whateley auto-transformer station satellite compound

2.3.64 This compound (see Map CT-05-404) would be used to manage railway systems works in the Lea Marston to Tamworth area, as illustrated in Figure 6.

2.3.65 No demolitions would be required as a result of the works to be managed from this compound.

2.3.66 Key railway systems works to be managed from this compound would include the construction and installation of the Whateley auto-transformer station, located 60m north-east of Holt Hall Farm. The installation of the railway systems equipment would take one year and three months to complete. Construction works for the Whateley auto-transformer station would be accessed from Holt Hall Farm Road off Trinity Road and/or from the site haul route.

2.3.67 There would also be utilities works managed from this compound.

Whateley Lane overbridge satellite compound

2.3.68 This compound (see Map CT-05-404) would be used to manage civil engineering and railway systems installation works in the Lea Marston to Tamworth area, as illustrated in Figure 5 and Figure 6.

2.3.69 No demolitions would be required as a result of the works to be managed from this compound.

2.3.70 The compound would be used to manage the construction of the Whateley Lane overbridge, which would take one year and three months to complete and support the installation of railway systems.

2.3.71 The works to be managed from this compound would require the temporary closure of 260m of the north leg of Whateley Lane during construction for a period of one year and four months, with diversions along the south leg of Whateley Lane. During this time the Whateley Lane overbridge would be constructed and connected to the north leg of Whateley Lane. The south leg of Whateley Lane would then be permanently closed west of the Proposed Scheme.

2.3.72 Key railway systems works to be managed from this compound would include the installation of crossovers, which would take three months to complete. All construction works managed from this compound would be accessed via existing Whateley Lane off Trinity Road and/or from the site haul route.

2.3.73 There would also be utilities works managed from this compound.

Stoneydelph satellite compound

2.3.74 This satellite compound would be located within the Birchmoor to Austrey area (LA02) (see Volume 2: LA02 Map Book, Map Series CT-05). The compound would be used to manage construction of the M42 junction 10 tunnel north portal which lies wholly within the Lea Marston to Tamworth area. The M42 Stoneydelph cutting which lies across the boundary between the Lea Marston to Tamworth area and the Birchmoor to Austrey area is described in detail in Volume 2: Community area LA02, Birchmoor to Austrey.

2.3.75 The works to be managed from this compound would require demolition of the following buildings and structures, as described in Table 3.

Table 3: Demolitions required as a result of the works to be managed from the Stoneydelph satellite compound

Description	Location	Feature resulting in the demolition
Commercial		
Motorway services area and outbuildings	Green Lane, Wilnecote, Tamworth	M42 Stoneydelph cutting
Hotel at motorway services area and associated outbuildings	Green Lane, Wilnecote, Tamworth	M42 Stoneydelph cutting
Retail unit	Green Lane, Wilnecote, Tamworth	M42 Stoneydelph cutting
Other		
Stables	Green Lane, Tamworth	M42 Stoneydelph cutting
Stables	near Birch Grove, Tamworth	M42 Stoneydelph cutting

2.3.76 The compound would be used to manage construction of the M42 junction 10 tunnel north portal, which would take two years to complete.

2.3.77 The compound would be used to manage construction of the M42 Stoneydelph cutting, which would take four years and nine months to complete.

2.3.78 There would also be utilities works managed from this compound.

Construction waste and material resources

2.3.79 Forecasts of the amount of construction, demolition and excavation waste (CDEW) that would be produced during construction of the Proposed Scheme are reported in Volume 3: Route-wide effects.

2.3.80 Local excess or shortfall of excavated material within the Lea Marston to Tamworth area would be managed through the mitigation earthworks design approach adopted for the Proposed Scheme, with the aim of contributing to an overall balance of excavated material on a route-wide basis. The overall balance of excavated material will be presented in Volume 3 of the formal ES.

Commissioning of the railway

2.3.81 Commissioning is the process of testing the infrastructure to ensure that it operates as expected. It would be carried out in the period prior to opening. Further details are provided in Volume 1, Section 6.

Construction programme

2.3.82 A construction programme illustrating indicative periods for each of the core construction activities described above is provided in Figure 7. Construction durations referred to in the following sections of this report are based on this indicative programme.

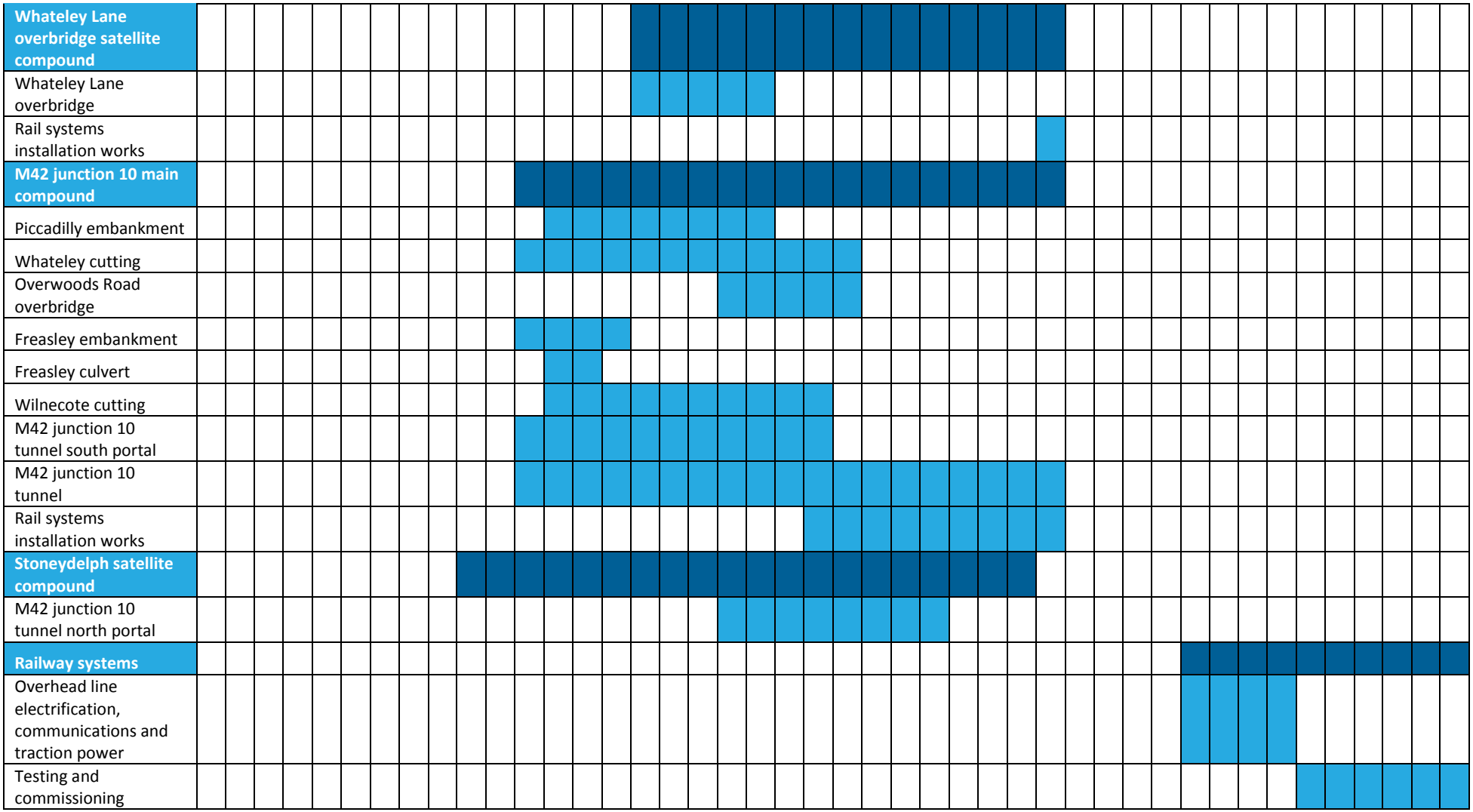
Monitoring during construction

2.3.83 The appointed contractor would be required to undertake the necessary monitoring for each environmental topic to comply with the requirements of the CoCP, the relevant LEMP and any additional consent requirements. Any actions that may be necessary for compliance would be reported to the nominated undertaker and remedial action identified.

2.3.84 The CoCP and the relevant LEMP would set out inspection and monitoring procedures to assess the effectiveness of measures to prevent or reduce environmental effects during construction. Relevant local authorities and consenting authorities, such as the Environment Agency, would be consulted on the monitoring procedures to be implemented prior to construction commencement.

Figure 7: Indicative construction programme between 2023 and 2033

Lea Marston to Tamworth	2023 Quarters				2024 Quarters				2025 Quarters				2026 Quarters				2027 Quarters				2028 Quarters				2029 Quarters				2030 Quarters				2031 Quarters				2032 Quarters				2033 Quarters			
Construction Activity	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
Main Works Civils Contractor early works																																												
Kingsbury auto-transformer feeder station satellite compound																																												
Rail systems installation works																																												
Kingsbury main compound																																												
Marston cutting																																												
Seeney Lane overbridge																																												
Marston embankment																																												
Bodymoor Heath Road overbridge																																												
River Tame viaduct																																												
A51 Kingsbury viaduct																																												
A51 Tamworth Road satellite compound																																												
A51 Tamworth Road realignment																																												
M42 Tamworth viaduct satellite compound																																												
M42 Tamworth viaduct																																												
Piccadilly embankment culvert																																												
Whateley auto-transformer station satellite compound																																												
Rail systems installation works																																												


Whateley Lane overbridge satellite compound
Whateley Lane overbridge
Rail systems installation works
M42 junction 10 main compound
Piccadilly embankment
Whateley cutting
Overwoods Road overbridge
Freasley embankment
Freasley culvert
Wilnecote cutting
M42 junction 10 tunnel south portal
M42 junction 10 tunnel
Rail systems installation works
Stoneydelph satellite compound
M42 junction 10 tunnel north portal
Railway systems
Overhead line electrification, communications and traction power
Testing and commissioning

2.4 Operation of the Proposed Scheme

Introduction

2.4.1 This section describes the operational characteristics of the Proposed Scheme in the Lea Marston to Tamworth area. Volume 1, Section 4 describes the envisaged operational characteristics of the Proposed Scheme as a whole, including Phase One, Phase 2a and Phase 2b.

HS2 services

2.4.2 It is anticipated that there would be up to nine trains per hour each way passing through the Lea Marston to Tamworth area. Services are expected to operate between 05:00 and midnight from Monday to Saturday and 08:00 and midnight on Sunday.

2.4.3 In this area, trains would run at speeds of up to 225mph (360kph). The trains would be either single 200m trains or two 200m trains coupled together, depending on demand and time of day.

Maintenance

2.4.4 Volume 1, Section 4 describes the maintenance regime for the Proposed Scheme.

2.4.5 Asset performance and condition monitoring would be undertaken using asset condition monitoring and unattended measurement systems fitted to the HS2 passenger rolling stock. Intrusive inspections would be carried out during the maintenance period. The maintenance approach would be a combination of risk based, preventative and reactive maintenance.

2.4.6 Provision for railway maintenance vehicles along the eastern leg of the route of the Proposed Scheme would be made at the Staveley depot in the Staveley to Aston area (LA11). Further information on the Staveley depot can be found in Volume 2: Community area report LA11, Staveley to Aston.

Operational waste and material resources

2.4.7 The assessment of the likely significant environmental effects associated with the disposal of operational waste will be undertaken for the Proposed Scheme as a whole and reported in Volume 3: Route-wide effects of the formal ES.

2.4.8 Forecasts of the amount of waste arising from track maintenance and ancillary infrastructure and the associated potential significant environmental effects will also be reported in the formal ES.

Monitoring during operation

2.4.9 The nominated undertaker would be responsible for monitoring during operation of the Proposed Scheme. Proposed indicative area-specific monitoring measures for each environmental topic area are presented in Sections 4 to 15 of this report based on the current level of assessment.

2.4.10 Relevant local authorities and consenting authorities, such as the Environment Agency, will be consulted on the monitoring procedures to be implemented during operation prior to construction commencement.

2.5 Route section alternatives

Proposed auto-transformer feeder station and grid supply point locations

2.5.1 During the design development process since the announcement of the preferred route in July 2017, consideration has been given to the location of an auto-transformer feeder station in Lea Marston, which would supply electrical power from the National Grid network to the Proposed Scheme. The auto-transformer feeder station would house the electrical equipment that would protect and control the power supply to the Proposed Scheme. The auto-transformer feeder station would be required at the start of a neutral section[23] along the route of the Proposed Scheme at a location with a potential grid supply point to provide grid connection to existing electrical infrastructure.

2.5.2 The following three options were taken forward in October 2017 to a more detailed appraisal where engineering and construction feasibility, cost and environmental impacts were considered:

- Option A1.0: the auto-transformer feeder station would be located east of the route of the Proposed Scheme, adjacent to the realigned Bodymoor Heath Road in Bodymoor Heath, and would require 3.5km of incoming feeder cables from Hams Hall 132kV National Grid substation;
- Option A1.1: the auto-transformer feeder station would be located east of the route of the Proposed Scheme and north of Marston Lane in Lea Marston, and would require 2km of incoming feeder cables from Hams Hall 132kV National Grid substation; and
- Option A1.2: the auto-transformer feeder station would be located north-west of the M42 junction 9, to the west of the route of the Proposed Scheme, the M42 and the Birmingham to Fazeley Canal. This option would require the construction of a new grid supply point adjacent to the west of the auto-transformer feeder station, which would provide very short incoming connections.

2.5.3 Table 4 provides a summary of the outcomes of the preliminary appraisal of the alternative options described above.

[23] A neutral section is an insulated section that prevents two differing electrical sections from touching, by introducing an electrical clearance (an earth section)

Table 4: Consideration of local alternatives for an auto-transformer feeder station in the Lea Marston to Tamworth area

Option	Outcome of analysis	Further action/considerations
Option A1.0	Smaller area of broadleaved woodland habitat loss compared to the Proposed Scheme. Less likelihood of impact on non-designated heritage assets (ridge and furrow ploughing in the two fields adjacent to Mullensgrove Farm in Lea Marston) compared to the Proposed Scheme. Greater visual impacts for recreation receptors along Warwickshire Footpath M22 compared to the Proposed Scheme. Potential greater risk of groundwater contamination compared to the Proposed Scheme. Similar technical and engineering complexities, construction programme and costs to the Proposed Scheme.	This option will not be subject to further consideration
Option A1.1 (the Proposed Scheme)	Larger area of broadleaved woodland lost compared to alternative options. Greater potential for impacts on non-designated heritage assets (ridge and furrow ploughing in the two fields adjacent to Mullensgrove Farm in Lea Marston) compared to Option A1.0, but less potential to affect non-designated heritage assets compared to Option A1.2. Fewer landscape character impacts and fewer visual impacts on recreational users of Warwickshire Footpath M22 and the cycleway/towpath of the Birmingham and Fazeley Canal compared to the alternative options. Fewer technical and engineering complexities compared to Option A1.2 though similar technical and engineering complexities compared with Option A1.0. Similar construction programme compared to the alternative options. Similar costs compared to Options A1.0, and would cost less than Option A1.2.	This is the selected option taken forward into the Proposed Scheme
Option A1.2	Larger area of pond habitat lost at Cuttle Mill Fishery compared to the Proposed Scheme. Larger area of agricultural land (quality unknown) lost compared to the Proposed Scheme. Greater difficultly providing vehicular access for maintenance of the auto-transformer feeder station and grid supply point compared to the Proposed Scheme. Greater risk of flooding from surface water and potential to increase flood risk elsewhere compared to the Proposed Scheme. Greater landscape character impacts and visual impacts to users of the cycleway/towpath of the Birmingham and Fazeley Canal compared to the Proposed Scheme. Similar technical and engineering complexities to the Proposed Scheme, although an additional site for the grid supply point of similar area as the auto-transformer feeder station would require preparation for this option compared to the Proposed Scheme. Higher construction and maintenance costs for the grid supply point (which would have a similar footprint to that of the auto-transformer feeder station site) compared to cabling from existing Hams Hall substation for the Proposed Scheme. Similar construction programme to the Proposed Scheme.	This option will not be subject to further consideration

2.5.4 Option A1.1 was taken forward into the Proposed Scheme. Whilst Option A1.0 would have less adverse impacts on broadleaved woodland and pond habitats and reduced potential to impact the non-designated heritage assets (ridge and furrow ploughing in the two fields adjacent to Mullensgrove Farm in Lea Marston) when compared to Option A1.1, Option A1.0 (in comparison to Option A1.1), would have a greater visual impact upon nearby recreational receptors using Warwickshire Footpath M22. Option A1.2, in comparison to Option A1.1, would have a greater cost associated with the construction and maintenance of the new grid supply point and a greater impact on the environment including greater landscape and visual impacts, greater loss of agricultural land and increased flood risk.

Proposed auto-transformer feeder station - further refinement

2.5.5 During the design development process since completion of the October 2017 sift (see above), further consideration has been given to the location of an auto-transformer feeder station following development of the interface of Phase One with Phase 2b.

2.5.6 The following two options were taken forward in April 2018 to a further detailed appraisal that followed engagement with the appointed Phase One construction contractors on their design, engineering and construction feasibility, cost and environmental impacts:

2.5.7 Option A1.1: the preferred auto-transformer feeder station option identified in the previous sift in October 2017 would be located to the east of the route of the Proposed Scheme and north of Marston Lane, in Lea Marston, and would require 2km of incoming feeder cables from Hams Hall 132kV National Grid substation; and

2.5.8 Option A1.3: the auto-transformer feeder station would be located to the east of the route of the Proposed Scheme and west of the A4097 Kingsbury Road in Lea Marston, 300m north of Option A1.1.

2.5.9 Table 5 provides a summary of the outcomes of the preliminary appraisal of Option A1.1 and Option A1.3 described above.

Table 5: Consideration of local alternatives for an auto-transformer feeder station in the Lea Marston to Tamworth area – April 2018

Option	Outcome of analysis	Further action/considerations
Option A1.1	Similar environmental constraints to Option A1.3. Less ability to achieve compliant neutral section[24] gradients compared to the Proposed Scheme and less ability to provide sufficient neutral section clearance compared to the Proposed Scheme. The location of this option would conflict with the location of a proposed balancing pond for the emerging Phase One detailed design at the Phase One/Phase 2b interface. Similar construction programme and cost compared to the Proposed Scheme.	This option will not be subject to further consideration

[24] A neutral section is a section of insulated overhead wire which provides a physical separation between two separate powered sections of overhead line.

Option	Outcome of analysis	Further action/considerations
Option A1.3 (the Proposed Scheme)	Similar environmental constraints to Option A1.1. Greater ability to achieve compliant neutral section gradients compared to Option A1.1 and greater ability to provide sufficient neutral section clearance compared to Option A1.1. Avoids a conflict with the location of the Proposed Scheme and the location of a proposed Phase One balancing pond for the emerging Phase One detailed design at the Phase One/Phase 2b interface. Similar construction programme and cost compared to Option A1.1.	This is the selected option taken forward into the Proposed Scheme

2.5.10 In April 2018, Option A1.3 was taken forward into the Proposed Scheme. Whilst Option A1.1 and Option A1.3 have very few differences in terms of environmental factors, Option A1.3 was chosen as it would better achieve compliant neutral section gradients, provide sufficient neutral section clearance and would avoid conflicting with the proposed Phase One balancing pond located at the interface with Phase 2b.

3 Stakeholder engagement and consultation

3.1 Introduction

3.1.1 HS2 Ltd's approach to stakeholder engagement and consultation on the Proposed Scheme is set out in Volume 1, Section 3.

3.1.2 Since the initial preferred route announcement in November 2016, HS2 Ltd has carried out a programme of informal stakeholder engagement and formal consultation with a broad range of stakeholders.

3.1.3 A variety of mechanisms have been used to enable an open and inclusive approach to engagement and consultation, reflecting the differing requirements and expectations of stakeholders.

3.1.4 Whilst stakeholders have informed the design and assessment of the Proposed Scheme to-date, it is important to note that this is an ongoing process. Feedback from the consultation on the working draft ES and emerging scheme design and ongoing engagement will continue to be considered as part of the ongoing design and assessment of the Proposed Scheme ultimately presented in the formal ES. There will be further consultation undertaken on the formal ES by Parliament following deposit of the hybrid Bill.

3.2 Key stages of Phase 2b engagement and consultation

3.2.1 The process of engagement remains ongoing. A summary of engagement undertaken or underway since the initial preferred route announcement in November 2016, is provided in Table 6.

Table 6: Mechanisms and timeline of stakeholder engagement since route announcement

Engagement and consultation activity and mechanisms	Date
Phase 2b initial preferred route announcement	15 November 2016
Phase 2b route refinement and property consultations	15 November 2016 – 9 March 2017
Phase 2b information events to support the route refinement and property consultations	January -February 2017
Confirmation of Phase 2b route announcement	17 July 2017
Start date of engagement with local communities and stakeholders on the confirmed Phase 2b route	July 2017
Consultation on the draft EIA and Equality Impact Assessment (EQIA) Scope and Methodology Report (SMR) to inform the EIA and EQIA and the proposed relocation of the Eastern Leg Rolling Stock Depot	17 July 2017 – 29 September 2017

Engagement and consultation activity and mechanisms	Date
Phase 2b information events to support SMR and Eastern Leg Rolling Stock Depot consultations	September 2017
Phase 2b information events to provide update on design development	June-July 2018
Phase 2b consultation on the working draft ES and working draft EQIA	October – December 2018

Draft EIA SMR consultation

3.2.2 The EIA SMR was formally consulted on between July and September 2017 and was issued to statutory bodies, non-government organisations and local authorities. It was also available on the Government's website, allowing comment by local interest groups and the public. One hundred and seven responses to the SMR were received, as a result of which changes were made to the SMR. These are set out in the SMR Consultation Summary Report published alongside this working draft ES, and will be used to inform the assessment methodologies applied for the formal ES.

Consultation on the working draft ES and ongoing engagement

3.2.3 As set out in Volume 1, the working draft ES is being formally consulted upon. The consultation is taking place during October 2018 to December 2018. A parallel consultation on the working draft equality impact assessment (EQIA) is also being undertaken during this period. As part of the process of consultation, stakeholders are invited to comment on the Proposed Scheme and the working draft ES and EQIA Reports which inform it.

3.2.4 These consultations and wider feedback from ongoing stakeholder engagement will continue to be considered as part of the ongoing design of the Proposed Scheme and the assessment and identification of mitigation opportunities for the Lea Marston to Tamworth area. A consultation summary report will be published with the formal ES explaining how the responses have been taken into consideration.

3.3 Informing the Proposed Scheme

3.3.1 The main purpose of stakeholder engagement and consultation at this early stage is to inform the Proposed Scheme. Volume 1 details the engagement and consultation undertaken prior to initial preferred route announcement in November 2016.

3.3.2 The main themes to emerge from stakeholder engagement in the Lea Marston to Tamworth area since the initial preferred route announcement in November 2016, and which are informing the Proposed Scheme are:

- temporary and permanent land required during construction and operation;
- refining the location of balancing ponds and environmental mitigation to minimise the loss of agricultural land;
- provision of access to severed agricultural land, including access under viaducts and the provision of farm access tracks;

- retention or realignment of PRoW including the Heart of England Way;
- temporary or permanent changes to road access;
- traffic impacts on local roads during construction;
- impacts on access to local community educational/sporting/leisure/cultural facilities including Kingsbury Water Park;
- impacts to local businesses;
- acknowledgement of existing high levels of traffic and constraints around M42 junction 10; and
- appreciation of Kingsbury's position at the interface point with Phase One – understanding the additional impacts this brings to the community of Kingsbury, experiencing longer term disruption during the construction phases of Phase One and Phase 2b.

3.3.3 Stakeholder feedback will continue to be considered as part of the ongoing design of the Proposed Scheme and will be reported in the formal ES.

3.4 Engagement and consultation with stakeholder groups

Communities

3.4.1 Community stakeholders in the Lea Marston to Tamworth area include a range of local interest groups, local facility and service providers, places of worship, schools and educational establishments, cultural, leisure and sports stakeholders.

3.4.2 The purpose of this engagement has been to give affected communities the opportunity to raise issues in relation to the Proposed Scheme. Community stakeholders have been provided with information on the development of the Proposed Scheme, as a basis from which to identify potential impacts and opportunities for mitigation within the local area, reflecting local conditions and issues.

3.4.3 Engagement has been, and will continue to be, undertaken with schools and educational establishments, in particular, with those within proximity to the Proposed Scheme and those with specialist interests or catering to the needs of vulnerable people within the community. This has informed the assessment of community and health in the working draft ES, whilst also informing the separate EQIA being undertaken in parallel to the EIA.

3.4.4 As part of the consultation process for this working draft ES, public events are being held in communities across the route of the Proposed Scheme. Communities have been notified of these events through a range of publicity in the Lea Marston to Tamworth area and also through the www.gov.uk/hs2 website. Documents have been made available online and in community libraries. Members of local communities and other interested parties have been invited to engage on issues pertinent to the working draft ES and the development of the Proposed Scheme design.

3.4.5 Table 7 summarises key engagement undertaken with community stakeholders to date, including the focus of the engagement and how this has informed the design of the Proposed Scheme.

Table 7: Engagement to date with community stakeholders

Stakeholder	Area of focus
Kingsbury Residents group	Meeting to discuss the Proposed Scheme, including timescales and potential impacts and opportunities for mitigation
The Wilnecote School	Meetings to discuss the Proposed Scheme and potential impacts on the local area and access, including timescales for the assessment the project more broadly and potential impacts on the local area including traffic and impacts on access.
Rawlett Secondary School, Tamworth	Meeting to discuss the Proposed Scheme, including timescales for the assessment and the project more broadly, potential impacts on the local area including traffic and impacts on access
Echills Wood Railway	Discussion around the Proposed Scheme impacts and potential mitigation measures for the operability of the railway during construction and operation
Best Foot Forward (Kingsbury Walking Group)	Meeting to discuss the Proposed Scheme (including discussion of timescales for assessment and the project) and potential impacts on local connectivity in Kingsbury
Wilnecote and Hockley Residents Association	Meeting to discuss the Proposed Scheme and potential impacts on the local area, and to give an update on project progress and discuss timescales

Local authorities and parish councils

3.4.6 Direct engagement has been offered to and undertaken with county, borough, district and parish councils within the Lea Marston to Tamworth area. The purpose of this engagement is to collate local baseline information and knowledge to inform the design and assessment, identify and understand local issues and concerns, provide access to wider stakeholders and communities and provide a mechanism for ongoing dialogue and discussion on the assessment and design development.

3.4.7 Engagement has focused on the technical areas which inform the assessment, including, landscape and visual, sound, noise and vibration and traffic and transport, amongst other topics.

3.4.8 Key issues identified during engagement with local authorities and parish councils include those summarised in Table 8.

Table 8: Engagement to date with local authorities and parish councils

Stakeholder	Area of focus
Warwickshire County Council	Engagement to provide an update on the Proposed Scheme and understand the local conditions and factors to inform scheme design and working draft ES
	Meetings to discuss the operability of Kingsbury Water Park during construction and operation of the Proposed Scheme

	Meetings to discuss highways impacts, including local roads and trunk roads
	Meeting to discuss the traffic and transport assessment and gaining understanding of key local constraints
	Meeting to discuss sensitive ecological receptors, plans for mitigation and gather information to assist the ecological assessment within the working draft ES
	Engagement around establishment of representative viewpoint and photomontage locations for landscape assessment and surveys
Staffordshire County Council	Engagement to provide an update on the Proposed Scheme and understand the local conditions and factors to inform scheme design and working draft ES
	Meeting to discuss the traffic and transport assessment and gaining understanding of key local constraints and discussion around highways impacts
	Engagement around establishment of representative viewpoint and photomontage locations for landscape assessment and surveys
Tamworth Borough Council	Meetings to provide an update on the Proposed Scheme and to better understand the local conditions and factors to inform the Proposed Scheme design
	Engagement around highways impacts, including local roads and trunk roads and detail around the traffic and transport assessment and gaining understanding of key local constraints
	Engagement around establishment of representative viewpoint and photomontage locations for landscape assessment and surveys
North Warwickshire Borough Council	Meetings provide an update on the Proposed Scheme and to better understand the local conditions and factors to inform the Proposed Scheme design
	Meetings with technical leads to collate data and discuss key assessment topics including: air quality; land quality; sound, noise and vibration and waste.
	Engagement around establishment of representative viewpoint and photomontage locations for landscape assessment and surveys
Curdworth Parish Council	Briefings on the Proposed Scheme, timelines and gather feedback on local conditions and concerns, including those of consecutive construction impacts from both Phase One and 2b and the impacts of traffic diversions.
Lea Marston Parish Council	Briefings on the Proposed Scheme, timelines and to gather feedback on local conditions and concerns, including those of consecutive construction impacts from both Phase One and 2b and the impacts of traffic diversions
Kingsbury Parish Council	Briefings on the Proposed Scheme, timelines and to gather feedback on local conditions and concerns, including those of consecutive construction impacts from both Phase One and 2b and the impacts of traffic diversions
Dordon Parish Council	Briefings on the Proposed Scheme, timelines and to gather feedback on local conditions and concerns

3.4.9 Councils will continue to be engaged as part of the design development of the Proposed Scheme with ongoing dialogue on key topics such as highways, PRoW and the draft Code of Construction Practice (CoCP)[25].

Expert, technical and specialist groups

3.4.10 Engagement has also been undertaken with expert, technical and specialist groups to provide appropriate specialist input, as and where appropriate. Stakeholders engaged to date include:

- Animal and Plant Health Agency;
- British Geological Survey;
- Campaign to Protect Rural England;
- Canal & River Trust;
- Coal Authority;
- Department of Environment, Food and Rural Affairs;
- Environment Agency;
- Fera Science Ltd;
- Forestry Commission;
- Highways England;
- Historic England;
- Inland Waterways Association;
- National Farmers Union;
- National Trust;
- Natural England;
- Network Rail;
- Public Health England;
- Ramblers Association;
- Royal Agricultural Society;
- Royal Society for the Protection of Birds;
- Royal Society of Wildlife Trusts/The Wildlife Trusts;
- Staffordshire Wildlife Trust;
- Woodland Trust; and
- Warwickshire Wildlife Trust.

[25] Supporting document: Draft Code of Construction Practice

3.4.11 A key purpose of this engagement has been to obtain detailed specialist baseline information to inform the working draft ES and the design development of the Proposed Scheme.

3.4.12 Further information about topic-specific engagement is provided in Sections 4 to 15, where relevant.

Utilities

3.4.13 Engagement is also ongoing with utility companies and statutory stakeholders such as Three, EE, Vodafone, Virgin Media, Sky, National Grid, Cadent, South Staffordshire Water, Western Power Distribution, Network Rail and the Oil and Pipelines Agency to establish what infrastructure exists in the Lea Marston to Tamworth area and how it may need to be modified as part of the Proposed Scheme.

Directly affected individuals, major asset owners and businesses

3.4.14 This group includes those with property potentially affected by the Proposed Scheme, including individuals, major asset owners and businesses within the Lea Marston to Tamworth area.

3.4.15 Engagement is ongoing with farmers and growers whose land or property would be directly affected by the Proposed Scheme whether permanently or temporarily. The purpose of this engagement has been to obtain baseline information and provide them with the opportunity to raise issues and discuss mitigation in relation to the Proposed Scheme. For example, the location of environmental mitigation will seek to reduce the loss of agricultural land and the location of accommodation overbridges across the route will be considered to better reflect the needs of farmers.

3.4.16 Information gathered from four farm visits have informed the assessment presented in this working draft ES. Farm visits are ongoing and engagement will continue as the design and assessment develops.

3.4.17 Engagement is also continuing with key representatives for the farmers and growers industry, in particular with the National Farmers Union and Country Land and Business Association.

3.4.18 A route-wide programme of engagement is ongoing, in parallel to the working draft ES process. This engagement provides affected individuals, major asset owners and businesses the opportunity to raise issues and opportunities in relation to the Proposed Scheme and to gain an understanding of compensation and assistance available for property owners. Within the Lee Marston to Tamworth area, information events were held at the Wilnecote School on 16 June 2018, Kingsbury Community Centre on 20 and 26 June 2018 and The Tithe Barn, Polesworth on 18 July 2018. Facilities were available at the events for affected individuals, major asset owners and businesses to have private meetings with HS2 staff.

3.4.19 Engagement has been undertaken with Moto (operator of Tamworth Motorway Service Area), Pro-Mil Engineering and Kingsbury Garden Centre to discuss the impacts of the Proposed Scheme.

3.4.20 HS2 Ltd is continuing to engage with directly affected individuals, major asset owners and businesses, as the design and assessment develops.

4 Agriculture, forestry and soils

4.1 Introduction

4.1.1 This section provides a description of the current baseline for agriculture, forestry and soils and the likely impacts and significant effects of the construction and operation of the Proposed Scheme within the Lea Marston to Tamworth area. Consideration is given to the extent and quality of the soil and land resources underpinning the primary land use activities of farming and forestry, and the physical and operational characteristics of enterprises engaged in these activities. Consideration is also given to diversification associated with the primary land uses, and to related land-based enterprises, notably equestrian activities.

4.1.2 Engagement with farmers and landowners has commenced and is ongoing. The purpose of the engagement has been to obtain baseline information on the scale and nature of the farm and forestry operations and related farm-based uses, and to provide farmers and landowners with the opportunity to raise issues and discuss mitigation in relation to the Proposed Scheme. Engagement undertaken with farmers and landowners will be documented in a farm pack for each farm holding within a Phase 2b Farmers and Growers Guide[26].

4.1.3 Maps showing the location of the key environmental features (Map Series CT-10) and the key construction (Map Series CT-05) and key operational (Map Series CT-06) features of the Proposed Scheme can be found in the Volume 2: LA01 Map Book.

4.2 Scope, assumptions and limitations

4.2.1 The assessment scope, key assumptions and limitations for the agriculture, forestry and soils assessment are set out in Volume 1, Introduction and Methodology, (Section 8) and the Scope and Methodology Report (SMR)[27].

4.2.2 The study area for the agriculture, forestry and soils assessment covers all land required for the construction and operation of the Proposed Scheme. The resources and receptors that are assessed within this area are agricultural land, forestry land and soils, together with farm and rural holdings. The assessments of the impacts on agricultural land quality and forestry land are made with reference to the prevalence of best and most versatile (BMV) land and forestry land in the general locality, taken as a 4km corridor centred on the route of the Proposed Scheme.

4.2.3 The quality of agricultural land in England and Wales is assessed according to the Agricultural Land Classification (ALC)[28] system, which classifies agricultural land into five grades from excellent quality Grade 1 land to very poor quality Grade 5 land. Grade 3 is subdivided into Subgrades 3a and 3b. The main issue in the assessment of

[26] To be prepared for Phase 2b in due course, as per previous Phases found here: https://www.gov.uk/government/publications/hs2-guide-for-farmers-and-growers
[27] Supporting document: HS2 Phase 2b Environmental Impact Assessment Scope and Methodology Report
[28] Ministry of Agriculture, Fisheries and Food (1988), *Agricultural Land Classification of England and Wales – Revised guidelines and criteria for grading the quality of agricultural land.*

the impacts on agricultural land is the extent to which land of BMV agricultural quality (Grades 1, 2 and 3a) is affected by the Proposed Scheme.

4.2.4 Forestry is considered as a commercial land use feature providing resources such as timber or fuel. The impacts on this feature have been calculated quantitatively in terms of the physical extent of commercial forestry land required. The qualitative effects on forestry land and woodland are addressed principally in Section 7, Ecology and biodiversity and Section 11, Landscape and visual.

4.2.5 The primary functions provided by soils other than for food and biomass production, such as flood water attenuation , carbon storage or the support of ecological habitats, are identified in this section and the ability of the soils to fulfil their primary functions after construction of the Proposed Scheme is assessed. Soil attributes, other than for food and biomass production, are identified in this section, but the resulting function or service provided is assessed in other sections, notably Section 7, Ecology and biodiversity; Section 9, Historic environment; Section 11, Landscape and visual; and Section 15, Water resources and flood risk.

4.2.6 The main issue for farm holdings is disruption by the Proposed Scheme of the physical structure of agricultural holdings and the operations taking place upon them, during both construction and operational phases. Where any part of a farm or rural holding is required for the construction and operation of the Proposed Scheme, the whole land holding is part of the study area for impacts on this receptor.

4.2.7 Common assumptions that have been used in assessing the effects of the Proposed Scheme are set out in Volume 1, Introduction and Methodology, Section 8. These assumptions include the restoration of agricultural land that is required temporarily for construction to agricultural use, and the handing back of land used temporarily to the original landowner. It is also assumed that buildings and other farm infrastructure on the land holding will not be replaced as this would ultimately be at the discretion of the landowner. For this reason, financial compensation is not considered in the assessment of effects on farm holdings, as set out under Impacts on holdings below. In the majority of cases, the details of land use have been obtained from face-to-face interviews. Where this has not been possible, holding data has been obtained from publicly available sources.

4.3 Environmental baseline

Existing baseline

4.3.1 This section sets out the main baseline features that influence the agricultural and forestry use of land within the Lea Marston to Tamworth area. These include the underlying soil resources that are used for food and biomass production, as well as providing other services and functions for society, and the associated pattern of agricultural and other rural land uses.

Soil and land resources

Geology and soil parent materials

4.3.2 A full description of the geological characteristics of the Lea Marston to Tamworth area is provided in Section 10, Land quality and Section 15, Water resources and flood

risk. The underlying geology of the study area is mapped by the British Geological Survey (BGS)[29]. Superficial glaciofluvial and head deposits overlie the bedrock on the higher ground in the south of the study area and may include gravel, sand and clay.

4.3.3 Superficial deposits of alluvium are associated with the River Tame. The deposits normally include compressible silty clay, and can also include silt, sand, peat and gravel.

4.3.4 River terrace deposits of quaternary sand and gravel are mapped on the shallow, lower valley slopes of the River Tame.

4.3.5 The bedrock in the south of the study area, and as far north as Kingsbury, is mostly Triassic-age mudstone and siltstone of the Mercia Mudstone Group (Sidmouth Mudstone Formation) with a smaller unit of pebbly sandstone of the Helsby Sandstone Formation (within the Sherwood Sandstone Group). North of Kingsbury, the bedrock is predominantly of Carboniferous-age sandstone of the Salop Formation and Halesowen Formation (within the Warwickshire Group), with outcrops of the Pennine Lower Coal Measures Formation and the Pennine Middle Coal Measures Formation (within the Pennine Coal Measures Group) also present.

4.3.6 The Sidmouth Mudstone Formation generally includes red-brown mudstone, siltstone and occasionally sandstone, which may be interbedded and interlaminated.

4.3.7 The Helsby Sandstone Formation comprises fine-to medium-grained sandstones, which weather to sand near the surface.

4.3.8 The Salop Formation is mudstone-dominated in the lower parts, but with an increasing component of sand or sandstone towards the top of the formation. The Halesowen Formation includes grey-green sandstones and mudstones with thin coals and limestone beds. A sandstone dominant variant is found within the main bedrock type. The Pennine Middle and Lower Coal Measures formations include interbedded grey mudstone and siltstone, and pale grey sandstone, commonly with coal seams and mudstones containing marine fossils. Coal seams are more numerous and thicker in the lower parts of the sequence.

Topography and drainage

4.3.9 The main topographic feature within this study area is the valley of the River Tame, which has cut into the underlying mudstone.

4.3.10 The higher ground over the mudstone in the south of the study area is at approximately 80m above Ordnance Datum (AOD), with shallow valley sides of less than seven degrees falling to the River Tame which lies at 65m to 70m AOD. North of the valley, the topography undulates between approximately 75m and 115m AOD with typically gentle slopes of less than seven degrees.

4.3.11 Land at risk of flooding by rivers is confined to the broad valley of the River Tame. This land is classed as predominantly Flood Zone 3[30], in which there is a 1 in 100 or greater

[29] British Geological Survey (2018). *Geology of Britain viewer*. Available online at: http://mapapps.bgs.ac.uk/geologyofbritain/home.html
[30] Environment Agency; Flood map for planning 2018; https://flood-map-for-planning.service.gov.uk/confirm-location?easting=421720&northing=295615&placeOrPostcode=Kingsbury

annual probability of flooding, with some land in Flood Zone 2 to the south. Further details are provided in Section 15, Water resources and flood risk.

Description and distribution of soil types

4.3.12 The broad characteristics of the soils likely to be present in the study area are described by the Soil Survey of England and Wales[31] and their general distribution is shown on the National Soil Map[32]. Soils possessing similar characteristics are amalgamated into associations.

4.3.13 There are three mapped groups of soil associations in this study area. The presence of the two main groups has been confirmed in parts of the study area by published survey data [33].

4.3.14 The most prevalent group is developed in glaciofluvial drift and river terrace deposits and includes sandy loam, sandy silt loam or sandy clay topsoils overlying similar or coarser textured (sand and loamy sand) subsoils. The group includes the Arrow, Wigton Moor and Wick 1 associations. The Wick 1 soils are typically well drained, of Wetness Class (WC)[34] I, and affected by droughtiness. The Arrow and Wigton Moor associations are variably affected by groundwater and may be WC II or III. Soils within this group have been identified in the detailed survey undertaken at Whateley[33].

4.3.15 The next most prevalent group of soil associations is developed in Triassic and Carboniferous mudstone and includes the Whimple 3 and Bardsey associations. Topsoils are of clay loam, silty clay loam or sandy clay loam and overlie silty clay or clay subsoils. Profiles are imperfectly (WC III) to poorly drained (WC IV). These soils have also been identified in the surveys undertaken at Whateley[33].

4.3.16 The least prevalent group, comprising the Compton association, is mapped across the floodplain of the River Tame. The association consists of stoneless, reddish alluvial clay or silty clay throughout. Drainage of the soils can be improved to WC III or IV depending on the height above river level, though undrained profiles may be very poorly drained in WC V.

Soil and land use interactions

Agricultural land quality

4.3.17 The principal soil/land use interaction is the quality of the agricultural land resource. The ALC is based on the identification of physical limitations to the agricultural capability of land resulting from the interactions of soil, climate, topography and drainage.

[31] Soil Survey of England and Wales (1984), *Soils and their use in Midland and Western England*, Soil Survey of England and Wales, Bulletin No. 12, Harpenden.
[32] Cranfield University (2001), *The National Soil Map of England and Wales 1:250,000 scale.* Cranfield University: National Soil Resources Institute.
[33] MAFF (1998), *Staffordshire and Stoke-on-Trent Structure Plan; Site 10 - Whateley. Agricultural Land Classification ALC Map and Report. Job ref 010/98*
[34] The wetness class of a soil is classified according to depth and duration of waterlogging in the soil profile and has six categories from WC I which is well drained to WC VI which is very poorly drained.

4.3.18 The main soil properties that affect the cropping potential and management requirements of land are texture, structure, depth, stoniness and chemical fertility.

4.3.19 Climate within this area does not in itself place any limitation on agricultural land quality. However, the interactions of climate with soil characteristics are important in determining the wetness and droughtiness[35] limitations of the land.

4.3.20 The local agro-climatic data has been interpolated from the Meteorological Office's standard 5km grid point dataset[36] for three points within the study area. The data show the area to have a mild climate. The number of Field Capacity Days[37] (FCDs), when the moisture deficit[38] is zero, ranges from 147 to 151 days per annum, which is average for lowland England (150 days). Moisture deficits, which give an indication of the liability of soils to droughtiness in summer, are moderate to moderately large.

4.3.21 Site factors[39] include flood risk, which affects agricultural land quality within the valley of the River Tame, limiting land quality to Subgrade 3b. Further details are provided in Section 15, Water resources and flood risk. There are no gradient limitations to agricultural land quality in this study area.

4.3.22 The main physical limitations that result from interactions between soil, climate and site factors are soil wetness and soil droughtiness. For soil wetness, each soil can be allocated a Wetness Class based on soil structure, evidence of waterlogging and the number of FCDs. The topsoil texture then determines its ALC grade. Soil droughtiness is determined by the moisture retention of different soil textures and thicknesses of each soil horizon, soil structures, stone content and moisture deficits

4.3.23 The most prevalent group of soil associations, comprising coarse loamy profiles of the Arrow, Wigton Moor and Wick 1 associations, is affected by soil droughtiness or, where affected by groundwater, soil wetness. Those affected by groundwater may typically be of WC II or III depending upon drainage measures, which limits them slightly to Grade 2.

4.3.24 The Wick 1 association is not affected by groundwater but mostly by droughtiness. The severity of the limitation with respect to droughtiness is determined by the specific textures throughout the profiles as well as the stone content.

4.3.25 Survey data at Whateley includes soil profiles that comprise sandy clay loam or medium sandy loam topsoil overlying a medium sandy loam upper subsoil and a similar or loamy sand lower subsoil. These profiles have little or no limitation to their agricultural use and are classified as Grade 1.

[35] A measure of the likely moisture stress in a crop arising from the crop's requirement for water exceeding the available water capacity in the soil
[36] Meteorological Office (1989), *Gridpoint Meteorological data for Agricultural Land Classification of England and Wales and other Climatological Investigations*
[37] Field Capacity Days (FCD) is a meteorological parameter which estimates the duration of the period when the soil moisture deficit is zero. Soils usually return to field capacity (zero deficit) during the autumn or early winter and the field capacity period, measured in days, ends in the spring when evapotranspiration exceeds rainfall and a moisture deficit begins to accumulate.
[38] The moisture deficit is a crop-related meteorological variable which represents the balance between rainfall and potential evapotranspiration calculated over a critical portion of the growing season.
[39] Site factors include slope or flood risk but may be other things specific to a site that affect agricultural land quality.

4.3.26 Profiles of medium sandy loam throughout, or those with loamy medium sand subsoils, and with common to abundant stones are limited slightly by droughtiness to Grade 2.

4.3.27 The droughtiness limitation becomes more severe as subsoil textures become coarser. Where subsoil is of loamy sand and sand with many to abundant stones, there is a droughtiness limitation to Subgrade 3a, or occasionally Subgrade 3b.

4.3.28 Imperfectly and poorly drained profiles of the second most prevalent group of soil associations, comprising the Whimple 3 and Bardsey associations, with fine loamy topsoils over slowly permeable subsoils, are limited by wetness and workability. Profiles of WC III are Subgrade 3a where the topsoil is of a medium loam or Subgrade 3b where the topsoil is a heavy loam. Profiles of WC IV are Subgrade 3b.

4.3.29 The survey data at Whateley also identifies the second most prevalent group of soil associations near Holt Hall Farm. Topsoil is of medium clay loam and overlies heavy clay loam upper subsoil, passing to slowly permeable silty clay lower subsoil. The profiles are of WC III and limited by wetness and workability to Subgrade 3a.

4.3.30 Similar profiles are identified south-east of Whateley Lane, though the depths to gleying, which is an indicator of wetness, and slowly permeable subsoils are shallower, resulting in WC IV and a limitation to Subgrade 3b.

4.3.31 The alluvial clays of the Compton association are affected by wetness. Profiles with clayey topsoils of WC III or IV are limited to Subgrade 3b whilst those of WC V are Grade 4.

4.3.32 As set out in the SMR, the sensitivity of BMV land in the study area is determined relative to the abundance of such land in the area, set as a 4km corridor centred on the route of the Proposed Scheme. Department for Environment, Food and Rural Affairs (Defra) predictive mapping[40] shows that there is a high likelihood of encountering BMV agricultural land in the locality, which makes such land a resource of low sensitivity in this study area.

4.3.33 The preceding assessment of agricultural land quality attributed to the soil associations is based on interpretation of publicly available data and will be confirmed by detailed soil survey, as will be the detailed distribution of soil types and land in the various grades of the ALC. The results will be reported in the formal ES.

Other soil interactions

4.3.34 Soil fulfils a number of functions and services for society in addition to those of food and biomass production, which are central to social, economic and environmental sustainability. These are outlined in sources such as the Soil Strategy for England[41] and the Government's White Paper, The Natural Choice: securing the value of nature[42], and include:

[40] Defra (2005), *Likelihood of Best and Most Versatile Agricultural Land.* Available online at http://publications.naturalengland.org.uk/file/5955660136579072.
[41] Defra (2009), *Soil Strategy for England.*
[42] HM Government (2011), *The Natural Choice: securing the value of nature.*

- the storage, filtration and transformation of water, carbon and nitrogen in the biosphere;
- the support of ecological habitats, biodiversity and gene pools;
- support for the landscape;
- the protection of cultural heritage;
- the provision of raw materials; and
- the provision of a platform for human activities, such as construction and recreation.

4.3.35 Forestry resources represent a potentially multifunctional source of productive timber, landscape amenity, biodiversity and carbon storage capacity. An assessment of the value and sensitivity of woodland resources is reported in Section 7, Ecology and biodiversity and Section 11, Landscape and visual.

4.3.36 The floodplain of the River Tame and the lakes and ponds of the Kingsbury Water Park occupy land where water has to flow or be stored in times of flood, as set out in Section 15, Water resources and flood risk. The soils and floodplains in this study area function as water stores for flood attenuation, as well as providing ecological habitat.

Land use

Land use description

4.3.37 The agricultural land within this study area is predominantly mixed arable and livestock holdings. Land use in the southern part of the study area between Marston Lane and Seeney Lane is dominated by a number of small equestrian units, which have been, or are in the process of being acquired by HS2 Ltd following the receipt of Royal Assent for Phase One. The effects on these holdings were assessed and reported in Volumes 2 and 5 of the Phase One Environmental Statement (ES) for Community forum area (CFA) 20[43], as well as in Volume 2 of the Additional Provision ES[44] and Volume 2 of the Supplementary Environmental Statement and Additional Provision 2[45]. As the impacts on these holdings have been examined as part of Phase One and have already occurred or are in the process of occurring, the assessment of these effects has not been repeated in this section.

4.3.38 There is a block of approximately 12ha of broadleaved woodland between Marston Lane and Seeney Lane in the south of the study area, along with the broadleaved woodland associated with Kingsbury Water Park and the woodland areas within the

[43] HS2 Ltd (2013) *Phase One Environment Statement Vol 2: CFA 20 report and map book, Curdworth to Middleton*. Available online at: https://www.gov.uk/government/publications/hs2-phase-one-environmental-statement-volume-2-community-forum-area-reports-and-mapbooks. HS2 Ltd (2013) *Phase One Environmental Statement Vol 5: agriculture, forestry and soils. Available* online at: https://www.gov.uk/government/publications/hs2-phase-one-environmental-statement-volume-5-agriculture-forestry-and-soils
[44] HS2 Ltd (2014), *Additional Provision (September 2014) Environmental Statement Vol 1, 2 and 3*. Available online at: https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/350687/AP0914_Vols_1-3_and_glossary.pdf
[45] HS2 Ltd (2015), *Supplementary Environmental Statement and Additional Provision 2 Environmental Statement Vol 2, CFA 20, Curdworth to Middleton*. Available online at: https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/442224/SES_and_AP2_ES_Volume_2_CFA20.pdf

Kettle Brook Local Nature Reserve (LNR). These woods are not known to be commercially managed for forestry.

4.3.39 A number of environmental designations influence land use within the study area. The entire Lea Marston to Tamworth area is a nitrate vulnerable zone, where statutory land management measures apply limiting the average amount of nitrogen from manufactured fertiliser and organic manures that can be applied to agricultural land in order to reduce nitrogen losses from agricultural sources to the natural water environment.

4.3.40 Some agricultural land is also subject to agri-environment management prescriptions that seek to retain and enhance the landscape and biodiversity qualities and features of farmland. These are associated with the Environmental Stewardship Scheme (the Entry Level Scheme (ELS) or Higher Level Scheme (HLS), or the Countryside Stewardship Scheme (CSS), which has been the main agri-environment scheme in England since 2015. The CSS incorporates elements of Environmental Stewardship, the England Woodland Grant Scheme and Catchment Sensitive Farming grants.

4.3.41 The majority of Environmental Stewardship agreements, which were extensive and covered approximately 70% of agricultural land in England, have now ended although existing agreements will run their course. The higher tier and mid-tier options in the CSS are more focused than Environmental Stewardship, with applications for funding being competitive and the area covered by the scheme less than that covered under Environmental Stewardship. However, four new simpler non-competitive offers have been introduced in 2018 to complement the higher tier and mid-tier options and open up the scheme to more farmers and land managers. Only one farm holding in this area (Bodymoor Heath Farm) currently has land entered into an agri-environment scheme, as identified in Table 9, although there are also HLS agreements at Kingsbury Water Park and the Kettle Brook LNR.

Number, type and size of holdings

4.3.42 Table 9 sets out the current understanding of the main farm holdings within this study area. The details of holdings have been obtained from face-to-face interviews with farm owners and occupiers. Publicly available sources have been used to obtain information about farm holdings where it has not yet been possible to arrange interviews, and this information will be validated as survey work continues. Other farm holdings may be identified as survey work continues and the design develops. Effects on these farm holdings will be reported in the formal ES.

4.3.43 Table 9 also sets out the sensitivity of individual holdings to change. This is determined by the extent to which they have the capacity to absorb or adapt to impacts, which in turn is determined primarily by their nature and scale. In general terms, larger holdings have a greater capacity to change enterprise mix and scale, can better absorb impacts and are less sensitive. Units that rely on the use of buildings (such as intensive livestock and dairy farms, and horticultural units) are less able to accommodate change and have a higher sensitivity. Non-commercial land uses and units, such as pony paddocks associated with residential properties, have a low sensitivity.

Table 9: Summary of characteristics of holdings

Holding name	Holding type	Holding size (ha)	Diversification	Agri-environment scheme	Sensitivity to change
Rye Farm*	Arable	404	Not known	None	Medium
Bodymoor Heath Farm	Arable, beef cattle and sheep	256	Commercial business and storage units; commercial catering business	ELS	Medium
Land north of Kingsbury*	Arable	Not known	Not known	None	Medium
Land off A51 Tamworth Road*	Grassland	8	Not known	None	Low
Camp Farm*	Arable	91	Commercial lets	None	Medium
Holt Hall Farm	Arable and beef cattle	209	Caravan storage; garden centre	None	Medium
Whateley Hall Farm	Arable and sheep	54	None	None	Medium

* It has not yet been possible to arrange farm impact assessment interviews with these holdings. Publicly available sources have been used to obtain the information presented.

4.4 Effects arising during construction

Avoidance and mitigation measures

4.4.1 In addition to design features that would be included in the Proposed Scheme to mitigate the impacts on farm holdings, there is a need to avoid or reduce environmental impacts to soils during construction. Soil resources from the areas required temporarily and permanently for the Proposed Scheme would be stripped and stored. This would enable agricultural land that is required temporarily for construction to be returned to agricultural use. It would also enable soils to be returned to other uses, such as to support landscape planting and biodiversity, and to a suitable condition whereby they would be able to fulfil the identified function.

4.4.2 Compliance with the Code of Construction Practice (CoCP) will avoid or reduce environmental impacts during construction. Those measures that are particularly relevant to agriculture, forestry and soils are set out in the draft CoCP[46] and relate to:

- the reinstatement of agricultural land that is used temporarily during construction to agriculture, where this is the agreed end use (Section 6);
- the provision of a method statement within the farm pack for stripping, handling, storing and replacing agricultural and woodland soils to reduce risks associated with soil degradation on areas of land to be returned to agriculture and woodland following construction, based on detailed soil survey work to be undertaken prior to construction. This would include any remediation measures necessary following the completion of works (Section 6);

[46] Supporting document: Draft Code of Construction Practice

- a requirement for contractors to monitor and manage flood risk and other extreme weather events, insofar as reasonably practicable, that may affect agriculture, forestry and soil resources during construction (Sections 5 and 16);
- arrangements for the maintenance of farm and field accesses affected by construction (Section 6);
- the protection and maintenance of existing land drainage and livestock water supply systems, where reasonably practicable (Sections 6 and 16);
- the protection of agricultural land adjacent to the construction site, including the provision and maintenance of appropriate stock-proof fencing (Sections 5, 6, 9 and 12);
- the adoption of measures to control the deposition of dust on adjacent agricultural crops (Section 7);
- the control of invasive and non-native species; and the prevention of the spread of weeds generally from the construction site to adjacent agricultural land (Section 9);
- the adoption of measures to prevent, insofar as reasonably practicable, the spread of soil-borne, tree, crop and animal diseases from the construction area (Sections 6 and 9); and
- liaison and advisory arrangements with affected landowners, occupiers and agents, as appropriate (Sections 5 and 6).

4.4.3 As the design develops it will be necessary to continue to assess the requirement for access to severed parcels of agricultural land. Upon completion of construction, it is currently anticipated that soils replaced for agricultural, forestry or landscape uses would be monitored to identify any unsatisfactory growing conditions during the five-year aftercare period.

4.4.4 Where agricultural uses are to be resumed on land disturbed during the construction of the Proposed Scheme, the design objective is to avoid any reduction in long term capability, which would downgrade the quality of the disturbed land, through the adoption of good practice techniques in handling, storing and reinstating soils on that land. Some very poorly drained land or land with heavier textured soils (particularly the Compton association soils) may also require particularly careful management, such as the timing of cultivation and livestock grazing, during the aftercare period to ensure this outcome.

Assessment of impacts and effects

4.4.5 The acquisition and use of land for the Proposed Scheme would interfere with existing uses of that land and, in some locations, preclude existing land uses or sever and fragment individual fields and operational units of agricultural and forestry land. This could result in potential effects associated with the ability of affected agricultural and forestry interests to access and effectively use residual parcels of land. There may also be the loss of, or disruption to, buildings and operational infrastructure such as drainage. The Proposed Scheme seeks to reduce this disruption and, where

appropriate and reasonably practicable, incorporate residual parcels of land no longer effective for agricultural use due to their size and/or shape as part of environmental mitigation works, such as ecological habitat creation.

4.4.6 Land used to construct the Proposed Scheme would fall into the following main categories when work is complete:

- part of the operational railway or associated infrastructure and kept under the control of the operator;
- returned to agricultural use (with aftercare management to ensure stabilisation of the soil structure);
- used for drainage or replacement floodplain storage areas, which may also retain some agricultural use; or
- used for ecological and/or landscape mitigation.

Temporary effects during construction

Impacts on agricultural land

4.4.7 Interpretation of publicly available data shows that the Proposed Scheme is likely to require approximately 150ha of agricultural land within the Lea Marston to Tamworth area during the construction phase, of which approximately 90ha (60%) are likely to be classified as BMV land (Grades 1, 2 and 3a). This is a high magnitude of impact on BMV land.

4.4.8 As BMV land in this study area is a receptor of low sensitivity, it is currently expected that the likely effect of the Proposed Scheme on BMV land during the construction phase would be moderate adverse, which would be significant.

4.4.9 Following completion of construction, temporary facilities would be removed and the topsoil and subsoil reinstated in accordance with the agreed end use for the land. Some permanently displaced soils may be used to restore land to agriculture or other uses with slightly deeper topsoil and subsoil layers, where appropriate.

Nature of the soil to be disturbed

4.4.10 The sensitivity of the soils disturbed by construction activity reflects their textural characteristics, in the light of local FCDs, as set out in the SMR. In areas with the highest number of FCDs, and during the wettest times of the year, soils with high clay and silt fractions are most susceptible to the effects of handling during construction and the re-instatement of land; whereas soils with a high sand fraction in areas with the fewest number of FCDs and during the driest times of the year are the least susceptible.

4.4.11 Successful soil handling is dependent upon movements being undertaken under appropriate weather and ground conditions using the appropriate equipment. The principles of soil handling are well established and set out in advisory material such as

Defra's Code of Practice for the Sustainable Use of Soils[47]. These principles would be followed throughout the construction period.

4.4.12 Clayey, alluvial and seasonally waterlogged soils (including Whimple 3, Bardsey and Compton associations) are least able to remain structurally stable if moved in wet conditions or by inappropriate equipment. They are susceptible to compaction and smearing, which could affect successful reinstatement.

4.4.13 Implementation of the measures set out in the draft CoCP would reduce the magnitude of impact on soil. The detailed soil survey data will define the sensitivity of soil, and the assessment of the effects on soils to be disturbed will be reported in the formal ES.

Impacts on holdings

4.4.14 Land may be required for the Proposed Scheme from holdings temporarily, during the construction period, or permanently. In most cases, the temporary and permanent land requirement would occur simultaneously at the start of the construction period and it is the combined effect of both that would have the most impact on the holding. During the construction period, some agricultural land would be restored and the impact on individual holdings would reduce.

4.4.15 The effects of the Proposed Scheme on individual agricultural and related interests during the construction period will be reported in the formal ES. The formal ES will present the total area of land required on a particular holding during the construction period in absolute terms and as a percentage of the total area farmed. It will also show the area of land that would be returned to the holding following the construction period. The disruptive effects, principally of construction noise and dust, will be reported in the formal ES and assessed according to their effects on land uses and enterprises.

4.4.16 The potential temporary effects from the construction of the Proposed Scheme on individual agricultural and related interests are summarised in Table 10 for those holdings currently identified. The scale of the impact of land required to construct the Proposed Scheme is based on the likely proportion of land required from the holding during construction. The effects of severance will be judged on the ease and availability of access to severed land. With the implementation of the measures set out in the draft CoCP, these would generally be the same during and post construction. The disruptive effects, principally of construction noise and dust, will be reported in the formal ES and assessed according to their effects on land uses and enterprises.

4.4.17 The potential scale of effect is determined by combining the highest impact on the farm holding with the sensitivity of that holding, as set out in the SMR.

[47] Defra (2009), *Construction Code of Practice for the Sustainable Use of Soils on Construction Sites.*

Table 10: Summary of temporary effects on holdings from construction

Holding name/ Sensitivity to change	Land potentially required	Potential severance impact	Potential scale of effect
Rye Farm Medium sensitivity	Negligible	Medium	Moderate adverse
Bodymoor Heath Farm Medium sensitivity	Low	Medium	Moderate adverse
Land north of Kingsbury Medium sensitivity	Low	Negligible	Minor adverse
Land off A51 Tamworth Road Low sensitivity	High	Negligible	Moderate adverse
Camp Farm Medium sensitivity	Low	Negligible	Minor adverse
Holt Hall Farm Medium sensitivity	High	Medium	Major/moderate adverse
Whateley Hall Farm Medium sensitivity	High	Medium	Major/moderate adverse

4.4.18 Overall, the construction of the Proposed Scheme could potentially affect seven holdings in the Lea Marston to Tamworth area temporarily. On the basis of information currently available, five holdings could experience moderate or major/moderate adverse temporary effects during construction, which would be significant for each holding.

4.4.19 Two farm holdings (Holt Hall Farm and Whateley Hall Farm) are expected to experience major/moderate adverse temporary effects due to the proportion of land required for the Proposed Scheme during the construction period. Three farm holdings would be expected to experience moderate adverse effects due to the effects of severance of land or the proportion of land required.

4.4.20 Although financial compensation would be available under existing statutory arrangements to offset these impacts, it is not a consideration in the assessment of effects on farm holdings.

Permanent effects of construction

Impacts on agricultural land

4.4.21 Interpretation of publicly available data shows that the Proposed Scheme is likely to require approximately 100ha of agricultural land permanently within the Lea Marston to Tamworth area, of which approximately 55ha (55%) are likely to be classified as BMV land (Grades 1, 2 and 3a). This is a medium magnitude of impact on BMV land.

4.4.22 As BMV land in this local area is a receptor of low sensitivity, it is currently expected that the likely effect of the Proposed Scheme on BMV land following construction would be minor adverse, which would be unlikely to produce a significant effect.

Impacts on forestry land

4.4.23 It is currently expected that an area of woodland to the east of the M42 at Marston and some woodland at Kingsbury Water Park would be required for the Proposed Scheme but these areas are not known to be used for commercial forestry. The effects on forestry land will be reported in the formal ES. The qualitative assessment of loss of woodland is presented in Section 7, Ecology and biodiversity and the effects on the recreational facility in Section 6, Community.

Impacts on holdings

4.4.24 The potential permanent effects from the construction of the Proposed Scheme on individual agricultural and related interests are summarised in Table 11 for those holdings currently identified. The scale of the impact of land required to operate the Proposed Scheme is based on the likely proportion of land required from the holding. The potential effects of severance are judged on the ease and availability of access to severed land once construction is completed. The impact on farm infrastructure refers mainly to the potential loss of or damage to farm capital, such as property, buildings and structures, and the consequential effects on land uses and enterprises.

4.4.25 The potential scale of effect is determined by combining the highest impact on the farm holding with the sensitivity of that holding, as set out in the SMR.

Table 11: Summary of permanent effects on holdings from construction

Holding name/ Sensitivity to change	Land potentially required	Potential severance impact	Potential impact on farm infrastructure	Potential scale of effect
Rye Farm Medium sensitivity	Negligible	Negligible	Low	Minor adverse
Bodymoor Heath Farm Medium sensitivity	Low	Negligible	Low	Minor adverse
Land North of Kingsbury Medium Sensitivity	Low	Negligible	Low	Minor adverse
Land off A51 Tamworth Road Low Sensitivity	High	Negligible	Low	Moderate adverse
Camp Farm Medium sensitivity	Low	Negligible	Negligible	Minor adverse
Holt Hall Farm Medium sensitivity	Medium	Medium	Low	Moderate adverse
Whateley Hall Farm Medium sensitivity	Medium	Medium	Low	Moderate adverse

4.4.26 Overall, the construction of the Proposed Scheme could potentially affect seven holdings in the Lea Marston to Tamworth area permanently. On the basis of information currently available, three holdings could experience moderate adverse permanent effects from construction, which would be significant for each holding.

4.4.27 Although financial compensation will be available under existing statutory arrangements, there can be no certainty that this would be used to reduce the above adverse effects by the purchase of replacement land or the construction of replacement buildings. Therefore, the above assessment should be seen as the worst case, which could be reduced if the owner and/or occupier is able, and chooses, to use compensation payments to replace assets.

Other mitigation measures

4.4.28 Other mitigation would incorporate climate change adaptation and resilience measures, insofar as reasonably practicable. For example, restored soils in areas that could be prone to drought with climate change could potentially be replaced at greater depths than at present to make them resilient to drought.

4.4.29 A farm pack within the Phase 2b Farmers and Growers Guide would be provided to all farmers and landowners, setting out baseline conditions on the farm and the assurances and obligations that HS2 Ltd would accept upon entering the land. This would include advice and appropriate assistance where there is a need for the landowner to relocate or re-provide agricultural buildings displaced by the Proposed Scheme.

Summary of likely residual significant effects

4.4.30 Although the extent of land required permanently by ALC grade is not yet known in the Lea Marston to Tamworth area, current indications based on publicly available information are that the effect on BMV agricultural land would be moderate adverse temporarily during construction, which would be significant, and minor adverse permanently from construction, which would be unlikely to produce a significant effect. The amount of land required by ALC grade will be assessed and reported in the formal ES.

4.4.31 Five of the seven farm holdings identified are expected to experience moderate or major/moderate adverse temporary effects during construction; with three expected to experience moderate adverse permanent effects, which would be significant for each holding.

4.4.32 Effects on forestry land and soils to be disturbed will reported in the formal ES.

4.5 Effects arising from operation

Avoidance and mitigation measures

4.5.1 No measures are currently anticipated to be required to mitigate the operational effects of the Proposed Scheme on agriculture, forestry and soils.

Assessment of impacts and effects

4.5.2 Potential impacts arising from the operation of the Proposed Scheme would include:

- noise emanating from moving trains; and
- the propensity of operational land to harbour noxious weeds.

4.5.3 One set of farm buildings at Holt Hall Farm lies within approximately 100m of the route of the Proposed Scheme. The potential for significant effects on sensitive livestock receptors from noise will be assessed and reported in the formal ES.

4.5.4 The propensity of linear transport infrastructure to harbour and spread noxious weeds is a consequence of:

- the management of the highway and railway land; and

- the propensity of the weeds to spread onto such land from adjoining land, which could be exacerbated by the effects of climate change.

4.5.5 The presence of noxious weeds (particularly ragwort) would be controlled using an appropriate management regime that identifies and remedies areas of weed growth that might threaten adjoining agricultural interests.

Other mitigation measures

4.5.6 No other mitigation measures have been identified at this stage.

Summary of likely residual significant effects

4.5.7 No residual significant effects on agriculture, forestry and soils have been identified at this stage as a result of the operation of the Proposed Scheme.

Monitoring

4.5.8 Volume 1, Introduction and Methodology, Section 9 sets out the general approach to environmental monitoring during operation of the Proposed Scheme.

4.5.9 There are no area-specific requirements identified for monitoring agriculture, forestry and soil during the operation of the Proposed Scheme in the Lea Marston to Tamworth area.

5 Air quality

5.1 Introduction

5.1.1 This section of the report provides an assessment of the impacts and likely significant effects on air quality arising from the construction and operation of the Proposed Scheme within the Lea Marston to Tamworth area. Oxides of nitrogen (NOx) including nitrogen dioxide (NO_2), fine particulate matter[48] (PM_{10}, $PM_{2.5}$) and dust have been considered in the assessment. Emissions of all or some of these air pollutants are likely to arise from construction activities, demolition, site preparation work and the use of site haul routes. Emissions would also arise from road traffic during the construction and operation of the Proposed Scheme.

5.1.2 Engagement with North Warwickshire Borough Council (NWBC) and Tamworth Borough Council (TBC) has commenced and is ongoing. The purpose of this engagement has been to obtain relevant baseline information, which includes monitoring data in this area.

5.1.3 Maps showing the location of the key environmental features (Map Series CT-10) and the key construction (Map Series CT-05) and key operational (Map Series CT-06) features of the Proposed Scheme can be found in the Volume 2: LA01 Map Book.

5.2 Scope, assumptions and limitations

5.2.1 The scope, assumptions and limitations for the air quality assessment are set out in Volume 1 (Section 8) and the Scope and Methodology Report (SMR)[49].

5.2.2 The study areas for the air quality assessment have been determined on the basis of where impacts on local air quality may occur[50]:

- from construction;
- from changes in the nature of traffic during construction and operation; for example, increases in traffic flows during construction or where road closures or restrictions cause diversions and heavier traffic on adjacent roads;
- where road alignments have changed; or
- from the operation of combustion plant at buildings.

5.2.3 The assessment of construction traffic will be reported in the formal ES. The assessment will incorporate HS2 Ltd's policies on vehicle emissions. These include the use of Euro VI heavy goods vehicles (HGV), Euro 4 petrol and Euro 6 diesel cars and light goods vehicles (LGV) during the construction of the Proposed Scheme.

[48] $PM_{2.5}$ and PM_{10} describe two size fractions of airborne particles that can be inhaled and therefore are of concern for human health. The designations refer to particles of size less than 2.5 and 10 microns in diameter
[49] Supporting document: HS2 Phase 2b Environmental Impact Assessment Scope and Methodology Report
[50] The assessment of construction dust emissions has been undertaken where sensitive receptors are located up to a distance of 350m from dust generating activities. The assessment of traffic emissions will be undertaken where sensitive receptors are located up to a distance of 200m from roads screened in for further assessment

5.2.4 The assessment of construction traffic impacts will use traffic data based on an estimate of the average daily flows in the peak year during the construction period (2023-2033). The assessment will assume vehicle emission rates and background pollutant concentrations from year 2023. As both pollutant emissions from vehicle exhausts and background pollutant concentrations are anticipated to reduce year by year as a result of vehicle emission controls, the year 2023 represents the worst case for the construction assessment.

5.3 Environmental baseline

Existing baseline

Background air quality

5.3.1 The main sources of air pollution in the Lea Marston to Tamworth area are emissions from road vehicles and agricultural activities. The main roads within the area are the M42, the A5 and the A51 Tamworth Road.

5.3.2 There are three industrial installations (regulated by the Environment Agency) with permits for emissions to air, namely Dosthill, Kingsbury and Wilnecote landfill sites. The contribution of all industrial processes and other emission sources to local air quality is included within the background concentrations.

5.3.3 Estimates of background air quality have been obtained from the Department for Environment, Food and Rural Affairs (Defra)[51] for the baseline year of 2017. The data are estimated for 1km grid squares for NOx, NO2, PM10 and PM2.5. Background concentrations are within the air quality standards for all pollutants within the Lea Marston to Tamworth area.

Local monitoring data

5.3.4 There are currently 10 local authority diffusion tube sites located within the Lea Marston to Tamworth area for monitoring NO2 concentrations. They are located near to the M42, the A5 Watling Street and the A5 Wilnecote Bypass, the B5404 Watling Street and Dosthill Road. Measured concentrations in 2016 were within the air quality standard[52].

Air quality management areas

5.3.5 There is one air quality management area (AQMA) within the Lea Marston to Tamworth area, the Two Gates Junction AQMA. This AQMA covers the Dosthill Road/Watling Street crossroads in the Two Gates area of Tamworth and was declared in May 2014. The AQMA was designated for exceedances in the annual mean NO2 standard.

Receptors

5.3.6 Several locations have been identified in the area as sensitive receptors, which are considered to be susceptible to changes in air quality due to their proximity to dust

[51] Department for Environment, Food and Rural Affairs (Defra), Defra Background Pollutant Concentration *Maps*. Available online at: http://uk-air.defra.gov.uk/data/laqm-background-maps?year=2015
[52] At the time of assessment, measurements for 2016 were the latest published annual monitoring baseline data

generating activities or traffic routes during construction or operation of the Proposed Scheme.

5.3.7 Most of the receptors which may be affected by the Proposed Scheme are residential. Other receptors include Marston Farm Hotel and Kingsbury Primary School.

5.3.8 There are three statutory designated ecological sites identified within the Lea Marston to Tamworth area that could be affected by emissions to air, namely Kingsbury Wood Site of Special Scientific Interest (SSSI), Middleton Pool SSSI and Whitacre Heath SSSI. Other non-statutory sensitive ecological sites identified close to the Proposed Scheme include Kettle Brook Local Nature Reserve (LNR) and Cliff Wood Local Wildlife Site (LWS). Further details of the ecological receptors are set out in Section 7, Ecology and biodiversity.

5.4 Effects arising during construction

Avoidance and mitigation measures

5.4.1 Emissions to the atmosphere will be controlled and managed during construction through the route-wide implementation of the Code of Construction Practice (CoCP). The draft CoCP[53] includes a range of mitigation measures that are accepted by the Institute of Air Quality Management (IAQM) as being suitable to reduce impacts from construction dust to as low a level as is reasonably practicable. These measures are generally sufficient to avoid any significant effects from dust during construction.

5.4.2 The assessment has assumed that the general measures detailed in Section 7 of the draft CoCP will be implemented. These include:

- contractors being required to manage dust, air pollution, odour and exhaust emissions during construction works;
- inspection and visual monitoring, undertaken in consultation with local authorities, to assess the effectiveness of the measures taken to control dust and air pollutant emissions;
- cleaning (including watering) of vehicle routes and designated vehicle waiting areas to suppress dust;
- the use of water spray systems on demolition sites to dampen down and minimise emissions of fugitive dust;
- keeping soil stockpiles away from sensitive receptors where reasonably practicable, also taking into account the prevailing wind direction relative to sensitive receptors;
- the use of enclosures to contain dust emitted from construction activities; and
- soil spreading, seeding and planting of completed earthworks as soon as reasonably practicable following completion of earthworks.

[53] Supporting document: Draft Code of Construction Practice

5.4.3 The draft CoCP includes the requirement for site-specific traffic management measures, such as the use of site haul routes for construction vehicles to minimise the need to use public roads.

Assessment of impacts and effects

Temporary effects

5.4.4 Impacts from construction of the Proposed Scheme could arise from dust generating activities and emissions from construction traffic. As such, the assessment of construction impacts has been undertaken for dust and exposure to NO2, PM10 and PM2.5 concentrations.

Construction dust effects

5.4.5 The risks of demolition of existing buildings, earthworks, construction and trackout[54] have been assessed for their effect on dust soiling, human health[55] and ecological sites. There are residential and ecological receptors located within the Lea Marston to Tamworth area.

5.4.6 It has been identified that the risk of dust effects from demolition would range from negligible to medium within this area, depending on the location of sensitive receptors and the magnitude of the demolition activities. There would also be a negligible risk of human health effects from demolition. For earthworks and construction, the risk of dust effects would range from low to high, depending on the location of sensitive receptors and the magnitude of the earthworks and construction activities. There would be a low risk of human health effects from earthworks and construction. For trackout, there would be a medium to high risk of dust effects and a low risk of human health effects. There would also be a negligible risk of ecological effects from demolition and a low risk from the other dust generating activities.

5.4.7 With the application of the established national best practice mitigation measures contained in the draft CoCP, no significant effects are anticipated from the risks associated with the dust generating activities.

Construction traffic effects

5.4.8 Construction activity could also affect local air quality through the additional traffic generated on local roads as a result of construction vehicles and through changes to traffic patterns arising from temporary road diversions and realignments.

5.4.9 The M42, the A5, the A4097 Kingsbury Road, the A51 Coventry Road/Tamworth Road, B5080 Pennine Way, Coton Road/Bodymoor Heath Road, Trinity Road, Whateley Lane, Overwoods Road, Centurion Way and Green Lane would likely provide the primary access for construction vehicles in this area. An increase in traffic flows as a result of construction traffic, temporary closures or diversions is anticipated on the A5, Green Lane and Relay Drive. A detailed assessment of air quality impacts from traffic emissions in the area will be undertaken and reported in the formal ES.

[54] Trackout refers to the transport of dust and dirt from the construction site(s) onto the public road network, where it may be deposited and then re-suspended by vehicles using the network
[55] Human health effects relate mainly to short-term exposure to particles of size between 2.5µm to 10µm, measured as PM10

5.4.10 Direct and indirect effects from changes in air quality, such as those arising from increased levels of construction traffic, will be considered for all sensitive receptors within 200m of construction routes. These will include human receptors and those ecological habitats considered to be sensitive to changes in air quality. These effects will be reported in the formal ES.

Permanent effects

5.4.11 No permanent effects on local air quality are likely to arise during construction of the Proposed Scheme.

Other mitigation measures

5.4.12 No other mitigation measures are proposed at this stage in relation to air quality during construction of the Proposed Scheme in this area.

Summary of likely residual significant effects

5.4.13 The methods outlined within the draft CoCP would be effective at reducing dust emissions and, therefore, no significant residual effects would be anticipated. Any significant residual effects from construction traffic emissions will be reported in the formal ES.

5.5 Effects arising from operation

Avoidance and mitigation measures

5.5.1 No specific mitigation measures for air quality are proposed during operation of the Proposed Scheme.

Assessment of impacts and effects

5.5.2 Impacts from the operation of the Proposed Scheme would arise from changes in the volume, composition and/or speed of road traffic, and changes in road alignment.

5.5.3 There would be no direct atmospheric emissions from the operation of trains that would cause an impact on air quality, and therefore no assessment is required. Indirect emissions from sources such as rail wear and brakes have been assumed to be negligible.

Operational traffic effects

5.5.4 Direct and indirect effects from changes in air quality, such as those arising from increased levels of traffic, will be considered for all receptors within 200m of affected roads. These will include human receptors and those ecological habitats considered to be sensitive to changes in air quality. Any effects will be reported in the formal ES.

Other mitigation measures

5.5.5 No other mitigation measures are proposed at this stage in relation to air quality in this area during operation of the Proposed Scheme.

Summary of likely residual significant effects

5.5.6 Any significant residual effects for air quality from the operation of the Proposed Scheme will be reported in the formal ES.

Monitoring

5.5.7 Volume 1, Section 9 sets out the general approach to environmental monitoring during operation of the Proposed Scheme.

5.5.8 Any area specific requirements for monitoring air quality effects during operation of the Proposed Scheme in this area will be reported in the formal ES.

6 Community

6.1 Introduction

6.1.1 This section of the report describes the impacts and likely significant effects identified to date on local communities resulting from the construction and operation of the Proposed Scheme in the Lea Marston to Tamworth area.

6.1.2 The assessment draws on information gathered from engagement with the users and operators of community facilities including Warwickshire County Council (WaCC), Staffordshire County Council (SCC), North Warwickshire Borough Council (NWBC), Tamworth Borough Council (TBC), the Wilnecote and Hockley Residents Association and Kingsbury Water Park. The purpose of this engagement has been to understand how the facilities are used and to obtain relevant baseline information to inform the design development and assessment of the Proposed Scheme. Engagement will continue with these and other stakeholders to inform the formal ES.

6.1.3 Maps showing the location of the key environmental features (Map Series CT-10) and the key construction (Map Series CT-05) and key operational (Map Series CT-06) features of the Proposed Scheme can be found in the Volume 2: CA LA01 Map Book.

6.2 Scope, assumptions and limitations

6.2.1 The assessment scope, key assumptions and limitations for the community assessment are set out in Volume 1 (Section 8) and the Scope and Methodology Report (SMR)[56] .

6.2.2 The assessment of in-combination effects will draw upon the findings of other technical disciplines (e.g. air quality, sound, noise and vibration, landscape and visual and traffic and transport). Likely significant in-combination and isolation effects on community facilities and resources will be reported in the formal ES.

6.2.3 Effects relating to the severance of public rights of way (PRoW) (public footpaths and bridleways) and highway and pedestrian diversions, are assessed under the Traffic and transport topic. However, where PRoW and other routes are a 'promoted' destination in their own right as a recreation resource, they will be considered within the community assessment. Where impacts on open space and PRoW are considered, these have been informed by open space and PRoW condition surveys, where it has been possible to undertake such surveys.

6.2.4 Where reasonably practicable, public footpaths and routes would be reinstated or convenient alternatives provided. HS2 Ltd will seek to provide a temporary or permanent alternative route in advance of a closure of a road or PRoW. No significant effects on these routes are likely once the mitigation measures have been implemented. Alternative temporary routes have not been defined in all cases due to the relatively early stage of design of the Proposed Scheme. Where this is the case they will be reported in the formal ES.

[56] Supporting document: HS2 Phase 2b Environmental Impact Assessment Scope and Methodology Report

6.2.5 If a temporary or permanent alternative route cannot be provided in advance of any road or PRoW closure then this will be discussed with the relevant local authority and local groups and reported in the formal ES.

6.2.6 The assessment in the working draft ES is based on the design information, including demolitions as set out in Section 2 available at the time of the assessment. This is subject to change as a result of design changes confirmed in advance of the submission of the hybrid Bill.

6.2.7 The construction of the Proposed Scheme could lead to isolation effects in one or more communities in this area. These will be assessed in the formal ES.

6.2.8 Overall, the study area is taken as the area of land that encompasses the likely significant effects of the Proposed Scheme. The study area includes the area of land required both temporarily and permanently for the construction and operation of the Proposed Scheme. It also includes a wider corridor within which receptors or resources could be affected by a combination of significant residual effects arising from, for example, noise, vibration, poor air quality, HGV traffic and visual intrusion. These in-combination effects will be identified in the formal ES. In addition, the study area has regard to the proposed routes of construction traffic and takes account of catchment areas for community facilities that could be affected where intersected by the Proposed Scheme.

6.2.9 For the working draft ES, the full details of the construction traffic routes and geographical scope of likely in-combination (amenity) effects are yet to be determined. In the formal ES, the study area and associated baseline of community resources will be updated to take account of these.

6.3 Environmental baseline

6.3.1 The Proposed Scheme through the Lea Marston to Tamworth area would be approximately 8.7km in length and lies within the local authority areas of NWBC, TBC, WaCC and SCC. The route would extend from Lea Marston in the south to Stoneydelph in the north, passing close to the settlements of Whateley, Wilnecote and Freasley.

6.3.2 The Lea Marston to Tamworth area is predominantly rural in nature with a few settlements. In general, the majority of community facilities are located within Kingsbury, Wilnecote and Stoneydelph.

Kingsbury, Piccadilly and surrounds

6.3.3 The village of Kingsbury is located approximately 2.9km south of Wilnecote (a district ward situated within Tamworth), and approximately 490m east of the M42. The village of Piccadilly is located approximately 1.8km south of Wilnecote and approximately 350 south-east of the M42. In total, the villages of Kingsbury and Piccadilly comprise approximately 1,750 residential properties. The nearest residential properties would be approximately 130m south-east of the route of the Proposed Scheme. Kingsbury village is bordered to its south by the River Tame and to its north by the Birmingham to Derby Railway. Scattered hamlets are located south of Seeney Lane, alongside Coton Road and north of the M42 next to the A51 Tamworth Road.

6.3.4 Many community facilities are situated within the study area. Kingsbury Water Park, located to the east and west of the route of the Proposed Scheme, is a country park of 243ha in size, bounded to the south by Bodymoor Heath Road and to the north by the River Tame. Kingsbury Water Park includes recreational facilities such as a children play area and Echills Wood Railway, which is a miniature train attraction with several stops within the park. Echills Wood Railway attracted approximately 32,000 passengers in 2017[57]. A promoted recreational walking route, known as the Heart of England Way, passes through Kingsbury Water Park from east to west. Kingsbury Water Park also includes several water features, including lakes and a number of pools including Sandy Pool and Alder Pool adjacent to the east of the M42. The Birmingham and Fazeley Canal, running west of Kingsbury Water Park, is used by pleasure craft for recreational activities. In addition to these open spaces, Kingsbury village provides a range of community resources comprising educational resources (including Kingsbury Primary School and Kingsbury School), medical facilities, community, leisure and sport centres (including Kingsbury Leisure Centre), public houses (including The Royal Oak and The White Swan) and places of worship (Church of St Peter and St Paul and Kingsbury Methodist Church).

Whateley, Freasley and surrounds

6.3.5 The hamlet of Whateley is located approximately 780m south of Wilnecote and approximately 370m west of the M42. The hamlet of Freasley is located approximately 420m east of Wilnecote and 210m east of the M42. In total, Whateley and Freasley comprise approximately 50 residential properties. Some residential properties would be on the route of the Proposed Scheme. Whateley is connected to larger urban areas by Whateley Lane, which runs north towards Wilnecote and east crossing the M42 and joining Trinity Road before leading to Kingsbury village. The main access road to Freasley, The Green, is connected to Trinity Road which joins the M42 junction 10.

6.3.6 Within the study area, the community resources include a place of worship (St Mary, Freasley), an allotment area and a garden centre, named Planters Garden Centre. Located to the south of Freasley, the garden centre organises regular social activities, as well as occasional events. There is also a restaurant and a children's play area.

Wilnecote, Stoneydelph and surrounds

6.3.7 Wilnecote is a ward area within the Borough of Tamworth, located approximately 1.9km south-west of Dordon and approximately 150m west of the M42. Stoneydelph, a ward area within the Borough of Tamworth, is located approximately 1.5km west of Dordon and approximately 200m west of the M42. In total, Wilnecote and Stoneydelph comprise approximately 7,100 residential properties. The nearest residential properties would be approximately 60m west of the route of the Proposed Scheme. Wilnecote and Stoneydelph comprise residential areas, including the Hockley residential area, as well as the Centurion Park logistics and distribution site, Tame Valley and the Relay Park industrial zones. The area is bordered to the north by the A51 Tamworth Road, to the east by Green Lane and the M42, to the west by

[57] Echills Wood Railway (2018)

Pennine Way, Deltic Road and the Birmingham to Derby Railway. The area to the south of Wilnecote and Stoneydelph is bounded by agricultural fields.

6.3.8 Within the study area, community resources include educational facilities (including Three Peaks Primary Academy and the Wilnecote School), a nursery (Pennymoor Pre School Nursery), a public house, allotment areas, a community centre and a retirement facility. In addition, several open and nature spaces are located within the wider area of Wilnecote and Stoneydelph, including the Kettle Brook Local Nature Reserve (LNR). The area also has a number of play spaces.

6.4 Effects arising during construction

Avoidance and mitigation measures

6.4.1 As part of design development the following measures have been incorporated into the Proposed Scheme design to avoid or minimise adverse environmental impacts during construction:

- provision of the River Tame viaduct crossing over Kingsbury Water Park and the Heart of England Way which would limit the amount of land required for construction and enable the recreational route to continue to function; and
- provision of new ponds required to offset the loss of Sandy Pool and Alder Pool, in Kingsbury Water Park.

6.4.2 The draft Code of Construction Practice (CoCP)[58] includes a range of provisions that will help mitigate community effects associated with construction within this area, including:

- implementation of a community engagement framework to provide appropriate information and resolve community issues (Section 5 of the draft CoCP);
- sensitive layout of construction sites to reduce nuisance as far as possible (Section 5);
- maintenance of public rights of way (PRoW) during construction where reasonably practicable (Section 14);
- monitoring and management of flood risk and other extreme weather events, where reasonably practicable, which may affect community resources during construction (Section 16);
- specific measures in relation to air quality and noise will also serve to reduce impacts for the neighbouring communities including discretionary noise insulation for sensitive community resources and, in special circumstances, temporary rehousing (Sections 7 and 13); and
- where practicable, the avoidance of HGVs operating adjacent to schools during drop-off and pick-up periods (Section 14).

[58] Supporting document: Draft Code of Construction Practice

Assessment of impacts and effects

Temporary effects

Residential properties

6.4.3 No temporary effects on residential properties have been identified as a result of the land required for the construction of the Proposed Scheme.

Community facilities

6.4.4 No temporary effects on community facilities have been identified as a result of the land required for the construction of the Proposed Scheme.

Recreational facilities

6.4.5 No temporary effects on recreational facilities have been identified as a result of the land required for the construction of the Proposed Scheme.

Open space and recreational PRoW

6.4.6 Within the Lea Marston to Tamworth area, for the construction of the River Tame viaduct, approximately 10.5ha of the land at Kingsbury Water Park (equivalent to 5% of the park) would be required for approximately three years and three months. The directly affected part of the park would be inaccessible to the public during construction. It is used for walking and informal recreation and constitutes an important part of the park as it lies broadly at the centre of it. Although the remainder of Kingsbury Water Park would remain open during the construction phase, recreational users could be deterred from visiting adjacent areas of the park due to the presence of construction activities. The resource is regularly used by the local community and the nearest alternative (Pooley Country Park, which is located approximately 8.2km north in the Birchmoor to Austrey area), would also be affected by the Proposed Scheme. The temporary loss of land at Kingsbury Water Park would result in a moderate adverse effect, which would be significant.

6.4.7 Within the Lea Marston to Tamworth area, construction of the River Tame viaduct would temporarily require 135m of the route (less than 0.1%) of the Heart of England Way (on Warwickshire Footpath T25). The Heart of England Way is a long recreational walking route (160km) and approximately 135m of the route (less than 0.1%) would be directly affected for a duration of approximately three years and three months. The resource is regularly used by regional and local users. Proposed mitigation and an assessment of the likely effects will be reported in the formal ES.

6.4.8 Within the Wilnecote area, construction of Freasley embankment and Wilnecote cutting would temporarily require approximately 7.1ha of land at the Kettle Brook LNR (equivalent to 11% of the LNR). The land would be required for approximately two years and nine months. Kettle Brook LNR would remain accessible to the local community as most of the pedestrian access points would be maintained.
The temporary loss of land from Kettle Brook LNR would result in a minor adverse effect, which would not be significant.

Permanent effects

Residential properties

6.4.9 Within the Lea Marston to Tamworth area, the realignment of Bodymoor Heath Road would require the demolition of one residential property on Dog Lane. This residential property would be permanently lost.

6.4.10 Within the hamlet of Whateley, the construction of Whateley cutting would require the demolition of seven residential properties situated on Whateley Lane. These properties would be permanently lost. This represents a relatively large proportion (approximately 30%) of the hamlet. The permanent loss of these residential properties would result in a major adverse effect which would be significant for this community.

6.4.11 Within Stoneydelph, the construction of M42 junction 10 tunnel would require the demolition of two residential properties situated on Kinsall Green. These residential properties would be permanently lost.

Community facilities

6.4.12 No permanent effects on community facilities have been identified as a result of the land required for the construction of the Proposed Scheme.

Recreational facilities

6.4.13 Within the Lea Marston to Tamworth area, construction of the River Tame viaduct and the associated construction access route would require land on which part of the Echills Wood Railway is located within Kingsbury Water Park. As such, the resource would no longer be operational and would therefore be lost. The closest similar attraction, the Avonvale Model Engineering Society is located approximately 50km south of Kingsbury Water Park. The permanent loss of Echills Wood Railway would result in a major adverse effect, which would be significant.

Open spaces and recreational PRoW

6.4.14 Within the Lea Marston to Tamworth area, a proportion of Kingsbury Water Park would lie within the land required for River Tame viaduct. It would represent a permanent loss of approximately 1.9ha of open space land (equivalent to 0.7% of the park). Two ponds, Sandy Pool and Alder Pool, both located beneath the proposed River Tame viaduct would be permanently lost. Additional ponds (on a two to one basis) would be provided within a distance of 50m and 200m to the north of Sandy Pool and Alder Pool. Kingsbury Water Park is regularly used by the local community. The permanent loss of land at Kingsbury Water Park would result in a minor adverse effect, which would not be significant.

6.4.15 Within the Wilnecote area, a proportion of Kettle Brook LNR would lie within the land required for Wilnecote cutting. It would represent a permanent loss of approximately 1.2ha of open space land (equivalent to 1.9% of the LNR) located in the east part of the park. A number of similar open spaces are located within the local area. The permanent loss of land at Kettle Brook LNR would have a negligible effect, which would not be significant.

Other mitigation measures

6.4.16 HS2 Ltd will continue to engage with owners/operators to identify reasonably practicable measures to help mitigate potential significant effects identified in the assessment.

6.4.17 Any other mitigation measures will be described in the formal ES.

Summary of likely residual significant effects

6.4.18 Land required for construction of the Proposed Scheme is likely to result in temporary residual significant effects on Kingsbury Water Park.

6.4.19 Land required for construction of the Proposed Scheme is likely to result in permanent residual significant adverse effects:

- Loss of residential properties on Whateley Lane in Whateley; and
- Loss of Echills Wood Railway in the Lea Marston to Tamworth area.

6.4.20 Cumulative effects Community wide effects occur where a number of individual impacts on resources come together within a location and have a wider impact on the community, such that they change the experience of a considerable proportion of people within that community.

6.4.21 No cumulative effects have been identified at this time. Any combined effects on a community during construction of the Proposed Scheme, which would result in cumulative community effects, will be reported in the formal ES.

6.5 Effects arising from operation

Avoidance and mitigation measures

6.5.1 Avoidance and mitigation measures will be reported in the formal ES.

Assessment of impacts and effects

6.5.2 Operation of the Proposed Scheme could lead to in-combination effects on the community in this area which will be reported in the formal ES.

Other mitigation measures

6.5.3 Any other mitigation measures will be described in the formal ES.

Summary of likely residual significant effects

6.5.4 A summary of the likely residual significant effects will be reported in the formal ES.

Cumulative effects

6.5.5 Community wide effects occur where a number of individual impacts on resources come together within a location and have a wider impact on the community, such that they change the experience of a considerable proportion of people within that community.

6.5.6 No cumulative effects have been identified at this time. Any combined effects on a community during operation of the Proposed Scheme, which would result in cumulative community effects, will be reported in the formal ES.

Monitoring

6.5.7 Volume 1 Section 9 sets out the general approach to environmental monitoring during operation of the Proposed Scheme.

6.5.8 There are no area-specific community monitoring requirements during operation of the Proposed Scheme. Any area-specific operational monitoring requirements in relation to air quality effects, noise and vibration effects, traffic effects and visual effects that would contribute to the in-combination assessments, will be described in the relevant topic sections of the formal ES.

7 Ecology and biodiversity

7.1 Introduction

7.1.1 This section of the report identifies the predicted impacts and likely significant effects on species and habitats identified to date in the Lea Marston to Tamworth area as a consequence of the construction and operation of the Proposed Scheme. This includes effects on sites recognised or designated on the basis of their importance for nature conservation.

7.1.2 Engagement with stakeholders including Natural England, Environment Agency, Warwickshire Wildlife Trust, Warwickshire County Council (WaCC) and Staffordshire Wildlife Trust has commenced and is ongoing. The purpose of this engagement has been to discuss the Proposed Scheme and potential effects, obtain relevant baseline information and consider alternative locations for environmental mitigation. Engagement with these stakeholders and other local groups will continue as part of the development of the Proposed Scheme and inform the formal ES.

7.1.3 Maps showing the location of the key environmental features (Map Series CT-10) and the key construction (Map Series CT-05) and key operational (Map Series CT-06) features of the Proposed Scheme are provided in the Volume 2: LA01 Map Book.

7.1.4 All distances and area measurements in this section are approximate.

7.2 Scope, assumptions and limitations

7.2.1 The scope, assumptions and limitations for the ecological assessment are set out in Volume 1, Introduction and Methodology (Section 8) and the Scope and Methodology Report (SMR)[59].

7.2.2 In the absence of field surveys and fully developed mitigation, the assessment has been undertaken on a realistic precautionary approach.

7.2.3 Field surveys are ongoing, but are limited to locations where landowner permission has been obtained and to areas accessible to the public. The surveys include (but are not limited to) broad habitat and detailed plant surveys, great crested newt surveys, wintering and breeding bird surveys, bat surveys, otter and water vole surveys. The findings from these ongoing surveys will be taken into account in the formal ES.

7.3 Environmental baseline

Existing baseline

Introduction

7.3.1 This section describes the ecological baseline relevant to the assessment: the designated sites, habitats and species recorded in this area as known at this time.

7.3.2 The Proposed Scheme would be located parallel (to east and west) and in proximity to the M42 in this area. Land required for the Proposed Scheme consists mainly of

[59] Supporting document: HS2 Phase 2b Environmental Impact Assessment Scope and Methodology Report

agricultural land, woodland, floodplain, urban and suburban land on the outskirts of Tamworth, and villages and farmsteads throughout the area. The Proposed Scheme in the Lea Marston to Tamworth area would also pass through wetland and woodland habitat to the south of the River Tame, within Kingsbury Water Park.

7.3.3 Statutory and non-statutory designated sites are shown on Map Series CT-10, Volume 2: LA01 Map Book.

Designated sites

7.3.4 There are no internationally important sites relevant to the assessment in the Lea Marston to Tamworth area.

7.3.5 There are three nationally important sites of special scientific interest (SSSI) that are relevant to the assessment in the Lea Marston to Tamworth area. For each of these sites, the land required for the Proposed Scheme is within the Impact Risk Zone[60] relevant to railway infrastructure as identified by Natural England. They are:

- Whitacre Heath SSSI, covering an area of 44.1ha, is designated for its wetland breeding birds. The site is located on the floodplain of the River Tame upstream of the Proposed Scheme, and comprises a series of wetland habitats that have established after gravel extraction. The site is notified for its assemblage of breeding birds of lowland open waters and their margins. Bird species that breed regularly here include little grebe, mute swan, tufted duck, snipe and redshank. The site is also considered important for wintering and migrant birds. This SSSI is located north of Coleshill 1.4km south-east of the land required for the Proposed Scheme within the Lea Marston to Tamworth area;
- Kingsbury Wood SSSI, covering an area of 62.4ha, is designated for its ancient woodland and diverse breeding bird community. The majority of the woodland comprises oak woodland, with areas of ash woodland associated with limestone workings. Bird species that breed within the site include lesser spotted woodpecker, woodcock, willow tit and lesser whitethroat. This SSSI is located south of Edge Hill, 380m south of the land required for the Proposed Scheme; and
- Middleton Pool SSSI, covering an area of 12.6ha, is designated for its diverse flora and assemblages of breeding birds of lowland open waters and woodland associated with fen, swamp, neutral grassland, old orchard and woodland habitats. Bird species that breed within the site include great crested grebe, little grebe, lesser woodpecker and willow tit. This SSSI is located to the east of Middleton 1.8km west of the land required for the Proposed Scheme.

7.3.6 There are two local nature reserves (LNR) of potential relevance to the assessment in the Lea Marston to Tamworth area, each of which is of up to county/metropolitan value. They are:

[60] The Impact Risk Zones are a GIS tool developed by NE to make a rapid initial assessment of the potential risks to SSSI posed by development proposals and indicate the types of development proposal which could potentially have adverse impacts.

- Kingsbury Meadow LNR, covering an area of 3ha, comprises grassland habitat located on either side of Hurley Brook, which is a tributary of the River Tame. This LNR is located 700m south-east of the land required for the Proposed Scheme, within Kingsbury to the east of the A51 Tamworth Road; and
- Kettle Brook LNR, covering an area of 61.7ha, comprises a diverse range of habitats including woodland, grassland, running water and water bodies. The southern part of this LNR is within the land required for the Proposed Scheme, to the north of Hockley, Tamworth.

7.3.7 There are 12 local wildlife sites (LWS) relevant to the assessment in this area, these are described below. There are an additional nine potential LWS and one deferred LWS identified by WaCC. These are sites where further survey is required to determine the status of the site. As such they are not formally designated sites, but relevant habitats within them are included within the description of habitat types. Due to the habitats and species present, the 12 notified LWS sites are considered to be of county/metropolitan value. They are:

- Dunton Wood LWS, covering an area of 1.8ha, supports woodland habitat of ancient origin and scrub habitat. The woodland is dominated by mature and semi-mature sessile oaks with silver birch, rowan and hawthorn. The ground flora is dominated by bracken and bramble. This LWS is located 280m south-east of the land required for the Proposed Scheme, to the south of Marston. The LWS is separated from the land required for the Proposed Scheme by the A4097 Kingsbury Road;
- North Wood LWS, covering an area of 7.2ha is a small, damp ancient woodland with a diverse list of vascular plants (124 species) characteristic of W10 Pedunculate Oak-Bracken-Bramble community as defined by the National Vegetation Classification[61] (NVC). Within the woodland there are at least seven ponds, together with moats and a number of drains. The LWS is located 530m west of the land required for the Proposed Scheme to the east of The Belfry. The LWS is separated from the land required for the Proposed Scheme by the M42;
- Lea Marston Old Quarry LWS, covering an area of 17.9ha, supports semi-natural grasslands and marsh. The quarry supports a range of habitats including extensive areas of willow scrub, semi-improved grassland and swamp. The most diverse areas are the wet hollows and ruts, as well as the swamp-dominated pits, which contain a range of wetland plants. The site is noted for the diversity of scrub and wetland birds, and a wide range of invertebrates particularly butterflies and moths. The LWS is located 620m east of the land required for the Proposed Scheme to the south of Marston. There is no direct habitat connectivity between the LWS and the land required for the Proposed Scheme, though Kingsbury Road, which is located 175m to the north

[61] National Vegetation Classification (NVC) is a survey method used to classify vegetation within the Great Britain based solely on the plant species that are present. The NVC breaks down each broad vegetation type (e.g. woodland, mires) into communities, designated by a number and name e.g. W12 Beech – Dogs mercury woodland.

of the LWS, would be used for construction access to the Proposed Scheme;

- Lea Marston Lake LWS, covering an area of 58.7ha, comprises two water bodies with semi-natural grassland and marsh, which are part of the county important Tame Valley wetlands. Although primarily important for its winter wildfowl population, which includes nationally important numbers of gadwall, tufted duck and pochard, the site also contains an interesting mosaic of wet and dry semi-improved grassland and tall herb habitats, swamp, pools and sallow scrub. The LWS is located 700m east of the land required for the Proposed Scheme to the south of Marston. The LWS and land required for the Proposed Scheme are connected by the River Tame, with the LWS being located upstream of land required for the Proposed Scheme;
- Kingsbury Linear Park LWS, covering an area of 2.9ha (located entirely within the boundary of Kingsbury Meadow LNR), supports semi-natural grasslands and marsh with a diverse plant composition, with 130 species recorded. Marsh and wet grassland are the most important habitats within the LWS, with all significant blocks of this habitat occurring north of Hurley Brook. This LWS is located 700m south-east of the land required for the Proposed Scheme and located within Kingsbury, to the east of the A51 Tamworth Road. The A51 Tamworth Road would be used for construction access for the Proposed Scheme;
- Fisher's Mill Meadow LWS, covering an area of 20.1ha, supports a mosaic of wet and dry semi-improved grassland, with marsh and swamp areas. The most important botanical habitat present within the LWS is the marsh and swamp running down the west side of the meadow adjacent to the canal. The meadow also supports an above average diversity of breeding and wintering birds, with the wetland area containing the majority. This LWS is located 330m east of the land required for the Proposed Scheme and is connected to the land required for the Proposed Scheme via the River Tame;
- Dosthill Lake LWS, covering an area of 48.3ha, is one of the largest water bodies in the Middle Tame valley complex. The principle nature conservation interest is the presence of wintering populations of waterfowl. This LWS is located 300m north-east of the land required for the Proposed Scheme, and is connected to the land required for the Proposed Scheme via the River Tame;
- Dosthill Quarries LWS, covering an area of 23.6ha, comprises two large lakes with adjacent grassland and woodland habitat. The LWS is located 1.1km north of the land required for the Proposed Scheme, and is connected to the land required for the Proposed Scheme via the River Tame;
- Dosthill Park LWS, covering an area of 11.4ha, supports a complex of habitats including unimproved neutral grassland, woodland, drains and streams. The LWS is located 1.8km north of the land required for the Proposed Scheme, and is connected to the land required for the Proposed Scheme via the River Tame;
- Cliff Wood LWS, covering an area of 3.2ha supports woodland which is a good example of W10 Pedunculate Oak – Bracken - Bramble woodland NVC

community and scrub habitat. The LWS also contains a small pond surrounded by rough grassland and scrub. This LWS is adjacent to the land required for the Proposed Scheme;

- Hockley Clay Pit (west of) LWS, covering an area of 3.2ha supports grassland, swamp and woodland habitat. This LWS is located 1.2km north of the land required for the Proposed Scheme, and is connected to the land required for the Proposed Scheme via the Birmingham to Derby Railway; and
- Edge Hill Woodland and Kingsbury Spoil Mound LWS, covering an area of 34.6ha, supports a mosaic of habitats including dry and marshy semi-improved grassland, birch scrub, wet drains and acid pools. This LWS is located 315m to the south-east of the land required for the Proposed Scheme.

7.3.8 There is one biodiversity alert site (BAS), a Staffordshire County Council (SCC) designation, of potential relevance to the assessment in the Lea Marston to Tamworth area. This site is Kettle Brook BAS, which is entirely within Kettle Brook LNR and covers an area of 21.3ha. The site provides a green corridor through Tamworth, comprising wet woodland, semi-improved neutral grassland and Kettle Brook. It is partly within the land required for the Proposed Scheme. This site is of district/borough value.

7.3.9 There are three ancient woodland inventory sites (AWIS) supporting either ancient semi-natural woodland (ASNW) or plantation on ancient woodland sites (PAWS), or both, of potential relevance to the assessment in the Lea Marston to Tamworth area, each of which is of county/metropolitan value. These are:

- Dunton Coppice - a 1.8ha AWIS. This woodland supports ASNW and is located 280m south-east of the land required for the Proposed Scheme. This woodland is also designated as Dunton Wood LWS;
- North Wood - a 7.1ha AWIS. Most of the woodland (5.4ha) is ASNW, but the northern parcel (1.7ha) is PAWS. This woodland is located 530m west of the land required for the Proposed Scheme, and is entirely within North Wood LWS; and
- Kingsbury Wood - a 45ha AWIS. This woodland supports ASNW and is within Kingsbury Wood SSSI. It is located 514m west of the land required for the Proposed Scheme.

7.3.10 A review is being undertaken to identify any additional woodlands that are not currently listed on the AWI but that may nevertheless be ancient. These will be identified and assessed in the formal ES.

Habitats

7.3.11 The following habitat types which occur in this area are relevant to this assessment of effects and impacts within the Lea Marston to Tamworth area.

Woodland

7.3.12 In addition to the woodlands located within designated sites, there are five other areas of lowland deciduous woodland (likely to qualify as habitats of principal importance[62], and local biodiversity action plan (BAP)[63,64] habitats, which would be within or partly within the land required for the Proposed Scheme. These are:

- at Lea Marston at the southern extent of the Proposed Scheme;
- at Cocksparrow Farm in Marston, within Kingsbury Wetlands (Water Park) potential LWS (Kingsbury Water Park);
- a small area of woodland adjacent to the M42 to the north of the River Tame;
- woodland within the roundabout of the M42 junction 10; and
- woodland along the northbound carriageway of the M42 near Tamworth Services.

7.3.13 On a precautionary basis, pending the findings of field surveys these woodlands are considered to be of up to county/metropolitan value.

Grassland

7.3.14 Grassland areas outside of designated sites occur within the land required for the Proposed Scheme. This includes the semi-improved grassland within Kingsbury Wetlands (Water Park) potential LWS (Kingsbury Water Park) and the grassland located between the M42 and Kettle Brook LNR, which may qualify as a habitat of principal importance and local BAP habitat. On a precautionary basis, pending the findings of field surveys, the grasslands within Kingsbury Wetlands (Water Park) potential LWS are considered to be of up to county/metropolitan value and other grasslands are considered to be of up to district/borough value.

Hedgerows

7.3.15 Many of the hedgerows in the Lea Marston to Tamworth area (including hedgerows within the land required for the Proposed Scheme) are likely to qualify as a habitat of principal importance and a local BAP habitat. Some may also meet the wildlife and landscape criteria to be 'important' hedgerows as defined in the Hedgerows Regulations 1997[65]. In addition, they may also be of functional importance for the integrity and cohesiveness of landscape-scale wildlife corridor, nesting and feeding habitats for wildlife and other green corridors identified in local planning policy. On a precautionary basis, pending the findings of field surveys, the hedgerow network is considered to be of up to district/borough value.

[62] Natural England (2010), *List of habitats and species of principal importance in England under Section 41 of the Natural Environment and Rural Communities (NERC) Act 2006*
[63] Staffordshire Wildlife Trust (2001), *Staffordshire Biodiversity Action Plan*
[64] Warwickshire Wildlife Trust (2012-2014), *Warwickshire, Coventry and Solihull Local Biodiversity Action Plan*. Available online at: http://www.warwickshirewildlifetrust.org.uk/LBAP
[65] Hedgerows Regulations 1997 (SI 1997/1160)

Watercourses

7.3.16 The River Tame, Thistlewood Brook, Kettle Brook and three smaller land drainage watercourses (Tributary of River Tame 1, Tributary of Thistlewood Brook 2 and Tributary of Thistlewood Brook 3) would be crossed by the Proposed Scheme. In addition, sections of Thistlewood Brook, Kettle Brook and a land drain located south of Bodymoor Heath Road (Tributary of the River Tame 1) would be diverted. The River Tame, Thistlewood Brook and Kettle Brook may qualify as habitats of principal importance and local BAP habitats. On a precautionary basis, pending the findings of field surveys, these watercourses are considered to be of up to county/metropolitan value. The smaller watercourses, pending clarification through field surveys of their associated habitat context and water quality status are considered to be of up to district/borough value.

Water bodies

7.3.17 There are six water bodies (ponds and lakes, two of which are within Kingsbury Water Park as detailed below) that would be located within, or partly within, the land required for the Proposed Scheme. Some may qualify as habitats of principal importance or local BAP habitats, for example, if they support faunal species of high conservation importance. On a precautionary basis, pending the findings of field surveys, these water bodies have been assumed to be of up to county/metropolitan value.

7.3.18 Kingsbury Water Park, which covers an area of 243ha, is partly located within the land required for the Proposed Scheme. This site has 15 lakes (two of which are within the land required for the Proposed Scheme) and are within the Tame Valley Wetlands Nature Improvement Area[66]. On a precautionary basis, pending the findings of field surveys, the lakes within Kingsbury Water Park have been assumed to be of up to county/metropolitan value.

Ancient and veteran trees

7.3.19 Pending the results of the field surveys, it is possible that ancient and veteran trees will be present within the land required for the Proposed Scheme. Information on ancient and veteran trees will be confirmed upon further survey and be reported in the formal ES. On a precautionary basis, it is considered that ancient and veteran trees would be of district/borough value.

Protected and notable species

7.3.20 A summary of the likely value of faunal species of relevance to the assessment is provided in Table 12. This assessment excludes any features of species interest, for which the sites described above are designated.

[66] Tame Valley Wetlands (2018), *Nature Improvement Area.* Available online at: http://www.tamevalleywetlands.co.uk/landscape/

Table 12*:* Species potentially relevant to the assessment within the Lea Marston to Tamworth area

Resource/feature	Value	Rationale
Bats	Up to regional	At least nine bat species have been recorded (foraging/commuting and roosting) in the Lea Marston to Tamworth area, based on field survey and desk study data. Ongoing bat activity surveys undertaken within woodland at Lea Marston and at Whateley Hall Farm have identified the presence of at least five bat species: common pipistrelle, soprano pipistrelle, noctule, brown long-eared bat and bats in the Myotis genus. Desk study[67] records of bats, within 100m of the land required for the Proposed Scheme are mainly concentrated around Kingsbury Water Park. Five bat species have been recorded within Kingsbury Water Park, including common pipistrelle, noctule, serotine, Daubenton's bat and whiskered/Brandt's bat. Nathusius' pipistrelle has also been recorded at Middleton Lakes. There are several desk study records of bat roosts located between 250m and 1km from land required for the Proposed Scheme, including a recent (2016) record of a brown long-eared bat roost in a farmstead in Bodymoor Heath. Higher quality habitat for bats is present within and adjacent to the land required for the Proposed Scheme, including woodland areas at Lea Marston at the southern extent of the Proposed Scheme, woodland and wetland habitat within Kingsbury Water Park, the River Tame, and hedgerow networks and copses around Whateley. These habitats, as well as buildings and structures to be affected by the Proposed Scheme, have the potential to support important roost sites, foraging areas and commuting routes of the bat species known to be present in the Lea Marston to Tamworth area, as well as other bat species. Important sites for rarer bat species could be of up to regional value.
Otter	Up to county/metropolitan	Otter surveys within Warwickshire indicate a trend in otter re-colonisation through both the Severn and Trent catchments. Otter signs have been recorded throughout the county, including on small streams and canals. It is considered that the population is breeding but unlikely to exceed 20 animals[68]. Habitat suitable for this species is present along the watercourses and drainage ditches. Desk study records have confirmed the presence of otter along the River Tame within 500m of the land required for the Proposed Scheme in Warwickshire and within 1km within Staffordshire. Otter has also been recorded on the Birmingham and Fazeley Canal within 100m of the land required for the Proposed Scheme. There are also otter records from within Kingsbury Water Park. In addition, there is suitable terrestrial habitat for otter within the land required for the Proposed Scheme including woodland, scrub and other dense vegetation within proximity of watercourses.
Water vole	Up to county/metropolitan	Surveys for water vole in Warwickshire have identified that there has been a decline in the water vole population, reflecting the national trend, although there has been an expansion in the north of the county, with the main populations being found within the Coventry/Nuneaton area[69]. Desk study records have also confirmed presence of water vole within the Tame valley.

[67] Ecological data received from Warwickshire County Council and Staffordshire County Council
[68] Warwickshire Wildlife Trust (2015), *Warwickshire, Coventry and Solihull Local Biodiversity Action Plan for Otter - Draft Revised Plan – August 2015*. Available online at: http://www.warwickshirewildlifetrust.org.uk/sites/default/files/files/Otter%20-%20August%202015.pdf
[69] Warwickshire Wildlife Trust (2014), *Warwickshire, Coventry and Solihull Local Biodiversity Action Plan for Water Vole - Draft Revised Plan 2014*

Resource/feature	Value	Rationale
		Habitat suitable for water vole is present along a number of watercourses and drainage ditches within the Lea Marston to Tamworth area, including Kettle Brook and the River Tame. There are historical (2003) records that have been established through desk studies of their presence in Kingsbury Water Park, within 500m of land required for the Proposed Scheme.
Polecat	Up to county/metropolitan	Populations of polecat are rare in Warwickshire and Staffordshire. Habitat suitable for this species is present including hedgerows, farmland and woodland. There are records for polecat in the Lea Marston to Tamworth area, including to the west of the M42 near The Belfry Hotel and Resort, from 2012 and 2013.
Water shrew	Up to district/borough	There is suitable habitat for water shrew, in particular within Kingsbury Water Park and the Tame Valley. There is one historic record (more than 20 years old) from Kingsbury Water Park, with more recent records (2013, 2015 and 2016) from Middleton Lakes Nature Reserve located 2km west of the land required for the Proposed Scheme.
Great crested newt	Up to county/metropolitan	Ongoing surveys have identified the presence of great crested newt in a pond located 350m east of the land required for the Proposed Scheme at Freasley and is separated from the Proposed Scheme by the M42. Great crested newt surveys of 13 water bodies within Kingsbury Water Park in 2017 (including Alder Pool) did not identify the presence of great crested newt. There are several previous great crested newt records from within 250m of the land required for the Proposed Scheme. The first record is located west of Marston and dates from 2016, a second record is located 55m north of the land required for the Proposed Scheme, near Cliff (record is from 2005). The third record is from a water body within woodland at Kingsbury Water Park (record also dates from 2005). These findings indicate that there are a number of distinct populations of great crested newt that could be present within land required for the Proposed Scheme. There is suitable aquatic and terrestrial habitat within and adjacent to the land required for the Proposed Scheme, including at Marston, Kingsbury Water Park, River Tame valley and around Holt Hall Farm.
Birds	Up to county/metropolitan	The farmland and woodland is suitable for breeding and wintering birds. Species typically associated with these habitats include those of open and partially wooded farmland including Schedule 1 species such as barn owl: there are estimated to be at least 100 breeding pairs of barn owl in Warwickshire, with records concentrated in South Warwickshire[70]. Staffordshire Wildlife Trust's Barn Owl Action Group recorded 68 nesting pairs in 2017[71], although county data show that numbers can fluctuate significantly from year to year. Kingsbury Water Park and the River Tame valley provide suitable habitat for breeding and wintering waterfowl in the form of lakes and running water. Third party data include a record of nesting barn owl in 2007 (plus several older nesting records) and nesting Mediterranean gull in 2007 at Kingsbury Water Park. Casual sightings of Lesser Spotted Woodpecker, a Red List species, have also been reported by staff at the water park. Visitor information for Kettle Brook LNR indicates that kingfisher (a Schedule 1 species) breed within the LNR.

[70] Warwickshire Wildlife Trust (2017), *Warwickshire, Coventry and Solihull Local Biodiversity Action Plan for Barn Owl - Draft Revised Plan – January 2017*. Available online at: http://www.warwickshirewildlifetrust.org.uk/sites/default/files/files/BarnOwl_January%202017.pdf
[71] Staffordshire Wildlife Trust (2017), *2017 is a record year for barn owl group*. Available online at: https://www.staffs-wildlife.org.uk/news/2017/11/14/2017-record-year-barn-owl-group

Resource/feature	Value	Rationale
White-clawed crayfish	Up to county/metropolitan	White-clawed crayfish are rare in this area and declining. There are historic records (more than 20 years old) in Thistlewood Brook within 300m of the land required for the Proposed Scheme, and in Langley Brook 1.2km from land required for the Proposed Scheme. Suitable habitat for this species is likely to be present in these watercourses.
Aquatic invertebrates	Up to district/borough	Species data from the Environment Agency and records centres will be reported in the formal ES. It is currently anticipated that suitable habitat for aquatic invertebrates (other than white-clawed crayfish described above) is present in watercourses and water bodies in this area; including ponds and watercourses such as the River Tame, Thistlewood Brook, Kettle Brook and water bodies in Kingsbury Water Park.
Terrestrial invertebrates	Up to district/borough	Suitable habitat for terrestrial invertebrates is present in areas of woodland, scrub, hedgerows and grassland. Kingsbury Meadow LNR includes an area of wetland habitat supporting a wide range of invertebrates including bees, dragonflies and hoverflies. Suitable habitat for terrestrial invertebrates is likely to be present in the area. Records from Kingsbury Water Park include moth species, small square-spot and rosy rustic, in addition to a butterfly species, small heath, which are species of principal importance. There are records of terrestrial invertebrates from Kettle Brook LNR, including small heath butterfly.
Fish	Up to county/metropolitan	There are records in the river catchments that would be affected by the Proposed Scheme of European eel, spined loach and European bullhead (both listed on Annex II of the EC Habitats Directive[72]) from 2014 in the River Tame, within 1km of land required for the Proposed Scheme. There are also records of brown trout and numerous coarse fish species.
Reptiles	Up to district/borough	There are records of grass snake within 1km of the land required for the Proposed Scheme, including within Kingsbury Water Park as well as at locations near Piccadilly and Whateley. A number of habitat corridors which may support grass snake and other species of reptile such as common lizard are present, including the River Tame, Kettle Brook and the Birmingham and Fazeley Canal as well as other areas such as conventional lines and grassland habitats associated with Kettle Brook LNR. There is a record for adder near Dosthill Tip, 720m from the land required for the Proposed Scheme; it is yet to be confirmed whether there is habitat suitable for this species within the land required for the Proposed Scheme.

7.4 Effects arising during construction

Avoidance and mitigation measures

7.4.1 The following measures have been included as part of the design of the Proposed Scheme (in addition to the landscape planting shown on the Map Series CT-06 in the Volume 2 Map Book, along the rail corridor which would be largely a mixture of

[72] Council Directive 92/43/EEC of May 1992 on the Conservation of natural habitat and wild fauna and flora

woodland/scrub and grassland), and would contribute towards mitigation for the losses of habitat and effects on species:

- the River Tame viaduct would avoid direct effects to this watercourse and allow free passage for wildlife beneath it, including along the River Tame and its banks;
- proposed wetland habitat creation in the River Tame floodplain would enhance and maintain habitat connectivity between the River Tame and existing wetland within Kingsbury Water Park in this area;
- new woodland habitat creation and landscape mitigation planting (61.1ha) would contribute to compensation for losses of woodland (for example at Lea Marston Wood), and enhance connectivity between remaining woodlands;
- new woodland habitat creation, landscape mitigation planting (woodland and scrub), grassland habitat creation and wetland habitat creation to the north and south of Kingsbury Water Park would contribute to compensation for the loss of habitat from within the park;
- proposed grassland habitat creation to the south of Tamworth, near the M42 junction 10 would help compensate for the loss of grassland habitat within Kettle Brook LNR and the loss of semi-improved grassland to the south of Kettle Brook LNR;
- provision of new ponds (e.g. within Kingsbury Water Park and to the south of Bodymoor Heath Road), which would form part of the measures to address loss of water bodies and effects on great crested newt and other species;
- new species-rich hedgerows (10.6km), using appropriate native species would contribute to compensation for the loss of hedgerows and re-connect the ecological network in the surrounding areas, including along the margins of the route of the Proposed Scheme; and
- proposed grassland habitat creation (26.4ha), including species rich grasslands, would contribute to compensation for the losses from the Proposed Scheme.

7.4.2 The assessment assumes implementation of the measures set out within the draft Code of Construction Practice (CoCP)[73], which includes translocation of protected species where appropriate.

7.4.3 Section 9 of the draft CoCP requires contractors to implement a range of measures to protect ecological receptors including the following:

- manage impacts from construction, including the timing of works, on designated sites, protected and notable species and other features of ecological importance such as ancient woodlands and watercourses;

[73] Supporting document: Draft Code of Construction Practice

- reduce habitat loss by keeping the working area to the reasonable minimum;
- reinstatement of areas of temporary habitat loss;
- restoration and replacement planting;
- implement management measures for potential ecological impacts to control dust, water quality and flow, noise and vibration, and lighting;
- provision of a watching brief, where relevant;
- relocation or translocation of species, soil and/or plant material, as appropriate;
- consultation with Natural England, the Environment Agency, local wildlife trusts and relevant planning authorities prior to and during construction; and
- compliance with all wildlife licensing requirements, including those for protected and invasive species and designated sites.

Assessment of impacts and effects

7.4.4 The following section considers the impacts and effects on ecological features as a consequence of construction of the Proposed Scheme. All assessments have been undertaken on a precautionary basis, in the absence of survey information, and take account of the baseline value as presented in Section 7.3.

Designated sites

7.4.5 Whitacre Heath SSSI would not be directly or indirectly affected by construction of the Proposed Scheme as the closest point of construction would be 1.4km west of the SSSI boundary, to the west of Kingsbury Road. While the SSSI is located on the floodplain of the River Tame, it is located upstream of the Proposed Scheme and no hydrological or water quality effects are predicted for the SSSI (refer to Section 15, Water resources and flood risk). Whilst there is habitat connectivity via the River Tame and associated lakes, it is considered that the bird assemblages for which the site is notified would not be affected as the Proposed Scheme is unlikely to prevent birds moving to, or from, the SSSI. There would be no significant effect on the integrity of Whitacre Heath SSSI.

7.4.6 Kingsbury Wood SSSI and AWIS would not be directly or indirectly affected by construction of the Proposed Scheme. The closest point of construction would be 380m west of the SSSI boundary (access using Holt Hall Farm Road Access), with construction of Piccadilly embankment to the west of the M42 and 630m from the SSSI. No hydrological or water quality effects are predicted for the SSSI (refer to Section 15, Water resources and flood risk). It is anticipated that potential indirect effects would be controlled through implementation of measures within the draft CoCP to a level where there are no significant adverse effects. Due to the distance from the Proposed Scheme, it is considered that there would be no effect on the breeding bird assemblage for which the site is designated. There would be no significant effect on the integrity of Kingsbury Wood SSSI.

7.4.7 Middleton Pool SSSI would not be directly or indirectly affected by construction of the Proposed Scheme. The closest point of construction would be 1.8km east of the SSSI boundary, to the east of the River Tame and A51 Tamworth Road. No hydrological or water quality effects are predicted for the SSSI (refer to Section 15, Water resources and flood risk). Whilst there is habitat connectivity via the River Tame and associated lakes, the Proposed Scheme is unlikely to prevent birds moving to, or from, the SSSI. There would be no significant effect on the integrity of Middleton Pool SSSI.

7.4.8 Construction of a balancing pond for the Proposed Scheme would result in the permanent loss of 6.7ha of Kettle Brook LNR and 3.3ha of Kettle Brook BAS (11% of the LNR and 15% of the BAS). It is anticipated that potential effects on Kettle Brook itself would be controlled through implementation of measures within the draft CoCP to a level where there are no significant adverse effects to the watercourse. The proposed grassland habitat creation and landscape mitigation planting (scrub and woodland) within the LNR and BAS will help to reduce impacts to the site and further mitigation will be identified following ongoing surveys and assessment that will be reported in the formal ES. On a precautionary basis, the loss of habitat would result in a permanent adverse effect on the integrity of the LNR that would be significant at up to the county/metropolitan level for the LNR and at district/borough level for the BAS.

Habitats

Woodland

7.4.9 Construction of the Proposed Scheme would result in the loss of 24ha of broadleaved woodland outside designated sites, including 6.7ha woodland within Kingsbury Wetlands (Water Park) potential LWS. This is a permanent adverse effect that is significant at up to the county/metropolitan level. The proposed planting of woodland (woodland habitat creation and landscape mitigation planting) would compensate for losses of existing woodland so that the residual effect (following establishment of new woodland) would be significant at up to district/borough level. However, if the ongoing review identifies the presence of additional ancient woodland the residual effect would be significant at up to the county/metropolitan level.

Grassland

7.4.10 In the absence of further survey data, it is estimated that the Proposed Scheme could result in the loss of up to 31.6ha of semi-improved grassland, including 2.6ha of possible floodplain grassland within Kingsbury Wetlands (Water Park) potential LWS. This is a permanent adverse effect that is significant at up to the county/metropolitan level for grasslands within Kingsbury Wetlands (Water Park) potential LWS and at district/borough level for other grasslands. Whilst the proposed grassland creation would compensate for loss of existing grassland, until further surveys and assessment are completed the permanent loss of these grasslands is considered on a precautionary basis to have a residual adverse effect (following establishment of new grassland) that would be significant at up to district/borough level for the grassland lost within Kingsbury Wetlands (Water Park) potential LWS. For all other losses, it is considered that the residual adverse effect would be reduced to a level that is not significant.

Hedgerows

7.4.11 The land required for the Proposed Scheme would result in the permanent loss of 11km of hedgerows, and would result in severance of the hedgerow network in many places, adversely affecting connectivity with the surrounding area. Some of the affected hedgerows are expected to be habitat of principal importance and local BAP habitat 'important'[74] hedgerows, which will be confirmed following completion of surveys. The Proposed Scheme includes new hedgerow habitat creation (10.6km), which would help mitigate losses. Further hedgerow planting would be proposed as part of the design development. In the absence of this additional mitigation, the loss of these hedgerows would result in a permanent adverse effect on the conservation status of the hedgerow network that would be significant at up to the district/borough level.

Watercourses

7.4.12 The Proposed Scheme would require the realignment of three watercourses. These comprise the realignment of 130m of Tributary of the River Tame 1 to the south of Bodymoor Heath Road, the realignment and culverting of 770m of Thistlewood Brook and the realignment of 140m of Kettle Brook (outside the Kettle Brook LNR). Pending assessment of habitat conditions and species diversity, these watercourses may represent habitats of principal importance and local BAP habitats.

7.4.13 The Proposed Scheme would cross the River Tame and Kingsbury Water Park on a viaduct. The River Tame would not be directly affected, and indirect effects would be unlikely to produce a significant effect as they would be controlled through the implementation of measures in the draft CoCP. Once constructed, the viaduct would shade the River Tame immediately below the viaduct, but the likely effects of shading are not considered to be significant because the affected areas would be very small in comparison with the length of the river.

7.4.14 The Proposed Scheme would result in the loss of sections of watercourses and severance of river corridors due to culverts, including Thistlewood Brook, Kettle Brook (outside the Kettle Brook LNR) and three smaller land drainage watercourses (Tributary of River Tame 1, Tributary of Thistlewood Brook 2 and Tributary of Thistlewood Brook 3, as referred to in Section 15, Water resources and flood risk).

7.4.15 On a precautionary basis, adverse effects on Thistlewood Brook and Kettle Brook would be significant at up to county/metropolitan level, whilst adverse effects on Tributary of River Tame 1, Tributary of Thistlewood Brook 2 and Tributary of Thistlewood Brook 3 would be significant at up to district/borough level.

Water bodies

7.4.16 Alder Pool and Sandy Pool within Kingsbury Wetlands (Water Park) potential LWS would be lost as a result of construction of the River Tame viaduct and associated temporary works. Four other ponds would be lost during construction of the Proposed Scheme. These losses would be a permanent adverse effect that is significant at up to the county/metropolitan level. Replacement ponds are to be created within Kingsbury

[74] The Hedgerow Regulations 1997 (SI 1997/1160)

Water Park and elsewhere in this area which would compensate for habitat losses. On a precautionary basis, pending further survey information and assessment, it is considered that the residual effect would be significant at up to district/borough level, particularly if it is confirmed through field surveys that they support species of higher conservation importance.

Ancient and veteran trees

7.4.17 It is assumed that if any ancient and veteran trees are within the land required for the Proposed Scheme in the Lea Marston to Tamworth area they would be permanently lost. Ancient and veteran trees are an irreplaceable resource and their potential loss would result in a permanent adverse effect that would be significant at district/borough level in each case.

Species

Bats

7.4.18 At least nine bat species have been recorded within the Lea Marston to Tamworth area. The demolition of buildings/structures and the permanent removal of vegetation may have impacts on bats, including potential loss of roost sites, reduction in the availability of foraging resources, and fragmentation of commuting routes. This could particularly affect breeding populations of bats within the area. Bats may also be affected by the lighting associated with construction works, although it is anticipated that this would be controlled through measures in the draft CoCP.

7.4.19 The proposed woodland, grassland and hedgerow planting will help to reduce impacts to bats and further mitigation will be identified following ongoing surveys and assessment. On a precautionary basis, in the absence of further survey information it is considered that impacts would result in a permanent adverse effect on the conservation status of the bat populations that would be significant at up to the regional level.

Otter

7.4.20 Otter has been recorded along the River Tame, the Birmingham and Fazeley Canal and within Kingsbury Water Park within 100m of land required for the Proposed Scheme. The proposed viaduct over Kingsbury Water Park and the River Tame would minimise the loss of habitat, both aquatic and terrestrial, along and adjacent to the river corridor. Indirect effects from construction activities may result in disturbance to this species during the construction period. This could constrain otter movement across the land required for the Proposed Scheme. However, it is anticipated that these indirect effects would be controlled through measures in the draft CoCP.

7.4.21 The Proposed Scheme would cross eight smaller watercourses and therefore result in habitat loss. Five of these would be subject to culverting (Thistlewood Brook, Kettle Brook, Tributary of River Tame 1, Tributary of Thistlewood Brook 2 and Tributary of Thistlewood Brook 3). Another three would be affected by watercourse realignments (Tributary of the River Tame 1, Thistlewood Brook and Kettle Brook). Areas of terrestrial habitat such as woodland and scrub would also be lost. On a precautionary basis, in the absence of further survey information, impacts to otter would result in an

adverse effect on the conservation status of this species that would be significant at up to county/metropolitan level.

Water vole

7.4.22 Water voles have been recorded within Kingsbury Water Park within 320m of the Proposed Scheme. The viaduct over Kingsbury Water Park and the River Tame would minimise loss of habitat along the river corridor, however, four water bodies within Kingsbury Water Park (two ponds and two drains) would be wholly or partially lost. Indirect effects from construction activities may result in disturbance to these species during the construction period, and prevent water vole from moving along them. However, it is anticipated that these indirect effects would be controlled through measures in the draft CoCP.

7.4.23 The Proposed Scheme would cross eight smaller watercourses and therefore result in habitat loss. Of these, five would be subject to culverting (Kettle Brook in Freasley culvert, Thistlewood Brook in A51 Tamworth Road culvert, Bodymoor Heath Road culvert, Overwoods Road culvert and Piccadilly embankment culvert). The other three would be affected by watercourse realignments (tributary of the River Tame to the south of Bodymoor Heath Road, Thistlewood Brook and Kettle Brook). On a precautionary basis, in the absence of further survey information, the species is assumed to be present. Impacts to water vole would result in an adverse effect on the conservation status of this species that would be significant at up to county/metropolitan level.

Polecat

7.4.24 There are records for polecat within the Lea Marston to Tamworth area. The loss of woodland, grassland and hedgerows could affect polecat if surveys show this species to be present within the land required for the Proposed Scheme. On a precautionary basis and in the absence of survey information, this species is assumed to be present, and therefore, the effects of permanent habitat loss on this species would be significant at up to county/metropolitan level.

Water shrew

7.4.25 There is a historic record for water shrew within 70m of the land required for the Proposed Scheme within Kingsbury Water Park. The viaduct over Kingsbury Water Park and the River Tame would minimise loss of habitat along the river corridor; however, four water bodies within Kingsbury Water Park (two ponds and two drains) would be wholly or partially lost. The loss of this habitat could affect water shrew, if this species is present. On a precautionary basis, the species is assumed to be present and effects of permanent habitat loss on this species would be significant at up to district/borough level.

Great crested newt

7.4.26 It is assumed that, pending further survey information, the four ponds, Sandy Pool and surrounding terrestrial habitat within the land required for the Proposed Scheme support breeding populations of great crested newt and that these water bodies would be lost during construction. The loss of ponds supporting great crested newts and associated terrestrial habitat could result in the isolation and severance of

breeding populations of great crested newts across this area. Great crested newt populations present in ponds within 250m of the land required for the Proposed Scheme could also become isolated and experience a reduction in foraging habitat and severance where terrestrial habitat is lost.

7.4.27 New ponds and terrestrial habitats are included in the Proposed Scheme design and these will be suitable for great crested newt. Where great crested newts are present, two new ponds will be created for every one lost to the permanent works, and this would contribute towards reducing the effects to not significant. Additional ponds would also be required (on a two to one basis if great crested newt are present), where other ponds would be lost outside the area required for the operation of the Proposed Scheme, but within the land required for construction of the Proposed Scheme. Suitable terrestrial habitat would be required around all new ponds created along with links to encourage dispersal (e.g. by incorporating existing habitat or creating new habitat), and this would require further development. In the absence of further survey information and mitigation design, the loss of the ponds and terrestrial habitat would result in a permanent adverse effect on the conservation status of great crested newts that would be significant at up to the county/metropolitan level.

Birds

7.4.28 The Proposed Scheme would result in the loss of nesting, roosting and foraging habitat for a range of breeding and wintering birds, including waterfowl species present within Kingsbury Water Park and farmland and woodland species. Additionally, some of the species that could be affected include Schedule 1 birds: Barn owl has been recorded at Kingsbury Water Park within 1km of the land required for the construction the Proposed Scheme; and kingfisher has been recorded in the wider area, including at Kettle Brook LNR. On a precautionary basis, in the absence of further survey information, it is considered that the Proposed Scheme would result in a permanent adverse effect on birds that would be significant at up to county/metropolitan level.

White-clawed crayfish

7.4.29 Historic records of white-clawed crayfish have been identified in Thistlewood Brook and Langley Brook, and there is the potential for this species to occur in these watercourses. It is expected that white-clawed crayfish will not be present in the other minor watercourses and land drains to be culverted beneath the Proposed Scheme. On a precautionary basis, in the absence of survey information, this species is assumed to be present and there would be an adverse effect that would be significant at up to county/metropolitan level.

Aquatic invertebrates

7.4.30 The land required for the Proposed Scheme would result in loss of habitat suitable for aquatic invertebrates (other than white-clawed crayfish). On a precautionary basis, in the absence of survey information it is considered that the Proposed Scheme would result in an adverse effect that would be significant at up to district/borough level.

Terrestrial invertebrates

7.4.31 The land required for construction of the Proposed Scheme would result in loss of habitat suitable for terrestrial invertebrates, including species of principal importance such as the small heath butterfly. On a precautionary basis, in the absence of survey information, it is considered that the Proposed Scheme would result in permanent adverse effects that would be significant at up to district/borough level.

Fish

7.4.32 There are records of fish from the main watercourses, including species such as European bullhead and spined loach (both listed on Annex II of the EC Habitats Directive[75]), European eel and brown trout. The Proposed Scheme would pass over these watercourses on viaducts, and indirect impacts to the watercourses would be controlled through measures set out in the draft CoCP. However, other smaller watercourses would be affected by realignment and culverting and may require assessment under the Water Framework Directive (WFD)[76]. On a precautionary basis, in the absence of further survey information, it is considered that the Proposed Scheme would result in permanent adverse impacts to fish populations within watercourses, including Thistlewood Brook and Kettle Brook, which would be significant at up to county/metropolitan level.

Reptiles

7.4.33 There are a number of records of reptiles within 1km of the land required for the Proposed Scheme and suitable habitat is likely to be present for reptiles, including grass snake near the River Tame and within Kingsbury Water Park and common lizard and slow worm in grassland and scrub habitats near Dost Hill and Whateley. There is potential for reptiles to be affected where suitable habitat is present within the land required for the Proposed Scheme. Potential impacts include loss of foraging habitat and hibernation sites. Grassland habitat creation and hedgerow habitat creation as well as pond and other wetland habitat creation would contribute towards reducing impacts on reptiles. On a precautionary basis, in the absence of survey information and assessment, it is considered that the land required for the Proposed Scheme would result in a permanent adverse effect that would be significant at up to district/borough level.

7.4.34 Effects on all other habitats and species that are significant at local/parish level will be reported in the formal ES.

7.4.35 Indirect effects from changes in air quality, such as that arising from increased levels of construction traffic, will be considered where appropriate. These effects will be reported in the formal ES.

[75] Council Directive 92/43/EEC of May 1992 on the conservation of natural habitats and wild fauna and flora
[76] Directive 2000/60/EC of the European Parliament and of the Council establishing a framework for the Community action in the field of water policy. Available online at: http://ec.europa.eu/environemt/water/water-framework/index_en.html

Other mitigation measures

7.4.36 Further measures currently being considered, but which are not yet part of the design and will be informed by the findings of the ongoing field surveys and engagement with relevant stakeholders, include:

- opportunities to enhance watercourse sections proposed for realignment, notably Thistlewood Brook and Kettle Brook;
- mitigation during watercourse realignments, for example, fish/crayfish collection and relocation;
- provision of additional broadleaved woodland (non-ancient) to replace those non-ancient woodlands lost, and/or enhancement of remaining woodlands;
- provision of additional hedgerows which would offset the losses and maintain the connectivity of the network;
- options to create new species-rich grasslands (including translocation where appropriate) to offset grassland losses including at Kettle Brook LNR;
- liaison with Staffordshire and Warwickshire Wildlife Trust and WaCC and SCC to discuss strategic mitigation measures;
- provision of additional measures to facilitate connectivity where significant foraging or commuting routes of fauna species would be affected;
- use of temporary fencing or retention of existing habitat links to reduce the risk of disturbance to otters during construction;
- design of watercourse culverts and underpasses to allow the free passage of wildlife;
- provision of alternative roosting habitat for bats;
- structures to reduce severance effects on bats; and
- provision of additional ponds (on a two to one basis where existing ponds supporting great created newts are lost), outside the area required for the permanent works but within the land required for construction of the Proposed Scheme, and suitable terrestrial habitat around these ponds with habitat links to allow dispersal.

7.4.37 Some of the above may also be achieved through strategic mitigation, which is currently being discussed with relevant stakeholders.

Summary of likely residual significant effects

7.4.38 Taking into account mitigation proposed in the design of the Proposed Scheme set out above, the anticipated significant residual ecological effects during construction are described in Table 13.

Table 13: Residual significant effects on ecological resources/features during construction

Resource/feature	Residual effect	Level at which the effect would be significant
Kettle Brook LNR	Permanent adverse effect on site integrity due to loss of 6.7ha (11%) of grassland and scrub habitat.	Up to county/metropolitan
Kettle Brook BAS	Permanent adverse effect on site integrity due to loss of 3.3ha (15%) of grassland and scrub habitat.	Up to district/borough
Woodland	Permanent loss of up to 24ha of woodland outside designated sites including woodland of potential LWS quality. Potential adverse effect on ancient woodland. New woodland planting is included in the Proposed Scheme design.	Up to county/metropolitan
Grassland	Permanent loss of grassland, including 2.6ha of floodplain grassland within Kingsbury Wetlands (Water Park) potential LWS. Grassland creation is included in the Proposed Scheme design.	Up to district/borough
Hedgerows	Permanent loss and severance of 11km of hedgerows. Hedgerow creation is included in the Proposed Scheme design.	Up to district/borough
Watercourses	Potential adverse effects on aquatic invertebrates including white-clawed crayfish, fish, riparian mammals and the water quality of watercourses to be diverted.	Up to county/metropolitan
Water bodies	Permanent loss of two water bodies within Kingsbury Wetlands (Water Park) potential LWS, and four other ponds. New water bodies are included in scheme design to address losses.	Up to district/borough
Ancient and veteran trees	Permanent adverse effect from potential loss of ancient and veteran trees.	Up to district/borough (in each case)
Bats	Potential permanent adverse effect on conservation status due to loss of roosts, foraging habitat and fragmentation.	Up to regional
Otter	Potential permanent adverse effect on conservation status due to loss of	Up to county/metropolitan

Resource/feature	Residual effect	Level at which the effect would be significant
	habitat in the form of resting sites and foraging habitat.	
Water vole	Potential permanent adverse effect on conservation status due to loss of riparian habitat and fragmentation of habitat.	Up to county/metropolitan
Polecat	Potential permanent adverse effect on conservation status due to loss of foraging habitat and fragmentation.	Up to county/metropolitan
Water shrew	Potential permanent adverse effect on conservation status due to loss of habitat	Up to district/borough
Great crested newt	Potential permanent adverse effect on conservation status due to loss of water bodies (including those used for breeding) and surrounding terrestrial habitat which may support great crested newts.	Up to county/metropolitan
Birds	Potential permanent adverse effect on conservation status due to loss, fragmentation and/ or severance of habitat for nesting, roosting and feeding.	Up to county/metropolitan
White-clawed crayfish	Potential permanent adverse effect on conservation status due to loss of habitat	Up to county/metropolitan
Aquatic invertebrates	Potential permanent adverse effect on conservation status due to loss of habitat.	Up to district/borough
Terrestrial invertebrates	Potential permanent adverse effect on conservation status due to loss of habitat.	Up to district/borough
Fish	Potential permanent adverse effect on conservation status due to loss of habitat.	Up to county/metropolitan
Reptiles	Potential permanent adverse effect on conservation status due to loss of habitat.	Up to district/borough

7.5 Effects arising during operation

Avoidance and mitigation measures

7.5.1 There are no specific measures currently identified to avoid or mitigate ecological effects during operation of the Proposed Scheme within this section of the route.

Assessment of impacts and effects

7.5.2 This section considers the impacts and effects on ecological features during operation of the Proposed Scheme. All assessments are based on a precautionary basis, in the absence of survey information.

7.5.3 Bats are at risk of being struck by trains or possibly harmed by turbulence, particularly at frequently used commuting/foraging routes which cross the Proposed Scheme. This represents a potential permanent adverse effect on conservation status of the bat species concerned that would be significant at up to the regional level.

7.5.4 Barn owls are at risk of colliding with trains, particularly within the River Tame valley where there is suitable grassland foraging habitat. The grassland vegetation that would grow along the embankments of the Proposed Scheme may encourage barn owls to forage close to trains, with the risk that they may be killed. Mortality, even if infrequent, could affect the conservation status of this Schedule 1 species and the ongoing reduction in numbers would result in a permanent adverse effect that would also be significant at up to county/metropolitan level.

7.5.5 There is a risk of birds colliding with trains, including within Kingsbury Water Park where there is suitable habitat for breeding and wintering waterfowl. Further survey work and analysis of data is required to assess the extent to which these birds are at risk of collision with trains. On a precautionary basis in the absence of a full data set, it has been assumed that collision with trains would result in a permanent adverse effect that would be significant at up to the county/metropolitan level.

7.5.6 Effects on all other habitats and species likely to be significant at the local/parish level during operation will be assessed and reported in the formal ES.

Other mitigation measures

7.5.7 Additional mitigation measures currently being considered include:

- updating the HS2 barn owl mitigation plan[77] which has been developed to provide measures that would be implemented to reduce the effects of the Proposed Scheme to a level that is not significant. This is likely to include seeking opportunities to provide barn owl nest boxes and where feasible habitat enhancement opportunities at least 3km from the Proposed Scheme in consultation with landowners; and
- structures to reduce mortality to bats.

[77] Currently in development for Phase One of HS2

Summary of likely residual significant effects

7.5.8 Taking into account mitigation included as part of the Proposed Scheme design, the anticipated significant residual ecological effects during operation are detailed in Table 14.

Table 14: Residual significant effects on ecological resources/features during operation

Resource/feature	Residual effect	Level at which the effect would be significant
Bats	Potential permanent adverse effect on conservation status due to collision with trains.	Up to regional
Barn owl	Potential permanent adverse effect on conservation status due to collision with trains.	Up to county/metropolitan
Wintering and breeding birds (other than barn owl)	Potential permanent adverse effect on conservation status due to collision with trains.	Up to county/metropolitan

Monitoring

7.5.9 Volume 1, Introduction and Methodology, sets out the general approach to environmental monitoring during operation of the Proposed Scheme.

7.5.10 There are no area-specific requirements for monitoring ecology and biodiversity effects or mitigation during the operation of the Proposed Scheme in the Lea Marston to Tamworth area.

8 Health

8.1 Introduction

8.1.1 This section identifies the communities within the Lea Marston to Tamworth area that would be subject to impacts associated with the Proposed Scheme and describes the changes that are considered to be potentially important for the health and wellbeing of people within these communities, where these effects are considered to be consequential.

8.1.2 Engagement with key public health bodies is underway including with Public Health England (PHE), Directors of Public Health and Health and Wellbeing Boards. The purpose of the engagement has been to increase the understanding of health issues that may not be identified solely through a review of publicly available data. Engagement with key public health bodies will continue as part of the development of the Proposed Scheme.

8.1.3 This section deals specifically with impacts and effects at a local level within the Lea Marston to Tamworth area. Health effects across the Proposed Scheme as a whole are assessed in the route-wide health assessment contained in Volume 3: Route-wide effects.

8.1.4 Maps showing the location of the key environmental features (Map Series CT-10) and the key construction (Map Series CT-05) and key operational (Map Series CT-06) features of the Proposed Scheme are provided in the Volume 2: LA01 Map Book.

8.2 Scope, assumptions and limitations

8.2.1 The scope, assumptions and limitations for the health assessment are set out in Volume 1 and the Scope and Methodology Report (SMR)[78].

8.2.2 As set out in the SMR, the health assessment is based on a broad understanding of health, consistent with the World Health Organization (WHO) definition of health as 'a state of complete physical, mental and social well-being and not merely an absence of disease or infirmity'. An individual's health is mostly determined by genetics and lifestyle factors, but for a large enough population many other factors, or 'health determinants', are known to be important, and these factors may be affected by the Proposed Scheme.

8.2.3 The assessment has considered the impacts of the Proposed Scheme on a range of environmental and socio-economic 'health determinants', which could result in adverse or beneficial effects on health and wellbeing.

8.2.4 The health determinants of relevance within the Lea Marston to Tamworth area are:

- for impacts during construction (temporary and permanent):

[78] Supporting document: HS2 Phase 2b Environmental Impact Assessment Scope and Methodology Report

  - neighbourhood quality;
  - access to services, health and social care;
  - access to green space, recreation and physical activity; and
  - social capital[79].
- for impacts during operation (permanent):
  - neighbourhood quality.

8.2.5 The geographic extent of the health assessment covers those areas where impacts on health determinants are predicted to occur.

8.2.6 The health assessment is based on a review of evidence linking changes in health determinants to potential health outcomes. This information will be presented in a concise review of the key literature and included in the formal ES. The evidence varies in its strength; for example, the evidence linking physical activity to health outcomes is strong, whereas the evidence linking social capital with health outcomes is moderate. The strength of evidence does not necessarily determine the importance of a health effect, but is an indication of the level of certainty in the assessment. Additionally, there is greater certainty in the prediction of an impact on a health determinant than the consequent effect on health.

8.2.7 There is no established or widely accepted framework for assessing the significant health effects of a development proposal. The SMR sets out a methodology for describing the impacts on health determinants in terms of the magnitude and duration of the change and the extent of the population exposed to this change. It also draws attention to the strength of evidence that links a change in health determinant with health effects. This framework permits the assessment to describe the impacts on determinants in a largely qualitative manner, with some structure to the relative scale of these impacts to give a sense of the importance of the potential health effects. This does not, however, provide a clear basis for drawing conclusions as to whether a health effect is likely to be 'significant'.

8.2.8 Potential health effects have been identified based on information that is available at this stage of the assessment. A full assessment of health effects, applying the assessment criteria set out in the SMR, will be provided in the formal ES.

8.3 Environmental baseline

Existing baseline

Description of communities in the Lea Marston to Tamworth area

8.3.1 For the purposes of the health assessment, the study area is divided into the communities described below, including those settlements that are situated within

[79] Social capital is defined as the connections between the individuals within communities, and the inclination that arises through these networks for individuals to feel valued, to feel a sense of belonging, to have companionship and to tangibly support each other.

1km of the route of the Proposed Scheme. A description of community facilities is provided in Section 6, Community.

8.3.2 The route of the Proposed Scheme would run through a predominantly rural area, with agriculture being the main land use. The largely rural landscape is intersected by a number of built-up areas (the settlements of Kingsbury, Whateley and Freasley and Wilnecote and Stoneydelph); and villages.

Kingsbury, Piccadilly and surrounds

8.3.3 Kingsbury and Piccadilly are both villages which together comprise approximately 1,750 residential properties and lie to the south of Wilnecote. The nearest residential properties within Kingsbury would be situated approximately 130m south-east of the route of the Proposed Scheme, and within Piccadilly, are adjacent to the route of the Proposed Scheme.

8.3.4 Community resources in Kingsbury include Kingsbury Primary School and Kingsbury School (a secondary school), medical facilities, community, leisure and sport centres including Kingsbury Leisure Centre, the Kingsbury Village Theatre, public houses and places of worship including the Church of St. Peter and St. Paul and Kingsbury Methodist Church. To the west of the village, beyond the River Tame, Kingsbury Water Park is a country park of approximately 243ha.

Whateley, Freasley and surrounds

8.3.5 Whateley and Freasley are both hamlets comprising residential dwellings and farmsteads, and together amount to approximately 50 residential dwellings. Some residential properties in Whateley would be on the route of the Proposed Scheme. The nearest residential properties within Freasley would be located approximately 50m east of the route of the Proposed Scheme. There are no community resources in Whateley. Within Freasley, community resources include a place of worship, St. Mary Freasley and the Planters Garden Centre, which organises regular social activities and occasional events.

Wilnecote, Stoneydelph and surrounds

8.3.6 Wilnecote and Stoneydelph are both areas of south-east Tamworth, predominantly comprising residential areas, as well as the Centurion Park logistics and distribution site and Tame Valley industrial estate. Together, Wilnecote and Stoneydelph comprise approximately 7,100 residential properties, the nearest of which would be located approximately 60m west of the route of the Proposed Scheme.

8.3.7 Community resources in the Wilnecote and Stoneydelph area include educational facilities (including a nursery school, the Wilnecote School and Three Peaks Primary Academy), a public house, allotment areas, a community centre and a retirement home. Several open and nature spaces are located within the Wilnecote and Stoneydelph area, including the Kettle Brook Local Nature Reserve (LNR) and a number of play and recreational open spaces.

Demographic and health profile of the Lea Marston to Tamworth area

8.3.8 The local communities potentially directly affected by the Proposed Scheme in the Lea Marston to Tamworth area have a relatively low population density, commensurate with the predominantly rural nature of the area.

8.3.9 Data provided by the Office for National Statistics[80] show that this population has a better health status overall compared with the national (England) averages.

8.3.10 The population is less deprived than the national average with regard to the combined indices of multiple deprivation[81], and the health domain (a sub-set of the indices of multiple deprivation). The area as a whole is considered to be broadly in line with the national average, with regard to changes in the relevant health determinants, and with relatively few vulnerabilities in terms of the health status of the population.

8.3.11 The available data provide detail down to ward level and enable a profile to be made of the population in the Lea Marston to Tamworth area. The description of the whole population, and the populations within wards, does not exclude the possibility that there will be some individuals or small groups of people who do not conform to the overall profile.

8.4 Effects arising during construction

Avoidance and mitigation measures

8.4.1 Consideration of potential health issues is an integral part of the planning and design of the Proposed Scheme, alongside consideration of other environmental, community and economic issues. Insofar as reasonably practicable, mitigation measures have been incorporated into the design of the Proposed Scheme with the aim of avoiding or reducing adverse health effects. Examples of the mitigation measures incorporated into the design of the Proposed Scheme include the following:

- reducing the loss of property and community assets, insofar as reasonably practicable;
- reducing visual intrusion and noise, insofar as reasonably practicable;
- incorporating landscape design and screening into the design; and
- permanent realignment and diversion of some public rights of way (PRoW) and roads to maintain access (see Section 14, Traffic and transport for further detail).

8.4.2 The locations of construction compounds and site haul routes have been selected to reduce exposure to construction impacts insofar as reasonably practicable.

8.4.3 HS2 Ltd would require its contractors to comply with the environmental management regime for the Proposed Scheme, which would include the measures set out in the

[80] The Office of National Statistics (ONS) provides spatial data on levels of deprivation, using indicators of: 'multiple deprivation', 'employment', 'education', 'barriers to housing and social services', 'crime' and 'living environment'. These data are available by Lower Super Output area.
[81] Department for Communities and Local Government (2015), *English Indices of Deprivation 2015*. Available online at: https://www.gov.uk/government/statistics/english-indices-of-deprivation-2015

draft Code of Construction Practice (CoCP)[82], which provides a general basis for route-wide construction environmental management. Contractors would also be required to comply with the measures in Local Environmental Management Plans (LEMP), which apply the environmental management strategies at a local level.

8.4.4 The CoCP will be the means of controlling the construction works associated with the Proposed Scheme to ensure that the effects of the works upon people and the natural environment are reduced or avoided so far as reasonably practicable.

8.4.5 The CoCP will require the nominated undertaker and its contractors to: produce and implement a community engagement framework and provide appropriately experienced community relations personnel to implement the framework; provide appropriate information; and to be the first point of contact to resolve community issues. The nominated undertaker would be required to take reasonable steps to engage with the community, focusing on those who may be affected by construction impacts, including local residents, businesses, landowners and community resources, and the specific needs of protected groups (as defined in the Equality Act 2010).

8.4.6 In the event of any loss of a community facility, the options for mitigating significant community effects to be explored by HS2 Ltd would include:

- improving or altering the remaining portion of the community facility;
- improving other existing community facilities in the area that could reduce the effect;
- improving accessibility to other community facilities; and/or
- identifying land owned by the relevant local authority that could be brought into use as a community facility with its agreement.

Assessment of impacts and effects

Neighbourhood quality

8.4.7 The term 'neighbourhood quality' is used in this assessment to describe the combination of environmental factors that influence people's experience of, and feelings about, their local environment. When these factors are altered people's levels of satisfaction with their living environment may change. In turn, this could affect mental wellbeing or behaviours such as the use of outside space.

8.4.8 The construction of the Proposed Scheme will affect neighbourhood quality through impacts such as noise, air emissions, visual impacts and additional traffic, including heavy goods vehicles (HGVs). These will be assessed in the relevant sections of the ES, with a focus on those receptors, or groups of receptors, that are most affected. The Community section of the ES will provide a combined assessment, which will identify locations that are subject to significant environmental effects on two or more topics (e.g. noise and visual).

[82] Supporting document: Draft Code of Construction Practice

8.4.9 In contrast, a qualitative approach is taken to assessing impacts on neighbourhood quality. The assessment looks at changes in character, tranquillity and amenity across the neighbourhood as a whole, including streets and other public and private outdoor areas. This is judged on a case-by-case basis, taking into account the characteristics of each neighbourhood. It will be informed by the findings from other assessments, but does not rely on the same significance thresholds, as it is not focused on individual receptors. The assessment of health and wellbeing effects considers issues such as people's feelings of attachment to, and pride in, their neighbourhood and enjoyment of outside space, and how these may change.

8.4.10 The sections most relevant to the neighbourhood quality assessment are: Section 5, Air quality; Section 11, Landscape and visual; Section 13, Sound, noise and vibration; and Section 14, Traffic and transport.

8.4.11 Dust emissions from construction activities are considered in Section 5, Air quality, which identifies no adverse effects with respect to the effects of construction activities on dust soiling and human health within the Lea Marston to Tamworth area, taking account of mitigation measures contained in the CoCP. Therefore, it is not expected that dust emissions around construction sites would contribute to adverse impacts on neighbourhood quality.

8.4.12 The construction of the Proposed Scheme may have temporary and permanent[83] impacts on neighbourhood quality in areas close to construction sites, including those at Kingsbury, Whateley, Marston and Piccadilly. Impacts on neighbourhood quality have the potential to affect the wellbeing of residents adversely during the construction phase, by giving rise to negative feelings in relation to quality of life and the local environment, and potentially changing behaviours, such as deterring the use of outdoor space.

8.4.13 Construction noise would have the potential to generate a noticeable change in noise at outdoor areas and at neighbourhoods in the proximity to the route of the Proposed Scheme, as listed in Section 13, Sound, noise and vibration.

8.4.14 It is currently expected that the construction of the Proposed Scheme may be visible from a number of locations, as listed in Section 11, Landscape and visual. These impacts have the potential to contribute to impacts on neighbourhood quality. This will be assessed in the formal ES.

8.4.15 Traffic and transport impacts in the Lea Marston to Tamworth area may include:

- construction vehicle movements to and from the various construction compounds and sites;
- temporary and permanent road closures and associated diversions; and
- temporary and permanent alternative routes for PRoW.

[83] The SMR defines temporary changes (impacts) to health determinants as short term (<6 months), medium term (6 months-2 years), and long term (2 years +). Permanent impacts have not been defined in the SMR. A change in a health determinant lasting 4 years or more will be considered as a permanent impact. A professional judgement will be made as to when an impact would lead to a permanent effect on the health of the population.

8.4.16 Construction traffic, including HGVs, may be present on a number of roads in the area, as listed in Section 14, Traffic and transport.

8.4.17 The link between health and the aesthetic value of the public realm is not well understood, but there is moderate evidence to suggest that an attractive environment can improve people's enjoyment and sense of wellbeing. Conversely, poor quality environments have been shown to have negative effects on people's health. There is moderate evidence that people have a preference for views of natural environments over man-made environments, and that exposure to views of natural environments is associated with increased wellbeing.

8.4.18 Settlements in the Lea Marston to Tamworth area include the more urbanised locations such as Wilnecote and Stoneydelph while the settlements of Kingsbury, Whateley, Freasley and surrounds are predominantly rural. Within these rural locations, construction activities and permanent structures would be visible from a number of locations, due to the scale of the Proposed Scheme. Section 11, Landscape and visual, identifies locations that may experience changes in existing views, including country roads, PRoW and views from properties close to the Proposed Scheme. Changes to views of the rural landscape as a result of the Proposed Scheme may have negative effects on residents' perceptions of the quality and character of their local environment, which could lead to a reduction in wellbeing.

8.4.19 Overall, it is considered that the construction of the Proposed Scheme has the potential to affect wellbeing through changes to neighbourhood quality. This will be assessed in the formal ES.

Access to services, health and social care

8.4.20 There is strong evidence linking access to healthcare facilities with health outcomes, and there is also weak to moderate evidence to suggest that transport problems are a key barrier to people's ability to access these services. There is moderate evidence to suggest that access to shops and other local services can affect health. This is based on a range of factors affecting quality of life, and includes issues such as reducing feelings of isolation and enabling participation in society, as well as accessing basic needs such as food shopping.

8.4.21 The Lea Marston to Tamworth area is predominantly rural in character. Typically there is a reliance on shops and services in nearby towns and villages. Opportunities to access alternative services and facilities are limited, resulting in the necessity to travel longer distances to access alternative facilities. There is potential for communities to experience increased difficulty in accessing shops and community services (such as health services, post offices, banks, libraries) as a result of increased journey times during construction. The exceptions are the more urbanised settlements of Wilnecote and Stoneydelph which have a larger range of shops, services and community facilities. This will be assessed and reported in the formal ES.

Access to green space, recreation and physical activity

8.4.22 There is moderate evidence to show that access to green space contributes to good mental health. There is also moderate evidence that environmental factors such as access to high quality green space, safety and local amenity, can influence

participation in physical activity. Physical activity is strongly linked to health outcomes.

8.4.23 Construction of the Proposed Scheme may impact on levels of access to green space and physical activity, including:

- impacts of construction traffic, including HGVs, on pedestrians and cyclists;
- any loss of green space or facility used for physical activity; and
- the presence of construction traffic, including HGVs, on the local road network, which may deter their use by walkers, cyclists and equestrians.

8.4.24 The route of the Proposed Scheme would intersect a number of PRoW in the Lea Marston to Tamworth area. The effects on amenity and recreational value of these footpath networks, and therefore levels of physical activity and associated health and wellbeing benefits, will be reported in the formal ES.

8.4.25 Construction traffic would mainly use site haul routes along the route of the Proposed Scheme. Some construction traffic, however, including HGVs, would be present on a number of roads in this area, as outlined in Section 14, Traffic and transport. This could obstruct or deter pedestrians, cyclists and equestrians from using these routes. In the case of recreational users, it is considered that alternative routes are likely to be available in most cases, and therefore that impacts on the affected roads would not reduce overall levels of recreational non-motorised users. For those using affected routes for active travel to work or to access shops and services, there is the possibility that people would choose instead to travel by car, temporarily reducing levels of physical activity and associated health and wellbeing benefits.

8.4.26 It is estimated that approximately 5% of Kingsbury Water Park would be temporarily required for the construction of River Tame viaduct, for approximately three years and three months. Approximately 1% of Kingsbury Water Park would be lost permanently, including two ponds, Sandy Pool and Alder Pool. The park provides numerous routes for walking and informal recreation and provides a pleasant outdoor area characterised by ponds and lakes. It provides a positive contribution to the wellbeing of local communities through providing opportunities for physical activity and access to open space, encouraging healthy lifestyles among all age groups. The temporary loss of approximately 5% of the park would have an adverse effect on health and wellbeing, however permanent loss of 1% of the park would not have an adverse effect on the health and wellbeing of users, given the small area of space lost compared to the overall area remaining.

8.4.27 It is estimated that approximately 11% of Kettle Brook LNR would be temporarily lost for a period of approximately two years and nine months for the construction of Freasley embankment and Wilnecote cutting. Approximately 2% of Kettle Brook LNR would be lost permanently. Kettle Brook LNR provides open spaces for walking and informal recreation and makes a positive contribution to the wellbeing of local communities by providing opportunities for physical activity and access to green space, encouraging healthy lifestyles among all age groups. The temporary loss of approximately 11% of the LNR would have an adverse effect on the health and

wellbeing of users, however permanent loss of 2% of the LNR would not have an adverse effect on the health and wellbeing of users, given the small area of space lost compared to the overall area remaining.

Social capital

8.4.28 The connections between individuals within communities, and the increased likelihood that arises through these networks for individuals to feel valued, to feel a sense of belonging, to have companionship and to support each other, is important for health and wellbeing. A measure of the effectiveness of these connections within communities is termed 'social capital' and is a recognised determinant of health. The Office for National Statistics defines social capital as follows:

"In general terms, social capital represents social connections and all the benefits they generate. Social capital is also associated with civic participation, civic-minded attitudes and values which are important for people to cooperate, such as tolerance or trust."[84]

8.4.29 There is moderate evidence for a link between social capital and health and wellbeing outcomes. A change in social capital has the potential to influence health effects that are gained through social contact and support, social participation, reciprocity and trust. Adverse effects on health from changes in social capital could be experienced as a reduction in wellbeing or as physiological effects on the body's hormonal and immune systems, with increased susceptibility to mental and physical illness.

8.4.30 Settlements in the Lea Marston to Tamworth area support small, well-established communities. The size of the temporary construction workforce may be substantial relative to the size of these local communities. During the day, the workforce would be present on construction sites and compounds throughout the area, including satellite compounds near the settlements of Kingsbury and Whateley. The duration of the works at each site would range from approximately one to four years. The presence of construction workers is likely to be very noticeable, with construction vehicles using local roads to access compounds and workers using facilities such as shops, restaurants and public houses within local settlements, particularly Kingsbury and Whateley.

8.4.31 The introduction of a temporary construction workforce into communities has the potential to alter people's perceptions and interactions within their local communities, modifying behaviour and the value they place on social capital. Such a reduction in social capital has the potential to adversely affect wellbeing, and may influence behaviours that are beneficial to wellbeing such as the use of community facilities.

8.4.32 The draft CoCP includes a commitment to produce and implement a community engagement framework and provide appropriately experienced community relations personnel. HS2 Ltd will engage with local authorities and community representatives to identify measures aimed at fostering and maintaining good relationships between

[84] Office for National Statistics (2014), *Measuring Social Capital*. Available online at: http://webarchive.nationalarchives.gov.uk/20160105160709/http://www.ons.gov.uk/ons/dcp171766_371693.pdf

the workforce and local communities. Any measures identified will be included within the community engagement framework as appropriate.

8.4.33 The Community section of the ES will include an assessment of impacts resulting from the loss of residential properties. The loss of five properties is identified as the threshold for a significant Community effect. In some cases the Community assessment may identify significant impacts below this threshold, for example where the demolitions make up a significant proportion of a very small community.

8.4.34 The health assessment considers changes to the social environment and loss of social networks experienced by the remaining community following the loss of residential properties. For this to have an adverse impact on overall levels of social capital, the loss of homes would need to make up a sizeable proportion of the local community, with the potential to result in the direct loss of contacts in the local area and/or a noticeable reduction in the number of people using local facilities. This will be judged on a case-by-case basis, taking account of the size of the community and its characteristics. Therefore not all of the significant effects identified in the Community section will result in adverse health and wellbeing effects.

8.4.35 There is a potential for such effects to occur in Whateley where it is currently anticipated that seven residential properties would be demolished as a result of the construction of Whateley cutting. The erosion of social networks resulting from these demolitions would have the potential to reduce the beneficial health effects that are gained through social contact and support for the remaining community.

8.4.36 In Kingsbury, works associated with the realignment of Bodymoor Heath Road would require the demolition of one residential property. However, the demolition of this property would not constitute an erosion of social networks and impact on residents' health and wellbeing, and no health effects are anticipated on the remaining community.

8.4.37 In Stoneydelph, works associated with construction of the M42 junction 10 tunnel would require the demolition of two residential properties. However, the demolition of these two properties would not constitute an erosion of social networks and impact on residents' health and wellbeing, and no health effects are anticipated on the remaining community.

8.4.38 Effects on residents directly impacted by demolitions are assessed in Volume 3, Section 7, Health.

8.4.39 Road closures and diversions required for the construction of the Proposed Scheme would have the potential to reduce community connectivity by increasing journey times between rural communities. Potential health and well-being effects will be reported in the formal ES.

Other mitigation measures

8.4.40 Any other mitigation identified to reduce adverse impacts on health determinants during the construction of the Proposed Scheme will be described in the formal ES.

8.4.41 HS2 Ltd will engage with local authorities and community representatives to identify measures aimed at fostering positive relationships between local communities and

the temporary construction workforce. Any measures identified will be included within the Community Engagement Framework.

8.4.42 HS2 Ltd will continue to engage with owners/operators to identify reasonably practicable measures to help mitigate potential adverse effects identified in this assessment. Any other mitigation measures will be described in the formal ES.

8.5 Effects arising from operation

Avoidance and mitigation measures

8.5.1 Adverse impacts on health determinants would be reduced insofar as reasonably practicable through mitigation measures incorporated into the design of the Proposed Scheme to reduce adverse effects on people. The mitigation measures incorporated into the design of the Proposed Scheme in the Lea Marston to Tamworth area will be reported in the formal ES.

Assessment of impacts and effects

Neighbourhood quality

8.5.2 Operational noise would have the potential to generate a noticeable change in noise at outdoor areas and at neighbourhoods in proximity to the route of the Proposed Scheme, as listed in Section 13, Sound, noise and vibration. The permanent features of the Proposed Scheme would be visible from nearby neighbourhoods, as described in Section 11, Landscape and visual. These impacts have the potential to contribute to impacts on neighbourhood quality. This will be assessed in the formal ES.

Other mitigation measures

8.5.3 If a need is identified for mitigation to reduce adverse impacts on health determinants during the operation of the Proposed Scheme in this area, the mitigation will be described in the formal ES.

Monitoring

8.5.4 Volume 1, Section 9 sets out the general approach to environmental monitoring during operation of the Proposed Scheme.

8.5.5 No area-specific monitoring of health effects during the operation of the Proposed Scheme have been identified at this stage.

9 Historic environment

9.1 Introduction

9.1.1 This section of the report provides a description of the current baseline for heritage assets and the likely impacts and significant effects identified to date resulting from the construction and operation of the Proposed Scheme within the Lea Marston to Tamworth area. Consideration is given to the extent and value of heritage assets including archaeological and palaeo-environmental remains, historic buildings, the built environment and historic landscape.

9.1.2 Engagement has been undertaken with Historic England, Warwickshire County Council (WaCC) and Staffordshire County Council (SCC). The purpose of this engagement has been to discuss the assessment approach, to obtain relevant baseline information and to inform the design development and assessment of the Proposed Scheme. Engagement will continue as part of the development of the Proposed Scheme and to inform the formal assessment.

9.1.3 Maps showing the location of the key environmental features (Map Series CT-10) and the key construction (Map Series CT-05) and key operational (Map Series CT-06) features of the Proposed Scheme can be found in the Volume 2: LA01 Map Book. Only designated heritage assets within the Lea Marston to Tamworth area are shown on maps CT-10-350 to CT-10-352a. Non-designated heritage assets have also been assessed as part of this work, although they are not illustrated on these maps.

9.1.4 A gazetteer of designated and non-designated heritage assets with accompanying maps will be included in the formal ES. The formal ES will also include a Historic Landscape Characterisation Report, which will identify historic landscape character areas potentially affected by the Proposed Scheme.

9.1.5 Assets have been identified in this section of the report using their National Heritage List for England (NHLE) or Historic Environment Record (HER) name and number (numbers prefixed MWA and MST). If no record number is known (e.g. an asset identified from historic mapping), then the asset is referred to by name. Project-specific asset identification numbers will be used for the formal ES.

9.2 Scope, assumptions and limitations

9.2.1 The scope, key assumptions and limitations for the historic environment assessment are set out in full in Volume 1 (Section 8) and the Scope and Methodology Report (SMR)[85], including the method for determining the value of a heritage asset and magnitude of impact (tables 19 and 20 in the SMR, respectively).

9.2.2 The assessment focuses on the extent to which the Proposed Scheme would affect designated and non-designated heritage assets. Impacts on assets as a result of the Proposed Scheme would occur largely through the physical removal and alteration of heritage assets and changes to their setting.

[85] Supporting document: HS2 Phase 2b Environmental Impact Assessment Scope and Methodology Report

9.2.3 The study area within which a detailed assessment of all assets, designated and non-designated, has been carried out is defined as the land required for the Proposed Scheme plus 250m in urban areas and 500m in rural areas. This is referred to in the remainder of this assessment as the 250m, or 500m study area.

9.2.4 The setting of all designated heritage assets within a study area of up to 2km from the land required for the Proposed Scheme has been considered. This is referred to in the remainder of this assessment as the 2km study area.

9.2.5 The historic environment methodology includes the consideration of the relevant intra-project effects. These interactions will be included in the assessment of impacts and effects in the formal ES.

9.2.6 Where noise is considered, this is within the context of the contribution that this makes to the heritage value of the assets, and is not a reference to absolute noise levels or sound, or the noise or vibration impacts on the health and quality of life of people who live in or visit the area.

9.2.7 The baseline studies informing this assessment have been drawn from a wide and comprehensive range of information sources. These will be supported by a programme of non-intrusive survey, including geophysical survey, the results of which will be reported in the formal ES.

9.2.8 At this stage of the design development, heritage assets within the land required to construct the Proposed Scheme are assumed to require complete removal and the assessment has been undertaken on that basis. In relation to the following assets, although the asset is within the land required for the construction of the Proposed Scheme and may be affected, any effect in unlikely to be significant:

- the line of a Roman road at Watling Street (MWA420 and MWA4758) and a turnpike road at Tamworth (MST22387);
- a cropmark site of linear features and possible pits to the north of Cliff House (MWA4723);
- a deserted settlement at Cliff (MWA24);
- two former gardens; one at Holt Hall (MWA12552) and one at Whateley Hall (MWA12579);
- a fishpond at Kettle Brook (MST2797); and
- the site of a canal wharf to the north of Bodymoor Heath.

9.2.9 With respect to overhead line diversions/realignments in particular, it is likely that the majority of the heritage assets can in fact be retained, as the land is only required to allow for raising or lowering of pylons and/or re-stringing of cables, or to provide an access route to the works.

9.2.10 Common features of the historic landscape such as marl pits, field boundaries and former areas of ridge and furrow are not individually considered but have been included in the baseline, as part of the historic landscape character and will be

considered as part of the overall assessment of impacts on historic landscape reported in the formal ES.

9.2.11 In undertaking the assessment the following limitations were identified and assumptions made:

- field surveys are ongoing, and are subject to land access and site conditions. The result of field surveys will be included as part of the formal ES;
- desk-based assessment is ongoing and data on non-designated heritage assets will be described more fully in the formal ES and accompanying technical appendices; and
- intra-project topic assessments are ongoing and will be considered as part of the assessment of historic environment effects as part of the formal ES.

9.3 Environmental baseline

Existing baseline

9.3.1 Baseline data was collated from a variety of sources, including:

- the NHLE (Historic England register of designated heritage assets);
- Staffordshire and Warwickshire HERs;
- conservation area appraisals;
- historic maps and aerial photography; and
- relevant documentary and published sources at Warwickshire County Record Office.

9.3.2 In addition to collating documentary baseline data, site visits have been undertaken.

Designated assets

9.3.3 There are no designated heritage assets located partially or wholly within the land required for the Proposed Scheme.

9.3.4 The following designated heritage assets (listed from south to north) are located partially or wholly within the 2km study area:

- three scheduled monuments comprising: a moated site 270m south-east of Middleton Farm (NHLE 1012659), a moated site at Drakenage Farm with associated closes and fishpond (NHLE 1013769), and Kingsbury Hall enclosure castle and post-medieval house (NHLE 1019978), all of which are of high value;
- seven Grade II* listed buildings comprising: the Church of St. Peter and Paul (NHLE 1034683) and Kingsbury Hall (NHLE 1116550), both in Kingsbury Conservation Area, the Church of St. Nicholas and St. Peter (NHLE 1185754) in Curdworth, the Church of St. Chad (NHLE 1034654) in Wishaw, Middleton Hall (NHLE 1365196), the house 50m north-east of Middleton Hall (NHLE 1365197), and Dosthill Sunday School and Parish Room (NHLE 1207811), which is in Dostill Conservation Area, all of which are of high value;

- forty-eight Grade II listed buildings comprising three buildings within Kingsbury Conservation Area, three buildings within Dosthill Conservation Area, five buildings within Wilncote Conservation Area, plus 22 domestic and rural buildings, eight industrial and commercial buildings, and seven farmhouses, including Holt Hall and attached walls (NHLE 1319929), all of moderate value; and
- three conservation areas at Kingsbury, Dosthill and Wilncote, all of moderate value.

Non-designated assets

9.3.5 The following non-designated assets of low value lie wholly or partially within the land required for the Proposed Scheme:

- the line of a Roman road at Watling Street (MWA420 and MWA4758) and a turnpike road at Tamworth (MST22387);
- a cropmark[86] site of linear features and possible pits to the north of Cliff House (MWA4723);
- remains of three medieval settlements; a deserted medieval settlement at Cliff (MWA24), the possible limits of the medieval hamlet of Whateley (MWA19572) and the deserted hamlet at Holt (MWA21);
- seven domestic buildings comprising Bridge House on the south side of Bodymoor Heath Lane, and six buildings in Whateley comprising Nos.1 and 3 Whateley Lane; No. 29 Whateley Lane; No. 31 Whateley Lane; No. 32 Whateley Lane and Rathmore House on Whateley Lane;
- two former parks/gardens; one at Holt Hall (MWA12552) and one at Whateley Hall (MWA12579);
- a fishpond at Kettle Brook (MST2797); and
- the site of a canal wharf to the north of Bodymoor Heath Bridge (MWA4397).

9.3.6 Non-designated heritage assets located partially or wholly within the 500m study area includes thirty-nine heritage assets of low value providing evidence for prehistoric and Roman activity, medieval and post-medieval settlement and subsequent industrialisation in the Victorian period.

9.3.7 Non-designated heritage assets located partially or wholly within the 250m study area in the urban area of Tamworth include:

- undated cropmark features of low value; and
- the projected route of the Roman road at Watling Street, considered to be of low value.

[86] Cropmark is a term used to describe features identified through differential growth patterns observed in crops or grasses. They indicate the presence of buried features and are normally identified from the air.

Historic environment overview

9.3.8 There is limited evidence for early prehistoric activity in the study area. Two worked flints, dated early Neolithic to late Bronze Age (MWA5320), were discovered at the M42 junction 10. A Bronze Age socketed spearhead (MWA29) was discovered in the 500m study area at Kingsbury Water Park and cropmarks associated with Bronze Age or Iron Age field systems and enclosures are located approximately 200m north-west of Bodymoor Heath (MWA314). Archaeological work at Middleton Hall Quarry within the study area identified alluvial floodplain deposits associated with former courses of the River Tame, and peat layers have been recorded at the base of the river terrace deposits of the River Tame at Coleshill and Whiteacre Heath[87].

9.3.9 Known Roman activity in the study area includes the route of Watling Street Roman Road (MWA5320) which ran from London to Wroxeter. There is potential for settlement-related activity to the north-west of Slateley Hall Farm[88] and cropmark evidence in the vicinity of Middleton Farm may relate to later prehistoric or Early Roman field systems and enclosure. Find spot evidence from this period includes a coin and three fibulae brooches in Middleton (MWA4979).

9.3.10 Place-name evidence along with historical narratives presents a picture of a closely settled and developed landscape during the early medieval period. Tamworth was a centre of royal authority within the Kingdom of Mercia during the 8th and 9th centuries and many villages were established during this period, including the Saxon settlement at Curdworth. The site of a possible minster church (MWA13233) is located within the settlement core at Kingsbury. Minster churches would have had a degree of influence over an area as a centre of missionary teaching, housing a community with a collective life and pastoral responsibilities.

9.3.11 There is extensive evidence for medieval settlement activity across the study area. Notable are the scheduled monument and Grade II listed building of Kingsbury Hall enclosure castle (NHLE 1019978, 1186196), a defended residence built for the Bracebridge family. The castle was superseded by the later post-medieval Kingsbury Hall in the 16th century. The later hall falls within the scheduled area and is separately listed at Grade II* listed (NHLE 1116550). Also located within Kingsbury is the parish church of St. Peter and St. Paul (Grade II* listed; NHLE 1034683) which has 12th century origins. Further evidence of medieval settlement is found throughout the study area, including at Holt (MWA21), Cliff (MWA24), Whateley (MWA19572), and Freasley (MWA13160).

9.3.12 Moated sites were built throughout the medieval period, with the greatest concentrations recorded in the eastern and central parts of England. Moated sites at Blackgreaves Farm (MWA66), Middleton Farm (NHLE 1012659) and Drakenage Farm (NHLE 1013769) demonstrate the level of wealth and status that was present in the region during the medieval period.

9.3.13 Landscape changes due to industrialisation and enclosure occurred during the post-medieval and modern period. The Birmingham and Fazeley Canal (MWA4399) was

[87] Staffordshire County Council (2011) Tamworth Historic Character Assessment
[88] Staffordshire County Council (2011) Tamworth Historic Character Assessment

established in 1789 and the Birmingham to Derby Railway opened in 1839. Cliff Brickworks (MWA16) opened during the late 19th century and Kingsbury Colliery opened in 1897. Another major change was the development of formal landscapes which converted former post-medieval landscapes into designed spaces. There are no designed landscapes in the study area, although a former garden (MWA12552) was identified at Holt Hall during a landscape survey. Despite these changes the landscape remained predominantly rural, and beyond the established settlements the landscape was characterised by small hamlets, farmsteads and the houses of more prosperous families such as Whateley Hall Farmhouse (NHLE 1319936) and Holt Hall (NHLE 1319929) and former garden (MWA12552).

9.3.14 Further changes to the landscape occurred as a result of gravel extraction during the 20th century at Bodymoor Heath, where large areas of agricultural land were lost in the area that is now Kingsbury Water Park.

9.4 Effects arising during construction

Avoidance and mitigation measures

9.4.1 The design of the Proposed Scheme has sought to avoid impacts on heritage assets within the area insofar as reasonably practicable.

9.4.2 Section 8 of the draft Code of Construction Practice (CoCP)[89] sets out the measures that will be adopted, insofar as reasonably practicable, to control effects on heritage assets. These include:

- management measures that will be implemented for heritage assets that are to be retained within the land required for the Proposed Scheme;
- route-wide principles, standards and techniques for works affecting heritage assets; and
- a programme of historic environment investigation and recording (including archaeology and historic buildings) to be undertaken prior to or during construction works affecting the heritage assets.

Assessment of impacts and effects

Temporary effects

9.4.3 The construction works, comprising excavations and earthworks and including temporary works such as construction compounds, storage areas, and diversion of existing roads and services, have the potential to affect heritage assets during the construction period. Impacts would occur to assets both within the land required for the Proposed Scheme and assets in the wider study area as a result of changes to their settings.

9.4.4 The following significant effects are expected to occur as a result of temporary impacts on designated or non-designated heritage assets due to changes to their settings.

[89] Supporting document: Draft Code of Construction Practice

9.4.5 Holt Hall and attached walls (NHLE 1319929) is a Grade II listed farmhouse of moderate value located approximately 65m south-east of the land required for the Proposed Scheme. Holt Hall dates to the late-16th or early-17th century, with 18th and 19th century rebuilding and additions. It is listed for its architectural quality with surviving internal fittings and fixtures from the 17th century. The majority of the former garden (MWA12552) is no longer present and is occupied by agricultural fields. A small ornamental garden is present at the front of the Hall. The building derives some of its significance from its rural setting, particularly from the agricultural landscape to the west which provides a context for the farm building. The rural setting of Holt Hall would be affected by construction activities in the agricultural land to the west of the building, including excavations, the presence of Whateley auto-transformer station satellite compound and the movement of construction traffic, which would adversely affect the ability to appreciate the asset within its rural setting. This would constitute a medium magnitude of impact and a moderate adverse significance of effect.

Permanent effects

9.4.6 Permanent significant effects can occur either as a result of physical impacts on heritage assets within the land required for the Proposed Scheme, or through changes to the setting of heritage assets through the presence of the Proposed Scheme.

9.4.7 The following significant effects are currently expected to occur as a result of permanent physical impacts on heritage assets within the land required for the construction and operation of the Proposed Scheme:

9.4.8 The site of the deserted medieval hamlet at Holt (MWA21), which is a non-designated asset of low value, would be directly affected by the Proposed Scheme. The evidential value of potential buried archaeological remains contributes to the heritage significance of the asset as it could contribute to an understanding of medieval rural settlement and settlement shrinkage. Approximately 50% of the asset is located within the land required for the Proposed Scheme. The removal of buried archaeological remains would result in a comprehensive change to the significance of the asset. This would constitute a high magnitude of impact and a moderate adverse effect.

9.4.9 The medieval hamlet of Whateley (MWA19572), which is a non-designated asset of low value, would be directly affected by the Proposed Scheme. The asset derives heritage significance from the potential evidential value of buried archaeological remains. The village demonstrates an example of medieval settlement patterns and the continuity of this settlement to present day. The layout of the hamlet has seen little change, and the layout of the dwellings centred around a green is still legible. The site lies partially within the land required for the construction and operation of the Proposed Scheme. The portion of the asset that lies within this area amounts to approximately 35% of the asset's recorded extent, however this portion is assessed as representing the core of the hamlet; focused on the central green, surrounded by an informal collection of later 18th and 19th century buildings. The removal of this portion of the asset would result in comprehensive change to its heritage value. This

would constitute a high magnitude of impact and result in a moderate adverse significance of effect.

9.4.10 The following non-designated assets represent standing, historic and domestic buildings identified through investigation of historic maps and site visits. They derive their heritage significance from their historical value, contributing to the history of settlement in Whateley, aesthetic values and, in the case of the buildings located around the green in Whateley, from their group value and association with the former medieval hamlet (MWA19572). They are all of low heritage value. Their removal would result in a total loss of their heritage value. This would constitute a high magnitude of impact, and result in a moderate adverse significance of effect:

- Bridge House south of Bodymoor Heath;
- nos.1 and 3 Whateley Lane;
- no. 29 Whateley Lane;
- no. 31 Whateley Lane;
- no. 32 Whateley Lane; and
- Rathmore House on Whateley Lane.

9.4.11 The following significant effects are currently expected to occur as a result of permanent impact on the setting of designated or non-designated heritage assets:

9.4.12 Holt Hall and attached walls (NHLE 1319929), described above, is a Grade II listed farmhouse of moderate value located approximately 65m south-east of the land required for the Proposed Scheme. The farmhouse dates to the late-16th or early-17th century, with 18th and 19th century rebuilding and additions. The farmhouse derives its significance from its architectural and historic value. The building's rural setting, particularly the agricultural land to its west side, contributes to this by providing a context for the farmhouse where its relationship with its farmstead and farmland can be appreciated. The setting of the farmhouse would be subject to permanent change through the presence of the Proposed Scheme, including landscape earthworks, track and Whateley auto-transformer station, within its associated farmland. The presence of these elements of the Proposed Scheme would visually sever the farmhouse from its associated agricultural land to the west. This would noticeably change the asset's setting and affect how the farmhouse is appreciated and understood within its wider context. This would constitute a medium magnitude of impact and result in a moderate adverse significance of effect.

Other mitigation measures

9.4.13 No additional operational mitigation measures beyond those included within the Proposed Scheme design have been identified at this stage, however potential opportunities for further mitigation measures will continue to be considered through detailed design. These may include the identification of:

- suitable locations for advance planting, to reduce impacts on the setting of heritage assets; and

- locations where the physical impacts on below ground heritage assets can be reduced through the design of earthworks.

Summary of likely residual significant effects

9.4.14 The temporary effects of construction activity on the setting of heritage assets have been considered. However, they are largely reversible in nature and would be restricted to the duration of the construction works.

9.4.15 As no specific mitigation measures have yet been identified in relation to the heritage assets described above, the residual effects are the same as those reported under permanent effects. Over time, the effect of the setting of some heritage assets could change as planting matures and the Proposed Scheme assimilates into the landscape.

9.5 Effects arising from operation

Avoidance and mitigation measures

9.5.1 The following measures have been incorporated into the design of the Proposed Scheme, which would reduce the impacts and effects on heritage assets as shown on the CT-06 Map Series within the Volume 2: LA01 Map Book:

- noise mitigation measures have been included within the Proposed Scheme that could reduce potential impacts on some heritage assets; and
- landscape planting could increasingly reduce impacts on the setting of the designated assets within the study area as it matures.

Assessment of impacts and effects

9.5.2 The assessment considers the Proposed Scheme once operational and all effects are considered to be permanent.

9.5.3 During the operation of the Proposed Scheme, no further ground works are anticipated, and as such there would be no physical impacts on heritage assets arising from the operation of the Proposed Scheme.

9.5.4 Impacts on heritage assets due to changes in their settings arising from the presence of the Proposed Scheme are reported as permanent construction effects and are not repeated in detail here, although they would continue throughout the operation of the Proposed Scheme.

9.5.5 Further effects could occur in relation to heritage assets during the operation of the Proposed Scheme where additional, permanent, changes to the asset's settings have an additional detrimental effect on the way that the asset is understood or appreciated, for example as a result of increased noise or the movement of the trains in combination with the effect of the presence of the Proposed Scheme.

9.5.6 It is currently anticipated that in relation to Holt Hall and attached walls (NHLE 1319929) there would be no significant effects as a result of the operation of the Proposed Scheme and that therefore the significance of effect would remain as described for the permanent construction phase effect.

Other mitigation measures

9.5.7 The Proposed Scheme includes a number of design measures to address potential impacts and significant effects. At this time, no additional operational mitigation measures beyond those included within the Proposed Scheme design have been identified. Potential opportunities for further mitigation have not been identified, and will be considered as part of the detailed design process.

Summary of likely residual significant effects

9.5.8 As no mitigation beyond that described has been identified, it is currently anticipated that the residual effects would be the same as those reported in the assessment of effects during operation.

Monitoring

9.5.9 Volume 1, Section 9 sets out the general approach to environmental monitoring during operation of the Proposed Scheme.

9.5.10 No area-specific heritage monitoring requirements during operation of the Proposed Scheme have been identified at this stage.

10 Land quality

10.1 Introduction

10.1.1 This section of the report presents the baseline conditions that exist along the Proposed Scheme in the Lea Marston to Tamworth area in relation to land quality, and reports the likely impacts and significant effects identified to date resulting from construction and operation of the Proposed Scheme. Consideration is given to land that potentially contains contamination and land that has special geological significance, either from a scientific, historical, mineral exploitation or mineral resources point of view including geological sites of special scientific interest (SSSI) and local geological sites (LGS), areas of historical mineral extraction and areas of designated mineral resources. Consideration is also given to petroleum (including gas) prospects and licensing.

10.1.2 Engagement has been undertaken with the British Geological Survey (BGS), Warwickshire County Council (WaCC), North Warwickshire Borough Council (NWBC), Staffordshire County Council (SCC), Tamworth Borough Council (TBC), the Environment Agency, the Coal Authority, the Animal and Plant Health Agency (APHA), the Warwickshire Geological Conservation Group, the Geological Society Regional Group West Midlands, the Open University Geological Society West Midlands and the Geology Trust. The purpose of this engagement has been to discuss the Proposed Scheme and potential effects, and obtain relevant baseline information. Engagement will continue as part of the development of the Proposed Scheme and to inform the formal assessment.

10.1.3 Maps showing the location of the key environmental features (Map Series CT-10) and the key construction (Map Series CT-05) and key operational (Map Series CT-06) features of the Proposed Scheme can be found in the Volume 2: LA01 Map Book.

10.1.4 Land contamination issues are closely linked with those involving water resources and waste. Issues regarding groundwater resources are addressed in Section 15, Water resources and flood risk. Issues regarding the disposal of waste materials, including contaminated soils, are addressed in Volume 3: Route-wide effects (Section 15).

10.2 Scope, assumptions and limitations

10.2.1 The scope, assumptions and limitations for the land quality assessment are set out in Volume 1, Section 8 and the Scope and Methodology Report (SMR)[90].

10.2.2 In accordance with the SMR, a risk based approach was undertaken to identify contamination that may have an impact upon the construction of the Proposed Scheme. To support this, a desk based assessment has been undertaken for the study area, defined as the land required for construction of the Proposed Scheme plus a 250m buffer. In the case of groundwater abstractions, this buffer is increased up to 1km.

[90] Supporting document: HS2 Phase 2b Environmental Impact Assessment Scope and Methodology Report

10.2.3 The majority of new and diverted utilities would be laid in the boundaries of existing highways within normal road construction layers and natural soils below. These have been considered in the context of the conceptual site model (CSM) approach, and the lack of contact with nearby potentially contaminated sites, and the absence of sensitive receptors within the roadways reduces the risk of an impact occurring to very low levels. The impact of laying these new and diverted utilities has therefore been scoped out of the assessment as they are unlikely to cause any significant land quality effects.

10.2.4 Potentially contaminated areas of land have been identified that could affect, or be affected by, the construction of the Proposed Scheme (e.g. contaminated soils may need to be removed or construction may alter existing contamination pathways). Each of these areas has been studied to evaluate the scale of potential impacts caused by existing contamination (if present) and what needs to be done to avoid significant consequences to people and the wider environment.

10.2.5 The location of the Proposed Scheme was viewed from points of public access initially. In addition, visits to some key sites have been undertaken to verify desktop information.

10.2.6 A CSM approach has been used to provide an understanding of the types of contaminants that may be present, the likely sources and/or pathways by which contamination can spread and the potential receptors (i.e. people and the wider environment) that could be affected. It indicates the types of impacts that existing contamination may be having at present and may have during and after construction.

10.2.7 The minerals assessment is based upon the mineral resources[91] identified on published minerals plans, and existing planning or licensed areas. Any inference of minerals provided by geological maps/reports is excluded (except where these are covered by the relevant minerals plans).

10.2.8 The geo-conservation assessment is based upon publicly available local authority and publically available local geological trust records.

10.3 Environmental baseline

Existing baseline

10.3.1 Baseline data have been collected from a range of sources including Ordnance Survey mapping, the BGS, Coal Authority, WaCC, NWBC, SCC, TBC, Public Health England (PHE), the Environment Agency, Natural England, APHA as well as from local geological trusts.

[91] Defined in the SMR as 'mineral body including aggregates, salt, coal and other hydrocarbons, Petroleum Extraction Development Licences (PEDL), Shale Protective Areas (SPA)'

Geology

10.3.2 This section describes the underlying ground conditions within the Lea Marston to Tamworth area. Recent changes in lithostratigraphic classifications by the BGS have been incorporated where appropriate[92,93].

10.3.3 Table 15 provides a summary of the geology (made ground, superficial and bedrock units) underlying the study area.

Table 15: Summary of the geology underlying the land quality study area

Geology	Distribution	Formation description	Aquifer classification
Made ground			
Made ground	Present at various locations.	Artificial ground comprising variable deposits of reworked natural and man-made material.	Not classified
Superficial			
Head deposits	Present in parts to the south of the study area and to the north of Kingsbury.	Typically gravel, sand and clay. Can include peat and organic material.	Secondary Undifferentiated
Alluvium	Associated with the River Tame and located in the area of Kingsbury Water Park.	Clay, silt, sand and gravel.	Secondary A
River terrace deposits	Present across central parts of the study area, south of Bodymoor Heath and to the north and west of Kingsbury.	Sand and gravel.	Secondary A
Glaciofluvial deposits	Present in the south of the study area at Cocksparrow Farm and between Wishaw and Blackgreaves Farm.	Typically sand and gravel.	Secondary A
Glacial till[94]	Present in the west of the study area around Stonehill Barn, between Cliff and Whateley and to the north-west and east of Wilnecote.	Variable typically comprising sandy, silty clay with pebbles.	Secondary (Undifferentiated) (except east of Wilnecote where it is Unproductive strata)
Bedrock			
Mercia Mudstone Group - Sidmouth Mudstone Formation	Present across the south and central parts of the study area up to the west of Kingsbury.	Mudstone and siltstone with thin beds of dolomitic siltstone and sandstone.	Secondary B
Sherwood Sandstone Group - Helsby Sandstone Formation	Present to the north of Kingsbury and east of A51 Tamworth Road.	Sandstones.	Principal
Warwickshire Group – Salop Formation	Localised outcrop within the study area, north of Kingsbury.	Mudstone and sandstone. Sandstone in upper parts.	Principal (sandstone)
Warwickshire Group – Halesowen Formation	Present across central and north parts of the study area. Limestone outcrops at Kingsbury Link Industrial Estate and east of Whateley.	Sandstone and mudstone with thin coal, limestone and localised conglomerate.	Principal (limestone) Secondary A (mudstone, siltstone and sandstone)
Warwickshire Group – Etruria Formation	Present within the central part of the study area, west of Whateley.	Mudstone, with sandstones and conglomerates.	Secondary A

[92] British Geological Survey (2014), *Lithostratigraphy of the Sherwood Sandstone. Research Report RR/14/01*. Available online at: http://www.bgs.ac.uk/downloads/start.cfm?id=2904
[93] British Geological Survey (2008), *A Formational Framework for the Mercia Mudstone Group, Research Report RR/08/04*. Available online at: http://www.bgs.ac.uk/downloads/start.cfm?id=866
[94] Glacial till is sometimes described as diamicton in the BGS lexicon. The term relates to sediment deposited from land based erosion (such as from landslides and debris flows). In this case the term 'glacial till' refers to diamicton of glacial origin.

Geology	Distribution	Formation description	Aquifer classification
Pennine Coal Measures Group – Pennine Middle Coal Measures Formation	Present within the central part of the study area, west of Whateley.	Mudstone, siltstone, sandstone with coal seams.	Secondary A
Pennine Coal Measures Group – Pennine Lower Coal Measures Formation	Outcrops within the central part of the study area, west of Whateley.	Mudstone, siltstone and sandstone with coal seams.	Secondary A
Stockingford Shale Group – Merevale Shale Formation	Outcrops within the central part of the study area, north of Cliff Hall Lane.	Mudstone with dolomite.	Secondary B
Midlands Minor Intrusive Suite	Discrete outcrops within the central part of the study area, adjacent to Cliff Hall Lane.	Igneous rock intruded into the Merevale Shale Formation.	Secondary B

Made ground

10.3.4 Made ground is a term used to denote man-made deposits such as landfill, colliery spoil heaps or earthworks associated with construction or ground improvement. Such deposits may be poorly mapped and are often very variable in composition. Minor deposits of made ground may be encountered within this area, for example where ponds, sand or marl pits have been backfilled. There is evidence of historical and authorised landfilling within the area, which may comprise more significant deposits of made ground.

10.3.5 The BGS geological mapping[95,96] including artificial ground mapping data, indicates the presence of excavations backfilled or partially backfilled and flooded at Kingsbury Water Park. This area was previously the site of gravel extraction pits and is shown as worked and infilled ground. The area to the west of the route of the Proposed Scheme, north-east of Cliff and west of Whateley, is also an area of made ground and worked ground associated with historic gravel and clay extraction.

10.3.6 Made ground is also recorded to be present towards the east of the study area within the area of the Kingsbury Link Industrial Estate. This is an area of landfilling described by NWBC as colliery spoil and is an area formerly mined for coal and lignite with spoil heaps of unknown constituents recorded. The majority of this area of made ground falls outside the study area. Made ground is also indicated at junction 10 of the M42 associated with highway embankment fill.

10.3.7 No known farm burial or pyre sites associated with the 1967 and 2001 outbreaks of foot and mouth disease (FMD) are known to be present within the Lea Marston to Tamworth area. The 2001 to 2002 FMD outbreak risk assessment map[97] identifies the Lea Marston to Tamworth study area to lie within a FMD free county. However, older unrecorded sites may be present from the 1967 outbreak. Similarly, anthrax-infected cattle burials may be present, generally relating to burials over 50 to 100 years ago. However, no records have been found of such burials.

[95] British Geological Survey (1996), *Geological map sheet 168 (Birmingham) 1:50 000 scale (solid and drift)*
[96] British Geological Survey (2016), *Geology – 50,000 (DiGMapGB-50) Artificial Version 8*
[97] Animal Plant and Health Agency (2001), *Foot and Mouth Disease 2001 County Status Map 01.10.2001.*

Superficial geology

10.3.8 Head deposits are associated with slopes, forming down-slope layers and fans of accumulated material. Head deposits are present locally at the southern edge of the route of the Proposed Scheme and north of Kingsbury. These typically comprise sand and gravel but can also contain lenses of silt, clay, peat and organic material.

10.3.9 Alluvial deposits variably comprising silty clay, silt, sand, peat and gravel occur along the courses of streams and rivers. Alluvium is present associated with the River Tame floodplain in the centre of the study area.

10.3.10 River terrace deposits comprising sand and gravel occur at the edges of Kingsbury Water Park.

10.3.11 Glaciofluvial deposits comprising sand and gravel are present close to Cocksparrow Farm and at the south of the study area.

10.3.12 Glacial till deposits typically comprising sandy, silty clay with gravel are present around Stonehill Barn, between Cliff and Whateley and east of Wilnecote.

Bedrock geology

10.3.13 The Mercia Mudstone Group underlies almost half of the route of the Proposed Scheme in the study area and is present from the south up to Kingsbury. The Mercia Mudstone Group within this area comprises the Sidmouth Mudstone Formation which is typically described as mudstone, siltstone and sandstone.

10.3.14 To the north-east of Kingsbury, the geology is affected by faulting that results in the near surface bedrock geology within the route of the Proposed Scheme transitioning onto the Helsby Sandstone Formation of the Sherwood Sandstone Group, and then the Salop Formation and Halesowen Formation of the Warwickshire Group. The Halesowen Formation is the dominant near surface bedrock geology for the remainder of the study area to the north. However, to the north of Kingsbury there are also outcrops of the older Etruria Formation of the Warwickshire Group, the Pennine Middle and Pennine Lower Coal Measures Formations, the Merevale Shale Formation of the Stockingford Shale Group and the Midlands Minor Intrusive Suite.

10.3.15 The Helsby Sandstone Formation is typically a fine to medium-grained sandstone. This only outcrops within the study area at the north and east extents of Kingsbury. It is present within the route of the Proposed Scheme in this area.

10.3.16 The Salop Formation is dominated in the lower part by mudstone but becomes increasingly sand dominated towards the top. It only outcrops within the study area to the north of Kingsbury.

10.3.17 The Halesowen Formation is typically a sandstone and mudstone, with thin coal and limestone beds. The Halesowen Formation is indicated to be the main near surface bedrock geology within the north half of the study area, extending from the area just north and north-east of Kingsbury.

10.3.18 Approximately 250m to the west of the route of the Proposed Scheme west of Piccadilly and the M42, the Etruria Formation of the Warwickshire Group outcrops.

This comprises mudstone, sandstone and conglomerate. The Etruria Formation is present above the Pennine Coal Measures Group.

10.3.19 The Pennine Middle Coal Measures Formation, typically comprising mudstone, siltstone, sandstone and coal, is present outcropping within the study area east of the River Tame and west of the M42 in the general area of Cliff. These deposits underlie the Warwickshire Group formations present to the north and north-east of Kingsbury. The underlying Pennine Lower Coal Measures Formation typically comprises mudstone, siltstone and sandstone with coal seams.

10.3.20 The Merevale Shale Formation of the Stockingford Shale Group is a mudstone that outcrops in the area to the west of the M42 and north of Kingsbury. This formation is older than the Pennine Coal Measures Group but due to the dip of the strata in this location it is present near surface. The Midlands Minor Intrusive Suite, which are igneous rocks, locally intrude through the Merevale Shale Formation.

Radon

10.3.21 Radon is a radioactive gas formed by the radioactive decay of naturally occurring uranium in rocks and soils. The occurrence of radon gas is shown in the BGS Radon Potential dataset[98].

10.3.22 The majority of the route of the Proposed Scheme lies within a radon affected area. In the areas from Kingsbury to Whateley and from Whateley to Freasley, between 5% and 10% of homes are estimated to have radon levels at or above the action level of 200 becquerels per cubic metre of air (Bq/m^3) for residential properties. For the section around Whateley and from Freasley to the edge to the north of the route, between 1% and 3% are estimated to have radon levels at or above the action level. For the remainder of the area between the south of the route and Kingsbury, less than 1% of homes are estimated to have radon levels at or above the radon action level.

10.3.23 The formal ES will include an assessment of areas where 5% and over of homes are estimated to have radon levels at or above the action level of 200 Bq/m^3.

Groundwater

10.3.24 Five aquifer designations have been identified within the study area, as defined by the Environment Agency[99]:

- the Sherwood Sandstone Group comprising the Helsby Sandstone Formation; the Warwickshire Group comprising the Halesowen Formation (limestone) and the Salop Formation are designated as Principal aquifers;
- alluvium, river terrace deposits and glaciofluvial sand and gravel superficial deposits; the Halesowen Formation (mudstone, siltstone and sandstone) and the Etruria Formation, both of the Warwickshire Group; the Pennine Middle Coal Measures Formation and the Pennine Lower Coal Measures Formation,

[98] British Geological Survey (2018), *Radon data: radon potential dataset*. Available at: http://www.bgs.ac.uk/radon/hpa-bgs.html. This data set underpins Public Health England's Indicative Atlas on Radon in England and Wales (Miles J.C.H, Appleton J.D, Rees D.M, Green B.M.R, Adlam K.A.M and Myers, A.H. (2007). Indicative Atlas of Radon in England and Wales. Public Health England. ISBN: 078-0-85951-608-2.29 pp). Available online at: www.ukradon.org/information/ukmaps

[99] Environment Agency (2017), *New groundwater vulnerability mapping methodology mapping in England and Wales, Report SC040016/R*

both of the Pennine Coal Measures Group are designated as Secondary A aquifers;

- the Sidmouth Formation of the Mercia Mudstone Group, the Merevale Shale Formation of the Stockingford Shale Group and the Midlands Minor Intrusive Suite have been designated as Secondary B aquifers;
- head deposits and the majority of glacial till deposits are designated as Secondary (Undifferentiated) aquifers; and
- glacial till located to the east of Wilnecote is designated as Unproductive strata.

10.3.25 The Environment Agency reports that there is one licensed private groundwater abstraction located within the study area. This abstraction is located to the south-west of Marston, 205m east of the land required for the construction of the Proposed Scheme, and it relates to spray irrigation use. It is recognised that other unlicensed abstractions may exist.

10.3.26 The Proposed Scheme and study area is not located within a groundwater source protection zone (SPZ)[100]. The study area is not identified to lie within a groundwater drinking water safeguard zone.

10.3.27 Details of licensed abstractions are provided in Section 15, Water resources and flood risk. It should be noted that all abstractions that are used directly or indirectly for human consumption are designated as SPZ. In such cases the abstraction point qualifies for a default 10m radius SPZ1 and a default 250m radius SPZ2. There is no default SPZ3 for total catchment with respect to this type of abstraction.

10.3.28 Further information on the groundwater in the Lea Marston to Tamworth area is provided in Section 15, Water resources and flood risk.

Surface water

10.3.29 The River Tame is designated a main river by the Environment Agency and is crossed by the route of the Proposed Scheme to the west of Kingsbury.

10.3.30 The Birmingham and Fazeley Canal, is located on the west side of the study area, running in a south-west to north-east direction from the south of the study area to Kingsbury Water Park prior to turning west towards Cliff Pool Nature Reserve and Middleton Lakes Nature Reserve. The canal would not be crossed by the route of the Proposed Scheme.

10.3.31 Other surface water features which would be crossed by the route of the Proposed Scheme include an unnamed drainage channel to the west of Bodymoor Heath Road, Thistlewood Brook to the north of A51 Tamworth Road and Kettle Brook located at Freasley. The Thistlewood Brook and Kettle Brook are both designated ordinary watercourses by the Environment Agency.

[100] A groundwater SPZ is a defined area within which groundwater is extracted for potable water supply. The area is defined by the Environment Agency on the basis of the length of time taken for groundwater to migrate to the potable source.

10.3.32 The Kingsbury Water Park, a country park located both to the east and west of the route of the Proposed Scheme is a major area of pools, ponds and lakes created largely from historical sand and gravel workings. Two of the pools, Sandy Pool and Alder Pool would be crossed by the route of the Proposed Scheme.

10.3.33 A number of unnamed tributaries, drains and isolated ponds are also located within the study area.

10.3.34 Surface water bodies in the Lea Marston to Tamworth area are described in more detail in Section 15, Water resources and flood risk.

10.3.35 The Environment Agency reports that there is one licensed private surface water abstraction located within the study area. This abstraction is located to the south of Cuttle Mill Fishery, approximately 250m to the west of the land required for the construction of the Proposed Scheme, and it relates to lake and pond through flow[101] use.

Current and historical land use

10.3.36 Current potentially contaminative land uses within the study area include: one landfill site; and five industrial and commercial sites. The key potentially contaminative sites are:

- the operational Kingsbury Landfill;
- the fuel station at Tamworth Services which is within the route of the Proposed Scheme;
- Kingsbury Oil Terminal and various depots at the Kingsbury Link Industrial Estate;
- Centurion Business Park; and
- Relay Business Park.

10.3.37 Historical land uses identified within the study area with the potential to have caused contamination include 10 landfill sites, six mining sites and two industrial sites. The key historical potentially contaminative sites are:

- Cocksparrow Farm landfill site;
- 'Land West of Railway' landfill site;
- 'M42 Mullensgrove Farm' landfill site; and
- one former sewage works.

10.3.38 Further details of these current and historical contaminative land uses within the study area are shown in Table 16, Table 17 and Table 18.

[101] Pond through flow is the supply of a continuous flow of water to maintain water quality

Table 16: Current and historical landfill sites located within the study area

Name and area reference	Location	Description
M42 Mullensgrove Farm (LA01-01)	Located to the west of the M42, 1km east of Wishaw, and 65m to the west of the Proposed Scheme.	Environment Agency records state that the historical landfill was licensed to Sir Alfred McAlpine and Son Southern Limited to receive inert waste between 31 December 1984 and 31 December 1985. The landfill occupied an area of 4.3ha.
Cocksparrow Farm landfill (LA01-02)	Located partially within the route of the Proposed Scheme, 900m west of Marston.	Environment Agency records that the first deposit of waste occurred in April 1964 and the last input was in January 1988. The type of waste received at this landfill is not known. The landfill occupied an area of approximately 1,960m².
BCA Kingsbury (LA01-12)	Located towards the west of Kingsbury Water Park, east of Bodymoor Heath Road and 230m to the west of the land required for the construction of the Proposed Scheme.	The Environment Agency records show the historical landfill was operated by Blue Circle Aggregates and received inert and industrial waste between 31 December 1976 and 31 December 1983. The landfill occupied an area of approximately 1.4ha.
Kingsbury Landfill Site (LA01-13)	Located towards the west of the Kingsbury Water Park, east of Bodymoor Heath Road and 130m to the west of the land required for the construction of the Proposed Scheme.	The Environment Agency records show the historical landfill was operated by Blue Circle Aggregates and received inert waste between 31 December 1976 and 1 October 1988. The landfill occupied an area of approximately 3,850m².
The Coppice (LA01-19)	Located at the east of the Kingsbury Water Park, 500m south of Cliff, and 130m to the north-west of the land required for the construction of the Proposed Scheme.	The Environment Agency records show the historical landfill was operated by Mr B A Perkins and received inert waste between 31 December 1989 and 1 December 1990. The landfill occupied an area of approximately 2ha.
Land west of railway, Piccadilly (LA01-23)	Located within the route of the Proposed Scheme, between Kingsbury and Piccadilly.	The Environment Agency records received to date for this historical landfill do not provide details pertaining to waste type, licence holder or operation dates. The landfill occupied an area of approximately 22.6ha.
Hockley Quarry No. 2 (LA01-53)	Located 350m south of Dosthill and 170m to the north-west of the land required for the construction of the Proposed Scheme.	The Environment Agency records show the historical landfill was operated by Biffa-Severn Trent Waste and received inert, industrial, commercial, household, special waste and liquid sludge between 31 December 1959 and 30 September 1996. The landfill is shown to occupy an area of approximately 19.7ha. NWBC records indicate that quarry soil, rubble and incineration residues were deposited. NWMC shows the area that received this to occupy approximately 14ha.
Kingsbury Landfill (LA01-22)	Located adjacent east of the Birmingham to Derby Railway, 400m south-east of Dosthill. The route of the Proposed Scheme would cross the southern extension of the landfill.	The Environment Agency records that the active landfill is currently operational and it is licensed to Biffa Waste Services Ltd. The Environment Agency records that the landfill is licensed to accept greater than 10 ton/day, with a capacity of greater than 25,000 ton, excluding inert waste. The landfill occupies an area of approximately 31.3ha.
Baggeridge (Clay Hole 2) (LA01-22)	Located within the area occupied by the current Kingsbury landfill and is 160m to the north-west of the land required for the construction of the Proposed Scheme.	NWBC records state that quarry waste and soil rubble has been deposited. The licensing details, closure date and licence surrender date are not known. No information is available from the Environment Agency on this landfill. The landfill occupied an area of approximately 4.8ha.

Name and area reference	Location	Description
Baggeridge (Clay Hole 1) (LA01-22)	Located within the area occupied by the current Kingsbury landfill and is 105m to the north-west of the land required for the construction of the Proposed Scheme.	NWBC records state that quarry waste, soil and rubble was deposited in this historical landfill. The licensing details, closure date and licence surrender date are not known. No information is available from the Environment Agency on this landfill. The landfill occupied and area of approximately 4.9ha.
Kingsbury 1 (British Coal) (LA01-117)	Located in the area of Kingsbury Link Industrial Estate, part of which extends into the east of the study area and is 80m to the south-east of the land required for the construction of the Proposed Scheme.	NWBC records state that colliery spoil was deposited in this historical landfill. The licensing details, closure date and licence surrender date are not known. No information is available from the Environmental Agency on this landfill. The landfill occupied an area of approximately 3.7ha.

Table 17: Current and historical mining, mineral sites and colliery spoil sites located within the study area

Name and Area Reference	Location	Description
Kingsbury Water Park (area including and around LA01-55)	Located across Kingsbury Water Park, and crossed by the route of the Proposed Scheme.	Extensive area of former gravel pits and marshlands. This area forms part of an extensive extraction landscape with ponds, gravel and clay pits present.
Dosthill (LA01-22)	Located adjacent (east) of the Birmingham to Derby Railway, 400m south-east of Dosthill, and adjacent to the Proposed Scheme.	Extensive area of former clay pits, currently occupied by the active Kingsbury Landfill.
Mine entries (LA01-54 and LA01-117)	One mine entry is located 500m east of Cliff, adjacent to the land required for the construction of the Proposed Scheme. Two mine entries are located within the area of Kingsbury Link Industrial Estate, 200m south-east of the land required for the construction of the Proposed Scheme.	These mine entries all relate to shafts and indicate the recorded (charted) entrance to coal mine workings.

Table 18: Current and historical industrial sites located within the study area

Name and Area Reference	Location	Description
Historical and smaller current sewage works and pumping station, Kingsbury (LA01-18)	Located to the north-west of Kingsbury and within the route of the Proposed Scheme.	Kingsbury sewage works (including filter beds and tanks) since 1905 until 1985. The site currently includes a much smaller sewage works and a pumping station. The undeveloped land adjacent west of the site, was also occupied by the historical sewage works.
Kingsbury Oil Terminal (LA01-106)	Located to the north of Kingsbury, 470m to the east of the Proposed Scheme.	The site has been developed as oil storage depot since the late 1960s.
Various depots at Centurion Business Park, (LA01-38)	Located to the west of the M42 junction 10, and extending just within the land required for the construction of the Proposed Scheme.	Historically, the site was undeveloped land until around 1990. It then became the Centurion Business Park and includes various depots. The north-east part of the Centurion Business Park was labelled as a 'works' on the 1990 historical map.
Various depots at the Relay Business Park (LA01-41)	Located to the west of the M42 junction 10, adjacent west of the	Historically undeveloped and farmland and then developed into the Relay Business Park from around 1990. Contains a number of

Name and Area Reference	Location	Description
	land required for the construction of the Proposed Scheme.	depots including electrical sub-stations and tanks in the north and north-east areas.
Various depots at Kingsbury Link Industrial Estate (LA01-117)	Located to the north-east of Piccadilly, 80m to the south-east of the land required for the construction of the Proposed Scheme.	Historically, the site was occupied by a landfill (i.e. Kingsbury 1). It then became the Kingsbury Link industrial Estate, and includes various depots, tanks and electrical sub-stations. The site includes mine entries at its south-west extent.
Fuel station at Tamworth Services (LA01-42)	Located to the north of the M42 junction 10 and within the route of the Proposed Scheme.	Historically, the site remained largely undeveloped until the early 1990s when it became a fuel filling station at Tamworth Services.

10.3.39 Contaminants commonly associated with the sites in Table 16, Table 17 and Table 18 could include metals, semi-metals, asbestos, organic and inorganic compounds. Additionally, infilled pits and landfills could also give rise to landfill gases such as methane or carbon dioxide and leachate. Contamination with pathogens (micro-organisms) and gases such as methane and hydrogen sulphide may also be encountered in relation to the sewage works.

Other regulatory data

10.3.40 The regulatory data reviewed included pollution incidents (major, significant and minor categories), radioactive and hazardous substances consents and environmental permits (previously landfill, integrated pollution control and integrated pollution prevention and control licences). There were 10 minor (Category 3) pollution incidents to controlled waters reported in the study area over a four year period between 1996 and 1999.

10.3.41 There are two Control of Major Accident Hazards (COMAH) sites in the study area, which relate to Kingsbury Oil Terminal.

10.3.42 One active fuel station is located within the study area at the Tamworth Services, and is within the route of the Proposed Scheme. One inactive fuel station is located in the north of the study area, 50m to the north-west of the land required for the construction of the Proposed Scheme.

10.3.43 There are two authorised environmental permits (formerly Local Authority Pollution Prevention and Control permits) registered within the study area. The permits are registered to the active fuel station at Tamworth Services and to the Instarmac Group Plc at Kingsbury Link Industrial Estate.

10.3.44 The Environment Agency reports that there are 11 consented discharges to surface water and two to groundwater within the study area. Further details on these consents can be found in Section 15, Water resources and flood risk.

10.3.45 There are no nationally significant ecological designations as defined in the land quality section of the SMR[102] located within the study area. Further information on

[102] Sensitive ecological receptors are defined as national designations such as SSSIs

ecological designated sites in the study area is provided in Section 7, Ecology and biodiversity.

Mining/mineral resources

10.3.46 There are a range of mining and mineral resources located within the study area that have the potential to be affected by the Proposed Scheme. These can include sand, gravel, clay, stone and coal, which can be protected via local or county level mineral plans and by the Coal Authority, as well as other forms of petroleum hydrocarbons such as shale gas and oil which are regulated by the Oil & Gas Authority (OGA) via the issue of Petroleum Exploration Development Licences (PEDLs).

Minerals plans

10.3.47 WaCC is responsible for the overall minerals plan for Warwickshire. The Minerals Local Plan (MLP) (1995)[103] identifies areas of the county where significant mineral resources occur. A new Minerals Development Framework is currently being prepared and will replace the 1995 Minerals Local Plan. Once it is adopted, it will be the principal development plan that minerals proposals will be considered against in Warwickshire.

10.3.48 A small part of the study area falls within SCC. The MLP for Staffordshire (2015 to 2030)[104] was adopted in February 2017 and sets out the SCC policies aimed at controlling mineral related developments within Staffordshire up to the year 2030.

10.3.49 There is one MLP allocation within the current MLP (1995) within the study area. This is known as Middleton Hall Extension, which is located north of Bodymoor Heath, 30m to the west of the land required for the construction of the Proposed Scheme.

10.3.50 The locations of specific mineral and mining resources within the study area are described below.

Sand, gravel and clay deposits

10.3.51 The WaCC issues and options consultation document[105] that has been prepared in connection with the new Minerals Development Framework includes a plan showing the proposed extent of sand and gravel minerals safeguarding. There is a proposed unconsolidated sand and gravel mineral safeguarding area (MSA), which covers the south of the route of the Proposed Scheme from immediately north of A51 Tamworth Road to the southern limits of the study area. There is also a current 'Area of Search' for sand and gravel extraction to the south of Bodymoor Heath detailed within the MLP (1995).

10.3.52 The WaCC issues and options consultation document identifies a proposed brick clay MSA which partially covers the central part of the route of the Proposed Scheme intersecting the route of the Proposed Scheme between A51 Tamworth Road and Holt Hall Farm and from Rugeley to the village of Stockwell Heath.

[103] Warwickshire Country Council (1995), *Minerals Local Plan*. Available online at: https://www.warwickshire.gov.uk/mlp
[104] Staffordshire County Council (2015), *New Minerals Plan for Staffordshire (2015-2030)*.
[105] Warwickshire County Council (2015), *Minerals Plan Preferred Option and Policies.*

10.3.53 The MSAs listed above are proposed and not within the adopted minerals plan. They have not therefore, been considered further in the assessment.

Building stone

10.3.54 The WaCC issues and options consultation document identifies a potential building stone MSA, which covers the northern part of the route of the Proposed Scheme from A51 Tamworth Road. This corresponds to areas where the Halesowen Formation of the Warwickshire Group is the near surface bedrock geology.

10.3.55 The Building stone MSA is proposed and is not within the adopted minerals plan. It has not therefore, been considered further in the assessment.

Coal mining

Open cast coal mining

10.3.56 There are no licensed or unlicensed, current or historical open cast coal mining areas present within the study area. The WaCC issues and options consultation document identifies a limited proposed shallow coal MSA extending from the A51 Tamworth Road to Whateley.

10.3.57 The shallow coal MSA is proposed and is not within the adopted minerals plan. It has not therefore, been considered further in the assessment.

Deep coal mining

10.3.58 The WaCC issues and options consultation document identifies a proposed deep coal MSA extending from the A51 Tamworth Road to the northern limit of the study area. The deep coal MSA is proposed and is not within the adopted minerals plan. It has not therefore, been considered further in the assessment.

10.3.59 Available records from the Coal Authority show that the route of the Proposed Scheme would pass through areas where there has been underground working for coal. These areas are in the northern part of the study area from north of Kingsbury. The Coal Authority maps also identify an area of probable shallow coal mining workings[106] within the land required for the construction of the Proposed Scheme, 400m east of Cliff. This coal-bearing area concerns seams in the Pennine Middle Coal Measures and in the Pennine Lower Coal Measures.

10.3.60 The underground working areas described above also include one mine entry that indicates the recorded (charted) entrance to a mine working. This falls adjacent to the north of the land required for the construction of the Proposed Scheme. Two further mine entries are recorded in the east of the study area within the area of Kingsbury Link Industrial Estate. All of these entries relate to shafts.

[106] Probable shallow coal mine workings are defined by the Coal Authority as containing locations and estimated extents of probable shallow workings for which no recorded plan exists, but where it is likely that workable coal at shallow depth has been mined before records were kept'

Petroleum exploration and development licence (PEDL/hydrocarbons)

10.3.61 There are no current licences for hydrocarbon resources, including coal or coal bed methane exploitation, and no gas exploration licences[107] within the study area.

Geo-conservation resources

10.3.62 The following geo-conservation resources have been identified within the study area:

- Whateley Quarry[108] which is a disused sandstone quarry, situated in the hamlet of Whateley, adjacent to the junction with Cow Lane and Whateley Lane, and listed as a LGS site; and
- Kingsbury Brickworks[109] which is a disused brick-clay pit, situated north of the active Kingsbury landfill at the west of the study area, and listed as a LGS site.

10.3.63 There are no SSSI designated for their geological value within the study area.

Receptors

10.3.64 The sensitive receptors that have been identified within the study area are summarised in Table 19. A definition of receptor sensitivity is given in the SMR.

Table 19: Summary of sensitive receptors

Issue	Receptor type	Receptor description	Receptor sensitivity
Land contamination	People	Residents of existing properties, schools, study centres, play areas, and public open space.	High
		Employers and visitors at commercial areas, retail parks and areas, and hotels.	Moderate
		Industrial.	Low
	Groundwater	Principal aquifers - Helsby Sandstone Formation, Halesowen Formation and Salop Formation.	High
		Secondary A aquifers – superficial deposits of alluvium, river terrace deposits and glaciofluvial sand and gravel deposits; and the bedrock of the Halesowen Formation, Etruria Formation, the Pennine Middle Coal Measures Formation and Pennine Lower Coal Measures Formation.	Moderate
		Secondary B aquifers - Sidmouth Formation, Merevale Shale Formation and the Midlands Minor Intrusive Suite. Secondary (Undifferentiated) aquifer – head deposits and glacial till (except east of Wilnecote where the glacial till is defined as Unproductive strata).	Low
	Surface waters	River Tame, pools and drains within Kingsbury Water Park; Birmingham and Fazeley Canal; Thistlewood Brook and Kettle Brook; unnamed ponds and drains.	Moderate
	Built environment	Underground structures and buried services.	Low

[107] Oil and Gas Authority (2018), *Onshore Interactive Maps*. Available online at: https://ogauthority.maps.arcgis.com/apps/webappviewer/index.html?id=29c31fa4b00248418e545d222e57ddaa
[108] Warwickshire Geological Conservation Group (2009), *Site No: 04 Whateley Quarry*. Available online at: http://lgs.wgcg.co.uk/LoGS04.pdf
[109] Warwickshire Geological Conservation Group (2009), *Site No: 05 Kingsbury Brickworks(formerly Baggeridge Kingsbury Brickworks).* Available online at: http://lgs.wgcg.co.uk/LoGS05.pdf

Issue	Receptor type	Receptor description	Receptor sensitivity
	Geo-conservation resources	Whateley Quarry and Kingsbury Brickworks - LGS.	Moderate
Impacts on mining/mineral sites	Mining/mineral sites	Sand and gravel, bedrock (coal, brick clay and building stone) safeguarding areas.	Moderate
		Middleton Hall Extension – proposed MLP allocation.	Low

10.4 Effects arising during construction

Avoidance and mitigation measures

10.4.1 The construction assessment takes into account the mitigation measures described in the draft Code of Construction Practice (CoCP)[110]. The draft CoCP sets out the measures and standards of work that would be applied to the construction of the Proposed Scheme and includes requirements to ensure the effective management and control of work in contaminated areas.

10.4.2 The requirements in the draft CoCP relating to work in contaminated areas would ensure the effective management and control of the work. These requirements include:

- methods to control noise, waste, dust, odour, gases and vapours (Sections 5, 7, 11, 13, 14 and 15);
- methods to control spillage and prevent contamination of adjacent areas (Section 5, 11 and 16);
- the management of human exposure for both construction workers and people living and working nearby (Section 5, 7, 11, 13 and 14);
- methods for the storage and handling of excavated materials (both contaminated and uncontaminated) (Sections 6, 7, 11 and 15);
- management of any unexpected contamination found during construction (Section 11 and 15);
- a post-remediation permit to work system (Section 11);
- storage requirements for hazardous substances such as oil (Section 5, 11 and 16);
- traffic management to ensure that there is a network of designated haul roads to reduce compaction/degradation of soils (Section 5, 6 and 14);
- methods to monitor and manage flood risk and other extreme weather events which may affect land quality during construction (Section 5 and 16); and
- methods to manage discovery of unknown animal burial pits (Section 6).

10.4.3 The draft CoCP would require that prior to and during construction, a programme of further detailed investigations, which may include both desk based and site based

[110] Supporting document: Draft Code of Construction Practice

work, takes place in order to confirm the full extent of areas of contamination. It also requires a risk assessment to be undertaken to determine what, if any, site specific remediation measures are required to allow the Proposed Scheme to be constructed safely and to prevent harmful future migration of contaminants. The investigation and assessment of potentially contaminated sites would be undertaken in accordance with Environment Agency CLR11[111] and British Standards BS10175[112], BS8576[113] and Construction Industry Research and Information Association (CIRIA) SP32[114] CIRIA (1983) SP32, Construction over abandoned mine workings.

10.4.4 Where significant contamination is encountered, a remedial options appraisal would be undertaken to define the most appropriate remediation techniques. Where appropriate, this appraisal would be undertaken based on multi-criteria attribute analysis that considers environmental, resource, social and economic factors in line with the framework set out by the Sustainable Remediation Forum UK[115]. The preferred option would then be developed into a remediation strategy.

10.4.5 Contaminated soils excavated within the site, where practicable, would be treated to remove or render contamination inactive and reused within the Proposed Scheme where needed and suitable for use. Treatment techniques are likely to include stabilisation, soil washing and bio-remediation. Contaminated soil removed off-site would be taken to a soil treatment facility, another construction site (for treatment and reuse) or to an appropriately permitted landfill.

Assessment of impacts and effects

10.4.6 Construction of the Proposed Scheme in this area would require earthworks, utility diversions, deep foundations, grouting, ground stabilisation and other activities, including the construction of the various viaducts and road infrastructure works. These aspects of the Proposed Scheme, along with other construction features, are shown on the Map Series CT-05 in the Volume 2: LA01 Map Book.

Land contamination

10.4.7 In line with the assessment methodology, as set out in the SMR, an initial screening process has been undertaken to identify areas of current or historical contaminative use within the study area and to consider which of these areas might pose contaminative risks for the Proposed Scheme. Sites that present a low risk have not been taken further in the assessment. Any moderate to higher risk sites have been taken forward to more detailed risk assessments, in which the potential risks are assessed more fully. The majority of the areas that have undergone the more detailed risk assessments are historical or current landfills, industrial and commercial sites.

[111] Environment Agency (2004), *CLR11 Model Procedures for the Management of Land Contamination*
[112] British Standard (2011), *BS10175+A2:2017 Investigation of Potentially Contaminated Sites*
[113] British Standard (2013), *BS8576 Guidance on investigations for ground gas – Permanent gases and Volatile Organic Compounds (VOCs)*
[114] CIRIA (1983), SP32, Construction over abandoned mine workings
[115] Sustainable Remediation Forum UK (2010), *A Framework for Assessing the Sustainability of Soil and Groundwater Remediation*

10.4.8 CSMs have been produced for those areas taken to detailed risk assessments. The following factors determine the need for detailed risk assessments:

- whether the site is located on or off the route of the Proposed Scheme or associated off line works;
- the vertical profile of the route;
- the presence of underlying sensitive groundwater aquifers (Principal or Secondary A) or nearby watercourses; and
- the presence of adjacent residential properties or sensitive ecological receptors.

10.4.9 Clusters of potentially contaminated sites of a similar nature have been grouped, and assessed together, where appropriate.

10.4.10 A simple summary of the baseline CSM is provided in Table 20. The potential impacts and baseline risks quoted are those before any mitigation is applied. The assessed baseline risk is based on the information provided at the time of the assessment. Where limited information is available, the assessment is based on precautionary, worst case assumptions and may therefore report a higher risk than that which actually exists. A screening assessment of the effects of contamination has been completed by comparing the detailed CSM developed for potential contaminated areas at baseline with construction and post-construction stages.

Table 20: Summary of baseline CSM for sites which may pose a contaminative risk for the Proposed Scheme

Area reference[116]	Area name	Human health risk	Ground water risk	Surface water risk	Ecosystem risk	Buildings risk
On site[117]						
LA01-03, LA01-59, LA01-118	Cocksparrow Farm, former unnamed farm and Barn Covert Farm (Farms group)	Very low to moderate/low	Moderate/low	Moderate/low	Low	Very low
LA01-09, LA01-18, LA01-21, LA01-32, LA01-33, LA01-73, LA01-76, LA01-102, LA01-103	Key sites include: various works (engineering, sewage, former iron and concrete) and Birmingham to Derby Railway (Industrial/commercial group)	Very low to moderate/low	Moderate	Moderate	Moderate/low	Moderate/low
LA01-02, LA01-23, LA01-28, LA01-47, LA01-55, LA01-56, LA01-89	Former Cocksparrow Farm landfill, former landfill 'Land West of Railway Landfill', former marl pit (infilled land), infilled land/current unspecified yard, three areas of	Very low to moderate/low	Moderate	Moderate	Moderate/low	Moderate

[116] Each potentially contaminated site is allocated a unique reference number
[117] 'On site' is within the area of land required for construction of the Proposed Scheme

Area reference[116]	Area name	Human health risk	Ground water risk	Surface water risk	Ecosystem risk	Buildings risk
	potentially infilled land. (Landfill/infilled land group)					
LA01-30, LA01-37	Two disused quarries (Quarry/backfilled opencast group)	Very low to low	Low	Low	Low	Low
LA01-116	Motorway Services (Light industrial/commercial group)	Very low	Low	N/A[118]	Very low	Very low
LA01-58	BPA Pipeline	Very low	Moderate/low	Low	Very low	Moderate/low
LA01-42	Fuel station at Tamworth Services	Very low to low	Moderate/low	N/A	Very low	Moderate/low
LA01-22	'Kingsbury Landfill EPR/NP3635SZ Site' active landfill site	Very low to moderate/low	Moderate/low	Moderate/low	Very low	N/A
LA01-54, LA01-119	Shallow mining area and mine entry	Very low	Low	Very low	Low	N/A
Off site[119]						
LA01-20, LA01-29, LA01-35, LA01-52	Manor Farm, Cottage Farm/Cottage Barn, Whateley Lane Farm, Heath House Farm. (Off site farms group)	Very low to low	Low	N/A	Very low	Very low
LA01-08, LA01-39, LA01-40, LA01-62, LA01-101, LA01-106	Unspecified yard, current garage/obsolete fuel station, obsolete fuel station, current sewage works/pumping station, current sub-station, Kingsbury Oil terminal (Off site industrial/commercial group)	Very low to moderate/low	Moderate/low	Moderate/low	Low risk	Moderate/low

[118] N/A refers to the receptor being absent or a receptor being not applicable to the contaminant source being assessed
[119] 'Off site' is beyond the land required for construction of the proposed scheme but within 250m of it

Area reference[116]	Area name	Human health risk	Ground water risk	Surface water risk	Ecosystem risk	Buildings risk
LA01-01, LA01-12, LA01-13, LA01-19, LA01-53, LA01-117	Former Mullensgrove Farm Landfill, former BCA Kingsbury landfill, former Kingsbury landfill site, the Coppice former landfill site, former Hockley Quarry No. 2 landfill site, former Kingsbury 1 landfill/ current Kingsbury Link Industrial Estate. (Off site landfill sites group)	Very low to moderate/low	Moderate/low	Moderate/low	Moderate/low	Moderate/low
LA01-38, LA01-41	Current depots/warehouses (Centurion Business Park), current light industrial site/ depot/warehouse (Relay Business Park) (Off site light industrial/commercial group)	Very low	Very low	Very low	Low	Very low

Temporary effects

10.4.11 In order to identify potential temporary effects, the baseline and construction CSM have been compared to determine the change in level of risk at receptors during the construction stage, and thus to define the level of effect at the construction stage.

10.4.12 Where there is no change between the main baseline risk and the main construction risk, the temporary effect significance is deemed to be negligible even if the risk is deemed to be high. For example, this would be the case where the construction of the Proposed Scheme does not alter the risks from an existing potentially contaminated site that is outside the area required for construction.

10.4.13 A worsening risk at construction stage compared to baseline would result in a negative effect, and conversely, an improvement would result in a positive effect. The assessment assumes that contamination would be controlled through the general measures in the draft CoCP.

10.4.14 In the event that unexpected contamination is encountered during the construction of the route in this area, this would be remediated as described in the draft CoCP resulting in an overall beneficial effect.

10.4.15 All of the sites set out in Table 20 have been assessed for the change in impact associated with the construction stage of the work. Table 21 presents a summary of the resulting construction effects that have been found to be significant. All other sites referenced in Table 20 were found to have non-significant effects.

Table 21: Summary of construction CSM effects

Name and area ref	Receptor	Main baseline risk	Main post-construction risk	Temporary effect
On site				
LA01-54, LA01-119 Shallow mining area and mine entry	Human health (direct contact, ingestion, inhalation of vapours from contaminated soils, waters and inhalation of ground gases on site)	Very low	Moderate/low	Moderate adverse (significant)
	Controlled waters - groundwater	Low	Moderate	Moderate adverse (significant)

10.4.16 The extent to which mine water and mine gas is controlled is subject to ongoing investigation. For mining sites, potential for significant adverse effects has been identified associated with mine gas and mine water in historical workings. Any mitigation measures required will be identified, in consultation with authoritative consultees, including measures to be set out in the draft CoCP, to mitigate any significant effects.

10.4.17 For other sites unrelated to mining, the adoption of the draft CoCP makes it unlikely that there will be adverse consequences, but it is considered that there may still be temporary minor adverse effects during the construction period from ground disturbance in these areas. These minor adverse impacts at the construction stage are not regarded as significant in line with the methodology set out in the SMR.

10.4.18 The assessment has considered the extent of earthworks required together with the specific nature of the potential current and historical contamination sources and receptors identified. The following key issues have been identified which the draft CoCP will address:

- the Proposed Scheme requires the construction of the M42 junction 10 tunnel north portal across the active fuel station at Tamworth Services. There will be the potential to encounter fuel contaminated soil and groundwater and volatile vapours. Earthworks in this area could have the potential to impact on water quality including the underlying Secondary A aquifer. In addition, the tunnel north portal will generate large quantities of excavated material, some of which may require treatment to render it suitable for re-use;
- the Proposed Scheme requires the construction of the Marston cutting across Cocksparrow Farm historical landfill and M42 Tamworth viaduct partially within the historical 'Land West of Railway' Landfill. There is the potential to encounter contaminated material at these areas. Given that types of waste deposited in these landfills are unknown, the contaminants present may be wide-ranging and these areas could have the potential to impact on local water quality including the underlying Principal aquifer for the 'Land West of Railway' Landfill); and
- an active landfill ('Kingsbury Landfill EPR/NP3635SZ Site) is located partially

within the land required for the construction for the Proposed Scheme, north of Piccadilly embankment and M42 Tamworth viaduct. Earthworks in these areas could have the potential to encounter contaminated leachate impact on water quality including the underlying Secondary A aquifer.

10.4.19 Construction compounds located in this study area could include the storage of potentially hazardous substances, such as fuels and lubricating oils and may also be used for temporary storage of potentially contaminated soils. Mitigation measures set out within the draft CoCP include management of risks from the storage of such materials.

Permanent effects

10.4.20 In order to identify potential permanent effects, a screening assessment has been undertaken comparing the baseline and post-construction CSM to assess the permanent (post-construction) effects.

10.4.21 The magnitude of the permanent effects and their significance have been determined by assessing the change in risk between the main baseline risk and the main post-construction risk. Therefore, where there is no change between the main baseline risk and the main post-construction risk, the permanent effect significance is deemed to be neutral even if the risk is assessed to remain as high. This would be the case where the construction of the Proposed Scheme does not alter the risks from an existing potentially contaminated site that is outside the construction boundary. As noted above, a worsening would result in adverse effects and an improvement would result in beneficial effects.

10.4.22 All of the sites set out in Table 20 have been assessed for a change in impact associated with the permanent post-construction stage. Table 22 presents the summary of the resulting post construction effects that have been found to be significant. All other sites referenced in Table 22 were found to have non-significant effects.

Table 22: Summary of permanent (post-construction) effects

Name and area ref	Receptor	Main baseline risk range	Main post-construction risk range	Post-construction effect
LA01-03, LA01-59, LA01-118 (Farms group) Cocksparrow Farm, Former unnamed farm, Barn Covert Farm	Controlled waters – Groundwater (Principal, Secondary A, Secondary B and Secondary undifferentiated aquifers)	Moderate/low risk	Very low risk to low risk	Minor to moderate beneficial (significant)
	Controlled waters – surface water (Thistlewood Brook and tributaries, pond)	Moderate/low risk	Very low risk	Moderate beneficial (significant)
LA01-09, LA01-18, LA01-21, LA01-32, LA01-33, LA01-73, LA01-76, LA01-102, LA01-103. (Industrial/ commercial group)	Human health (direct contact, ingestion, inhalation of vapours from contaminated soils and waters (on and off-site))	Very low to moderate/low risk	Very low	Neutral to moderate beneficial (significant)

Name and area ref	Receptor	Main baseline risk range	Main post-construction risk range	Post-construction effect
Key sites include: various works (engineering, sewage, former iron and concrete) and Birmingham to Derby Railway	Controlled waters – Groundwater (Principal, Secondary A, Secondary B and Secondary undifferentiated aquifers)	Moderate risk	Low risk	Moderate beneficial (significant)
	Controlled waters – surface water (Thistlewood Brook and tributaries; pools, ponds and drains within the Kingsbury Water Park)	Moderate risk	Very low risk	Moderate beneficial (significant)
	Property receptors	Moderate/low risk	Very low risk	Moderate beneficial (significant)
	Ecological/geological designations (Kingsbury Water Park)	Moderate/low risk	Very low risk to low risk	Minor beneficial to moderate beneficial (significant)
LA01-02, LA01-23, LA01-28, LA01-47, LA01-55, LA01-56, LA01-89. (Landfill/infilled land group) Former Cocksparrow Farm landfill, former landfill 'Land West of Railway Landfill', former marl pit (infilled land), infilled land/current unspecified yard, three areas of potentially infilled land.	Human health (direct contact, ingestion, inhalation of vapours from contaminated soils and waters (on and off-site))	Very low to moderate/low risk	Very low risk	Neutral to moderate beneficial (significant)
	Controlled waters – Groundwater (Principal, Secondary A and Secondary B aquifers)	Moderate risk	Low risk	Moderate beneficial (significant)
	Controlled waters – surface water (River Tame and tributaries, Thistlewood Brook, pools and ponds within the Kingsbury Water Park)	Moderate risk	Very low risk	Moderate beneficial (significant)
	Property receptors	Moderate risk	Very low risk	Moderate beneficial (significant)
	Ecological/geological designations (Kingsbury Water Park)	Moderate risk	Very low risk	Moderate beneficial (significant)
LA01-42 Fuel station at Tamworth Services	Controlled waters – Groundwater (Secondary A aquifer)	Moderate/low risk	Very low risk	Moderate beneficial (significant)
	Properties receptors	Moderate/low risk	Very low risk	Moderate beneficial (significant)
LA01-54, LA01-119 Shallow Mining Area and Mine entry	Human health (direct contact, ingestion, inhalation of vapours from contaminated soils and waters (on and off-site))	Very low to moderate risk	Very low risk	Neutral to moderate beneficial (significant)
	Controlled waters – Groundwater (Secondary A aquifer)	Moderate	Very low risk	Moderate beneficial (significant)

10.4.23 Table 22 indicates that where remediation is carried out on sites identified within the land required for the construction of the Proposed Scheme, there will in most instances, be overall moderate beneficial effects which are considered to be significant.

10.4.24 In relation to the potential significant effects associated with mining sites at construction stage, there will be a greater level of knowledge and understanding of the mine workings ground model and the best means to mitigate the potential effects on a permanent basis.

10.4.25 Additional site-specific permanent remediation measures, that could focus on source removal, pathway breakage or receptor protection, would be developed during the detailed design stage if required. These measures would ensure that risks to people, controlled waters, property and ecological and geological areas would be controlled to an acceptable level.

Mining/mineral resources

10.4.26 Construction of the Proposed Scheme has the potential to affect existing mineral resources and proposed areas of mineral exploitation. This could occur by sterilisation of the resource through direct excavation during construction of the Proposed Scheme or through temporary and/or permanent severance[120] or isolation that may occur during the construction phase of the Proposed Scheme, possibly continuing through to its operation.

10.4.27 There are no MSA defined in the adopted minerals plan and all MSA discussed previously are proposed within the minerals plan under consultation and therefore not considered as part of the assessment.

10.4.28 Within the MLP (1995) there is an Area of Search for sand and gravel extraction to the south of Bodymoor Heath and also the Middleton Hall Extension Preferred Area for sand and gravel extraction to the north of Bodymoor Heath.

10.4.29 There are no PEDLs within the study area. There are no areas of future licensed opencast coal extraction.

Temporary effects

10.4.30 Temporary adverse effects may occur where construction compounds are proposed within an MSA or designated mineral site. In such cases, there would be a temporary sterilisation of the resource during construction works, but this is not considered to represent a significant effect and the resource would not be lost permanently.

Sand, gravel and clay deposits

10.4.31 The Preferred Area of sand and gravel north of Bodymoor Heath Road is not within the land required to construct the Proposed Scheme.

10.4.32 The 'Area of Search' located to the south of Bodymoor Heath is within the land required for the construction of the Proposed Scheme. However, the effect of

[120] In this context, severance refers to the Proposed Scheme splitting an actual or proposed mining/mineral site into two or more areas, such that separate accesses would be required to work the whole site

construction of the Proposed Scheme on the sand and gravel deposits here would be negligible given that the area is not a designated an allocated or preferred site. It may also be possible to remove the resource prior to construction.

Permanent effects

10.4.33 The majority of effects on mineral sites would be permanent where overlain by the footprint of the permanent works, with a strip of mineral becoming sterilised.

Sand, gravel and clay

10.4.34 A minor adverse effect has been identified concerning a defined Area of Search for sand and gravel south of Bodymoor Heath. The area identified is within the route of the Proposed Scheme and within an area of landscape mitigation. Mitigation measures (if any) would be discussed in advance of the works with the Mineral Planning Authority, WaCC, and the mineral owner.

10.4.35 Table 23 reports the assessment of permanent effects from construction on the mining and mineral resources identified.

Table 23: Summary of effects for mining and mineral resources

Site name	Status	Description	Sensitivity/ value	Magnitude of impact	Effect and significance (Y/N)
Middleton Hall Extension	Preferred Area	Preferred sand and gravel extraction site	Low	Negligible	Negligible (N)
Bodymoor Heath	Area of Search	Sand and gravel extraction	Medium	Moderate	Minor Adverse (N)

Geo-conservation sites

10.4.36 The study area includes two geo-conservation areas, listed as LGS. These are Whateley Quarry, which is a disused sandstone quarry, situated in the hamlet of Whateley; and Kingsbury Brickworks, which is a disused brick-clay pit, situated north of the active Kingsbury landfill at the west of the study area.

10.4.37 Although within the study area, neither of these sites are within the land required for the construction of the Proposed Scheme which would result in a negligible effect on these features.

Other mitigation measures

10.4.38 At this stage, no additional measures are considered necessary to mitigate risks from land contamination during the construction stage beyond those that are set out in the draft CoCP and/or instigated as part of the site specific remediation strategies that would be developed at the detailed design stage if required. These measures would ensure that risks to people and property from contaminants in the ground would be controlled such that they would not be significant. For example, measures might include excavation and treatment of contaminated soils or controls to manage movement of landfill gas and leachate.

10.4.39 Mitigation of the effects on mineral resources could include extraction of the resource in landscaping areas within the Proposed Scheme adjacent to, rather than beneath

the structural footprint of the Proposed Scheme, which would require good founding conditions. A plan would be discussed in advance of the construction works with the landowner, the mineral planning department at WaCC, and any other relevant parties to assist in achieving an effective management of minerals within the affected location of the Area of Search.

Summary of likely residual effects

10.4.40 For mining sites, the potential for significant adverse effects has been identified associated with mine gas and mine water in historical workings. For all other sites, and based on the information currently available and with the application of the mitigation measures detailed above, no likely significant adverse residual effects are anticipated with respect to land quality. However, where remediation is undertaken there may be significant beneficial residual effects.

10.5 Effects arising from operation

10.5.1 Users of the Proposed Scheme (i.e. rail passengers) are at all routine times within a controlled environment (i.e. within trains), and have therefore been scoped out of the assessment.

Avoidance and mitigation measures

10.5.2 Maintenance and operation of the Proposed Scheme would be in accordance with environmental legislation and good practice. Spillage and pollution response procedures similar to those to be outlined in the draft CoCP would be established for all high risk activities and employees would be trained in responding to such incidents.

Assessment of impacts and effects

10.5.3 The Proposed Scheme within this area would include one auto-transformer feeder station located at Marston cutting and one auto-transformer station located at Whateley cutting. An auto-transformer station, feeder stations and sub-stations can, in principle, be sources of contamination through accidental discharge or leaks of coolant. However, in common with other modern sub-stations, secondary containment appropriate to the level of risk would be included in the installed design.

10.5.4 The operation of the trains may give rise to minor contamination through leakage of hydraulic or lubricating oils. However, such leakage or spillage is expected to be very small and unlikely to result in significant contamination.

Other mitigation measures

10.5.5 No other mitigation measures are expected to be required beyond what has already been outlined relating to land quality in the study area.

Summary of likely residual significant effects

10.5.6 No significant residual effects are anticipated associated with operation of the Proposed Scheme.

Monitoring

10.5.7 Volume 1, Section 9 sets out the general approach to environmental monitoring during operation of the Proposed Scheme. Requirements for monitoring would be determined as part of the investigation, treatment and validation of contamination on a site specific basis as part of the detailed design process. Monitoring requirements may include water quality, air quality and/or (landfill bulk and trace gases), depending on the site being considered.

11 Landscape and visual

11.1 Introduction

11.1.1 This section of the report presents the assessment of the likely landscape and visual significant effects within the Lea Marston to Tamworth area. It summarises the baseline conditions found within and around the route of the Proposed Scheme and describes the likely impacts and significant effects during construction and operation on landscape and visual receptors.

11.1.2 The operational assessment section refers not just to the running of the trains, vehicles on roads and any associated lighting but also the presence of the new permanent infrastructure associated with the Proposed Scheme.

11.1.3 Engagement with Staffordshire County Council (SCC), Warwickshire County Council (WaCC), Tamworth Borough Council (TBC), the Canal & River Trust, National Trust and Natural England has commenced. The purpose of this engagement has been to discuss the assessment methodology, extent of the landscape and visual study area, and the locations of visual assessment and verifiable photomontage viewpoints. Engagement will continue as part of the development of the Proposed Scheme and to inform the formal assessment.

11.1.4 The Volume 2: LA01 Map Book shows the locations of key environmental features (Map Series CT-10) and the key construction (Map Series CT-05) and operational (Map Series CT-06) features of the Proposed Scheme. It also shows the locations of landscape and visual impact mitigation measures (Map Series CT-06) and viewpoints that would potentially be significantly affected at the construction (Map Series LV-03) and operation (Map Series LV-04) phases and Landscape Character Areas (LCA) that would potentially be significantly affected at the construction and operation phases (Map Series LV-02).

11.1.5 A separate, but related, assessment of effects on the setting of heritage assets is reported in Section 9, Historic environment.

11.2 Scope, assumptions and limitations

11.2.1 The scope, key assumptions and limitations for the landscape and visual assessment are set out in full in Volume 1 (Section 8) and the Scope and Methodology Report (SMR)[121].

11.2.2 Summer surveys for the landscape and visual assessment were undertaken from July to September 2017 and winter surveys were undertaken in November to December 2017 to inform the assessment. Further surveys will be undertaken to inform the assessment and will be reported in the formal ES. At this stage it has not been possible to complete surveys of all publicly accessible land in this area; therefore, for the working draft ES an assumption has been made about the level of sensitivity and

[121] Supporting document: HS2 Phase 2b Environmental Impact Assessment Scope and Methodology Report

magnitude of change on a case by case basis. This will be adjusted, as appropriate, on the basis of survey results to inform the formal ES.

11.2.3 The extent of the study area has been informed by construction and operational phase zones of theoretical visibility (ZTV). The ZTV have been produced in line with the methodology described in the SMR and are an indication of the theoretical visibility of the Proposed Scheme. In some locations, extensive vegetation cover would mean the actual extent of visibility is substantially less than that shown in the ZTV, and professional judgement will be used to further refine the study area to focus on likely significant effects.

11.2.4 Tall construction plant (for example cranes and piling rigs) is excluded from the ZTV for the construction phase, as there is a great degree of variability in the extent and timeframes of the visibility of construction activity and plant. Overhead line equipment rarely gives rise to significant effects if it is the only element visible and has, therefore, been excluded from the ZTV to give a better indication of the possible spread of significant effects to aid the assessment.

11.2.5 Landscape and visual receptors within approximately 1.5km of the route of the Proposed Scheme have been assessed as part of the study area. Long distance views of up to 1km have been considered at settlement edges, such as at Lea Marston, Kingsbury, Wood End, Freasley, Whateley and Tamworth.

11.2.6 This assessment is based on preliminary design information and makes reasonable worst case assumptions on the nature of potentially significant effects where these can be substantiated. It is based on information known at present. The assessment of visual effects during construction covers the situation in winter at peak activity. The assessment of operational visual effects covers the situation in winter and summer of year 1 and summer of year 15. The assessment of landscape effects is undertaken for the construction phase and for the operational phase at both year 1 and year 15. The landscape assessment does not consider seasonal variations e.g. winter/summer, since these do not affect character. Likely significant landscape and visual effects for year 30 will be reported in the formal ES.

11.2.7 Professional judgements on landscape value are summarised in the baseline descriptions and judgements on landscape susceptibility and sensitivity are summarised as part of the assessment of effects on each significantly affected LCA. Full judgements on value, susceptibility and sensitivity will be provided in the formal ES.

11.2.8 The assessment has been carried out on the basis that design of structures would, insofar as reasonably practicable, integrate with existing skyline features and would make use of a simple, clean and coherent palette of materials to help structures fit in the landscape.

11.3 Environmental baseline

Existing baseline

Landscape baseline

11.3.1 A predominantly rural landscape with scattered settlements and urban fringe land uses. Settled farmlands extend to the south of Marston through to the floodplain of the River Tame that includes numerous interlinked lakes. Predominantly farmland landscape dominates beyond Kingsbury to the north up to urban fringe of Tamworth and Birchmoor village. The farmland is frequently fragmented in many places by other land uses that are typical of the urban fringe including golf course, sewage works or distribution centres close to the M42 junction 10.

11.3.2 The landform of the River Tame floodplain is largely flat but altered in places by the raised corridor of the M42 and conventional railway line. Beyond the floodplain, the landform undulates gently to the south, in contrast to more steeply rising landform towards Whateley to the north.

11.3.3 There a number of ancient woodlands, with the nearest located approximately 1km from the Proposed Scheme in Wood End. Generally, less wooded farmland landscape contrasts with more enclosed wooded areas of the River Tame floodplain, which includes a country park - Kingsbury Water Park. Dense tree cover dominates the lakes within Kingsbury Water Park and beyond along the River Tame creating enclosed well-wooded and interlinked landscapes with a diverse range of wetland habitats. Linear tree belts are also found along wide verges and embankments associated with the conventional railway line and the M42.

11.3.4 Farmland is located on the higher ground to the south and north of the River Tame, with dominating arable land. The field patterns are fragmented by urban, commercial and industrial development, sand and gravel extraction, major roads and conventional railway. Land use throughout the area is mainly agricultural with some residential, recreational and industrial or other business uses. Mining and quarrying sites have been largely restored however some sites still remain linked to the former extraction, for example, the crushed aggregate recycling centre at Lichfield Road/ the A446 and the clay pits adjacent to Wienerberger brick factory on Rush Lane in Dosthill. The network of public rights of way (PRoW) includes two Long Distance Paths, Heart of England Way and Centenary Way.

11.3.5 The lakes, varying in size were created from sand and gravel extraction and provide currently major recreational activities such as boating, water sports, fishing, walking and areas of informal recreation. There is very little open access land within the study area. However, the presence of rivers, the Birmingham and Fazeley Canal and network of flooded gravel pits provide some access to informal recreation on and off the lakes.

11.3.6 Villages within the study area remain compact with a nucleated settlement pattern, but some villages including Kingsbury and Tamworth expanded rapidly in the 19th and 20th centuries and have sprawled out across the valleys with a mix of housing, commerce and industry. A number of historic settlements are connected by a network of rural lanes, notably Freasley, Whateley and Marston with characteristic traditional

architectural style based on local needs, materials and traditions complemented in places by modern development. The landscape of the study area is heavily used as a transport and communication corridor, notably for the M42, conventional railways and overhead power lines. This infrastructure heavily influences tranquillity, which is also affected by the urban landscape of Tamworth. However, a sense of tranquillity can still be found in the woodlands, sunken lanes, narrow river valleys and enclosed urban landscapes.

11.3.7 The LCAs have been determined as part of an integrated process of environmental characterisation, informed by a review of historic landscape mapping and the outcome from other topics including ecological assessments. These LCAs will be refined, as appropriate, upon review of available historic landscape characterisation data and will be included in the formal ES. Use has been made of published landscape character assessments and a wide range of supporting GIS data, aerial photography and Ordnance Survey mapping, plus desk study and fieldwork Landscape character assessments reviewed include the relevant National Landscape Character Areas 69 and 97 and the North Warwickshire Landscape Character Assessment[122].

11.3.8 These published LCAs have been adapted for this assessment to provide LCAs of an appropriate and consistent scale. Minor amendments have also been made to some published LCA boundaries to reflect existing conditions.

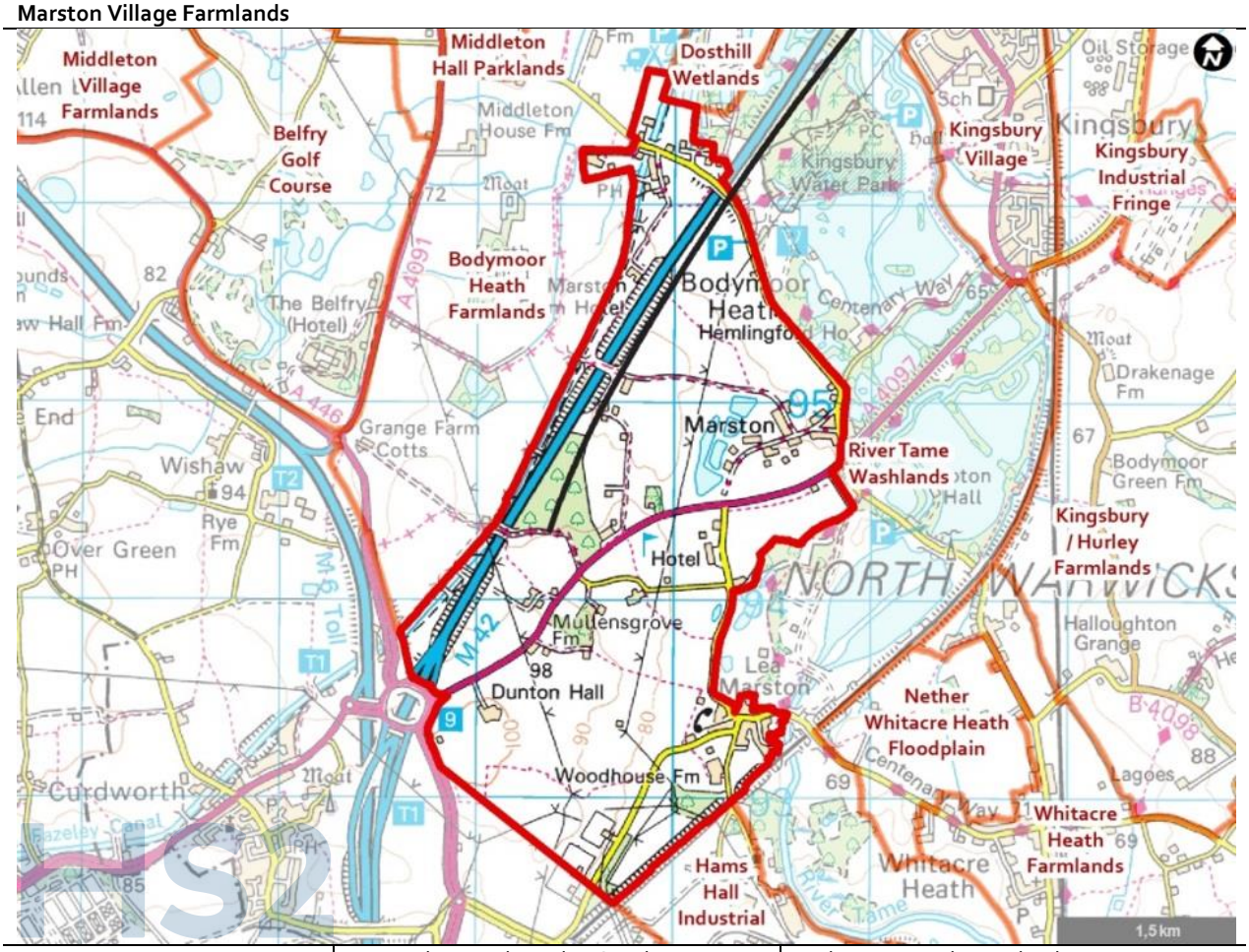
11.3.9 For the purposes of this assessment, the Lea Marston to Tamworth study area has been subdivided into 28 LCAs. These LCAs are draft and subject to review in consultation with local planning authorities. Full descriptions of all LCAs will be provided in Volume 5 of the formal ES.

11.3.10 Twenty-three of the 28 LCAs would not be significantly affected by the Proposed Scheme on account of lack of direct interference with the Proposed Scheme and weaker sense of continuity with the affected landscape. Birchmoor Village Farmlands LCA would be significantly affected by the Proposed Scheme and are included in Volume 2: Community area report LA02: Birchmoor to Austrey as they are located for the most part within the Birchmoor to Austrey area. A summary of the remaining 5 LCAs that would be significantly affected within the Lea Marston to Tamworth area is provided in Table 24.

[122] North Warwickshire Borough Council (2010), *Landscape character and area profiles for North Warwickshire - Final Report (August 2010)*

Table 24: Summary of significantly affected LCAs

Marston Village Farmlands



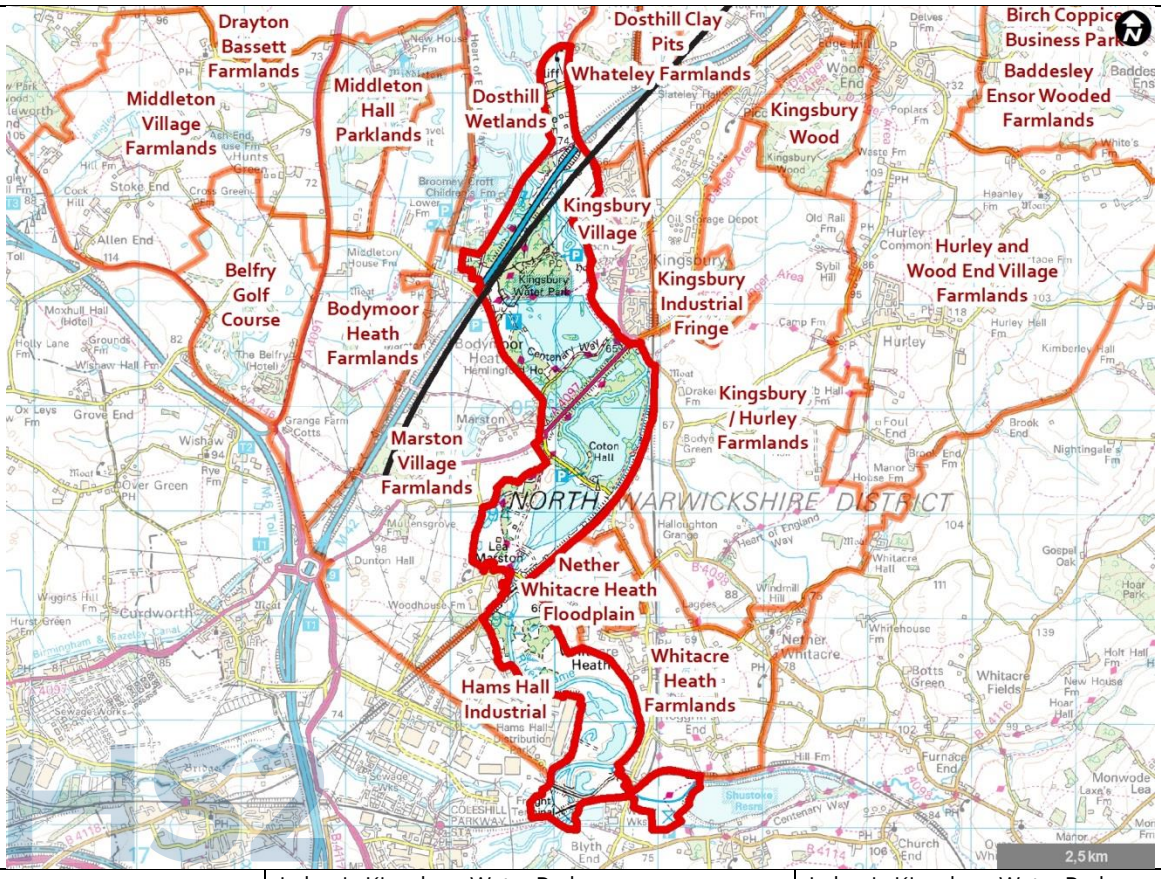
Birmingham and Fazeley Canal

Bodymoor Heath Farmlands

The Marston Village Farmlands Landscape Character Area (LCA) is a rural area, predominantly east of the M42 and to the north of junction 9. This is a gently undulating predominantly agricultural landscape, often defined by intact, small-scale fields reflecting historic landscape pattern in places that reflect rural qualities. Typically, the larger fields are used predominantly for arable crops, while the smaller ones are predominantly in pastoral use. The human interaction with natural landscape is in the form of man-made lakes such as at Marston Fields Farm, created from former mineral workings, which add to the strength of character. Tree cover varies across Marston Village Farmlands LCA with fewer trees and woodlands within the south and north of this LCA. Ancient woodlands at Dunton Coppice and Sych Wood are complemented by semi-natural woodlands of varying size and shape. The area is characterised by a dispersed settlement pattern. Buildings of post war origin dominate with some buildings of different architectural styles. There are few Grade II listed buildings including Dunton Hall, Blackgreaves Farm and Cabot Lodge. The M42 and nearby high-voltage overhead power lines have a strong influence on landscape character across this LCA, with M42 traffic noise notably detracting from tranquillity. The Birmingham and Fazeley Canal is an important landscape element within this LCA, valued by its users alongside other recreational land uses within this LCA.

The overall value of this LCA is moderate-high, derived from the combination of recreational and rural value of the landscape as well as sense of rural character and presence of woodland blocks.

River Tame Washlands



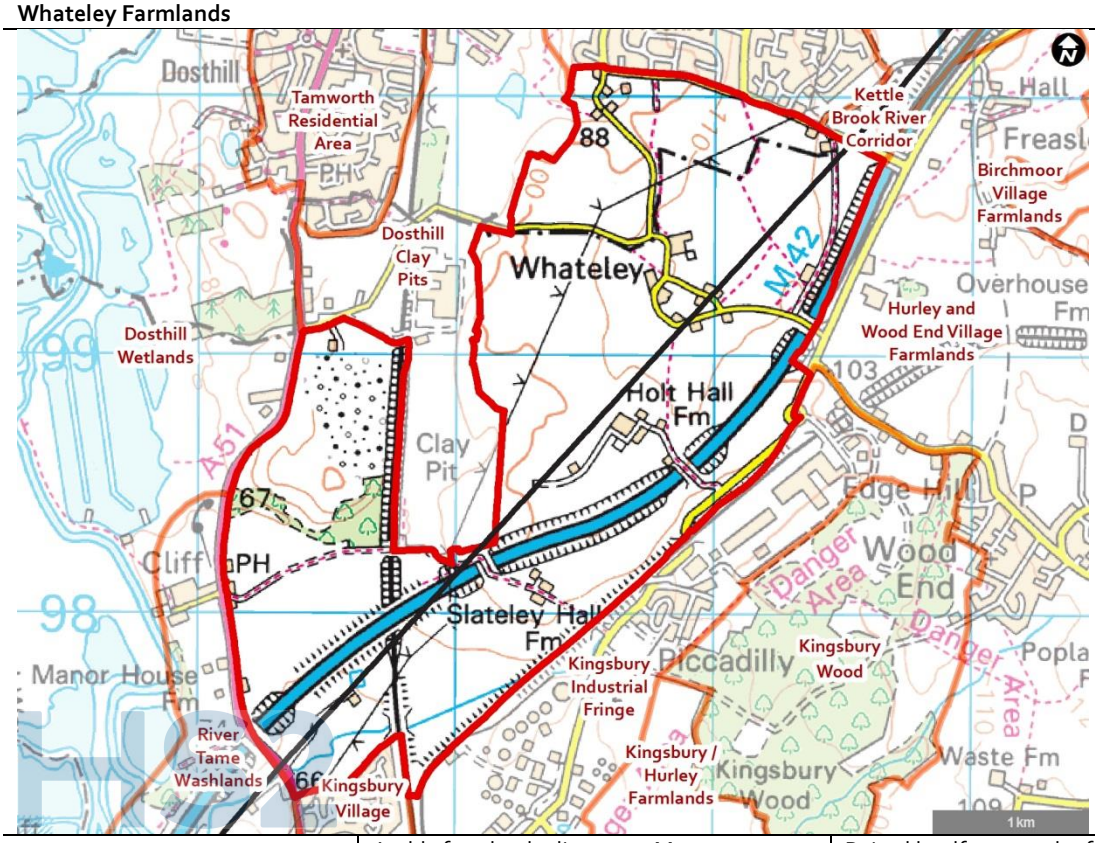
Lakes in Kingsbury Water Park

Lakes in Kingsbury Water Park

The River Tame Washlands LCA lies between the village of Marston and Kingsbury to the north. This is a predominantly flat landscape associated with the valley of the River Tame and Kingsbury Water Park. The low lying valley floor landscape of the meandering River Tame and large man-made lakes associated with Kingsbury Water Park are used predominantly for recreation and nature conservation. The landscape pattern of the River Tame Washlands LCA was completely transformed in the past through gravel extraction and subsequent restoration that has eroded a sense of historic continuity. Tree cover is dense, particularly associated with the Kingsbury Water Park and the M42 embankments. The LCA is sparsely populated containing a few scattered residential properties. This LCA is traversed by the M42, the A4097 Kingsbury Road but also some minor roads. A number of PRoW are present within the LCA, including the Centenary Way. The scenic qualities of the landscape are associated predominantly with presence of lakes and various recreational activities at the lake and within surrounding landscape. The network of paths is popular amongst cyclist and walkers, from where there are occasionally open views of large lakes with wooded edges. This landscape is valued by visitors for scenic qualities, recreational interest and wildlife. The landscape is generally moderately tranquil; however, traffic noise, presence of overhead power lines with pylons reduces tranquillity in parts of this LCA.

The overall value of this LCA is medium, derived from a presence of water bodies including the River Tame and lakes as combined with recreational and scenic value.

Whateley Farmlands



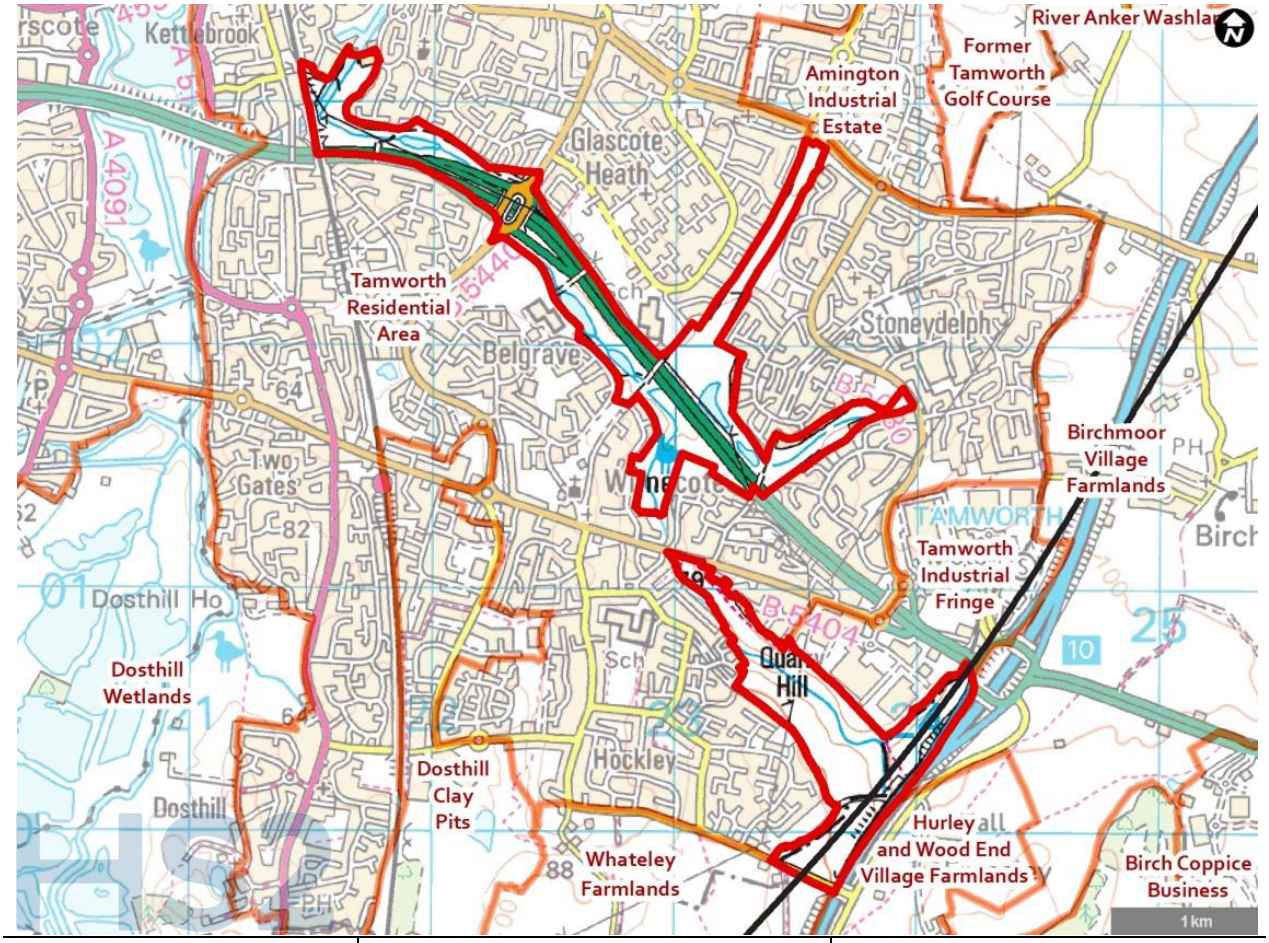
Arable farmland adjacent to M42

Raised landform south of Hockley

The Whateley Farmlands LCA lies between the A51 Tamworth Road and the residential edge of Tamworth. The landscape has local variations in terrain throughout the LCA. This is a predominantly arable landscape in good condition consisting of large fields and open character with a strong sense of scale. The historic pattern of smaller, rectangular fields is still evident close to the Grade II listed buildings of Holt Hall Farm and attached walls, Whateley Hall Farmhouse and Hockley Hall, at the south edge of Tamworth. These buildings add distinctiveness, quality and sense of place to local surroundings. The tree cover is sparse within the LCA, limited to hedgerow trees, woodland around farmsteads and along local roads. The LCA is sparsely populated containing some scattered farmsteads and the hamlet of Whateley. Most buildings within this LCA reflect the historic built character, however frequently with attached modern ancillary buildings. The tranquillity is reduced locally by the urban fringe of Tamworth to the north and presence of mineral extraction to the west. The presence of the M42 and high-voltage overhead power lines that cross this LCA, south to north has a strong influence on character and tranquillity of this LCA. Elevated land around Whateley and further to the north provides some opportunity for open views to the south of the LCA and towards the M42, although the majority of views are screened by subtle changes in terrain and by overlapping vegetation. The locally scenic qualities and historic influence of Whateley hamlet create a sense of place and cultural pattern for the local community.

The overall value of this LCA is medium, derived from a combination of strong rural character and a sense of place around Whateley hamlet as well as presence of locally tranquil areas.

Kettle Brook River Corridor



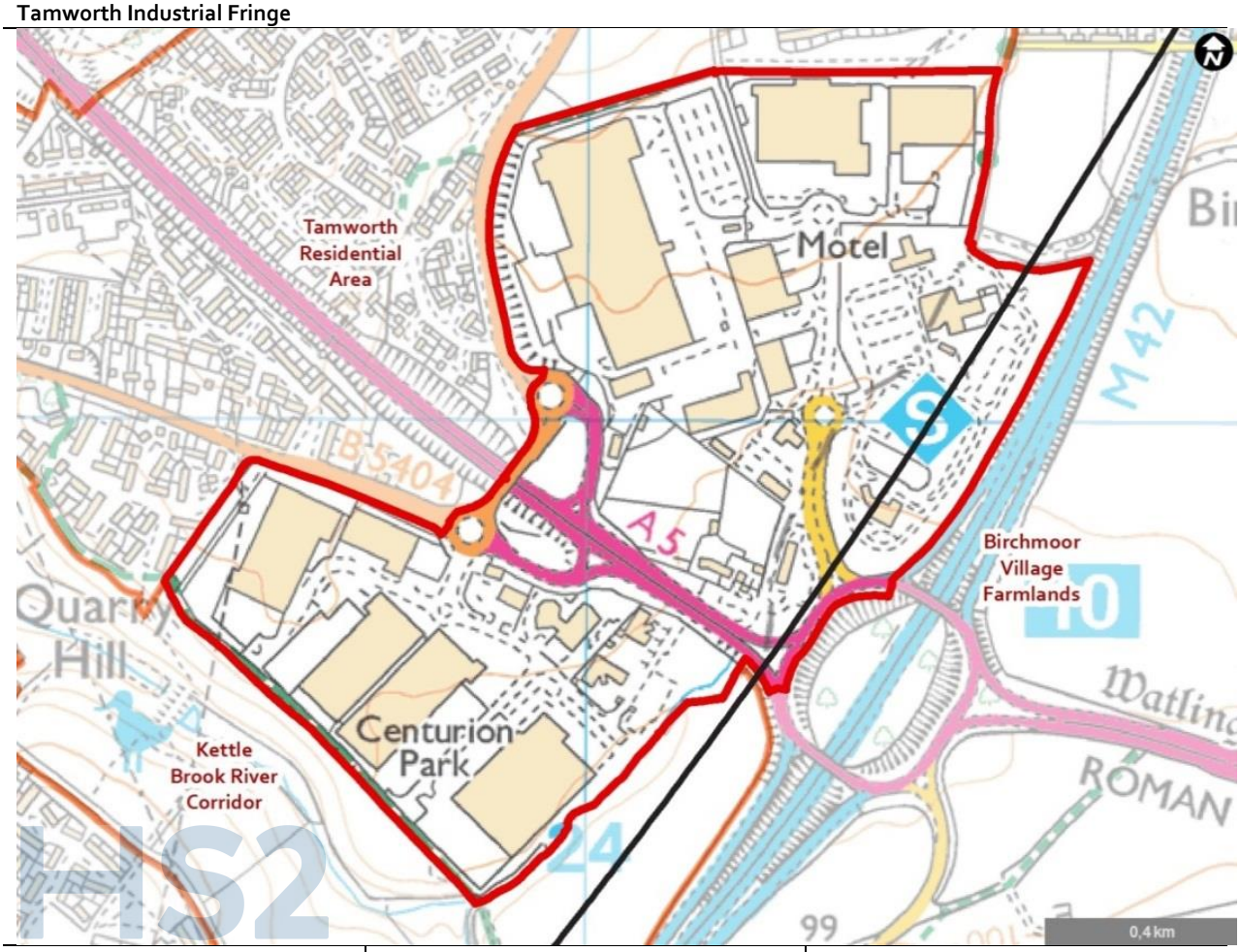
Undulating farmland adjacent to the M42

Landform features near Centurion Park

The Kettle Brook River Corridor LCA is split into two separate areas of man-made landscape centred on the Kettle Brook river corridor, both set within the urban fringe of Tamworth. The entire area of this LCA is designated as Kettle Brook Local Nature Reserve (LNR) comprising wetland habitats, meadows, islands and lakes. Land use is recreational in both of these areas with narrow meandering paths that are popular amongst cyclists and walkers. The north of this LCA stretches along the A5 west of M42 junction 10. The south area of Quarry Hill lies between the business units of Centurion Park to the north and residential areas of Hockley to the south. This LCA has been completely transformed by human intervention as the present landscape is a result of former mining activity that now forms part of the cultural landscape pattern. The valleys of the Kettle Brook comprise dense woodland interspersed with wild flower meadows. There are no residential properties located in this LCA, although the urban edge of Tamworth borders the LCA to the east and west. Topographical variation within this LCA with local mounds combined with enclosed and locally wooded landscape is an attractive setting for recreational activities. The landscape of the Kettle Brook River Corridor is generally moderately tranquil due to a presence of traffic noise from the M42 and high-voltage overhead power lines in the south of this LCA. The views are predominantly close to medium distance, focused on internal small scale landscapes with the backdrop of the Tamworth urban fringe in some views.

The overall value of this LCA is medium derived from past influences of former mining and subsequent restoration combined with recreational value and presence of man-made mounds and woodlands.

Tamworth Industrial Fringe



Business units at M42 Junction 10

The A5 approach to M42 junction 10

The Tamworth Industrial Fringe LCA adjoins the M42 junction 10 to the east of Tamworth. There are local differences in terrain with a high point of up to approximately 105m AOD at Relay Drive, north of the M42 junction 10. This relatively small area is wholly comprised of large scale business units, large distribution warehouses, two to three storey offices, a Premier Inn hotel, Tamworth Services and few undeveloped fields. Vegetation cover is limited to prominent woodland belts associated with the M42 and west edge of the Relay Park business park and internal grassland and amenity planting associated with the business park. The internal roads are linked to the A5 east of M42 junction 10 and provide an access to the M42. The landscape is generally of low tranquillity due to the traffic noise perceptible from the M42 and the industrial land use. This commercial landscape contains limited aesthetic qualities as it comprises of similar in nature business units. The landscape of this LCA lacks special features and views are predominantly close distance and focused on buildings and their close surroundings.

The overall value of this LCA is low, derived from low tranquillity, limited aesthetic qualities and built form combining presence of business units close to the M42 Junction 10.

Visual baseline

11.3.11 A summary description of the distribution and types of receptors most likely to be affected is provided below. The viewpoints are numbered to identify their locations and are shown on the viewpoint location maps (see Volume 2: LA01 Map Book, Map Series LV-03 and LV-04). In each case, the middle number (xxx.**xx.**xxx) identifies the type of receptor that is present in this area – 1: Protected views (none within this area), 2: Residential, 3: Recreational[123], 4: Transport, 5: Hotels/healthcare/education and 6: Employment.

11.3.12 No protected views have been identified within the study area. Residential views within the area are available from the settlements of Kingsbury, Tamworth, and Birchmoor; associated with villages such as Freasley and Marston or hamlets including Whateley and Edge Hill, with many dispersed residential properties and farmsteads.

11.3.13 Most views from settlement edges are typically filtered and framed by intervening hedgerows. Open views from settlement edges are rare; however these are available at the east of Tamworth.

11.3.14 Views from the majority of PRoW including the Heart of England Way and Centenary Way are restricted by woodland and hedgerows. Users travelling on rural roads and lanes generally experience partially restricted views, due to mature roadside hedgerows and trees. However, lanes located on more elevated ground, for example north of Whateley; allow glimpsed long distance views towards the valley of the River Tame. Views for motorists/road users travelling on the lower lying A4097 Kingsbury Road are generally restricted due to mature roadside hedgerows and woodland belts, which form barriers restricting views beyond the road corridor. There are several camping and caravan sites, including Marston Caravan and Camping Park and Reindeer Park Caravan and Camping Guest House, but their views are enclosed by surrounding belts of trees. Views from recreational and residential areas on elevated locations include the settlements of Tamworth and Edge Hill. However, views are frequently screened by adjacent woodland belts, or built form. Open panoramic views towards the River Tame valley are available from a network of PRoW located to the south of Hockley. Views are often restricted or filtered by landform or by hedgerow and woodland cover. Views from the Birmingham and Fazeley Canal are typically restricted by canal side vegetation.

11.3.15 Key transport receptors are located along the M42 and the A51 Tamworth Road. Views for road users travelling along the M42 vary in extent from occasionally open, to entirely screened by intervening woodland. Views from the A51 Tamworth Road and minor roads within the study area are generally restricted by mature roadside hedgerows with trees that form barriers. Some roads have hedgerows on one side only, allowing for glimpsed views into adjacent countryside.

[123] Reference to specific civil parish numbers for footpaths is provided where available otherwise the adjacent road name is used as a reference to the footpath

11.4 Temporary effects arising during construction

11.4.1 As is commonplace with major infrastructure works, the scale of the construction activities means that works would be visible from many locations and would have the potential to give rise to significant temporary effects that cannot practicably be mitigated. Such effects are temporary and would vary over the construction period depending on the intensity and scale of the works at the time. The assessment of landscape and visual effects has been based on the activities occurring during the peak construction phase, which is defined as the period during which the main construction works would take place, including the presence of compounds, main earthworks and structure works.

11.4.2 The effects associated with the peak construction stage in this area are generally considered to be medium-term, based on the indicative construction programme in Section 2.3. It is currently anticipated that the peak civil engineering stage in this area would be undertaken between autumn 2025 and spring 2030. Effects during other stages of works are likely to be less intensive due to less construction equipment being required at the time and a reduced intensity of construction activity.

11.4.3 Section 2.2 sets out the key permanent features of the Proposed Scheme and Section 2.3 describes the construction compounds and associated temporary works that have been considered in this assessment.

Avoidance and mitigation measures

11.4.4 Measures that have been incorporated into Sections 12 and 14 of the draft Code of Construction Practice (CoCP)[124] to avoid or reduce landscape and visual effects, where reasonably practicable, during construction include the following:

- avoidance of unnecessary tree and vegetation removal, and protection of existing trees in accordance with BS 5837: Trees in relation to design, demolition and construction[125];
- use of well-maintained hoardings and fencing;
- prevention of damage to the landscape features adjacent to the construction sites due to movement of construction vehicles;
- designing lighting to avoid unnecessary intrusion onto adjacent buildings and other land uses; and
- replacement of any trees intended to be retained which may die as a consequence of nearby construction works.

11.4.5 Implementation of these measures has been taken into account in the assessment of the construction effects.

[124] Supporting document: Draft Code of Construction Practice
[125] British Standard Institution (2012), *BS 5837:2012 Trees in relation to design, demolition and construction – Recommendations*

Assessment of temporary impacts and effects

11.4.6 The most apparent changes to the landscape and to the views experienced by visual receptors during construction would relate to the presence of construction plant, compounds and soils and material storage and stockpiling. Key construction activities that would give rise to the most apparent changes to landscape and visual receptors are: the excavation of cuttings; the construction of viaducts and embankments; the removal of existing landscape elements including trees and hedgerows; and the closure and diversion of highways and PRoW. Other key changes include the construction of a tunnel and tunnel portals, overbridges, an auto-transformer feeder station, culverts and watercourse diversions, diversion of overhead power lines and other utilities, the presence of transfer nodes and demolition of buildings and structures.

Landscape assessment

11.4.7 Based on the current design it is anticipated that the LCAs set out in Table 25 would be significantly affected during construction of the Proposed Scheme.

Table 25: Summary description and assessment of effects on LCAs

Marston Village Farmlands LCA	**Medium susceptibility and Medium sensitivity**
Susceptibility to change: The levels of tranquillity, strength of character, rural qualities including woodlands and landform within the landscape have a medium susceptibility to change arising from the Proposed Scheme. Marston Village Farmlands LCA would be directly affected by the construction of Marston cutting, Marston embankment, River Tame viaduct, Seeney Lane overbridge and Bodymoor Heath Road overbridge. The removal of deciduous woodland along Marston Lane would result in more open character. The presence of earthworks, stockpiles and excavation of balancing ponds around the Kingsbury auto-transformer feeder station would introduce notable alterations to the flat or gently sloping farmland landscape. Temporary addition of Kingsbury main compound and movement of construction plant would also introduce considerable change as these uncharacteristic features that would substantially alter the landscape character. However, these changes would occur close to the M42 corridor. The Proposed Scheme would be at variance with existing landscape character and would diminish the rural setting, tranquillity and alter existing landform. There would therefore be an overall high magnitude of change and moderate adverse effect.	**Level of effect:** Moderate adverse (significant)
River Tame Washlands LCA	**High susceptibility and Medium – high sensitivity**
Susceptibility to change: The largely enclosed landscape pattern of lakes interlinked with dense tree cover and the level of tranquillity have a high susceptibility to change arising from the Proposed Scheme. The River Tame Washlands LCA would be directly affected by the construction of the River Tame viaduct. The construction of the River Tame viaduct would add new uncharacteristic features that would result in substantial alteration to the character of this LCA due to its scale and prominence within the lowland valley landscape. Construction machinery and site haul routes would introduce uncharacteristic components substantially altering the character of the LCA. The landscape character would also be affected by the removal of substantial areas of trees and woodland close to the M42, within Kingsbury Water Park. The high level of construction works would affect the skyline through the presence of cranes and reduce tranquillity. The Proposed Scheme would be at considerable variance with existing landscape character, altering the landscape pattern and land use and tranquillity. There would therefore be an overall high magnitude of change and major adverse effect.	**Level of effect:** Major adverse (significant)
Whateley Farmlands LCA	**Medium susceptibility and Medium sensitivity**

Susceptibility to change: The open character, elevated landform, landscape pattern with principally rural cultural context, sense of place and cultural pattern associated with Whateley hamlet. This combined with good condition of the landscape would result in a medium susceptibility to change arising from the Proposed Scheme. The Whateley Farmlands LCA would be directly affected by the construction of the M42 Tamworth viaduct, Piccadilly embankment and Whateley cutting. Construction would also include the A51 Tamworth Road realignment and the A51 realignment M42 overbridge. These activities would disrupt the existing rural landscape pattern and gently undulating landform. The landscape will also be affected by the loss of historic settlement pattern and sense of place through removal of some residential properties around Whateley. Construction would add new uncharacteristic features comprising of temporary earthworks stockpiles, satellite compounds and construction machinery that would substantially alter a large part of the character area. The loss of vegetation would predominantly be restricted to field boundary hedgerows. The scale of the Proposed Scheme and presence of large scale construction activity will change the character of the predominantly rural landscape by introduction of uncharacteristic elements. Construction activities would be detracting throughout the core of the LCA. Existing landform would be altered through introduction of embankments, cutting and false earthworks. The Proposed Scheme would diminish characteristic features of existing landscape including landscape pattern landform, historic context of Whateley hamlet and rural outlook of landscape. There would therefore be an overall high magnitude of change and moderate adverse effect.	**Level of effect:** Moderate adverse (significant)
Kettle Brook River Corridor LCA	**Medium Susceptibility and Medium – Low sensitivity**
Susceptibility to change: The wooded character, man-made landform with local landform features and recreational land use and cultural landscape pattern have a medium susceptibility to change. This LCA comprises two areas that are separated by residential areas. The Proposed Scheme would affect only on the LCA area that adjoins the M42. This area would be directly affected by the construction of Whateley cutting and Freasley embankment. Construction would include also the M42 junction 10 tunnel south portal, Overwoods Road overbridge and presence of M42 junction 10 main compound. In combination these construction activities would substantially alter the landform and the character of the Kettle Brook River Corridor. The PRoW along Centurion Park would be diverted. Large scale construction works would change the character of the local landscape. The alteration of the landform to accommodate the cutting and embankment would be prominent within Kettle Brook LNR. Construction activities would result in removal of vegetation comprising woodland and meadows as a result of ground level modifications/earthworks. Movement of plant would create a new pattern of construction activities across this part of the LCA. The construction activities would be at variance with the existing character altering landform, land use and restored landscape of former coal mining. There would therefore be an overall high magnitude of change and moderate adverse effect.	**Level of effect:** Moderate adverse (significant)
Tamworth Industrial Fringe LCA	**Low susceptibility and Low Sensitivity-**
Susceptibility to change: The industrialised land use has a low susceptibility to change. The Tamworth Industrial Fringe LCA would be directly affected by the construction of the M42 Stoneydelph cutting and M42 junction 10 tunnel. The character would also be affected by the introduction of Stoneydelph satellite compound and presence of the temporary access route. In combination, these construction activities would substantially alter the landform and character of the LCA. The introduction of large scale construction works would change the key characteristics of the local landscape. The existing land use and landscape pattern of Tamworth Services would be replaced with temporary large scale construction activities and result in loss of vegetation/tree belts. The level of tranquillity across this LCA would be further eroded through the construction activities. The construction activities would further alter the setting of Tamworth Industrial Fringe LCA by changes to land use, tranquillity and woodland pattern. There would therefore be an overall high magnitude of change and moderate adverse effect.	**Level of effect:** Moderate adverse (significant)

Visual assessment

Introduction

11.4.8 The following section describes the likely significant effects on visual receptors during construction. The construction assessment has been undertaken for the winter period, in line with best practice guidance, to ensure a robust assessment. However, in some cases, visibility of construction activities may be reduced during summer when vegetation, if present in a view, would be in leaf.

11.4.9 Where a viewpoint represents multiple types of receptor, the assessment is based on the most sensitive receptors. Effects on other receptor types with lower sensitivity would be lower than those reported.

11.4.10 Night-time surveys will be undertaken to inform the assessment in the formal ES. Potential visual impacts arising from additional lighting at night during construction within the area may arise from continuous working and/or overnight working. Assessment of these effects will be reported in the formal ES on completion of the night time assessment.

11.4.11 Table 26 describes the construction phase potentially significant visual effects based on the current design of the Proposed Scheme. Viewpoint locations are shown in Map Series LV-03 in the Volume 2: LA01 Map Book.

Table 26: Construction phase significant visual effects

View looking north-west from the A4097 Kingsbury Road. (VP 350-04-03) **(Map Number LV-03-350)**	**Medium-Low sensitivity visual receptors**
Road users of the A4097 Kingsbury Road would have partial, middle distance views of the construction associated with Marston cutting and Bodymoor Heath Road overbridge. Views would include also construction of Kingsbury auto-transformer feeder station satellite compound, Kingsbury main compound, balancing and infiltration ponds, temporary earthworks stockpiles and the movement of vehicles along the site haul route. At peak construction, there would be isolated views of cranes at Bodymoor Heath Road overbridge, visible above overlapping vegetation in the view. Construction activities would represent a substantial change to key characteristic of the view as a large part of the rural landscape would be replaced by features that are uncharacteristic of the view. Large scale construction activities that would be prominent and uncharacteristic within the existing view from a receptor. There would therefore be an overall high magnitude of visual change and moderate adverse effect.	**Level of effect:** Moderate adverse (significant)

View looking west from PRoW along Seeney Lane (VP 350-03-05) **(Map Number LV-03-350)**	**High sensitivity visual receptors**
Users of recreational footpaths would experience substantial changes to near distance, elevated, views as a result of construction associated with Marston cutting, Seeney Lane overbridge and Bodymoor Heath Road overbridge. The Kingsbury main compound would be visible in the foreground. Views of earthworks, material stockpiles and the movement of vehicles along the site haul route would substantially alter the existing views of fields and the M42 corridor. The public footpath would be temporarily diverted during the construction of Seeney Lane overbridge. Ground level construction works, such as the movement of vehicles along the site haul route and formation of earthworks along Marston cutting would be prominent as well as the construction of	**Level of effect:** Major adverse (significant)

Bodymoor Heath Road overbridge. A substantial alteration of the rural view would occur as construction activity would be highly visible across much of the view close to the receptor. There would therefore be an overall high magnitude of visual change and major adverse effect.	

View looking south-east from the Birmingham and Fazeley Canal, south-east of Marston Farm Hotel (VP 350-03-07) **(Map Number LV-03-350)**	**Medium -High sensitivity visual receptors**
Users of the Birmingham and Fazeley Canal would have middle distance views of construction activities at Seeney Lane overbridge, Bodymoor Heath Road overbridge and works at the River Tame viaduct. The views of construction at Marston cutting would be screened by raised landform to the east and intervening vegetation, whilst construction at Seeney Lane overbridge would be visible within close distance views. The removal of vegetation near Marston Farm Hotel would open up middle distance views towards the construction activities at Bodymoor Heath Road overbridge, where movement of vehicles, material stockpiling, views of tall plant such as cranes working at the overbridge and the River Tame viaduct would substantially alter the views. Construction activities would represent a large scale and substantial change to views of predominantly rural landscape. Added components of construction would be continuously highly visible across much of the view. There would therefore be an overall high magnitude of visual change and major adverse effect.	**Level of effect:** Major adverse (significant)

View looking north-west from residential properties along A4097 Kingsbury Road, Marston (VP 350-02-04) **(Map Number LV-03-350)**	**Medium-Low sensitivity visual receptors**
Residents of Marston located on the raised landform to the north of the A4097 Kingsbury Road would have middle distance views of the construction of Bodymoor Heath Road overbridge and Marston cutting, which would result in a noticeable alteration to the view that is focused on the rural landscape to the east of the M42 corridor. The removal of Cocksparrow House Farm and mature deciduous woodland adjacent to Marston Lane as well as hedgerows would result in substantial changes but partially filtered to the extent, content, skyline and character of these views and the loss of distinctive local landscape features. Partial views of construction works and associated uncharacteristic elements including: Kingsbury main compound, Kingsbury auto-transformer feeder station satellite compound and temporary earthworks stockpiles as well as movement of vehicles along the site haul route would be noticeable. Partial and temporary views of cranes above the intervening field boundary vegetation at Bodymoor Heath Road overbridge would occur. These noticeable changes would be partially filtered by intervening vegetation but would be continuously highly visible across the majority of the view. The views of fields and the M42 corridor would be replaced by temporarily introduced uncharacteristic elements of large scale construction activities. There would therefore be an overall medium magnitude of change and moderate adverse effect.	**Level of effect:** Moderate adverse (significant)

View of residents looking to the south east near Marston Farm Hotel and Cheatles Farm Bridge (VP 350-02-09) **(Map Number LV-03-350)**	**High sensitivity visual receptors**
Residents would have close to middle distance views of construction works at Bodymoor Heath Road overbridge and the River Tame viaduct. Whilst construction activities associated with the River Tame viaduct at the ground level would be screened by vegetation along the M42 corridor in the middle ground, the views of construction activities at Bodymoor Heath overbridge and access track to Marston Farm Hotel would be continuously highly visible across much of the foreground. There would also be occasional views of cranes working at the River Tame viaduct above the corridor of the M42. Construction of the Proposed Scheme would result in a substantial alteration	**Level of effect:** Major adverse (significant)

to key characteristics of the views, as views or fields and field boundary vegetation would be replaced by construction activities with movement of vehicles, earthworks and road formation and views of work at height. Movement of vehicles during construction would be also uncharacteristic despite some partial views of vehicles moving along the M42. There would therefore be an overall high magnitude of visual change and major adverse effect.	
View looking to the south east from residential properties along Bodymoor Heath Road (VP 350-02-10) **(Map Number LV-03-350)**	**High sensitivity visual receptors**
Residential receptors at Lower Farm Cottages and Lower Farm would have middle distance views of the construction works at Bodymoor Heath Road overbridge and the River Tame viaduct. The views to the east towards the Proposed Scheme would be largely screened by garden vegetation close to Lower Farm Cottages. In contrast they would be open to the east from Lower Farm towards the Bodymoor Heath Road overbridge and the River Tame viaduct, but screened to the south by garden vegetation towards the Proposed Scheme. A noticeable change to the views would occur; fields would include large scale construction activity in the mid ground and background that would be partially filtered by intervening vegetation. There would also be occasional views of cranes working at the River Tame viaduct above the existing hedgerows. New components of construction activities would be continuously visible across much of the view. The views of rural landscape and the M42 corridor would be replaced by large scale construction activities with uncharacteristic and highly visible elements of the view. There would therefore be an overall high magnitude of visual change and moderate adverse effect.	**Level of effect:** Moderate adverse (significant)

View looking north-west from Warwickshire Footpath T25, within Kingsbury Water Park, adjacent to the route of the miniature railway, north of Kingsbury Water Park visitors centre (VP 351-03-05) **(Map Number LV-03-351)**	**Medium – High sensitivity visual receptors**
Users of the Heart of England Way, would have close distance views of construction works associated with the River Tame viaduct. Views of the clearing surrounded by woodland would be replaced with large scale construction activity. The removal of vegetation would open up views of construction works at the River Tame viaduct including views of tall cranes and works that would move sequentially in the view as erection of the viaduct progresses. Tall plant such as cranes, the stockpiling of materials and the movement of vehicles along the site haul route would be prominent in the view. These features would be uncharacteristic and highly visible across much of the view within Kingsbury Water Park. The views would be altered substantially as construction activities would take place in proximity to the receptor. The view from the PRoW including a mixture of woodland and meadow heavily used for recreation would be replaced by large scale construction. There would therefore be an overall high magnitude of visual change and major adverse effect.	**Level of effect:** Major adverse (significant)
View looking east from recreational footpath adjacent to Canal Pool within Kingsbury Water Park (VP 351-03-11) **(Map Number LV-03-351)**	**Medium -High sensitivity visual receptors**

Users of the recreational footpath would have partial views of construction works at the River Tame viaduct and the A51 Tamworth Road realignment in the middle ground of the view. Low level construction works, such as the movement of vehicles along the site haul route and vegetation clearance under the River Tame viaduct would be screened by overlapping tree belts located on islands dividing the lakes and overlapping in the views. High level construction works, such as the construction of viaduct spans and the installation of overhead line equipment and noise fence barriers would be visible above the wooded skyline. Construction of the River Tame viaduct would be visible within the middle distance of the view. Construction of the River Tame viaduct and the A51 Tamworth Road realignment would result in noticeable change to the views through introduction of prominent, uncharacteristic elements in the views across lakes with substantial changes on the skyline. There would therefore be an overall high magnitude of visual change and moderate adverse effect.	**Level of effect:** Moderate adverse (significant)

View looking north-west from residential properties along the A51 Tamworth Road, Kingsbury, close to junction with Sycamore Road (VP 351-02-09) **(Map Number LV-03-351)**	**High sensitivity visual receptors**
Occupants of residential properties would experience substantial changes to the foreground and middle distance of the views associated with construction of the River Tame viaduct and the A51 Tamworth Road realignment. There would be an extensive removal of vegetation including a dense belt of trees along Kingsbury Garden Centre, along the Thistlewood Brook and either side of the A51 Tamworth Road. Residents at the north end of Kingsbury would have open views of large scale construction activities including formation of landscape earthworks and roads, alteration to landform and river diversions with the construction of the River Tame viaduct being most prominent on the skyline. Temporarily, construction elements and activities would substantially alter key characteristics of views that have a rural character. Substantial alterations would take place in proximity to the receptor but also in the middle ground and on the skyline. There would therefore be an overall high magnitude of visual change and major adverse effect.	**Level of effect:** Major adverse (significant)
View looking south-east from residential properties along Cliff Hall Lane, Cliff (VP 351-02-14) **(Map Number LV-03-351)**	**High sensitivity visual receptors**
Residents would have close views of works at the A51 Tamworth Road realignment, the River Tame viaduct and the M42 Tamworth viaduct. Construction of the River Tame viaduct and the M42 Tamworth viaduct would be visible from the upper stories of residential receptors along Cliff Hall Lane. Views of construction operations including the A51 Tamworth Road realignment, tall plant such as cranes working at the River Tame and M42 Tamworth viaducts, the stockpiling of materials and the movement of vehicles along the site haul route would substantially alter the views of fields and the M42 corridor. Sequential views of cranes would be available above the M42 corridor. The lower elements of construction works, such as the movement of vehicles along the site haul route and the A51 Tamworth Road satellite compound would be partially screened by vegetation along the M42. However, cranes would be visible on the skyline. The views of adjacent fields with hedgerows would change substantially as they would be replaced by prominent, large scale construction activity that would be visible across much of the views in proximity to the viewer. There would therefore be an overall high magnitude of visual change and moderate adverse effect.	**Level of effect:** Major adverse (significant)
View looking west from Warwickshire Bridleway T67 adjacent to Slateley Hall (VP 352-03-05) **(Map Number LV-03-352)**	**High sensitivity visual receptors**

Users of the bridleway would have close-distance and partial views of construction work associated with the River Tame viaduct, as well as partial views of construction activities at the M42 Tamworth viaduct and Piccadilly embankment. Construction of the Proposed Scheme would result in a substantial alteration to the key characteristics of the view as views of fields; the M42 corridor would be temporarily replaced by large scale construction activities. These views would include tall plant and construction activity at the River Tame viaduct, A51 Tamworth Road realignment and A51 Kingsbury viaduct that would substantially change the skyline views in the middle ground and background, although some screening would be provided by retained existing vegetation along the M42. In the foreground some construction activities would take place around the crossing of the Birmingham to Derby Railway and the M42 as well as views of construction activity undertaken at Piccadilly embankment to the north of the M42. These activities, combined with the views of the A51 Tamworth Road satellite compound and movement of vehicles along the site haul route would result in a substantial alteration to the key characteristic of the wide panoramic view across a predominantly rural landscape. There would therefore be an overall high magnitude of visual change and major adverse effect.	**Level of effect:** Major adverse (significant)

View looking north-west from Warwickshire Footpath T70 adjacent to Holt Hall Farm (VP 352-03-07) **(Map Number LV-03-352)**	**High sensitivity visual receptors**
Residents would have close distance views of the works involved in the construction of Piccadilly embankment and Whateley cutting. The construction of the embankment and cutting in proximity would result in a substantial modification of key characteristics of the views that includes fields adjacent to the M42. The view of arable fields with sparse hedgerows would be replaced with close distance views of large scale construction activities, views of earthworks formation, views of Whateley auto-transformer station satellite compound, movement of vehicles along the site haul route and views of construction works at Whateley Lane overbridge. These construction activities would be highly visible and uncharacteristic within the existing view. The landform and landscape pattern would be substantially changed in a proximity to the viewer. There would therefore be an overall high magnitude of visual change and major adverse effect.	**Level of effect:** Major adverse (significant)

View looking east from residential properties at Overwoods Road at the edge of Hockley (VP 353-02-06) **(Map Number LV-03-353)**	**High sensitivity visual receptors**
Residential receptors would have partial and middle distance views of the M42 junction 10 main compound, works at Overwoods Road overbridge, Whateley cutting and Whateley Lane overbridge. Channelled views by tree belts along the Overwoods Road would be replaced with more open views of construction works at Overwoods Road overbridge and Whateley cutting. This would be a result of removal of large sections of vegetation along Overwoods Road. Views to the south of rolling landscape would be replaced with large scale construction works at Whateley cutting, which would substantially alter existing views. Addition of new components of construction including stockpiling of materials, movement of vehicles along the site haul route, earthworks formation and views of the M42 junction 10 main compounds would be continuously highly visible from the upper storeys of residential properties. The construction of Piccadilly embankment, Whateley cutting and Whateley Lane overbridge and the movement of vehicles on the site haul route would be uncharacteristic of the views across the sloping land to the south of Hockley. Construction of the Proposed Scheme would result in substantial changes within the middle ground and background of the view. There would therefore be an overall high magnitude of visual change and major adverse effect.	**Level of effect:** Major adverse (significant)

View looking to the east from residential properties and users of PRoW (VP 353-02-07) **(Map Number LV-03-353)**	**High sensitivity visual receptors**
Residents and users of recreational footpaths would experience substantial changes as a result of construction associated with the M42 junction 10 main compound, Whateley cutting, Overwoods Road overbridge, the M42 junction 10 tunnel south portal and M42 junction 10 tunnel. The landform in proximity to the receptor would be lowered to accommodate a balancing pond. Extensive clearance of vegetation, combined with alterations to the landform would open up views towards construction works at Wilnecote cutting, Freasley embankment and result in partial views of tall cranes working at the M42 junction 10 tunnel and M42 junction 10 tunnel north portal. Partial views of landscape earthworks formation, views of the M42 junction 10 main compound and movement of vehicles along the site haul route would substantially alter existing views of the wooded landscape. The views of enclosed and heavily wooded landscape would be replaced by the views of large scale construction activities. There would therefore be an overall high magnitude of visual change and major adverse effect.	**Level of effect:** Major adverse (significant)

View looking west from layby on A5 east of M42 junction 10, within proximity of the M42 junction 10 roundabout (VP 354-04-02) **(Map Number LV-03-354a)**	**Medium – Low sensitivity visual receptors**
Road users along the A5 east of the M42 junction 10 would have partial views of construction works in the middle ground at the M42 junction 10 tunnel south portal, M42 junction 10 tunnel, M42 junction 10 tunnel north portal and M42 Stoneydelph cutting. Although the majority of construction works would take place below the existing M42 junction 10 alignment, the temporary addition of construction elements would be continuously highly visible across the majority of the view. Removal of vegetation along the M42 northbound and around the M42 junction 10 would open up partial views of construction activities. Partial views of cranes used for construction of the M42 junction 10 tunnel would be visible on the skyline. Although construction activities would be extensive, they would be filtered by trees along the A5 east of M42 junction 10. The use of the M42 junction 10 as a construction traffic route combined with the proximity of large scale construction works would substantially change the character of views that already include the M42, roadside vegetation and business units. The movement of equipment, vehicles, earthworks formation and presence of the M42 junction 10 main compound would change the view substantially in proximity to the visual receptor, as road users would be surrounded by construction works. There would therefore be an overall high magnitude of visual change and moderate adverse effect.	**Level of effect:** Moderate adverse (significant)

Other mitigation measures

11.4.12 To further reduce the significant effects described above, consideration will be given during the detailed design stage to where planting can be established early in the construction programme to help achieve earlier landscape and visual integration.

11.4.13 However, not all landscape and visual effects can be mitigated due to the visibility of construction activity and the sensitivity of surrounding receptors. No other mitigation measures are considered practicable during construction.

Summary of likely residual significant effects

11.4.14 The temporary residual significant effects during construction remain as described above. These effects would be temporary and reversible in nature lasting only for the duration of the construction works. These residual effects would generally arise from the widespread presence of construction activity and construction plant within the

landscape and viewed by surrounding residents, users of PRoW and main roads within the study area.

11.4.15 The significant effects that would remain after implementation of construction phase mitigation are summarised below:

- major adverse effects in relation to one LCA;
- moderate adverse effects in relation to four LCAs;
- major adverse visual effects at five residential viewpoint locations;
- moderate adverse visual effects at two residential viewpoint locations;
- major adverse visual effects at five recreational viewpoint locations;
- moderate adverse visual effects at one recreational viewpoint location; and
- moderate adverse visual effects at two transport viewpoint locations.

11.5 Permanent effects arising from operation

11.5.1 The permanent features of the Proposed Scheme that have been taken into account in determining the effects arising during operation on landscape and visual receptors are presented in Section 2.2 of this report.

Avoidance and mitigation measures

11.5.2 The operational assessment of impacts and effects is based on year 1 (2033) and year 15 (2048) of the Proposed Scheme, with Year 30 (2093) to be reported in the formal ES. A process of iterative design and assessment has been employed, and is ongoing, to avoid or reduce adverse effects during the operation of the Proposed Scheme. Measures that would be integrated into the design of the Proposed Scheme include:

- design of earthworks to tie the engineering earthworks for embankments (such as Marston embankment and Piccadilly embankment) and cuttings into their wider landscape context and to mitigate views of structures and overhead line equipment from sensitive receptors, where reasonably practicable. Earthworks design also takes account of the relationship to surrounding land uses and management, such as agriculture;
- compensatory woodland planting in areas of loss, using the same species composition and planting types (and appropriate planting density), such as woodland planting to compensate for the partial loss of woodland adjacent to Marston Lane and within Kingsbury Water Park, and to provide habitat connectivity, enhanced landscape/green infrastructure connectivity, as well connectivity of historic landscape features, where reasonably practicable, and to soften embankments and viaduct abutments; and
- hedgerow replacement and restoration in areas of loss to restore connectivity and landscape pattern, where reasonably practicable, and using an appropriate palette of hedgerow types and species to tie the Proposed Scheme mitigation into the wider landscape character; compensation for loss of field ponds with

new wetlands, ecological ponds and biodiversity wetland features and wetland enhancement at Kingsbury Water Park.

Assessment of impacts and effects

11.5.3 The likely effects on landscape and visual receptors during operation of the Proposed Scheme relate to the presence of new structures and elements in the landscape including: cuttings; embankments; overbridges; viaducts; road realignments; tunnel portals and new planting.

Landscape assessment

11.5.4 Based on the current design, it is currently anticipated that the LCAs described in Table 27 would be significantly affected during operation of the Proposed Scheme.

Table 27: Operational phase significant landscape effects

Marston Village Farmlands	**Medium susceptibility and Medium sensitivity**
Susceptibility to change: The levels of tranquillity, strength of character, rural qualities including woodlands and landform, within the landscape have a medium susceptibility to change arising from the Proposed Scheme. **Year 1:** The LCA would be directly affected by the Proposed Scheme, mainly through severance of the landscape and changes to the landform, landscape features and vegetation cover. The Proposed Scheme would run in a south-west to north-east alignment enclosing a narrow strip of land between the route and the M42 further to the north, altering pattern and scale of the landscape. The Marston cutting would alter the local landform, which rises generally from the north to south. The addition of Seeney Lane and Bodymoor Heath Road overbridge as well as River Tame viaduct would substantially alter the character of the western part of the LCA. The proposed landscape mitigation planting would have limited beneficial effects in year 1. The tranquillity would be further reduced by the Proposed Scheme. Warwickshire Footpath M22 would be realigned towards Seeney Lane overbridge. The Proposed Scheme would introduce large scale infrastructure alongside the M42. The Proposed Scheme would be at variance with existing landscape character as its tranquillity, rural qualities and landscape pattern would be altered. There would therefore be an overall high magnitude of change and moderate adverse effect.	**Level of effect:** Moderate adverse (significant)
Year 15: Due to the maturing vegetation present in the view, effects would reduce to non-significant by year 15.	**Level of effect:** Minor adverse (non-significant)

River Tame Washlands	**High susceptibility and Medium – high sensitivity**
Susceptibility to change: The predominantly enclosed landscape pattern of lakes interlinked with dense tree cover and level of tranquillity have a high susceptibility to change arising from the Proposed Scheme. Year 1: The LCA would be directly affected by the Proposed Scheme, mainly through severance of the landscape and changes to the landscape features and vegetation cover. The Proposed Scheme would run from south–west to north–east and would extend the pattern of large scale infrastructure alongside the M42. New uncharacteristic features, including the River Tame viaduct would substantially alter the character of this LCA. The mitigation planting would have limited effect in year 1. The level of tranquillity in the eastern part of the LCA, already influenced by the M42 and high-voltage overhead power line, would be further reduced by the Proposed Scheme. The presence of the operational railway would introduce a large scale viaduct and moving trains into the landscape. The Proposed Scheme would be at variance with existing landscape character as landscape pattern, tranquillity and tree cover would be noticeably altered. There would therefore be an overall medium magnitude of change and moderate adverse effect.	**Level of effect:** Moderate adverse (significant)

Year 15: The mitigation measures would compensate partially for the loss of existing landscape elements and would not integrate the Proposed Scheme into the existing landscape by the summer of year 15. The overall medium magnitude of change and moderate adverse effect would remain.	**Level of effect:** Moderate adverse (significant)

Whateley Farmlands	**Medium susceptibility and Medium –high sensitivity**
Susceptibility to change: The open character and elevated landform, landscape pattern with principally rural cultural context, sense of place and cultural pattern associated with Whateley hamlet, good condition of landscape elements result in a medium susceptibility to change arising from the Proposed Scheme. **Year 1:** The LCA would be directly affected by the Proposed Scheme, mainly through severance of the landscape pattern and changes to the landform and vegetation cover. The Proposed Scheme would run in a north-south alignment and would enclose a narrow strip of landscape between the Proposed Scheme and the M42 altering the landscape pattern, landform and introducing new landscape elements. The Piccadilly embankment and Whateley cutting would alter the local landform. Arable fields would be dissected resulting in loss of field boundary vegetation within a landscape that generally has a strong sense of scale and open character. The level of tranquillity in the east of the LCA, already influenced by the existing M42 and high-voltage overhead power line, would be further reduced by the Proposed Scheme. The overbridges at Whateley Lane and Overwoods Road would be new noticeable features in the landscape in addition to the Piccadilly embankment, Whateley cutting and Whateley auto-transformer station. These elements of the Proposed Scheme would substantially alter the character of the east of the LCA. Landscape mitigation planting would provide limited screening effect at year 1. The Proposed Scheme would be at variance with existing landscape character as a result of substantial alterations to landform, landscape pattern and sense of place associated with former mining. There would therefore be an overall high magnitude of change and moderate adverse effect.	**Level of effect:** Moderate adverse (significant)
Year 15: Introduction of woodland and hedgerow planting would assist with some integration of the Proposed Scheme into the landscape by the summer of year 15. The magnitude of change would reduce to medium in year 15 due to the establishment of landscape planting, although the severance of landscape created by the Proposed Scheme would remain, creating noticeable change to key characteristics of the character area. The effects would remain moderate adverse as the Proposed Scheme would be at variance with the existing landscape character.	**Level of effect:** Moderate adverse (significant)
Kettle Brook River Corridor	**Low susceptibility and Low sensitivity**
Susceptibility to change: The wooded character, man-made landform with local features and recreational land combined with cultural landscape pattern result in a medium susceptibility to change. **Year 1:** The LCA would be directly affected by the Proposed Scheme, mainly through severance of the landscape and changes to the landform, landscape features and vegetation cover. The Proposed Scheme would run in a north-south alignment at the peripheries of one of the two identified areas that jointly form the Kettle Brook River Corridor LCA. The Whateley cutting with associated landscape earthworks and Freasley embankment would change the landscape pattern and transform the landform within the eastern part of this LCA. The lowering of existing ground levels in the eastern part of this LCA would result in a substantial alteration to this LCA as the wooded character of the valley with local man-made landform features would be altered. The sense of place would be altered at part of this LCA as it would become more open in character. The historic connection to the coal mining that took place in this area would be further eroded by the Proposed Scheme. The level of tranquillity in the east of the LCA, already influenced by the existing M42 and a high-voltage overhead power line, would be further reduced by the Proposed Scheme. The Proposed Scheme would be at variance with existing landscape character as a result of substantial alterations to landform, restored landscape as a result of former mining and recreational use. There would therefore be an overall high magnitude of change and moderate adverse effect.	**Level of effect:** Moderate adverse (significant)
Year 15: Mitigation planting along the Proposed Scheme would provide some integration of structures into the landscape by summer of year 15, but the changes to the landscape pattern and land form would remain. The magnitude of change would reduce to medium, however the effects would remain moderate adverse on this LCA, as the Proposed Scheme would be at variance with existing landscape character.	**Level of effect:** Moderate adverse (significant)

Visual assessment

Introduction

11.5.5 The following section describes the likely significant effects on visual receptors during operation year 1 and year 15. Effects at operation year 30 will be reported in the formal ES. The assessment has been undertaken for the winter period, in line with best practice guidance, to ensure a robust assessment. However, in some cases, visibility of the operational Proposed Scheme may be reduced during summer when vegetation, if present in a view, would be in leaf. Any general night-time effects on visual receptors arising from additional lighting are also identified. Where a viewpoint represents multiple types of receptor, the assessment is based on the most sensitive receptors. Effects on other receptor types with a lower sensitivity would be lower than those reported.

11.5.6 The assessment has not identified any locations within this study area where additional lighting during operation of the Proposed Scheme would result in significant visual effects at night.

11.5.7 Table 28 identifies the locations where the operation of the Proposed Scheme would potentially result in significant effects. Viewpoint locations are shown in Map Series LV-04 in the Volume 2: LA01 Map Book

Table 28: Operational phase significant visual effects

View looking west from PRoW along Seeney Lane (VP 350-03-04) (Map Number LV-04-350)	**High sensitivity visual receptors**
Year 1 – winter and summer: At year 1, users of recreational footpaths would experience substantial changes to foreground views. The presence of Marston cutting and Seeney Lane overbridge would be prominent due to the proximity of the receptor. There would be partial views of the upper parts of the overhead line equipment, noise fence barriers as well as views of passing trains, although they would be largely screened by the Marston cutting. Bodymoor Heath Road overbridge and Kingsbury auto-transformer feeder station would be continuously highly visible across much of the middle distance views. The presence of these new features in the view would substantially change the current rural outlook across arable fields and pastures adjacent to the M42. There would be a noticeable change to existing views at both winter and summer of year 1, as views would be filtered by intervening vegetation in the view. Landscape mitigation planting would provide little beneficial effect in year 1 resulting in marked deterioration to the views. The magnitude of change would be high and there would be a moderate adverse effect.	Level of effect: Moderate adverse (significant)
Year 15 - summer: By summer year 15, views of Marston cutting and Bodymoor Heath Road overbridge would be partially screened and filtered by established landscape mitigation planting and hedgerow habitat creation along the Proposed Scheme. However, due to its proximity, the route of the Proposed Scheme would remain very apparent and continuously visible across the majority of the view. Whilst the presence of Kingsbury auto-transformer feeder station and balancing ponds as well as the passing trains with overhead line equipment would be partially screened by maturing vegetation, the changes would be substantial in proximity. The magnitude of change would remain high and the effects would remain moderate adverse as there would be a marked deterioration to the views.	Level of effect: Moderate adverse (significant)

View looking south-east from the Birmingham and Fazeley Canal, south-east of Marston Farm Hotel (VP 350-03-07) (Map Number LV-04-350)	**Medium -High sensitivity visual receptors**
Year 1 – winter and summer:	Level of effect:

At year 1, users of the Birmingham and Fazeley Canal would experience substantial but filtered changes to middle ground views as a result of the Proposed Scheme. The views would be noticeably altered by Bodymoor Heath Road overbridge and Seeney Lane overbridge with associated earthworks. These components of the Proposed Scheme would form a noticeable change in the views as views of farmland along the Canal would include new uncharacteristic elements of the Proposed Scheme. The scale of the Bodymoor Heath overbridge would alter the appearance of the landform and the pattern of fields that are visible to the west of the M42. There would be a little change to existing views at both winter and summer of year 1 due to existing vegetation being located primarily within the background of the view. The mitigation planting would contribute little to visual integration or enclosure at this stage although views would be filtered through intervening vegetation in the view resulting in marked deterioration to the views. The magnitude of change would be medium and there would be a moderate adverse effect.	Moderate adverse (significant)
Year 15 – summer: Due to the maturing vegetation present in the view, effects would reduce to non-significant by year 15.	Level of effect: Minor adverse (non significant)
View looking to the south east of residents near Marston Farm Hotel and Cheatles Farm Bridge (VP 350-02-09) **(Map Number LV-04-350)**	**High sensitivity visual receptors**
Year 1 – winter and summer: At year 1, occupants of residential properties would experience substantial changes to the foreground as a result of Bodymoor Heath Road overbridge and to the middle distance as a result of the River Tame viaduct. Receptors would have views of the elevated Bodymoor Heath Road overbridge and partial views of the River Tame viaduct to the east of the M42. In addition, the realigned access to Bodymoor Heath Road would be perceptible to some residents whilst some would have views of the hedgerow and landscape mitigation planting. The presence of these new features would change the outlook of the rural landscape, interrupting views of fields towards the M42. The loss of vegetation along the M42, loss of field pattern and loss of woodland close to Marston Farm Hotel would be apparent. There would be a noticeable change to existing views at both winter and summer of year 1 due to views being filtered by existing vegetation in the foreground and background of the view. Mitigation planting would provide little screening or landscape integration at this stage. The Bodymoor Heath Road overbridge and River Tame viaduct would substantially change the characteristic of the existing views. There would therefore be an overall high magnitude of visual change and moderate adverse effect.	**Level of effect**: Moderate adverse (significant)
Year 15 – summer: By summer year 15, the change to the views would remain. Whist landscape mitigation planting along Bodymoor Heath Road overbridge would mature, the proximity to the Proposed Scheme and the scale of the overbridge with views of the River Tame viaduct within middle distance of the views would create a noticeable change in the view. The elements of the Proposed Scheme would be continuously highly visible across much of the view, resulting in marked deterioration to the views. The magnitude of change would remain high and there would be a moderate adverse effect.	**Level of effect**: Moderate adverse (significant)

View looking north-west from Warwickshire Footpath T25, within Kingsbury Water Park, adjacent to the route of the miniature railway, north of Kingsbury Water Park visitors centre (VP 351-03-05) **(Map Number LV-04-351)**	**Medium – High sensitivity visual receptors**
Year 1 – winter and summer: At year 1, users of the Heart of England Way would experience substantial changes but filtered changes to near distance views as a result of the Proposed Scheme. Footpath users would experience views of the River Tame viaduct on the skyline, including views of overhead line equipment and moving trains due to its height of up to 14m. A combination of proposed woodland with grassland habitat creation would replace lost existing woodland and grassland areas. However, the proposed planting would only partially screen the River Tame viaduct, leaving more open views towards the M42 with the River Tame viaduct being prominent across the majority of the view. There would be a noticeable change to existing views at both winter and summer of year 1 due to screening provided by trees in full leaf close to the receptors.	**Level of effect**: Moderate adverse (significant)

There would therefore be an overall medium magnitude of visual change and moderate adverse effect.	
Year 15 – summer: By summer year 15, views of the River Tame viaduct, overhead line equipment and the movement of trains would remain highly visible across much of the view in the foreground. The change in vegetation cover would result in noticeable alteration to key characteristics of the view. The magnitude of change would remain as medium and there would therefore be an overall medium magnitude of visual change and moderate adverse effect.	**Level of effect**: Moderate adverse (significant)

View looking north-west from residential properties along the A51 Tamworth Road, Kingsbury, close to junction with Sycamore Road (VP 351-02-09) **(Map Number LV-04-351)**	**High sensitivity visual receptors**
Year 1 - winter and summer: Residents would have close views of the A51 Tamworth Road realignment with landscape mitigation planting and middle distance views of the River Tame viaduct. The views of undulating rural landscape would be screened partially by landscape mitigation planting along the landscape earthworks. However, where partial views would be available these would include the River Tame viaduct, along with overhead line equipment, noise barriers and passing of trains would define the horizon, though partially obscured by the A51 Tamworth Road realignment. Views would also include a balancing pond and wetland habitat creation area as well as landscape mitigation planting close to properties along the A51 Tamworth Road realignment; however, this would not provide screening or landscape integration at this stage. The operation of the Proposed Scheme would result in a substantial alteration to the views as new components would be continuously highly visible and uncharacteristic within close and middle distance views. The views of undulating arable landscape towards the M42 would be screened completely filtered or allowing for views of upper parts of the viaduct. There would be no difference to the views at both winter and summer of year 1. There would therefore be an overall high magnitude of visual change and major adverse effect.	**Level of effect**: Major adverse (significant)
Year 15 - summer: By summer year 15, as landscape and ecological mitigation planting would mature along the landscape earthworks it would help to screen completely views of introduced features at the ground level and filter views of the River Tame viaduct. However, the Proposed Scheme, in particular the A51 Tamworth Road realignment and the River Tame viaduct would remain prominent. There would be noticeable change to key characteristics of the view in year 15. The magnitude of change would reduce to medium and there would be moderate adverse effect.	**Level of effect**: Moderate adverse (significant)

View looking south-east from residential properties along Cliff Hall Lane, Cliff (VP 351-02-14) **(Map Number LV-04-351)**	**High sensitivity visual receptors**
Year 1 – winter and summer: At year 1, occupants of residential properties at Cliff Hall Lane would experience substantial changes to near distance views as a result of the Proposed Scheme. The A51 Tamworth Road realignment, the M42 Tamworth viaduct and River Tame viaduct, overhead line equipment and the movement of trains would be partially visible. This would result in a substantial alteration of key characteristics of the view as views of fields with field boundary vegetation would be replaced by uncharacteristic elements associated with the Proposed Scheme. Views of some sections of the viaduct would be obstructed by vegetation close to Cliff Hall Lane and the A51 Tamworth Road realignment. The A51 Tamworth Road realignment would alter the landscape pattern and would represent a new large-scale feature that would extend across much of the existing view. The River Tame viaduct would be set back behind the M42, but would be prominent on the skyline from this location. There would be a noticeable change to existing views at both winter and summer of year 1 due to the views being filtered by existing vegetation in the foreground and middle ground of the view. The landscape mitigation woodland and hedgerow planting along the proposed A51 Tamworth Road	**Level of effect:** Major adverse (significant)

overbridge and along the M42 would provide limited visual integration or enclosure at this stage, resulting in prominent deterioration to the views. There would therefore be an overall high magnitude of visual change and major adverse effect.	
Year 15 – summer: By summer year 15, views of the embankments associated with the A51 Tamworth Road realignment and the River Tame viaduct would remain prominent due to the scale of change in the view. The Proposed Scheme would remain a substantial alteration of key characteristics of the view, including the subtle landform and field pattern. The magnitude of change would remain high and there would be a major adverse effect.	**Level of effect:** Major adverse (significant)

View looking north-west from Warwickshire Footpath T70 adjacent to Holt Hall Farm (VP 352-03-07) **(Map Number LV-04-352)**	**High sensitivity visual receptors**
Year 1 - winter and summer: At year 1, occupants of Holt Hall Farm and users of the PRoW would have close to middle distance views of the M42 Tamworth viaduct, Piccadilly embankment, Whateley cutting and Whateley Lane overbridge. Close distance views would also include Whateley auto-transformer station and the passing trains which would be partially visible within Whateley cutting. Long distance views of the M42 Tamworth viaduct with its overhead line equipment and noise fence barriers would also be available. These new uncharacteristic elements would replace the view of fields and field boundary vegetation adjacent to the M42. The operation of the Proposed Scheme would result in a new feature that would cross horizontally across the mid-ground of the view, forming a new horizon of the view. Long distance views towards the rural landscape within the urban fringe of Tamworth would be truncated. There would be little change to existing views at both winter and summer of year 1 due open nature of the view in the foreground and background of the view. Mitigation planting would provide little screening or landscape integration at this stage resulting in substantial change in the views. There would therefore be an overall high magnitude of visual change and major adverse effect.	**Level of effect**: Major adverse (significant)
Year 15 - summer: By summer year 15, as landscape mitigation planting along the Piccadilly embankment matures it would help to both filter views and integrates the new features within their landscape context. However, the Proposed Scheme, in particular the landscape earthworks, landscape mitigation planting and the M42 Tamworth viaduct would remain prominent. The magnitude of change would reduce to medium and therefore there would be moderate adverse effect.	**Level of effect**: Moderate adverse (significant)

View looking east from junction of Overwoods Road with Tamar Road, south-eastern extent of Hockley (VP 353-02-06) **(Map Number LV-04-353)**	**High sensitivity visual receptors**
Year 1 – winter and summer: At year 1, occupants of residential properties would experience substantial but filtered changes in the middle ground of the view as filtered views of rural fields would be altered by introduced elements of the Proposed Scheme. Receptors would have views of Overwoods Road overbridge that would be filtered by retained vegetation along Overwoods Road and landscape mitigation planting along the overbridge embankments. The views towards Whateley cutting and Piccadilly embankment would be filtered by existing vegetation in summer. The lower parts of the Proposed Scheme would be screened by field boundary vegetation. The upper parts of embankments, overhead line equipment, noise barriers and fencing alongside landscape mitigation planting would be apparent above overlapping vegetation in the view. The operation of the Proposed Scheme would result in a noticeable alteration that is uncharacteristic of the view within the middle distance and background views that would be partially filtered by intervening vegetation resulting in a noticeable change to existing views at both winter and summer of year 1.	**Level of effect**: Moderate adverse (significant)

There would therefore be an overall medium magnitude of visual change and moderate adverse effect.	
Year 15 – summer: By summer year 15, the Proposed Scheme would become less noticeable in the view by year 15 as the mitigation planting along the Overwoods Road, restored hedgerow pattern and a combination of landscape and ecological mitigation planting would mature to help to both screen and filter views, and integrate the new landform within its wider visual context. The new infrastructure components would be added to the view and would be intermittently visible in part of the view altering rural landscape. Due to the maturing vegetation present in the view, effects would reduce to non-significant by year 15.	**Level of effect**: Minor adverse (non-significant)

View looking east from PRoW accessed off Ottery (VP 353-02-07) **(Map Number LV-04-353)**	**High sensitivity visual receptors**
Year 1 – winter and summer: Occupants of residential properties and users of recreational footpaths would experience substantial changes to close to middle distance views as a result of the Proposed Scheme. The views of wooded and enclosed landscape of LNR would be replaced with partial views of Whateley cutting and Freasley embankment, whilst the views towards the north of Whateley cutting would be open. Whilst the lower parts of the Proposed Scheme would be screened in the Whateley cutting, where the screening would be reinforced by landscape earthworks, partial views of passing trains and overhead power lines through the Wilnecote cutting would be available. Open close distance views would be available towards the north of the Whateley cutting with views of wetland habitat creation area and the nearby balancing pond. The operation of the Proposed Scheme would result in addition of new features highly visible within panoramic views across substantially lowered and sloping landform. There would be little difference at both winter and summer of year 1 due to open character of the views. There would therefore be an overall high magnitude of visual change and moderate adverse effect.	**Level of effect**: Moderate adverse (significant)
Year 15 - summer: Visual effects would remain due to the change within close and middle distance of the views. Although the presence of landscape earthworks with landscape mitigation planting along the north of the Whateley cutting and mitigation planting along Wilnecote cutting would provide some screening and integration of the Proposed Scheme. The changes to the views at close distance would remain continuously highly visible across much of the view. The magnitude of change would remain high and there would be a moderate adverse effect.	**Level of effect**: Moderate adverse (significant)

Other mitigation measures

11.5.8 The permanent effects of the Proposed Scheme on landscape and visual receptors would be reduced through integration of the measures described in this section. Effects in Year 1 may also be further reduced through establishing planting early or in advance of the main construction programme. Other features such as additional earthworks, planting or public greenspace would be considered as part of the ongoing development of the design. These measures would potentially provide additional screening and/or greater integration of the Proposed Scheme into the landscape.

Summary of likely residual significant effects

11.5.9 In many cases, significant effects would reduce over time as the proposed mitigation planting matures and reaches its designed intention. However, the following likely residual significant effects would remain following year 15 of operation:

- moderate adverse effects in relation to four LCAs;
- major adverse visual effects in relation to three residential receptors;
- moderate adverse visual effects in relation to two residential receptors; and
- moderate adverse visual effects in relation to four recreational receptors.

Monitoring

11.5.10 Volume 1, Section 9 sets out the general approach to environmental monitoring during operation of the Proposed Scheme.

11.5.11 There are no area-specific requirements for monitoring landscape and visual mitigation during the operation of the Proposed Scheme in the Lea Marston to Tamworth area.

12 Socio-economics

12.1 Introduction

12.1.1 This section reports on the environmental baseline, likely economic and employment impacts as well as significant effects during construction and operation of the Proposed Scheme within the Lea Marston to Tamworth area. The assessment considers existing businesses, community organisations, local employment and local economies, including planned growth and development.

12.1.2 Engagement with North Warwickshire Borough Council (NWBC) will be undertaken as part of the development of the Proposed Scheme. The purpose of the engagement will be to increase the understanding of socio-economic characteristics identified through a review of publicly available data. Engagement will continue as part of the development of the Proposed Scheme and to inform the formal assessment.

12.1.3 The socio-economic effects on employment at a route-wide level are reported in Volume 3: Route-wide effects (Section 12).

12.1.4 Maps showing the location of the key environmental features (Map Series CT-10) and the key construction (Map Series CT-05) and operational (Map Series CT-06) features of the Proposed Scheme can be found in the Volume 2: LA01 Map Book.

12.2 Scope, assumptions and limitations

12.2.1 The scope, assumptions and limitations for the socio-economics assessment are set out in Volume 1 (Section 8) and the Scope and Methodology Report (SMR)[126].

12.2.2 The assessment of in-combination effects will draw upon the findings of other technical disciplines (e.g. air quality, sound, noise and vibration, landscape and visual and traffic and transport). Likely significant in-combination effects on socio-economic receptors and resources will be reported in the formal ES.

12.2.3 Businesses may experience isolation effects as a result of the Proposed Scheme. Isolation effects will be reported in the formal ES.

12.3 Environmental baseline

Existing baseline

Study area description

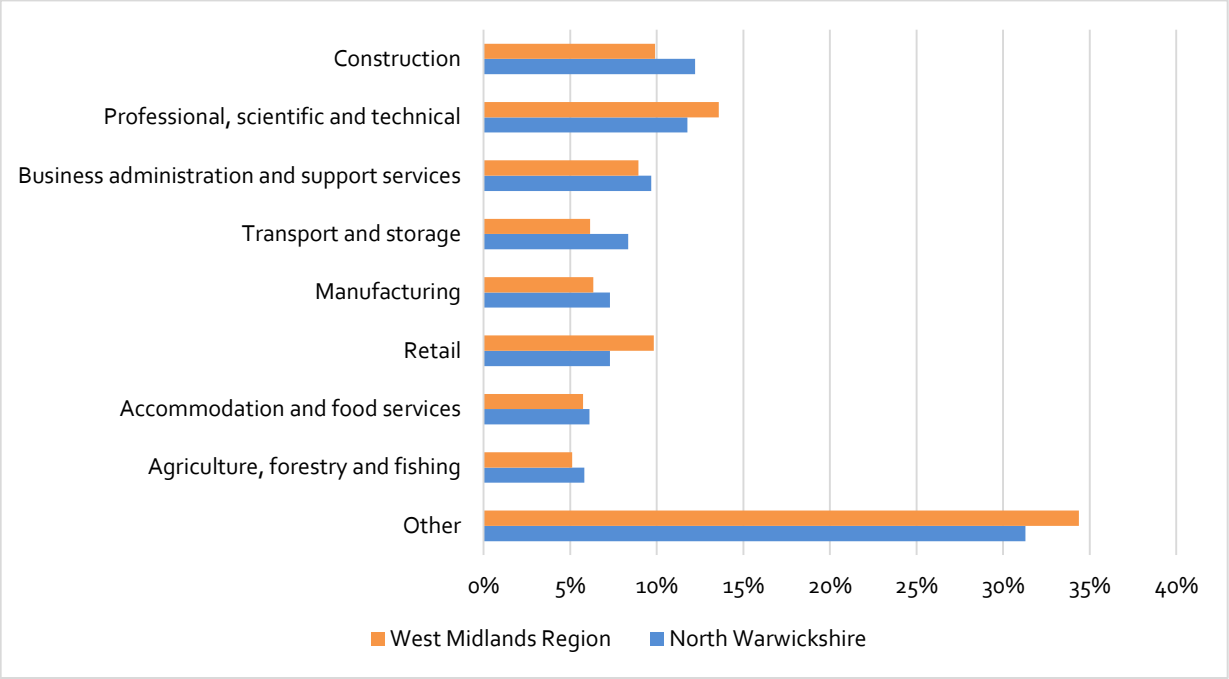
12.3.1 The following provides a brief overview of employment, economic structure, labour market and business premises availability within the Lea Marston to Tamworth area. It lies within the administrative area of NWBC. It also falls within the Coventry and Warwickshire LEP area[127] and West Midlands region.

[126] Supporting document: HS2 Phase 2b Environmental Impact Assessment Scope and Methodology Report
[127] Coventry & Warwickshire Local Enterprise Partnership (2016), *Strategic Economic Plan August 2016*.

Business and labour market

12.3.2 Within the NWBC area there is a wide spread of business types reflecting a diverse range of commercial activities. The construction sector accounts for the largest proportion of businesses (12%), with the professional, scientific and technical sector the second largest (12%) followed by business administration and support services (10%). This is shown in Figure 8. For comparison in the West Midlands region, the largest sectors were professional, scientific and technical (14%), followed by construction (10%) and retail (10%)[128].

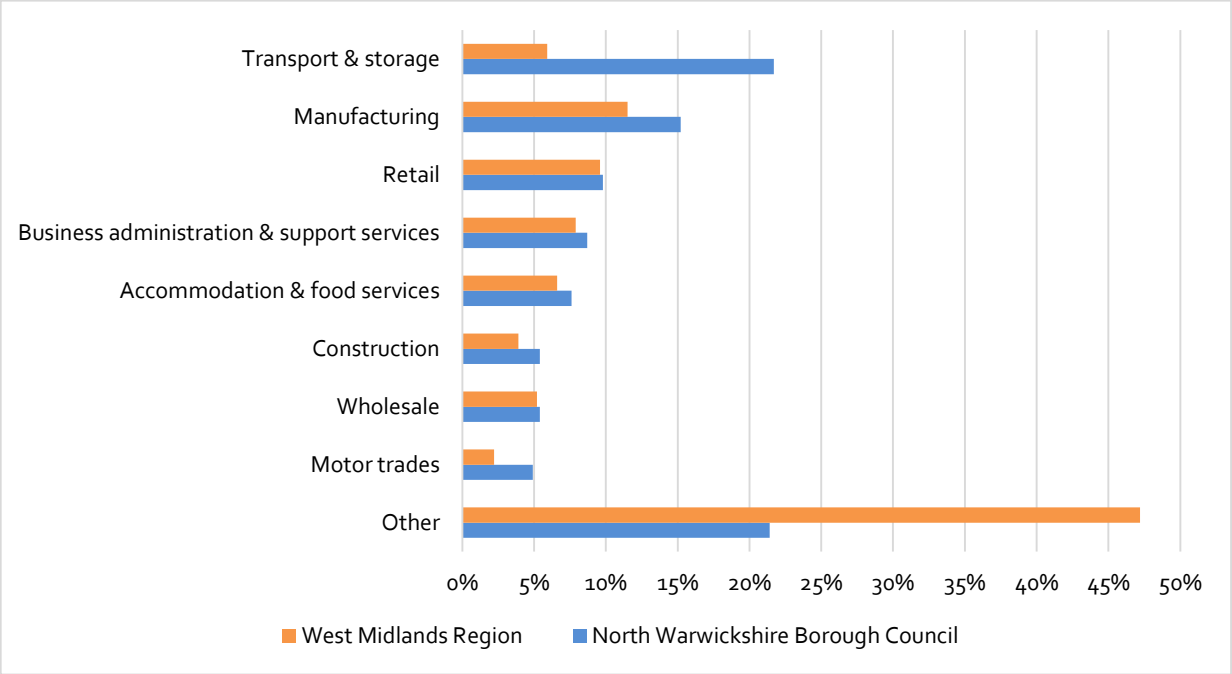
Figure 8: Business sector composition in NWBC area and the West Midlands[129]



12.3.3 In 2016[130], approximately 46,000 people worked in the NWBC area. According to the Office for National Statistics Business Register and Employment Survey 2016, the top five sectors in terms of share of employment in NWBC were: transport and storage (22%), manufacturing (15%); retail (10%); business administration and support services (9%); and accommodation and food services (8%). These compare with the top five sectors for the West Midlands region, which were: manufacturing (12%); retail (10%); business administration and support services (8%); accommodation and food services (7%); and transport and storage (6%). This is shown in Figure 9[131].

[128] Office for National Statistics; UK Business count – Local Units 2016; https://www.nomisweb.co.uk
[129] 'Other' includes: Wholesale; Transport & Storage; Property; Motor Trades; Education; Financial & Insurance; Agriculture, Forestry & Fishing, Public Administration & Defence; Mining; Quarrying & Utilities
[130] Office for National Statistics; 2016; Business Register and Employment Survey; http://www.nomisweb.co.uk, This number includes both residents and non-residents of NWBC who work within its boundaries
[131] Ibid

Figure 9: Employment by industrial sector in the NWBC area and the West Midlands



12.3.4 According to the Annual Population Survey (2016)[132], the employment rate[133] within the NWBC area was 83% (32,400 people), which is higher than recorded for both the West Midlands (75%) and England (74%). In 2016, unemployment[134] in the NWBC area was 3%, which was lower than that recorded both for the West Midlands (4%) and England (5%).

12.3.5 According to the Annual Population Survey (2016)[135], 40% of NWBC residents aged 16-64 were qualified to National Vocational Qualification Level 4 (NVQ4) and above, compared to 31% in the West Midlands and 38% in England, while 6% of residents had no qualifications, which was lower than that recorded both for the West Midlands (12%) and England (8%).

Property

12.3.6 A review of employment land in 2013 identified a need for 3.2ha per year to 2029 for general business land in the NWBC area with a strong demand for distribution and logistics space. This figure does not include land for strategic distribution. A strategic employment site at Atherstone has been identified as providing a key opportunity for employment growth[136].

[132] Annual Population Survey (2016), *NOMIS*. Available online at: http://www.nomisweb.co.uk
[133] The proportion of working age (16-64 year olds) residents that is in employment.
[134] Refers to people without a job who were available to start work in the two weeks following their interview and who had either looked for work in the four weeks prior to interview or were waiting to start a job they had already obtained. As the unemployed form a small percentage of the population, the APS unemployed estimates within local authorities are based on very small samples so for many areas would be unreliable. To overcome this ONS has developed a statistical model that provides better estimates of total unemployed for unitary authorities and local authority districts (unemployment estimates for counties are direct survey estimates), NOMIS.
[135] Annual Population Survey (2016), *NOMIS*. Available online at: http://www.nomisweb.co.uk
[136] North Warwickshire Borough Council (2014), *North Warwickshire Site Allocations Pre Submission Plan (2014)*.

12.3.7 The average vacancy rate for industrial and warehousing property in the NWBC area has been assessed as 7.3% based on marketed space against known stock[137].

12.3.8 Based upon the latest available data from the Estates Gazette (March 2018) there is 106,409 m² of industrial space available in the NWBC area[138].

12.4 Effects arising during construction

Avoidance and mitigation measures

12.4.1 The draft Code of Construction Practice (CoCP)[139] includes a range of provisions that would help mitigate socio-economic effects associated with construction within this area, including:

- reducing nuisance through sensitive layout of construction sites (Section 5);
- consulting businesses located close to hoardings on the design, materials used and construction of the hoarding, to reduce impacts on access to and visibility of their premises (Section 12);
- applying best practicable means during construction works to reduce noise (including vibration) at sensitive receptors (including local businesses) (Section 13);
- monitor and manage flood risk and other extreme weather events that may affect socio-economic resources during construction (Section 13);
- site specific traffic management measures including requirements relating to the movement of traffic from business and commercial operators of road vehicles, including goods vehicles (Section 14); and
- maintaining access to businesses for the duration of construction works where reasonably practicable (Section 14).

Assessment of impacts and effects

12.4.2 The proposed construction works are assessed for socio-economic effects in relation to:

- premises demolished with their occupants and employees needing to relocate to allow for construction of the Proposed Scheme;
- in-combination effects (e.g. air quality, noise, vibration, construction traffic and visual impacts) and isolation of an area, which could affect business operations will be reported in the formal ES. Any resulting effects on employment will be reported at a route-wide level (see Volume 3: Route-wide effects); and

[137] Vacant space is based on marketed space identified from Estates Gazette data (EGi); stock data is taken from information supplied by the Valuation Office (VOA).
[138] Based on marketed space identified from Estates Gazette data (EGi) (March 2018). Available online at: https://www.egi.co.uk/Property/Availability/
[139] Supporting document: Draft Code of Construction Practice

- potential employment opportunities arising from construction in the local area (including in adjacent community areas).

Temporary effects

Construction employment

12.4.3 In the Lea Marston to Tamworth area, there would be two main construction compounds, one at Marston and one at the M42 junction 10. There would also be three satellite construction compounds, one of which would continue to be used as a railway installation satellite compound following completion of the civil engineering works. In addition there are two further rail system compounds. These sites could result in the creation of up to 3,050 person years of construction employment opportunities140, broadly equivalent to 305 full-time jobs[141] which, depending on skill levels required and the skills of local people, are potentially accessible to residents in the locality and to others living further afield. The impact of the direct construction employment creation has been considered as part of the route-wide assessment (see Volume 3: Route-wide effects).

12.4.4 Direct construction employment could lead to opportunities for local businesses to supply the project or to benefit from expenditure of construction workers. The impact of the indirect construction employment creation has been considered as part of the route-wide assessment (see Volume 3: Route-wide effects).

12.4.5 The resulting effects on employment are reported in aggregate at a route-wide level (see Volume 3: Route-wide effects).

Permanent effects

Businesses

12.4.6 Businesses directly affected, comprising those that lie within land required for the Proposed Scheme, are reported in groups, where possible, to form defined resources based on their location and operational characteristics. A group could contain either one or a number of businesses reflecting the fact that a building may have more than one occupier or that similar businesses and resources are clustered together.

12.4.7 Overall, sixteen business accommodation units or sites in the study area would experience direct impacts as a result of the Proposed Scheme. These 16 units or sites, together, form nine defined resources. These are as follows:

- Tamworth Services, Green Lane;
- Redrow House;
- Kinsall Green Garage;
- Kingsbury Garden Centre;
- Pro-Mil Engineering;

[140] Construction labour is reported in construction person years, where one construction person year represents the work done by one person in a year composed of a standard number of working days.
[141] Based on the convention that 10 employment years is equivalent to one full-time equivalent job

- Ladbrokes Bookmakers;
- Esso Petrol Station;
- Travelodge Tamworth M42; and
- DFS Distribution Centre.

12.4.8 Four of the resources which experience direct impacts are subject to potentially significant effects on business activities and employment. These resources are listed in Table 29.

Table 29: Resources which would potentially experience significant direct effects

Resource	Description of business activity
Tamworth Services, Green Lane, Tamworth, Staffordshire. B77 5PS	Service station and associated facilities
Redrow House, Kinsall Green, Dordon. B77 5PX	Property development
Travelodge Tamworth M42, Green Lane, Tamworth. B77 5PS	Hotel/Motel
DFS Distribution Centre, Centurion Park, Wilnecote, Tamworth. B77 5PN	Warehouse/Distribution Centre

Impact magnitude

12.4.9 The magnitude of impact focuses on the number of jobs that would be affected by the Proposed Scheme, either through displacement or possible job loss. It also considers the implications of this impact in relation to the scale of economic activity and opportunity in the area.

Sensitivity

12.4.10 The sensitivity of resources considers the following:

- availability of alternative, suitable premises;
- size of the local labour market;
- skill levels and qualifications of local people; and
- levels of unemployment.

Significance of effects

12.4.11 Taking account of the sensitivity of the resource and the magnitude of impact, it is currently expected that the significance of the resultant effects would be as set out in Table 30.

Table 30: Significance of effects on resources

Resource	Impact magnitude	Sensitivity	Significance of effect
Tamworth Services	High	Medium	Major adverse
Redrow House	High	Low	Moderate adverse
Travelodge Tamworth M42	Moderate	Medium	Moderate adverse
DFS Distribution Centre	High	Low	Moderate adverse

12.4.12 Tamworth Services would be demolished. Tamworth Services is located in a unique location based on the volume of traffic and its ability to integrate with the road network at Junction 10. It is considered that the Tamworth Services would have difficulty in finding suitable alternative premises i.e. near to an existing junction or through the provision of a new junction to allow direct access from the road network without disrupting traffic flows. The effect on the businesses based at the Tamworth Services, and their employees, is assessed to be major adverse and therefore significant.

12.4.13 Redrow House operates as the headquarters of Redrow Ltd, a property development company. The nature of the company's operations and scale of employment on site suggest that the company should be able to find suitable alternative premises nearby. The effect on Redrow House and its employees is therefore considered moderate adverse.

12.4.14 The location of the Travelodge Tamworth M42 allows the capture of custom from passing traffic on the M42 and Tamworth Services. It is considered that Travelodge Tamworth M42 would have difficulty in finding suitable alternative premises with direct access from the M42 and proximity to complementary services. The effect on Travelodge Tamworth M42, and its employees, is assessed to be moderate adverse and therefore significant.

12.4.15 The DFS Distribution Centre at Centurion Park allows the company to store and distribute its products across the region. The requirements of such a facility suggest that the company should be able to find suitable alternative premises nearby with access to the strategic road network. The effect on the DFS Distribution Centre is assessed as moderate adverse owing to the magnitude of employment associated with the facility.

12.4.16 There are also locations where the construction footprint requires the demolition of properties. Where the associated employment losses do not present particular relocation problems given the commercial/ office-type premises that these occupiers would require and the availability of alternative premises, these effects are not expected to be significant.

12.4.17 Across all of the employment areas reviewed, it is currently anticipated that an estimated 270 jobs[142] would either be displaced or possibly lost within the Lea Marston to Tamworth area. There is a reasonable probability that businesses would be able to relocate to places that would still be accessible to residents within the travel to work areas due to the general availability of vacant premises. However, there may be cases where alternative locations are problematic and the businesses may be unable to relocate on a like-for-like basis within the area. The impact on the local economy from the relocation or loss of jobs is considered to be relatively modest in the context

[142] Employment within businesses has been estimated through a combination of sources, for example, surveys of businesses, the Experian employment dataset, employment floor space and the Homes and Communities Agency (HCA) Employment Densities Guide 3rd Edition (2015). The estimate is calculated using standard employment density ratios and estimates of floor areas and may vary significantly from actual employment at the sites.

of the total number of people employed in the NWBC area (approximately 46,000 jobs) and the scale of economic activity and opportunity in the area.

12.4.18 The resulting effects on employment are reported in aggregate at a route-wide level (see Volume 3: Route-wide effects).

Other mitigation measures

12.4.19 Businesses displaced by the Proposed Scheme would be compensated in accordance with the Compensation Code. HS2 Ltd recognises the importance of businesses, displaced from their existing premises, being able to relocate to suitable alternative premises and at this stage it assumes that it would, therefore, adopt a policy to offer additional support over and above statutory requirements to facilitate this process as it has done on Phases One and 2a.

12.4.20 The construction of the Proposed Scheme offers considerable opportunities to businesses and residents along the route of the Proposed Scheme in terms of supplying goods and services and obtaining employment. HS2 Ltd at this stage assumes that it would, therefore, adopt a policy to work with its suppliers to build a skilled workforce that promotes further economic growth across the UK as it has done on Phases One and 2a.

Summary of likely residual significant effects

12.4.21 Any likely residual significant socio-economic effects will be reported in the formal ES.

12.5 Effects arising from operation

Avoidance and mitigation measures

12.5.1 No mitigation measures are proposed in relation to business resources during operation of the Proposed Scheme.

Assessment of impacts and effects

Resources with direct effects

12.5.2 It is currently expected that no resources would experience significant direct socio-economic effects during the operation of the Proposed Scheme.

In-combination effects

12.5.3 In-combination effects will be assessed and reported in the formal ES.

Operational employment

12.5.4 Direct operational employment created by the Proposed Scheme could lead to indirect employment opportunities for local businesses in terms of potentially supplying the Proposed Scheme or benefiting from expenditure of directly employed workers on goods and services.

12.5.5 The impact of operational employment creation will be assessed and reported at a route-wide level in Volume 3: Route-wide effects.

Other mitigation measures

12.5.6 No mitigation measures during operation of the Proposed Scheme are proposed in relation to business resources.

Summary of likely residual significant effects

12.5.7 Any likely residual significant socio-economic effects will be reported in the formal ES.

Monitoring

12.5.8 Volume 1, Section 9 sets out the general approach to environmental monitoring during operation of the Proposed Scheme.

12.5.9 There are no area-specific requirements for monitoring socio-economic effects during the operation of the Proposed Scheme in the Lea Marston to Tamworth area.

13 Sound, noise and vibration

13.1 Introduction

13.1.1 This section reports the initial assessment of the noise and vibration likely significant effects arising from the construction and operation of the Proposed Scheme within the Lea Marston to Tamworth area on:

- 'residential receptors'; people, primarily where they live, in terms of individual dwellings and on a wider community basis including any shared community open areas[143]; and
- 'non-residential receptors'[144] such as:
  - community facilities including schools, hospitals, places of worship and 'quiet areas'[145]; and
  - commercial properties such as hotels.

13.1.2 The methodology for the assessment of likely significant noise and vibration effects was developed in alignment with Government noise policy[146], planning policy, planning practice guidance on noise (PPGN)[147] and EIA Regulations as described in the Scope and Methodology Report[148] (SMR).

13.1.3 Engagement has been undertaken with North Warwickshire Borough Council (NWBC) and Tamworth Borough Council (TBC) with respect to the sound, noise and vibration assessment. This engagement process will continue as part of the development of the Proposed Scheme. The purpose of this engagement has been twofold. Firstly, engagement has been undertaken on a route wide basis covering matters including process, scope, method and the approach to baseline and mitigation strategy. Secondly, local engagement has been undertaken to obtain relevant information regarding residential and non-residential receptors and existing baseline sound levels, and to discuss the development of the mitigation to be included in the Proposed Scheme. Officers from local and county authorities are invited to attend and witness baseline sound measurements.

13.1.4 Maps of the Proposed Scheme in the Lea Marston to Tamworth area showing the location of the key environmental features (Map Series CT-10), key construction features (Map Series CT-05), key operational features (Map Series CT-06) and operational sound, noise and/or vibration impacts and proposed noise mitigation (Map series SV-01), can be found in the Volume 2: LA01 Map Book. Map series SV-01

[143] 'Shared community open areas' are those that the Planning Practice Guidance identifies may partially offset a noise effect experienced by residents at their dwellings and are either a) relatively quiet nearby external amenity spaces for sole use by a limited group of residents as part of the amenity of their dwellings or b) a relatively quiet external publicly accessible amenity space (e.g. park or local green space) that is nearby.
[144] Non-residential receptors with multiple uses would be assessed either based on the most noise sensitive use or would be subject to multiple assessments as appropriate.
[2] 'quiet areas' are defined as either Quiet Areas as identified under the Environmental Noise Regulations 2007 (as amended) or are resources which are prized for providing tranquillity as noted in the NPPF and are therefore designated as such under the relevant local plan or are designated under local plans or neighbourhood development plans as local green spaces.
[146] Noise Policy Statement for England (2015) Department for Environment, Food & Rural Affairs (Defra)
[147] Planning Practice Guidance – Noise (2014) Department for Communities and Local Government (DCLG). Available online at: https://www.gov.uk/guidance/noise--2
[148] Supporting document: HS2 Phase 2b Environmental Impact Assessment Scope and Methodology Report

also presents key 'non-residential receptors'. These receptors will be reviewed and developed further to incorporate, where appropriate, consultation feedback and ongoing stakeholder engagement.

13.1.5 The assessment of noise and vibration likely significant effects on agricultural, heritage and ecological receptors and the assessment of tranquillity is ongoing and will be reported in the formal ES.

13.2 Scope, assumptions and limitations

13.2.1 The approach to assessing sound, noise and vibration and identifying envisaged mitigation is outlined in Volume 1 (Section 8 and Section 9) and the SMR.

13.2.2 In this assessment 'sound' is used to describe the acoustic conditions that people experience as a part of their everyday lives. Noise is taken as unwanted sound and hence adverse effects are noise effects and mitigation is, for example, by noise barriers.

13.2.3 Effects can either be temporary from construction or permanent from the operation of the Proposed Scheme. These effects may be direct, resulting from the construction or operation of the Proposed Scheme, and/or indirect, resulting from changes in traffic patterns on existing roads or railways that result from the construction or operation of the Proposed Scheme.

13.2.4 The effects of construction noise and vibration are assessed qualitatively, based on construction compound locations, construction routes, initial construction estimates and professional judgement. No quantitative assessment has been undertaken for the construction of the Proposed Scheme at this stage. The quantitative assessment will be reported in the formal ES.

13.2.5 The effects on operational noise and vibration are assessed quantitatively based on forecast noise emission from the Proposed Scheme combined with outline baseline information and professional judgement. As baseline information is limited at this stage the quantitative assessment including a full baseline will be reported in the formal ES.

13.2.6 The assessments included in this section consider the potential impacts from Phase 2b of the HS2 route only. A full consideration of the combined impacts of Phase One and Phase 2b will be included in the formal ES.

13.3 Environmental baseline

13.3.1 The SMR describes the three rounds of baseline data collection covering existing sources, modelling and by targeted monitoring. Baseline sound levels will be published in the formal ES.

13.3.2 The area is characterised by a mix of small towns, villages, hamlets and isolated residential properties in a predominantly rural setting. Kingsbury Water Park is located to the south of Kingsbury, close to the M42. Towards the north of the area, the route would pass closer to the edge of Tamworth. The sound environment is generally dominated by local and distant road traffic, and local neighbourhood

sources, with natural and agricultural sounds also contributing. Sound levels on the eastern side of Kingsbury are also affected by sound from the Birmingham to Derby Railway.

13.3.3 There are several main roads within the Lea Marston to Tamworth area: primarily the M42, which runs through the length of the area. The M6 Toll contributes to sound levels in the south of the area. Other main roads that contribute to the sound environment are the A4097 Kingsbury Road that connects the M42 to Kingsbury; the A51 Tamworth Road that runs through Kingsbury, and the A5 east of the M42 junction 10 that runs from Atherstone to the M42 and on towards Tamworth.

13.3.4 Sound levels close to these main transportation routes are high during the daytime and are generally lower at night. Sound levels decrease with increasing distance from the main transportation routes.

13.3.5 The effects of vibration at all receptors are being initially assessed using specific thresholds, below which receptors would not generally be adversely affected by vibration. Further information is provided in Volume 1 (Section 8).

13.3.6 The baseline assessment presented in the formal ES will consider current sound levels and how these may change in the future. This will include any changes firstly due to national trends such as road traffic growth and the progressive electrification of road vehicles and secondly due to area specific changes caused either by local committed development and/or noise reduction provided in Important Areas identified in Defra's Noise Action Plans for Agglomerations[149], Roads[150] or Railways[151]. HS2 Ltd will engage with the Competent Authorities responsible for the relevant Important Areas. Map Series SV-01 (Volume 2: LA01 Map Book) shows any noise Important Areas in the Lea Marston to Tamworth area.

13.4 Effects arising during construction

Assumptions and limitations

13.4.1 The construction arrangements that form the basis of the assessment are presented in Section 2.3 of this report, in Volume 1 (Section 8) and in the draft Code of Construction Practice (CoCP)[152]. The assessment focuses on the initial identification of communities that may be affected by construction noise. The formal ES will include the assessment of likely significant effects from construction noise and/or vibration on individual receptors and communities.

13.4.2 The following assumption has also been made in relation to the construction methods specific to the Lea Marston to Tamworth area.

13.4.3 The crossing of the road network at M42 junction 10 includes building cut and cover and jacked box tunnels. This involves construction works in proximity to Tamworth, including cutting formation, secant piling for retaining wall construction and installation of beams and concreting for the cut and cover tunnels. These works have

[149] Noise Action Plan: Agglomerations (large urban areas) (2014) Department for Environment, Food & Rural Affairs (Defra)
[150] Noise Action Plan: Roads (including major roads) (2014) Department for Environment, Food & Rural Affairs (Defra)
[151] Noise Action Plan: Railways (including major railways) (2014) Department for Environment, Food & Rural Affairs (Defra)
[152] Supporting document: Draft Code of Construction Practice

been assumed to be undertaken during the day and in the evening for reasons of engineering practicability or to reduce the impact on existing transport.

13.4.4 The assessment takes account of people's sensitivity to noise during the day, evening and night. More stringent criteria are applied during evening and night-time periods, compared to the busier and more active daytime period.

Avoidance and mitigation measures

13.4.5 The assessment assumes the implementation of the principles and management processes set out in the noise and vibration section of the draft CoCP (Section 13), which are:

- best practicable means (BPM) as defined by the Control of Pollution Act 1974 (CoPA) and Environmental Protection Act 1990 (EPA), which will be applied during construction activities to minimise noise (including vibration) at neighbouring residential properties and other sensitive receptors[153].
- as part of BPM, mitigation measures are applied in the following order:
  - noise and vibration control at source: for example, the selection of quiet and low vibration equipment, review of construction methodology to consider quieter methods, location of equipment on-site, control of working hours, the provision of acoustic enclosures and the use of less intrusive alarms, such as broadband vehicle reversing warnings;
  - screening: for example, local screening of equipment or perimeter hoarding or the use of temporary stockpiles; and
  - where, despite the implementation of BPM, the noise exposure exceeds the criteria defined in the draft CoCP, noise insulation or ultimately temporary re-housing would be offered at qualifying properties.
- lead contractors will seek to obtain prior consent from the relevant local authority under Section 61 of the CoPA for the proposed construction works. The consent application will set out BPM measures to minimise construction noise and vibration, including control of working hours, and provide a further assessment of construction noise and vibration, including confirmation of noise insulation/temporary re-housing provision;
- contractors would undertake and report such monitoring as is necessary to assure and demonstrate compliance with all noise and vibration commitments. Monitoring data would be provided regularly to, and be reviewed by, the nominated undertaker and made available to the local authorities; and
- contractors would be required to comply with the terms of the draft CoCP and appropriate action would be taken by the nominated undertaker as required to ensure compliance.

[153] Including local businesses and quiet areas designated by the local authority

13.4.6 Noise insulation or, where appropriate, temporary re-housing would avoid residents of qualifying properties being significantly affected by levels of construction noise inside their dwellings. Work is being undertaken to provide a reasonable worst case estimate of the buildings that are likely to qualify for such measures and the estimate will be reported in the formal ES.

13.4.7 Qualification for noise insulation and temporary re-housing would be confirmed as part of seeking prior consent from the local authority under Section 61 of the CoPA. Qualifying properties would be identified, as required in the draft CoCP so that noise insulation could be installed, or temporary re-housing provided, before the start of the works predicted to exceed noise insulation or temporary re-housing criteria.

Assessment of impacts and effects

13.4.8 Potential construction airborne noise significant effects could occur at the communities, or those parts of the communities, that are nearest to the Proposed Scheme in the following locations, as a result of the construction works illustrated on Map Series CT-05 (Volume 2: LA01 Map Book):

- Kingsbury, arising from construction activities such as road realignment works and overbridge construction;
- Whateley, arising from construction activities such as cutting formation, road realignment works, and overbridge construction;
- Freasley, arising from construction activities such as cutting formation, road realignment works, and overbridge construction; and
- Tamworth (around Wilnecote and Stoneydelph), arising from construction activities such as cutting formation, road realignment works, overbridge construction, cut and cover and jacked box tunnel construction.

13.4.9 Map Series SV-01 (Volume 2: LA01 Map Book) shows key non-residential properties that have been identified within the study area as defined in the SMR. Of these, there is no non-residential property that is likely to experience significant effects (to be confirmed in the formal ES).

13.4.10 The avoidance and mitigation measures to be implemented would avoid or reduce airborne construction noise adverse likely significant effects. Residual temporary noise or vibration likely significant effects will be reported in the formal ES.

13.4.11 Construction traffic on the following local roads has the potential, on a precautionary basis, to cause adverse noise or vibration effects on the nearest parts of residential communities and nearest noise sensitive non-residential receptors:

- the B5080 Pennine Way between the A5 and B5000;
- Coton Road/Bodymoor Heath Road;
- Trinity Road;
- Whateley Lane;
- Overwoods Road;

- Centurion Way; and
- Green Lane

13.4.12 The magnitude and extent of effect will depend on the level of construction traffic using the road. Residual significant temporary noise or vibration effects will be reported in the formal ES.

Other mitigation measures

13.4.13 Further work is being undertaken to confirm the likely significant effects and identify any site-specific mitigation, or amendment to construction routes considered necessary in addition to the general measures set out in the draft CoCP. Any site-specific mitigation will be presented in the formal ES and would include an estimate of the number of properties that may qualify for noise insulation or temporary re-housing under provisions set out in the draft CoCP.

Summary of likely residual significant effects

13.4.14 Further work is being undertaken to confirm significant construction noise and vibration effects, including temporary indirect effects from construction traffic.

13.4.15 Non-residential receptors identified at this stage as potentially subject to construction noise or vibration effects will be further considered, where necessary, on a receptor-by-receptor basis. Likely significant effects will be reported in the formal ES.

13.5 Effects arising from operation

Assumptions and limitations

Local assumptions

13.5.1 The assessment of the effects of noise and vibration from the operation of the Proposed Scheme is based on the envisaged design as described in Section 2.2 of this report and in Volume 1 (Sections 4 and 8) and the highest likely train flows, assuming the service pattern including Phase One and Phase Two services. The expected passenger service frequency for Phase 2b is described in Volume 1 (Section 4) and as outlined below for the Lea Marston to Tamworth area.

13.5.2 Passenger services will start at or after 05:00 from the terminal stations. In this area, with Phase One and Phase Two in operation, after 05:00 services will progressively increase to nine trains per hour in each direction on the main lines with an operating speed of around 280kph at the southern end of the Lea Marston to Tamworth area progressively increasing to 330kph for 90% of services and 360kph for 10% of services. This number of services is assumed to operate every hour from 07:00 to 21:00. The number of services will progressively decrease after 21:00 and the last service will arrive at terminal stations by midnight. Further information is presented in Volume 1 (Section 4).

Avoidance and mitigation measures

13.5.3 The development of the Proposed Scheme alignment has sought to reduce noise impact insofar as reasonably practicable.

13.5.4 Envisaged avoidance and mitigation measures that apply route-wide are described in Volume 1 (Section 9).

Airborne noise

13.5.5 Through the procurement process for the trains and the track, the use of proven international technology will enable the railway to be quieter than implied by current minimum European standards. Details of operational train noise will be provided in the formal ES. This will include reduction of aerodynamic noise from the pantograph that otherwise would occur above 300kph (186mph) with current pantograph designs, drawing on proven technology in use in East Asia where reasonably practicable. Overall it is assumed that proven international technology would reduce noise emissions by approximately 3dB at 360kph (225mph) compared to the current minimum European standards[154].

13.5.6 The Proposed Scheme would incorporate noise barriers, in the form of either landscape earthworks and/or noise fence barriers to avoid or reduce significant adverse airborne noise effects. The assessment has been based on the assumption that noise fence barriers are acoustically absorbent on the railway side and are located 5m from the outer rail. The envisaged noise barrier locations based upon the currently available information are shown on Map Series SV-01 (Volume 2: LA01 Map Book) and described in Section 2.2.

13.5.7 In practice, barriers may differ from this description while maintaining the required acoustic performance. For example, where noise barriers are in the form of landscape earthworks, they would need to be higher above rail level to achieve similar noise attenuation to the noise fence barrier because the crest of the earthwork would be further than 5m from the outer rail.

13.5.8 Noise effects would also be reduced in other locations along the route by engineering structures and landscape earthworks provided to avoid or reduce significant visual effects.

13.5.9 As required by statute, noise insulation measures would be offered for qualifying buildings as defined in the Noise Insulation (Railways and Other Guided Transport Systems) Regulations 1996 and the Noise Insulation Regulations 1975 ('the NI Regulations'). Additionally, HS2 Ltd will apply more onerous criteria, to provide the same mitigation as defined in 'the NI Regulations' at residential buildings where[155] noise from the use of the Proposed Scheme measured outside a dwelling exceeds the Interim Target defined by the World Health Organization's (WHO) Night Noise Guidelines for Europe[156] or the maximum noise level criteria[157] defined in the SMR. Noise insulation is designed to avoid residents experiencing any residual significant effect on health and quality of life from resulting noise inside their dwelling.

13.5.10 Noise can be generated at exits from tunnels due to pressure waves created inside the tunnel as the train enters. This is a well understood phenomenon and is mitigated by

[154] Technical Specification for Interoperability (TSI) Noise – EU Commission Regulation No 1304/2014
[155] Following Government's National Planning Practice Guidance https://www.gov.uk/government/collections/planning-practice-guidance
[156] Night time Noise Guidelines for Europe (2010) World Health Organization
[157] Dependent on the number of train passes

appropriate design and construction techniques. Porous tunnel portals, tunnels and vent shafts (where required) will be designed to avoid any significant airborne noise effects caused by the trains entering the tunnel.

Ground-borne noise and vibration

13.5.11 Significant ground-borne noise or vibration effects would be avoided or reduced through the design of the track and track-bed.

Assessment of impacts and effects

13.5.12 Map Series SV-01 (Volume 2: LA01 Map Book) indicates the likely long-term daytime noise level (defined as the equivalent continuous sound level from 07:00 to 23:00 or $L_{pAeq,day}$) from HS2 operations alone. The contours are shown in 5dB steps from 50dB to 70dB. With the train flows described in Volume 1, the night-time noise level (defined as the equivalent continuous noise level from 23:00 to 07:00 or $L_{pAeq,night}$) from the Proposed Scheme would be approximately 10dB lower than the daytime sound level. The 50dB contour, therefore, indicates the distance from the Proposed Scheme at which the night time noise level would be 40dB. This contour represents where adverse noise effects may start to be observed during the day (with respect to annoyance) and night (with respect to sleep disturbance). With regard to sleep disturbance the assessment also takes account of the maximum noise levels generated by each train pass by as defined in the SMR.

13.5.13 The potential for noise effects that are considered significant on a community basis in areas between the 50dB and 65dB daytime noise contours, or 40dB and 55dB night-time contours, is dependent on the baseline in that area and the change in level brought about by the Proposed Scheme. Baseline information will be confirmed in the formal ES.

13.5.14 A summary of the likely significant effects identified on a precautionary basis is presented at the end of this section.

13.5.15 Likely significant airborne noise effects arising from permanent changes to existing roads will be reported in the formal ES.

Other mitigation measures

13.5.16 Further work is being undertaken to confirm the extent, location and type of the noise mitigation to be included within the design of the Proposed Scheme, which will be reported in the formal ES.

Summary of likely residual significant effects

13.5.17 Mitigation, including landscape earthworks and noise fence barriers, described in Volume 1 (Section 9), Section 2.2 and presented in Map Series SV-01 (Volume 2: LA01 Map Book) and Map Series CT-06 (Volume 2: LA01 Map Book), would substantially reduce the potential airborne noise effects that would otherwise arise from the Proposed Scheme. It is anticipated that the mitigation would avoid likely significant adverse effects due to airborne operational noise on the majority of receptors and communities.

13.5.18 Taking account of the avoidance and mitigation measures this initial assessment has identified effects on a precautionary basis with the potential to be considered significant on a community basis due to increased airborne noise levels in line with the SMR at or around:

- Kingsbury: occupants of residential properties in the vicinity of The Laurels, Maple Drive, Fircroft, Sorrel Drive, Hazelcroft and The Aspens, located closest to the Proposed Scheme, identified by LA01-C01 on Map SV-01-351 (Volume 2: LA01 Map Book); and
- Tamworth: occupants of residential properties in the vicinity of Swallowhurst, Teign, Tamar Road, Ottery, Torridge and Stour, located closest to the Proposed Scheme, identified by LA01-C02 on Map SV-01-352a (Volume 2: LA01 Map Book).

13.5.19 The initial assessment indicates that, the forecast noise from long-term railway operation may exceed the daytime threshold set by the Noise Insulation Regulations, the night-time Interim Target identified in the WHO Night Noise Guidelines for Europe 2009 or the maximum noise levels criteria set out in the SMR, at individual residential properties closest to the Proposed Scheme in:

- Bodymoor Heath, in the vicinity of Bodymoor Heath Lane (identified on Map SV-01-350 in Volume 2: LA01 Map Book);
- Holt Hall House, Whateley, Tamworth in the vicinity of Trinity Road (identified on Map SV-01-351 in Volume 2: LA01 Map Book); and
- Hockley, Tamworth in the vicinity of Overwoods Road (identified on Map SV-01-352a in Volume 2: LA01 Map Book).

13.5.20 The initial assessment indicates that there are no significant effects identified at non-residential receptors in the Lea Marston to Tamworth area as a result of operational noise.

13.5.21 Further assessment work is being undertaken to identify operational noise and vibration significant effects. This will be reported in the formal ES.

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

Monitoring

13.5.23 Volume 1, Section 9 sets out the general approach to environmental monitoring during operation of the Proposed Scheme.

13.5.24 Operational noise and vibration monitoring would be carried out at different times during the lifetime of the Proposed Scheme at a combination of carefully selected monitoring locations including: adjacent or attached to moving vehicles, at fixed positions or in the vicinity of individual assets; and locations within the surrounding areas and communities alongside the railway corridor.

13.5.25 The expected noise and vibration performance of the Proposed Scheme, operational noise and vibration measurement data, associated asset information, description of corrective actions, results of measured performance compared to expected conditions, and monitoring reports would be shared with the relevant local authorities at appropriate intervals.

14 Traffic and transport

14.1 Introduction

14.1.1 This section considers the likely impacts on all forms of transport and the potential likely significant effects identified to date on transport users arising from the construction and operation of the Proposed Scheme through the Lea Marston to Tamworth area.

14.1.2 Engagement with Highways England, Warwickshire County Council (WaCC), Staffordshire County Council (SCC) and Network Rail has been undertaken. An important focus of this engagement has been to obtain relevant baseline information and discuss transport survey requirements and assessment methodology. This engagement process will continue as part of the development of the Proposed Scheme.

14.1.3 Maps showing the location of the key environmental features (Map Series CT-10) and the key construction (Map Series CT-05) and key operational (Map Series CT-06) features of the Proposed Scheme can be found in the Volume 2: LA01 Map Book.

14.2 Scope, assumptions and limitations

14.2.1 The scope, key assumptions and limitations for the traffic and transport assessment are set out in Volume 1 (Section 8) and the Scope and Methodology Report (SMR)[158].

14.2.2 The study area for traffic and transport includes the villages of Kingsbury, Whateley, Freasley and the south-east boundary of the Tamworth urban area including Tamworth Services at M42 junction 10.

14.2.3 The study area also includes all roads potentially affected by the Proposed Scheme including strategic roads: the M42 between junctions 9 and 10; and the A5 east and west of the M42 junction 10.

14.2.4 Local roads include the A51 Coventry Road/Tamworth Road; the A4097 Kingsbury Road; the B5080 Pennine Way; Coton Road; Bodymoor Heath Road; Trinity Road; Whateley Lane; Overwoods Road; Centurion Way; Green Lane; and Relay Drive.

14.2.5 The potential effects on traffic and transport have been assessed qualitatively, based on the Proposed Scheme design, proposed construction routes, initial estimates of construction traffic and professional judgement.

14.2.6 No quantitative assessment has been undertaken at this stage. A quantitative assessment will be presented in the formal ES.

14.3 Environmental baseline

Existing baseline

14.3.1 Existing conditions in the study area have been determined through site visits, traffic and transport surveys, liaison with Highways England, WaCC, SCC and Network Rail

[158] Supporting document: HS2 Phase 2b Environmental Impact Assessment Scope and Methodology Report

(including provision of information on public transport, public rights of way (PRoW) and accident data) and desktop analysis.

Surveys

14.3.2 Traffic surveys, comprising junction turning counts, queue surveys and automatic traffic counts, were undertaken in October and November 2017. These data have been supplemented by existing traffic data from other sources, including from WaCC, SCC and Highways England. Assessment of the data indicates that the peak hours in the area are 08:00-09:00 and 17:00-18:00 which correspond to the HS2 assessment hours.

14.3.3 PRoW surveys were undertaken in August 2017 to establish their nature and usage by non-motorised users (pedestrians, cyclists and equestrians). The surveys included PRoW and roads that would cross the route of the Proposed Scheme, and any additional PRoW and roads that may be affected by the Proposed Scheme. The majority of the PRoW surveys were undertaken during the weekend, at times when recreational use is expected to be highest, but where routes are likely to be used for non-leisure uses such as commuting, surveys were undertaken on a weekday.

Strategic and local highway network

14.3.4 The strategic routes that pass through the area are the M42 and the A5 east and west of the M42 junction 10. The strategic road network in and around the Lea Marston to Tamworth area is busy at peak times and delays can be experienced. Tamworth Motorway Services Area is located adjacent to the M42 and accessed off Green Lane via the M42 junction 10.

14.3.5 The local roads that could be affected by the Proposed Scheme include: the A4097 Kingsbury Road; the A51 Coventry Road/Tamworth Road; the B5080 Pennine Way; Coton Road; Bodymoor Heath Road; Trinity Road; Whateley Lane; Overwoods Road; Centurion Way; Relay Drive; and Green Lane. The local road network in this area generally operates well although some localised delays can be experienced, particularly at peak times.

14.3.6 Relevant accident data for the road network subject to assessment have been obtained from the Department for Transport[159]. Data for the three year period (January 2014 to December 2016) have been assessed and any identified clusters (i.e. where there are nine or more accidents in the three year period) have been examined.

14.3.7 Three accident clusters were identified within the Lea Marston to Tamworth area:

- along the M42 between junction 9 and junction 10 (51 accidents, including one with serious casualties);
- the M42 junction 9 (12 accidents, including two with serious casualties); and
- the M42 junction 10 (17 accidents, including two with serious casualties).

14.3.8 The route of the Proposed Scheme would cross five roads with footways within the Lea Marston to Tamworth area. These are: Bodymoor Heath Road; the A51 Tamworth

[159] Department for Transport; Crashmap.co.uk; www.crashmap.co.uk. CrashMap provides accident data for the UK.

Road; Overwoods Road; the A5 west of the M42 junction 10; and Green Lane. In addition, there is one road crossed by the Proposed Scheme without a footway which is Whateley Lane.

Parking and loading

14.3.9 There is no parking or loading identified in the Lea Marston to Tamworth area that is expected to be impacted by the Proposed Scheme. Consequently, this topic is not considered further in this assessment.

Public transport network

14.3.10 Thirteen bus routes operate on seven roads that are crossed by the route of the Proposed Scheme in the Lea Marston to Tamworth area. There are also bus stops primarily located to serve the main built up area. The bus routes that could be affected by the Proposed Scheme include:

- services along the A51 Coventry Road/Tamworth Road, including the 16 and 16A (Tamworth – Ventura Park – Kingsbury), the 16S (Kingsbury – Water Orton – Castle Bromwich) and the 223 (Solihull – Kingsbury via Coleshill, Water Orton);
- services along the A51 Coventry Road/Tamworth Road and Trinity Road, including the 115 (Tamworth – Kingsbury – Hurley) the 118 and 119 (Tamworth – Kingsbury – Hurley Circular) the 228 (Coleshill – Maxstoke – Shustoke – Whitacre Heath – Kingsbury) and the 766 (Tamworth – Dordon – Atherstone – Nuneaton);
- the X16 service (Tamworth – Kingsbury – Birmingham) along the A51 Coventry Road/Tamworth Road and the B5080 Pennine Way;
- service 15 (Tamworth – Hockley – Hurley) along Trinity Road and Overwoods Road;
- service 16S (Kingsbury – Water Orton – Castle Bromwich) along the A4097 Kingsbury Road;
- service 216 (Coleshill – Whitacre Heath – Lea Marston – Middleton – Tamworth) along the A4097 Kingsbury Road and Coton Road/Bodymoor Heath Road; and
- services 766 and 767 (Tamworth – Dordon – Atherstone – Nuneaton) along the A5 west of the M42 junction 10.

14.3.11 National and local rail services are accessible via Tamworth Station, 5km to the west of the Proposed Scheme. Tamworth Station provides access to national services to London, Crewe and Glasgow and provides access to local services to Birmingham, Lichfield and Nuneaton.

Non-motorised users

14.3.12 There are pedestrian footways adjacent to many of the roads in the built up areas of the villages of Kingsbury, Whateley, Freasley and the south-east boundary of the Tamworth urban area. Footways vary in width and condition within these areas.

Where there is no formal footway provision adjacent to a road, non-motorised user numbers are generally low.

14.3.13 The route of the Proposed Scheme would cross the route of 11 PRoW within the Lea Marston to Tamworth area that could be affected either temporarily or permanently due to, for example, temporary diversion of PRoW during construction and permanent diversion or upgrades, including for maintenance access to the Proposed Scheme. The PRoW surveys undertaken to inform the assessment showed that there were fewer than 10 people a day recorded on six of the PRoW. The routes with the greatest usage recorded during the survey day were Warwickshire Footpath T25 (also known as the Heart of England Way) which was used by 345 pedestrians, 109 cyclists, and 16 equestrians; Warwickshire Footpath T26 which was used by 42 pedestrians and 186 cyclists; and Warwickshire Footpath T170 which was used by 57 pedestrians and 11 cyclists.

Waterways and canals

14.3.14 There is one navigable waterway in the Lea Marston to Tamworth area, the Birmingham and Fazeley Canal, which is located west of the M42, following a south-north direction.

Air transport

14.3.15 There is no relevant air transport in the Lea Marston to Tamworth area. Consequently, this topic is not considered further in this assessment.

14.4 Effects arising during construction

Avoidance and mitigation measures

14.4.1 The following measures are currently proposed to avoid or reduce effects on transport users:

- new highways (roads and PRoW) would be constructed and operational prior to the permanent closure of any existing highways, insofar as reasonably practicable;
- the majority of roads crossing the route of the Proposed Scheme would be maintained or locally diverted during construction to limit the need for diversion of traffic onto alternative routes;
- traffic management measures would be implemented to limit any disruption;
- road closures would be restricted to overnight and weekends, insofar as reasonably practicable;
- temporary alternative routes for PRoW would be provided during construction, insofar as reasonably practicable, where either the existing or final proposed route is not available;
- where reasonably practicable, site haul routes would be created adjacent to the route of the Proposed Scheme to transport construction materials and

equipment to reduce heavy goods vehicle (HGV) movements on public roads with access taken via the main road network;

- HGV would be routed, insofar as reasonably practicable, along the strategic and/or primary road network;
- the use of the local road network would, insofar as reasonably practicable, be limited to use for site set-up, access for surveys and on-going servicing (including refuse collection and general deliveries to compounds) during construction;
- the reuse of excavated material along the route of the Proposed Scheme, insofar as reasonably practicable;
- highway measures including junction improvements, passing places and carriageway widening would be provided, as required, to manage the safe passing of construction vehicles on construction HGV routes; and
- on-site welfare facilities would be provided which would reduce daily travel by site workers.

14.4.2 Section 14 of the draft Code of Construction Practice (CoCP)[160] includes measures that aim to reduce the adverse impacts and effects on local communities and maintain public access. This includes the impacts of deliveries of construction materials and equipment.

14.4.3 The measures in the draft CoCP include controls on vehicle types, hours of site operation and routes for HGVs to reduce the impact of road-based construction traffic. In order to achieve this, general and site specific traffic management measures would be implemented during the construction of the Proposed Scheme on or adjacent to public roads and PRoW affected by the Proposed Scheme.

14.4.4 The draft CoCP includes the requirement to develop local traffic management plans in consultation with the highway and traffic authorities and the emergency services. These would consider the local traffic management strategy including consideration of sensitive receptors, such that adverse impacts would be reduced insofar as reasonably practicable and any effect on safety and accidents would not be significant

14.4.5 Specific measures would include core site operating hours of 08:00 to 18:00 on weekdays and 08:00 to 13:00 on Saturdays with site staff and workers generally arriving before the morning peak hour and departing after the evening peak hour.

14.4.6 The number of private car trips to and from the construction compounds (both workforce and visitors) would be reduced by encouraging alternative sustainable modes of transport or vehicle sharing. This would be supported by an overarching framework travel plan that would require construction workforce travel plans[161] to be

[160] Supporting document: Draft Code of Construction Practice
[161] Construction and operational travel plans would promote the use of sustainable transport modes as appropriate to the location and types of trip. They would include measures such as: provision of information on and promotion of public transport services; provision of good cycle and pedestrian facilities; liaison with public transport operators; promotion of car sharing; and the appointment of a travel plan coordinator to ensure suitable measures are in place and are effective.

produced that would include a range of potential measures to mitigate the impacts of traffic and transport movements associated with construction of the Proposed Scheme.

14.4.7 Where works potentially affect Network Rail assets, disruption to travelling passengers and freight movements would be reduced insofar as reasonably practicable. This includes measures such as:

- programming the construction works to coincide with the possessions that are required and planned by Network Rail for the general maintenance of their railway;
- planning the required construction works so that they can be undertaken in short overnight stages so that passenger services are not disrupted; and
- programming longer closures at the weekend and on bank holidays to reduce insofar as reasonably practicable the number of passengers affected.

Assessment of impacts and effects

Temporary effects

14.4.8 The traffic and transport impacts during the construction period within the Lea Marston to Tamworth area are likely to include:

- construction vehicle movements to and from the various construction compounds;
- road closures and associated realignments and diversions;
- alternative routes for PRoW; and
- possessions on the conventional rail network.

14.4.9 The construction assessment has also considered any impacts in the Lea Marston to Tamworth area that arise from construction of the Proposed Scheme in the adjoining community areas.

14.4.10 Construction vehicle movements required to construct the Proposed Scheme would include the delivery of plant and materials, movement of excavated materials and site worker trips. Works would include utilities diversions, earthworks, underpass, viaduct, bridge and highway construction.

14.4.11 Construction activities would be managed from compounds. Details of the construction compounds are provided in Section 2.3. The locations of the compounds are shown in Map Series CT-05 in the Volume 2: LA01 Map Book.

Strategic and local highway network

14.4.12 The primary HGV access routes for construction vehicles would be the strategic and/or primary road network with the use of the local road network limited, where reasonably practicable. The construction routes would also provide access to compounds. Where reasonably practicable, HGVs would use the site haul routes

alongside the route of the Proposed Scheme to reduce the impact on the local road network. In this area, it is expected that the main construction routes would use:

- the M42 junction 9 and junction 10;
- the A5 west of the M42 junction 10 to the B5080 Pennine Way;
- the A4097 Kingsbury Road to the A51;
- the A51 Coventry Road/Tamworth Road north of the A4097 to south of Cliff Hall Lane;
- the B5080 Pennine Way between the A5 and the B5000;
- Coton Road/Bodymoor Heath Road from the A4097 to the Birmingham and Fazeley canal;
- Trinity Road from Whateley Lane to the M42 junction 10;
- Whateley Lane;
- Overwoods Road;
- Centurion Way; and
- Green Lane.

14.4.13 In addition to increases in traffic flows due to construction traffic, construction of the Proposed Scheme is expected to result in temporary highway closures and diversions or realignments as set out in Section 2.3. The works to construct both temporary and permanent highway diversions/realignments could also result in disruption to highway users These are expected to include:

- the M42 near Bodymoor Heath Road, the A51 Tamworth Road, and south of Warwickshire Bridleway T67p requiring temporary traffic management measures;
- the M42 junction 10;
- the A5 west of the M42 junction 10, between Kinsall Green and M42 junction 10;
- Green Lane between Kinsall Green and M42 junction 10; and
- Relay Drive.

14.4.14 Permanent changes to highways are reported under operation.

14.4.15 Changes in traffic have the potential, at some locations, to result in increased travel distance, congestion and delays and increased traffic severance for non-motorised users. The assessment of these changes will be reported in the formal ES.

14.4.16 Assessment of the traffic and transport impacts from utilities works, either separately or in combination with other works, will be reported in the formal ES.

Accidents and safety

14.4.17 Changes in traffic as a result of the Proposed Scheme could result in changes in accident risk. The impacts on accident risk during construction of the Proposed Scheme will be reported in the formal ES.

Public transport network

14.4.18 It is expected that construction of the Proposed Scheme would require bus route diversions, including bus routes 15, 16, x16, 16A, 16S, 115, 118, 119, 216, 223, 228, 766 and 767. This could result in increased journey times and the need to relocate bus stops. Any consequent effects will be reported in the formal ES.

14.4.19 There are interfaces with the existing rail network in this area, in particular on the operation of the Birmingham to Derby Railway and its passengers and rail freight services. Railway possessions would be required to undertake localised works, including for the construction of the M42 Tamworth viaduct to carry the Proposed Scheme over the Birmingham to Derby Railway and the M42. This could result in disruption to conventional rail services, although many of the interventions would be combined to reduce the frequency of potential disruption. The effects of railway possessions will be assessed and reported in the formal ES.

Non-motorised users

14.4.20 The construction works associated with the Proposed Scheme would require the temporary closure or diversion/realignment of PRoW and roads. There would be temporary alternative routes for a number of PRoW in the vicinity of the Proposed Scheme. Where necessary, PRoW would be re-routed around construction compounds.

14.4.21 It is currently expected that the following PRoW would be temporarily diverted/realigned or closed:

- Warwickshire Bridleway M23a (Seeney Lane near Marston); and
- Warwickshire Footpath T25 (also known as the Heart of England Way) through Kingsbury Water Park.

14.4.22 Permanently diverted PRoW are reported under operation although these PRoW could also be subject to temporary closure or diversion/realignment.

14.4.23 The changes to PRoW are likely to result in some increases in travel distance with the potential for adverse significant effects. The assessment of these will be reported in the formal ES.

Waterways and canals

14.4.24 It is not currently expected that the construction of the Proposed Scheme would have a significant effect upon navigable waterways or canals in the Lea Marston to Tamworth area.

Permanent effects

14.4.25 Any permanent effects of construction will be considered in the assessment of operation for traffic and transport. This is because the impacts and effects of ongoing increases in travel demand and the wider impacts and effects of the operations phase need to be considered together.

Other mitigation measures

14.4.26 The implementation of the draft CoCP, in combination with the construction workforce travel plan would help mitigate transport-related effects during construction of the Proposed Scheme.

14.4.27 Any further traffic and transport mitigation measures required during the construction of the Proposed Scheme will be considered based on the outcomes of the assessment. These will be reported in the formal ES.

Summary of likely residual significant effects

14.4.28 Construction of the Proposed Scheme would have the potential to lead to additional congestion and delays for road users on a number of routes including: the M42 between junctions 9 and 10; the M42 junction 10; the A5 west of the M42 junction 10; the A4097 Kingsbury Road; the A51 Coventry Road/Tamworth Road; the B5080 Pennine Way; Coton Road/Bodymoor Heath Road; Trinity Road; Whateley Lane; Overwoods Road; Centurion Way; Green Lane; and Relay Drive. Increases in traffic could also result in increased traffic severance for non-motorised users of the routes and changes in traffic could result in changes in accident risk.

14.4.29 Construction of the Proposed Scheme would result in temporary highway closures and diversions or realignments. These are expected to affect the M42, M42 junction 10, the A5 west of the M42 junction 10, Green Lane and Relay Drive.

14.4.30 Bus services 15, 16, x16, 16A, 16S, 115, 118, 119, 216, 223, 228, 766 and 767 would be affected by temporary diversions.

14.4.31 Rail possessions would also be required on the Birmingham to Derby Railway with potential disruption to services.

14.4.32 Two PRoW, Warwickshire Bridleway M23a and Warwickshire Footpath T25 (known as the Heart of England Way) would be temporarily diverted or realigned.

14.4.33 The assessment of significant effects in relation to traffic and transport during construction of the Proposed Scheme will be reported in the formal ES.

14.5 Effects arising from operation

Avoidance and mitigation measures

14.5.1 The following measures have been included as part of the design of the Proposed Scheme and would avoid or reduce impacts on transport users:

- reinstatement of roads on or close to their existing alignments, where reasonably practicable; and
- replacement, diversion or realignment of PRoW;

Assessment of impacts and effects

14.5.2 The following section considers the impacts on traffic and transport and the likely consequential effects resulting from the operational phase of the Proposed Scheme. Operational effects arising from the Proposed Scheme in year 2033 and year 2046 will be reported in the formal ES.

Key operation transport issues

14.5.3 The operation of the Proposed Scheme would be unlikely to have any substantial impacts within this area due to increased traffic, as there are no stations or depots proposed within the Lea Marston to Tamworth area. The maintenance of the Proposed Scheme would generate limited vehicular trips and the effect would not be significant.

14.5.4 The operational impacts are therefore primarily related to permanent diversion, realignment and closure of roads and the diversion or closure of PRoW.

Highway network

Strategic and local highway network

14.5.5 The Proposed Scheme would result in a number of permanent highway changes. These include:

- Bodymoor Heath Road overbridge (permanently realigned on a new bridge over the Proposed Scheme and the M42);
- the A51 Tamworth Road (permanently realigned under the Proposed Scheme);
- Whateley Lane overbridge (permanently realigned on a new bridge over the Proposed Scheme); and
- Overwoods Road overbridge (permanently realigned on a new bridge over the Proposed Scheme).

14.5.6 The permanent highway changes are not expected to result in significant changes in travel distances. The effects of these changes including on non-motorised users will be reported in the formal ES.

Accidents and safety

14.5.7 Changes in traffic could result in changes in accident risk. Operational effects arising from the Proposed Scheme will be reported in the formal ES.

Public transport network

14.5.8 The permanent realignment of roads could increase travel distances for bus passengers. However, as the realignments are likely to be less than 1km in length, it is not currently expected that there would be significant effects on public transport within the Lea Marston to Tamworth area.

Non-motorised users

14.5.9 A number of PRoW that cross the route of the Proposed Scheme would be either permanently realigned or diverted including:

- Warwickshire Footpath M22 which runs across arable land north of Seeney Lane would be realigned to the south of its existing alignment;
- Warwickshire Bridleway T67p which runs between Trinity Road and the A51 Tamworth Road would be realigned to the south-west of its existing alignment;
- Warwickshire FootpathT70 which runs between Trinity Road and Whateley Lane would be diverted to the east of its existing alignment and into Whateley Lane;
- Warwickshire Footpath AE203 which runs between Whateley Lane and Footpath T77 would be realigned to the west of its existing alignment;
- Warwickshire Footpath T77 – the eastern section of the Warwickshire Footpath T77 which crosses the Proposed Scheme would be permanently closed and an alternative route provided along the proposed new Whateley Lane overbridge;
- Warwickshire Footpath T170 which runs between Whateley Lane and Overwoods Road would be diverted to the east of its existing alignment and into Overwoods Road;
- Warwickshire Bridleway AE56 would be closed and be diverted along the proposed diversion route of Staffordshire Bridleway Tamworth 79; and
- Staffordshire Bridleway Tamworth 79 which runs between Falcon and south of Centurion Way would be closed from south of Centurion Way to Warwickshire Bridleway AE56 and would be diverted to an existing unnamed footpath which links to Swallowhurst.

14.5.10 No PRoW diversion/realignment is expected to result in additional travel distance in excess of 500m.

14.5.11 The realignment of some of the PRoW would increase journey distance and time for non-motorised users and may result in significant effects. The assessment of these changes will be reported in the formal ES.

Waterways and canals

14.5.12 It is not currently expected that the operation of the Proposed Scheme would have a significant effect upon navigable waterways or canals in the Lea Marston to Tamworth area.

Other mitigation measures

14.5.13 HS2 Ltd is continuing to engage with local highway and transport authorities regarding the need for highway and public transport measures to mitigate the impacts of the Proposed Scheme in the area.

14.5.14 Any further traffic and transport mitigation measures required during the operation of the Proposed Scheme will be considered based on the outcomes of the assessment. These will be reported in the formal ES.

Summary of likely residual significant effects

14.5.15 Operation of the Proposed Scheme would require the permanent diversion or realignment of: Bodymoor Heath Road; the A51 Tamworth Road; Whateley Lane; and Overwoods Road although these are unlikely to result in permanent significant effects. Increases in traffic could also result in increased traffic severance for non-motorised users of the routes and changes in traffic could result in changes in accident risk.

14.5.16 Seven PRoW, including Warwickshire Footpath M22; Warwickshire Bridleway T67p; Warwickshire Footpath T70; Warwickshire Footpath AE203; Warwickshire Footpath T77; Warwickshire Footpath T170; and Staffordshire Bridleway Tamworth 79 would be permanently diverted. One PRoW, Warwickshire Bridleway AE56, would be closed and be diverted along the proposed diversion of Staffordshire Bridleway Tamworth 79.

14.5.17 The assessment of significant effects in relation to traffic and transport during operation of the Proposed Scheme will be reported in the formal ES.

Monitoring

14.5.18 Volume 1, Section 9 sets out the general approach to environmental monitoring during operation of the Proposed Scheme.

14.5.19 There are no other area-specific monitoring requirements currently proposed for traffic and transport in the Lea Marston to Tamworth area.

15 Water resources and flood risk

15.1 Introduction

15.1.1 This section provides a description of the current baseline for water resources and flood risk in the Lea Marston to Tamworth area. The likely impacts and significant effects identified to date arising from the construction and operation of the Proposed Scheme on surface water and groundwater bodies and their associated water resources are reported. The likely impacts and significant effects of the Proposed Scheme on flood risk and land drainage are also reported.

15.1.2 Engagement has been undertaken with the Environment Agency, Canal and River Trust (CRT), Warwickshire County Council (WaCC) and Staffordshire County Council (SCC), which are the Lead Local Flood Authorities (LLFA), North Warwickshire Borough Council (NWBC), Tamworth Borough Council (TBC) and Severn Trent Water Limited (the local water and sewerage undertaker). The purpose of this engagement has been to obtain relevant baseline information and to discuss the Proposed Scheme and potential effects. Engagement with these stakeholders will continue as part of the development of the Proposed Scheme.

15.1.3 Maps showing the location of the key environmental features (Map Series CT-10), and the key construction (Map Series CT-05) and key operational (Map Series CT-06) features of the Proposed Scheme can be found in the Volume 2: LA01 Map Book. This map book also includes Map Series WE-01 and WR-02 showing surface water and groundwater baseline information respectively.

15.1.4 Volume 3: Route-wide effects, Water resources and flood risk (Section 16) covers the following at a route-wide level:

- the risk to water resources associated with accidents or spillages from trains during operation of the Proposed Scheme;
- a summary of how the Proposed Scheme aims to demonstrate compliance with the statutory requirements of the Water Framework Directive (WFD); and
- route-wide flood risk issues related to alignment of the Proposed Scheme with the Sequential Test and Exception Test policies in the National Planning Policy Framework (NPPF)[162].

15.2 Scope, assumptions and limitations

15.2.1 The scope, assumptions and limitations for the water resources and flood risk assessment are set out in Volume 1 (Section 8) and the Scope and Methodology Report (SMR)[163].

15.2.2 Unless indicated otherwise, the spatial scope of the assessment (the study area) is based upon the identification of surface water and groundwater features within 1km of the centre line of the route of the Proposed Scheme, as described in Section 2.2 of

[162] National Planning Policy Framework, DCLG, 2015
[163] Supporting document: HS2 Phase 2b Environmental Impact Assessment Scope and Methodology Report

this report. In the Lea Marston to Tamworth area, the HS2 Phase 2b study area overlaps with that of HS2 Phase One.

15.2.3 This assessment is based on desk study information, including information provided to date by consultees and stakeholders, as well as surveys of accessible water features.

15.2.4 Where surveys have not been undertaken due to land access constraints, a precautionary approach has been adopted in the assessments of receptor value and impact magnitude.

15.2.5 Hydraulic analysis is currently being undertaken of watercourses and key structures within flood risk areas. This includes modelling of the River Tame and Thistlewood Brook.

15.2.6 Groundwater levels have been inferred from the available Environment Agency groundwater level monitoring boreholes, historic borehole logs and topographic data, as well as from spring and watercourse locations.

15.2.7 Impacts on biological receptors such as aquatic fauna and flora are assessed in Section 7, Ecology and biodiversity.

15.2.8 The assessments in this working draft ES are based on professional judgement using the information that is currently available. A precautionary approach has been adopted with regard to assessing the potential for adverse impacts to occur. The surveys, analysis and modelling work currently in progress, and the results of the consultation process, will be used to refine the assessments reported in the formal ES.

15.3 Environmental baseline

Existing baseline - Water resources and WFD

Surface water

15.3.1 All surface water bodies in the study area fall within the Tame Anker and Mease management catchment of the Humber river basin district (RBD).

15.3.2 The river basin management plan[164] identifies the chemical[165] and ecological[166] status of surface water bodies, and the quantitative[167] and chemical[168] status of groundwater bodies within this RBD.

15.3.3 To be compliant with WFD legislation, the Proposed Scheme should not cause deterioration of a water body from its current status; nor prevent future attainment of

[164] Environment Agency (2015), Water for life and livelihoods Part 1: Humber river basin district: River basin management plan
[165] The chemical status of surface waters reflects concentrations of priority and hazardous substances present
[166] The ecological status of surface waters is determined based on the following elements:
- Biological elements – communities of plants and animals (for example, fish and rooted plants), assessed in the ecology and biodiversity section;
- Physico-chemical elements – reflects concentrations of pollutants such as metal or organic compounds, such as copper or zinc;
- Hydromorphological elements – reflects water flow, sediment composition and movement, continuity (in rivers) and the structure of physical habitats
[167] The quantitative status of groundwaters reflects the presence or absence of saline or other intrusions, interactions with surface water, issues related to groundwater dependent terrestrial ecosystems (GWDTE) and overall water balance
[168] The chemical status of a groundwater body reflects effects on drinking water protected areas, its general quality, the importance of water quality within the water body for GWDTEs and surface water interactions and whether there are intrusions of poor quality groundwater present

good status where this has not already been achieved. The Proposed Scheme should also avoid adverse impacts on protected or priority species and habitats.

15.3.4 Specialist field surveys are being undertaken, where access is available. Receptor values will be adjusted to reflect the outputs from these surveys, in close consultation with the Environment Agency. In the absence of field surveys, surface water bodies, other than minor ponds and ditches, have been identified within this assessment as being of either high or very high value on a precautionary basis.

15.3.5 Summary information relating to the surface water bodies potentially affected by the Proposed Scheme within the study area is provided in Table 31.The receptor value attributed to each individual water body is based on the methodologies set out in the SMR.

Table 31: Surface water body receptors

Water body name and location[169]	**Designation**	**Q95 value (m^3/ s)**[170]	**Receptor value**	**Parent WFD water body name and identification number**[171]	**Current WFD status/ Objective**[172]
Tributary of River Tame (1) WR-01-350-C5	Minor ditch	n/a	Moderate	River Tame (Tame from River Blythe to the River Anker) GB104028046440	Poor / Good by 2027
Sandy Pool WR-01-350-D5	Static water body	n/a	Moderate		
Alder Pool WR-01-350-D5	Static water body	n/a	Moderate		
River Tame WR-01-350-E5	Main river	7	Very high	River Tame (Tame from River Blythe to the River Anker) GB104028046440	Poor / Good by 2027
Thistlewood Brook WR-01-350-E5	Ordinary watercourse	0.02	High		
Tributary of Thistlewood Brook (2) WR-01-350-F5	Minor ditch	n/a	Moderate		
Tributary of Thistlewood Brook (3) WR-01-350-F5	Minor ditch	n/a	Moderate		

[169] The feature locations are indicated by the grid coordinates on the relevant Volume 2: LA01 Map Book figure (in this case WR-01)
[170] The Q95 value is the flow within the watercourse that is exceeded for 95% of the time
[171] The Environment Agency has attributed each surface water and groundwater body a unique water body identification (ID) number
[172] Status and objectives are based on those set out in the 2015 River basin management plan

Kettle Brook WR-01-350-I6	Ordinary Watercourse	0.008	Moderate	River Anker (Anker from River Sence to River Tame) GB104028046460	Poor / Good by 2027

Abstractions and permitted discharges (surface water)

15.3.6 There is one licensed surface water abstraction in the study area, which is not located within the land required for the construction and operation of the Proposed Scheme and is considered a high value receptor.

15.3.7 Records of private unlicensed surface water abstractions, which comprise those for quantities less than 20m^3 per day, have been obtained from the local authorities. These data indicates that there are no registered private unlicensed surface water abstractions within the study area. As there is no obligation to register private water supplies, unregistered private surface water supplies may be present. Private water supplies would be assessed as high value receptors unless details obtained from the owner indicate otherwise.

15.3.8 There are 19[173] consented discharges to surface waters within the study area, four of which are within the land required for the Proposed Scheme. These have been assessed as being receptors of low value.

Groundwater

15.3.9 The geology of the study area is described in Section 10, Land quality, and the superficial and bedrock hydrogeology is summarised in Table 32. Unless stated otherwise, the geological groups listed would all be crossed by the Proposed Scheme.

15.3.10 Table 32 also identifies the receptor values attributed to each groundwater receptor based on the methodologies set out in the SMR.

[173] Note that the number of consents listed in Section 10, Land quality may be different to that stated here. This is because the Water resources and flood risk study area comprises all land within 1km of the centreline of the Proposed Scheme, whereas the Land quality study area comprises land within 250m from the boundary of the Proposed Scheme. The default study areas may be extended where potential for wider pathways exist.

Table 32: Summary of geology and hydrogeology in the study area

Geology[174]	Distribution	Formation description	Aquifer classification	WFD body (ID) and current overall status[175]	WFD status objective[176]	Receptor value
Superficial deposits						
Head deposits	Present in the southern parts of the study area and in the vicinity of Kingsbury.	Dependent on source but typically gravel, sand and clay	Secondary (undifferentiated)	Not assessed by the Environment Agency	Not assessed by the Environment Agency	Moderate
Alluvium	Along the River Tame and tributaries.	Clay, silt, sand and gravel	Secondary A	Not assessed by the Environment Agency	Not assessed by the Environment Agency	Moderate
River terrace deposits	Along the River Tame valley and floodplain and present south of Heath House Farm.	Sand and gravel	Secondary A	Not assessed by the Environment Agency	Not assessed by the Environment Agency	Moderate
Glaciofluvial deposits	Present in the south of the study area at Cocksparrow Farm and between Wishaw and Blackgreaves Farm.	Sand and gravel	Secondary A	Not assessed by the Environment Agency	Not assessed by the Environment Agency	Moderate
Glacial till	Present in the west of the study area around Stonehill Barn, between Cliff and Whateley and to the north-west of the route of the Proposed Scheme, east of Wilnecote.	Variable typically comprising sandy, silty clay with pebbles	Secondary (undifferentiated) Except east of Wilnecote where the till deposit is defined as unproductive strata	Not assessed by the Environment Agency	Not assessed by the Environment Agency	Moderate
Bedrock						
Mercia Mudstone Group – Sidmouth Mudstone Formation (including Gunthorpe Member)	Southern part of route of the Proposed Scheme in the Lea Marston to Tamworth area.	Mudstone and dolomitic siltstones	Secondary B	Tame Anker Mease – Secondary Combined (GB40402G990800) Good	Good by 2015	Moderate

[174] In recent years the British Geological Survey has revised the nomenclature used to describe the geological materials present in Great Britain, with the publication of a series of lithostratigraphic framework reports. Some of these reports cover an entire geological period e.g. The Carboniferous and others cover a single group e.g. the Triassic Mercia Mudstone. The nomenclature used in these reports supersede the nomenclature introduced in the 1980s. While some traditional names have been retained by this process, many new names have also been generated, and many geological maps have not yet been updated. Some stratigraphic units have been renamed twice in the last 35 years. To reflect this, the previous name used for geological units (if different) is shown in brackets.
[175] As stated in the 2015 River basin management plan.
[176] As stated in the 2015 River basin management plan.

Geology[174]	**Distribution**	**Formation description**	**Aquifer classification**	**WFD body (ID) and current overall status**[175]	**WFD status objective**[176]	**Receptor value**
Sherwood Sandstone Group-Helsby Sandstone Formation	Small north-west to south-east orientated outcrop just north of Kingsbury.	Sandstone	Principal	Tame Anker Mease – Sandstone Burton (GB40401G301200) Poor	Good by 2027	High
Warwickshire Group - Salop Formation	Localised outcrop within the study area, north of Kingsbury.	Mudstone and sandstone. Sandstone in upper parts	Principal		Good by 2027	High
Warwickshire Group-Halesowen Formation	Kingsbury Water Park to northern border of the Lea Marston to Tamworth area. Limestone outcrops at Whateley Villas.	Sandstone and mudstone, with thin coals and limestone	Principal (limestone)	Tame Anker Mease – Secondary Combined (GB40402G990800) Good Tame Anker Mease – Secondary Combined (GB40402G990800) Good	Good by 2015	High
			Secondary A (mudstone, siltstone and sandstone)			Moderate
Warwickshire Group - Etruria Formation	Present within the central part of the study area, west of Whateley and west of the route of the Proposed Scheme.	Mudstone, with sandstones and conglomerates	Secondary A		Good by 2027	Moderate
Pennine Coal Measures Group - Pennine Middle Coal Measures	Present within the central part of the study area, west of Whateley and west of the route of the Proposed Scheme.	Mudstone, siltstone, sandstone with coal seams	Secondary A		Good by 2027	Moderate
Pennine Coal Measures Group - Pennine Lower Coal Measures	A small outcrop north of Kingsbury crossed by the route of the Proposed Scheme, and present west of the route of the Proposed Scheme to the west of Whateley.	Mudstone, siltstone, sandstone, with coal seams	Secondary A		Good by 2027	Moderate

Geology[174]	Distribution	Formation description	Aquifer classification	WFD body (ID) and current overall status[175]	WFD status objective[176]	Receptor value
Stockingford Shale Group - Merevale Shale Formation	Outcrops within the central part of the study area, north of Cliff Hall Lane.	Mudstone with dolomite	Secondary B		Good by 2027	Moderate
Midlands Minor Intrusive Suite	Discrete outcrops within the central part of the study area, adjacent to Cliff Hall Lane.	Igneous rock intruded into the Merevale Shale Formation	Secondary B		Good by 2027	Moderate

Superficial deposit aquifers

15.3.11 The basis of the receptor values attributed to the superficial deposit aquifers present within the study area, as shown in Table 32, is outlined briefly as follows:

- alluvium, river terrace deposits and glaciofluvial deposits are classified as Secondary A aquifers, which may be capable of supporting water supplies at a local rather than regional scale and may also form an important source of baseflow to rivers. They have therefore been classified as moderate value receptors; and
- head deposits and glacial till that would be crossed by the route of the Proposed Scheme are classified as Secondary (undifferentiated) aquifers, as it is not possible to attribute category A or B rock type to these Secondary aquifers. Secondary (undifferentiated) aquifers may supply baseflow to watercourses or store and yield limited amounts of groundwater. They have therefore been classified as moderate value receptors.

Bedrock aquifers

15.3.12 The basis of the receptor values attributed to the bedrock aquifers present within the study area, as shown in Table 32, is outlined briefly as follows:

- the Triassic Mercia Mudstone Group (locally comprising the Sidmouth Mudstone Formation and Gunthorpe Member) has been classified as a Secondary B aquifer by the Environment Agency. The Mercia Mudstone Group has traditionally been regarded as predominantly impermeable. Limited quantities of groundwater suitable for domestic or agricultural use are occasionally obtainable within this rock formation it has been assessed as a moderate value receptor;
- the Sherwood Sandstone Group (locally comprising sandstone of the Helsby Formation, outcrops in a small area north-east of Kingsbury. This formation has been classified as a Principal aquifer by the Environment Agency. This aquifer can also provide an important component of baseflow to rivers. It has, therefore, been assessed as a high value receptor;

- the small outcrop of Pennine Lower Coal measures that would be crossed by the Proposed Scheme north of Kingsbury is classified as a Secondary A aquifer and consists of sequences of mudstone, siltstone, sandstone, and coals, which form a complex multi layered aquifer where groundwater flow occurs mainly within the fractures in the sandstones. These aquifers have been assessed as moderate value receptors; and
- the Warwickshire Group (locally comprising the Halesowen Formation, Salop Formation and the Etruria Formation) is classified by the Environment Agency as both a Secondary A aquifer, where it comprises sandstone, siltstone or mudstone (Halesowen Formation and Etruria Formation), and a Principal aquifer where it comprises limestones and sandstones (Halesowen Formation and Salop Formation). The permeable sandstones and limestones can yield limited quantities of groundwater therefore, where the Halesowen limestone and Salop Formation outcrops it is assessed as a high value receptor, while the remaining outcrops are assessed as moderate value receptors.

WFD status of groundwater bodies

15.3.13 A summary of locations, current overall WFD status, and future overall status objectives associated with the designated bedrock groundwater bodies within the study area is provided in Table 32. The value attributed to each of these receptors is also indicated.

15.3.14 The superficial deposits in the study area are not formally designated as WFD groundwater bodies but may be hydraulically connected to the WFD bedrock aquifers.

Abstraction and permitted discharges (groundwater)

15.3.15 There are no groundwater abstractions licensed for public water supply in the study area and there are no source protection zones (SPZ) associated with licensed public water supplies within the study area.

15.3.16 There is one private groundwater abstraction licence registered in the study area, as shown on Map-WR-02-309. This is a non-potable supply for spray irrigation of a golf course, and is considered a high value receptor.

15.3.17 Records of private unlicensed groundwater abstractions, which comprise those for quantities less than 20m^3 per day, have been requested from the local authorities. Responses are being sought. As there is no obligation to register private water supplies, unregistered private groundwater supplies may also be present. Private water supplies have been assessed as high value receptors unless details obtained from the owner indicate otherwise.

15.3.18 There are four[177] consented discharges to groundwater within the study area, none of which are located within the land required for the Proposed Scheme. These discharges have been assessed as low value receptors.

[177] Note that the number of consents listed in Section 10, Land quality may be different to that stated here. This is because the Water resources and flood risk study area comprises all land within 1km of the centreline of the Proposed Scheme, whereas the Land quality study area for groundwater

Groundwater – surface water interactions

15.3.19 Desk-based assessment using Ordnance Survey maps and detailed river network data provided by the Environment Agency identified 14 features within the study area that had potential to be springs. Access was not possible to inspect any of these features at this stage.

15.3.20 The 14 potential spring features yet to be inspected are assumed to be high value receptors on a precautionary basis. Three of these 14 features are located within the land required for the Proposed Scheme; south of Body Moor Heath, central Kingsbury and near Cliff.

15.3.21 There are 12 ponds within the land required for the Proposed Scheme. The nature and relative value of these features, the magnitude of the impacts that the Proposed Scheme would have on them, and the mitigation proposed, are outlined in Section 7, Ecology and biodiversity.

Water dependent habitats

15.3.22 The following nature conservation sites within the study area are potentially groundwater dependent:

- Whitacre Heath Site of Special Scientific Interest (SSSI) is located within the study area on the floodplain of the River Tame, approximately 1.7 km south east of the Proposed Scheme. The SSSI comprises of a series of wetland habitats that have established following gravel extraction and hence are dependent on groundwater flows and levels; and
- Kettle Brook Local Nature Reserve (LNR) is a slow flowing wetland habitat likely to be dependent on groundwater flows and levels. The southern part of this LNR is within land required for the construction of the Proposed Scheme, to the north of Hockley, Tamworth.

15.3.23 The following nature conservation sites are potentially dependent on surface water flows, for example periodic flooding from a watercourse:

- Whitcare Heath SSSI is also dependent on periodic flooding from the River Tame. The SSSI is located upstream of the Proposed Scheme; and
- Kettle Brook LNR is located within the study area and is dependent on periodic inundation from Kettle Brook watercourse.

15.3.24 Further details of the ecology of these sites, including the reporting on the effects and associated other mitigation, are provided in Section 7, Ecology and biodiversity.

Existing baseline - flood risk and land drainage

15.3.25 The Environment Agency's Flood map for planning (rivers and sea)[178] has been used to scope the baseline flood risk for flooding from main rivers and ordinary watercourses. These plans define Flood Zone 2 (land assessed as having between a 1 in 100 (1%) and

comprises all land within 1km from the boundary of the Proposed Scheme. The default study areas may be extended where the potential for wider pathways exists.

[178] Environment Agency (2018), *Flood map for planning.* Available online at: https://flood-map-for-planning.service.gov.uk/

1 in 1,000 (0.1%) annual probability of river flooding) and Flood Zone 3 (land assessed as having a 1 in 100 (1%) or greater annual probability of river flooding).

15.3.26 The updated Flood map for surface water[179] has been used to scope surface water flood risks. Infrastructure failure flood risks have been scoped using the Environment Agency risks of flooding from reservoirs national dataset[180]. The British Geological Survey's (BGS) Groundwater flooding susceptibility data set[181], has been used to assess the future risk of groundwater flooding.

15.3.27 The following reports were used to help determine the baseline flood risk within the study area:

- WaCC Preliminary Flood Risk Assessment (PFRA) (2011)[182];
- NWBC Strategic Flood Risk Assessment (SFRA) (2013)[183];
- WaCC Local Flood Risk Management Strategy (LFRMS) (2016)[184];
- WaCC Surface Water Management Plan (SWMP) (2015)[185];
- TBC SFRA (2014)[186];
- SCC PFRA (2010)[187];
- SCC LFRMS (2015)[188]; and
- SCC SWMP (2010)[189].

River flooding

15.3.28 The study area includes substantial areas of floodplain (Flood Zone 2 and 3) associated with the River Tame at Kingsbury Water Park, and its tributary Thistlewood Brook. Other floodplains that would be crossed by the route of the Proposed Scheme include Kettle Brook at Freasley. Table 33 shows all relevant watercourses within the study area with receptors that would potentially be affected by any changes in flood magnitude. The value of these receptors, based on the definitions in Table 57 of the SMR, is also indicated.

[179] GOV.UK (2018), *Long term flood risk assessment for locations in England.* Available online at: https://flood-warning-information.service.gov.uk/long-term-flood-risk/
[180] GOV.UK (2018), *Long term flood risk assessment for locations in England.* Available online at: https://flood-warning-information.service.gov.uk/long-term-flood-risk/
[181] British Geological Society (2018), *BGS groundwater flooding.* Available online at: http://www.bgs.ac.uk/products/hydrogeology/groundwaterFlooding.html
[182] Royal Haskoning (2011). *Warwickshire Preliminary Flood Risk Assessment*. Available online at: http://webarchive.nationalarchives.gov.uk/20140328165716/http:/cdn.environment-agency.gov.uk/flho1211bvrt-e-e.pdf
[183] URS (2013).Stratford-upon-Avon DC, Warwickshire CC, North Warwickshire BC and Rugby BC *Level 1 Strategic Flood Risk Assessment*
[184] Warwickshire County Council (2016). *Local Flood Risk Management Strategy*
[185] AECOM (2015). *Warwickshire County Council Surface Water Management Plan*
[186] Halcrow Group Limited (2009). *Tamworth Borough Council Strategic Flood Risk Assessment for Local Development Framework, Level 1*
[187] Royal Haskoning (2011). *Staffordshire Preliminary Flood Risk Assessment*
[188] Shropshire Council and Staffordshire County Council (2015). *Shropshire and Staffordshire Local Flood Risk Management Strategy, Part 1*
[189] Royal Haskoning (2010). *South Staffordshire Surface Water Management Plan, Phase 1*

Table 33: River flood risk sources and receptors

Source	Location description and Figure/ coordinate[190]	Receptor potentially affected	Receptor value / sensitivity to flooding
River Tame and associated tributaries (Thistlewood Brook and small unnamed watercourses, and Kingsbury Water Park)	Bodymoor Heath WR-01-350-D5	Farms	High
		Kingsbury Water Park commercial property	Moderate
		Leisure and recreation Farm attraction	High
		Bodymoor Heath Road	Moderate
		Camping and Caravan Site	High
		Bodymoor Heath Lane	Moderate
		Residential properties in Kingsbury Water Park	High
		Agricultural land and amenity open space	Moderate
	Kingsbury Water Park WR-01-350-D6	Echills Wood Railway	Moderate
		Outdoor sport and recreation facility	Moderate
		Agricultural land and amenity open space	Moderate
	North Kingsbury WR-01-350-E5	Retail facilities	Moderate
		Pumping Station	Low
		Outdoor sport and recreation facility	Low
		A51 Tamworth Road	Very high
		Agricultural land and amenity open space	Moderate
Kettle Brook	Kettle Brook WR-01-350-I6	Kettle Brook LNR (amenity open space and woodland)	Low

Surface water flooding

15.3.29 There are numerous areas that are susceptible to surface water flooding within the study area. The key sources and receptors with potential to be affected are shown in Table 34[191]. The value of these receptors, based on Table 52 of the SMR, is also indicated.

Table 34: Surface water flood risk sources and receptors

Source	Location description and figure/ coordinate[192]	Receptor potentially affected	Receptor value
Surface water ponding at Cocksparrow House Farm	Lea Marston WR-01-350-B5	Woodland	Low
Surface water flow path from land drains at Bodymoor Heath	Bodymoor Heath WR-01-350-C5	Agricultural land	Moderate
		M42	Very high
Surface water flow path from Kingsbury	Kingsbury WR-01-350-E5	Residential Properties	High
		Kingsbury Pumping Station	Low

[190] This is the location at which the source intersects the Proposed Scheme, as indicated by the grid coordinates on the relevant Volume 2: LA01 Map Book figure (in this case WR-01)
[191] The receptor value has been assumed based on the Risk of Flooding from Surface Water dataset. Where the risk of flooding is high (1 in 30 year event) the receptor value is very high, where the risk of flooding is medium (1 in 30 to 1 in 100 year event) the receptor value is high and where the risk of flooding is low (1 in 100 to 1 in 1000 year event) the receptor value is moderate.
[192] This is the location at which the source intersects the Proposed Scheme, as indicated by the grid coordinates on the relevant Volume 2: LA01 Map Book figure (in this case WR-01).

Source	Location description and figure/ coordinate[192]	Receptor potentially affected	Receptor value
		Agricultural land	Moderate
Surface water flow path from M42	Slateley Hall WR-01-350-F6	Agricultural land	Moderate
Surface water flow path at M42 public right of way (PRoW)	Warwickshire Bridleway T67 WR-01-350-F5	Agricultural land	Moderate
Surface water flow path draining the area around Dreycote	Dreycote WR-01-350-H6	Residential properties	High
		Agricultural land	Moderate
		Unnamed lane	Moderate
		M42	Very high
Surface water flow path draining Freasley and south Wilnecote	Freasley and south Wilnecote WR-01-350-I6	The Green	Moderate
		Residential Properties	High
		Agricultural land	Moderate
		Residential properties	High
		Kettle Brook LNR (Woodland and grassland)	Low
Surface water ponding at the M42 junction 10 Tamworth Services	M42 junction 10 WR-01351a-J6	Filling station	High
		Commercial property	Moderate
		Hotel	High

Artificial water bodies

15.3.30 Flooding from artificial water bodies may occur due to failure of an impounding structure, such as a dam or canal embankment. Artificial water bodies with potential implications for flood risk within the study area include the Birmingham and Fazeley Canal, Shustoke Lower Reservoir, Bartley Reservoir and Rotton Park Reservoir.

15.3.31 Shustoke Lower Reservoir located approximately 5.5km south of the Proposed Scheme, Bartley Reservoir, located approximately 25km south-west of the Proposed Scheme, and Rotton Park Reservoir, located approximately 18km west of the Proposed Scheme, are the only artificial water bodies with potential to affect flood risk of relevance to the Proposed Scheme. However, as this is a large raised reservoir, subject to the requirements of reservoir safety legislation[193], the inundation risk posed by this reservoir is considered negligible. The risk of flooding from the Birmingham to Fazeley Canal is considered negligible due to the distance from the Proposed Scheme to the canal (approximately 235m north-west), with topography and the embanked M42 limiting the pathway for flood waters from this source. In addition, the canal is regularly inspected and is managed and maintained by the Canal & River Trust.

Groundwater flooding

15.3.32 Information related to historical incidents of groundwater flooding in the Lea Marston to Tamworth area is provided within the NWBC and TBC SFRA. The NWBC SFRA states that there is no history of groundwater flooding within the North Warwickshire Borough. The SFRA states that due to the presence of mudstone across the area, the risk of groundwater flooding is likely to be relatively low. The TBC SFRA states that apart from the valleys of the Tame and Trent, there are no other known problems with flooding from groundwater in the borough of Tamworth.

[193] Department for Environment, Food and Rural Affairs (Defra) and Environment Agency (2016), *Reservoirs: owner and operator requirements.* Available online at: https://www.gov.uk/guidance/reservoirs-owner-and-operator-requirements

15.3.33 The BGS Groundwater flooding susceptibility data set indicates that there is some potential for groundwater flooding to occur at the west and central end of the study area in the River Tame floodplain and also where the Proposed Scheme is underlain by glaciofluvial, alluvium and river terrace deposits.

Land drainage

15.3.34 Existing topography, soils and land drainage systems within the study area are described in Section 4, Agriculture, forestry and soils. The rivers and watercourses within the area are connected to an extensive network of existing open drains. Subsurface drainage systems are also likely to be present in fields used for agriculture. The land drainage function of these systems, which is important for crop productivity, is potentially sensitive to increases in water levels within the receiving watercourses.

15.4 Effects arising during construction

Avoidance and mitigation measures

15.4.1 The principal strategy adopted to limit the temporary and permanent effects of the Proposed Scheme is through avoidance of sensitive receptors wherever reasonably practicable. Where receptors could not be avoided, mitigation measures have been incorporated where appropriate and reasonably practicable, to limit the potential effects. Section 16 of the draft Code of Construction Practice (CoCP)[194] includes a range of mitigation measures that aim to reduce construction impacts insofar as is reasonably practicable. The avoidance and mitigation measures that are of particular relevance to water resources and flood risk during construction are described in the following sections of this report.

Water resources and WFD

15.4.2 The avoidance of sensitive receptors has reduced the risks associated with the Proposed Scheme not complying with the requirements of the WFD. Examples of this strategy include:

- avoidance, of channels and floodplain areas, where reasonably practicable – the route of the Proposed Scheme would avoid passing along river or stream valleys, such as that of River Tame and its associated floodplain. Instead it would pass over these larger watercourses on viaducts spanning the floodplain, with piers set back from the channel;
- avoidance, where reasonably practicable, of water dependent habitats, including natural springs that can play a key role in the hydrology and hydrogeology of such ecosystems; and
- avoidance, where reasonably practicable, of major public water supplies and smaller licensed and unlicensed abstractions of surface water and groundwater.

[194] Supporting document: Draft Code of Construction Practice

15.4.3 The presence of any unregistered private water supplies, their function and the means of protecting or if necessary replacing them would be discussed with any landowners potentially affected by the Proposed Scheme.

15.4.4 The temporary works shown on Map Series CT-05 in the Volume 2: LA01 Map Book have been informed by a detailed consideration of the water resources constraints and have sought to avoid sensitive features wherever reasonably practicable.

15.4.5 Watercourse realignments are proposed at the following locations: tributary of the River Tame (1), Thistlewood Brook and Kettle Brook. The aim will be to design these with equivalent hydraulic capacity to the existing channels. The Proposed Scheme would also aim to ensure that field subsurface drainage systems can be adapted to discharge into the new channel. Where such watercourses are natural channels, the design principle will be to incorporate appropriate features to retain and, where reasonably practicable, enhance their hydromorphological condition[195].

15.4.6 Watercourse diversions, which would result in changes in flow regime within discrete sections of channel, have been avoided wherever possible. There are no diversions proposed within this study area.

15.4.7 For watercourses that are not in their natural condition, the design aim for realignments will be to incorporate measures, where reasonably practicable, to improve their hydromorphological condition, provided this is compatible with their flood risk and land drainage functions.

15.4.8 The design of infrastructure required within or in proximity to an existing channel (including bridge abutments, intermediate piers and outfalls) will aim to reduce impacts on the natural hydromorphology of watercourse channels, insofar as is reasonably practicable.

15.4.9 The draft CoCP includes requirements to protect water bodies and their associated water resources from the potential impacts of pollution from construction site runoff, including where appropriate:

- provision of maps showing sensitive areas and buffer zones where no pollutants are to be stored or used; and
- preparation of method statements for silt management, site drainage at compounds and satellite compounds, for the storage and control of oils and chemicals and the prevention of accidental spillages, in consultation with the Environment Agency, and if appropriate, the LLFA and other relevant authorities as part of the approvals process. These method statements will cover, where applicable:
  - the avoidance of discharges of site runoff to ditches, watercourses, drains, sewers or soakaways without the prior approval of the appropriate authority;

[195] 'Hydromorphological condition' reflects the extent to which water flow, sediment composition and movement, continuity (in rivers) and the structure of physical habitats departs from that expected of a natural river or stream system.

- measures to prevent silt-laden runoff and other pollutants entering the water environment; and
- restrictions or controls on excavation within watercourses to limit effects on water quality, sedimentation, fisheries and aquatic ecology.

15.4.10 Method statements will be required for all watercourse crossings and channel realignments required for site haul routes. The method statements will describe how potential changes to flood risk, water quality and channel hydromorphology will be managed during the establishment, use and decommissioning of all site haul routes.

15.4.11 Permanent culverts proposed on the smaller watercourse crossings within this study area include those on Kettle Brook (Freasley culvert) and Thistlewood Brook culvert beneath the A51 Tamworth Road realignment. Culverts are also proposed for the new drainage ditch network associated with the Proposed Scheme for rail, highway and land drainage and include Bodymoor Heath Road culvert, A51 Tamworth Road culvert east, A51 Tamworth Road culvert west, Piccadilly embankment culvert and Overwoods Road culvert. The detailed design of these culverts will be developed in general accordance with Construction Industry Research and Information Association (CIRIA) and Environment Agency guidance and in consultation with Environment Agency specialists. The design has sought to mitigate the impact on the hydromorphology of the affected watercourses, as follows:

- drop inlet culverts and inverted siphons have been avoided;
- culvert lengths have been reduced insofar as is reasonably practicable; and
- invert levels will be set below the firm bed of the watercourse to allow a natural substrate to develop along the bed of the culvert.

15.4.12 The wider issues associated with these culverts, and how their detailed design will aim to ensure no deterioration in the status of any of the relevant water bodies WFD quality elements, will be considered within the formal ES.

15.4.13 Existing groundwater abstraction boreholes or monitoring points would be protected from physical damage, insofar as reasonably practicable, including appropriate decommissioning of abandoned boreholes in order to prevent pollution pathways. If boreholes are to be decommissioned and replaced with alternatives, the contractors would follow the latest good practices. This principle would also be applicable to springs potentially affected by the Proposed Scheme, although additional measures may be required to mitigate temporary construction impacts on springs that are to be relocated. Wherever reasonably practicable, the design will aim to recreate affected spring features nearby.

15.4.14 Measures would be introduced, as required, to mitigate the temporary and permanent effects on groundwater flows and water quality during excavation and construction of foundations, tunnels and cuttings insofar as is reasonably practicable. The types of measure likely to be adopted could include:

- installation of cut-off[196] structures around excavations;
- ensuring cut-off structures are driven to sufficient depths to meet an underlying strata or zone of lower permeability;
- promoting groundwater recharge, such as discharging pumped water to recharge trenches around excavations to maintain baseline groundwater and surface water conditions; and
- incorporating passive bypasses within the design, which could comprise a 'blanket' of permeable material, such as gravel, placed around temporary structures allowing groundwater to bypass the below-ground works, without a rise in groundwater levels on the upstream side.

15.4.15 The exact requirements would be refined and method of mitigation would be designed following ground investigation at foundation, tunnels or cutting locations.

Flood risk and land drainage

15.4.16 The design of the Proposed Scheme will aim to mitigate permanent impacts on flood risk and land drainage as follows:

- the floodplain avoidance strategy will ensure that the impacts on flood flows within rivers and streams, and their floodplains, will be limited to those associated with the intermediate pier structures on the River Tame viaduct and A51 Tamworth Road realignment, which would be located in the River Tame and Thistlewood Brook floodplain. The Proposed Scheme includes replacement floodplain storage areas to replace losses associated with the piers and highway realignment;
- the temporary works shown on Map Series CT-05 in the Volume 2: LA01 Map Book have been informed by a detailed consideration of the flood risk constraints and have sought to avoid flood zones wherever reasonably practicable;
- provision has been made to pass surface water runoff and land drainage flows beneath sections of raised embankment that would cross surface water flow paths where reasonably practicable. This would be achieved using perimeter drainage and culverts, with their inverts set below the likely level of any upstream field subsurface drainage systems;
- in locations where the route of the Proposed Scheme would cross watercourses, the design aim is for structures to accommodate flood flows up to and including the 1 in 100 (1%) annual probability flood with an allowance for climate change based on latest guidance issued by the Environment Agency[197];
- runoff from the footprint of the infrastructure could occur more rapidly post-construction due to steeper slope angles and the permeability of the newly-

[196] Impermeable barrier preventing water flow
[197] Environment Agency (2016) *Adapting to Climate Change. Advice for Flood and Coastal Erosion Risk Management Authorities.*

created surfaces. The design of drainage systems aims to ensure that there would be no significant increases in flood risk downstream, during storms up to and including the 1 in 100 (1%) annual probability design event, with an allowance for climate change based on the latest guidance issued by the Environment Agency;

- balancing ponds for new sections of highway and railway drainage have been sized on a precautionary basis, pending more detailed information about the permeability and runoff characteristics of existing and proposed ground surfaces;
- where the Proposed Scheme would run in cutting, drainage measures would be provided with the aim of preventing flow into the cutting and diverting this water to natural catchments and balancing ponds in the surrounding area. Where reasonably practicable, runoff from the cuttings would also be drained to the balancing ponds within the natural catchment to which this water would naturally drain, avoiding transfer of water from one water body to another, which could increase flood risk or impact on land drainage systems; and
- measures would be introduced to reduce any potentially significant effects on groundwater flood risk insofar as is reasonably practicable, including the incorporation of passive hydraulic bypasses at cuttings and other below ground structures. These could for example comprise a 'blanket' of permeable material such as gravel.

15.4.17 The nominated undertaker will, insofar as reasonably practicable, ensure that flood risk is managed throughout the construction period and will consider flooding issues when planning sites and storing materials. If necessary, temporary provision would be made to reduce to the potential for impacts on existing land drainage systems during construction. Some of the specific measures referred to in the draft CoCP, include:

- preparation of flood risk assessments and method statements for temporary works, including main construction and satellite compound drainage, watercourse crossings and realignments and temporary realignments in consultation with the Environment Agency, and where applicable, the LLFA and other relevant regulators;
- location of storage, machinery, equipment and temporary buildings outside flood risk areas where reasonably practicable;
- construction of outfalls during periods of low flow to reduce the risk of scour and erosion;
- design of temporary watercourse realignments with equivalent hydraulic capacity to the existing channels, ensuring that field subsurface drainage systems can be adapted to discharge into the new channel; and
- having regard to the requirement for construction activities to avoid any increases in flood risk to vulnerable receptors.

15.4.18 In accordance with Section 16 of the draft CoCP, monitoring would also be undertaken in consultation with the Environment Agency and, where applicable, the LLFA, to ensure that temporary structures are installed, maintained and removed in accordance with the relevant environmental approvals and that impact on existing land drainage systems are managed appropriately.

Assessment of impacts and effects

15.4.19 This section describes the significant effects following the implementation of the avoidance and mitigation measures. The majority of the potential temporary impacts on the water environment during construction would be avoided or mitigated by the working methods outlined in the draft CoCP. The mitigation embedded into the design has focused on reducing permanent impacts resulting from the presence of the Proposed Scheme to as low a level as is reasonably practicable.

Temporary effects – Water resources and WFD

Surface water

15.4.20 Potential temporary impacts on surface water quality, due to site runoff and increased pollution risk, are a key concern during construction and have the potential to affect abstractions and the water environment more generally. However, the practices outlined in the draft CoCP are considered adequate to mitigate any impacts, such that there are unlikely to be any significant effects.

Groundwater

Aquifers

15.4.21 The proposed cuttings and tunnels, including Marston cutting, Whateley cutting, Wilnecote cutting, M42 junction 10 tunnel and M42 Stoneydelph cutting, in the study area would intersect the Mercia Mudstone Group Secondary B aquifer, the Warwickshire Group Halesowen Formation Secondary A aquifer, the superficial head and glacial till deposits and Secondary undifferentiated aquifers. Whilst there are likely to be minor localised impacts, the implementation of the measures outlined in the draft CoCP is likely to mean that any impacts on the overall status of these aquifers would not be significant.

15.4.22 Where cuttings could affect local receptors, such as groundwater abstractions or springs, this is reported in the sections below.

Abstractions

15.4.23 There is one licensed groundwater abstraction at Lea Marston Hotel, Marston. Due to the low hydraulic conductivity of the Sidmouth Mudstone encountered by the Marston cutting there are no expected impacts on this abstraction.

Groundwater - surface water interactions

15.4.24 There is the potential for baseflows to the drain north of the Wilnecote cutting and M42 junction 10 tunnel to be impacted whilst groundwater levels are lowered for the construction of these elements of the Proposed Scheme. This would result in a temporary minor impact on flow in the receiving Kettle Brook, which is a moderate

value receptor. This would result in a temporary minor adverse effect which would not be significant.

Water dependent habitats

15.4.25 Kettle Brook LNR is dependent on periodic flooding from Kettle Brook watercourse. As a result of flow potentially being temporarily reduced during the construction of Wilnecote cutting and M42 junction 10 tunnel, the flows reaching Kettle Brook LNR would also be affected. This would result in a minor impact on river levels connected to the LNR.

15.4.26 Whitacre Heath SSSI is located 1.7 km upstream of the Proposed Scheme which will be viaduct in its closest location and the construction of the Proposed Scheme is not anticipated to alter surface water or groundwater flow at the SSSI. Therefore, there will be no temporary surface water or groundwater impacts to Whitcare Heath SSSI.

15.4.27 Further details of the effects and associated other mitigation, are provided in Section 7, Ecology and biodiversity.

Temporary effects - flood risk and land drainage

15.4.28 Construction of the River Tame viaduct, A51 Tamworth Road realignment, A51 Kingsbury viaduct and Freasley embankment and the associated flood mitigation measures would require temporary working within flood zones. Construction sequencing and temporary works design would carefully consider and assess potential impacts on flood risk. Method statements detailing how these works would be undertaken will be produced by the nominated undertaker in consultation with the Environment Agency and the LLFA. It is not expected that these temporary activities would result in significant effects related to flood risk and land drainage.

15.4.29 Temporary access roads and construction compounds would cross ordinary watercourses and land drainage routes, including the A51 Tamworth Road satellite compound located across a tributary of Thistlewood Brook (2). Construction sequencing and temporary works design would be carefully considered and assessed in terms of potential impacts on flood risk. Method statements detailing how these works would be undertaken will be produced by the nominated undertaker in consultation with the LLFA. It is not expected that these temporary activities would result in significant effects related to flood risk and land drainage.

Permanent effects – water resources and WFD

15.4.30 Permanent effects are those initially caused by activity to construct the Proposed Scheme but which would also remain after the Proposed Scheme has been constructed and is present in the area.

Surface water

15.4.31 The A51 Tamworth Road realignment would require the installation of Thistlewood Brook Culvert beneath the embankment. This has potential to cause a minor localised impact on the hydromorphology of Thistlewood Brook, which is a high value receptor. This would potentially result in a moderate adverse effect, which would be significant.

15.4.32 Thistlewood Brook and the tributary of Thistlewood Brook (2) would be realigned. This has high potential to cause a minor localised impact on the hydromorphology of both Thistlewood Brook and the tributary, which are high and moderate value receptors respectively. This would potentially result in a moderate adverse effect on Thistlewood Brook, which is significant, and a minor adverse effect on the tributary of Thistlewood Brook (2), which would not be significant.

15.4.33 The A51 Tamworth Road would be permanently closed where it would cross the route of the Proposed Scheme, and a new section of open channel along Thistlewood Brook would be created following removal of the existing road. This is a minor beneficial impact on hydromorphology, resulting in a moderate beneficial effect, which would be significant.

15.4.34 Construction of the Freasley embankment would require a new culvert for Kettle Brook. This has the potential to cause a minor localised impact on the hydromorphology of the Kettle Brook, which is a moderate value receptor. This would potentially result in a minor adverse effect, which would not be significant.

15.4.35 Kettle Brook would be realigned in Kettle Brook LNR. This has the potential to cause a minor localised impact on the hydromorphology of Kettle Brook, which is a moderate value receptor. This would potentially result in a minor adverse effect, which would not be significant.

Groundwater

Aquifers

15.4.36 It is currently anticipated that implementation of the avoidance and mitigation measures would ensure that there are no permanent significant effects related to the impact of the proposed cuttings on water levels and quality in the aquifers intercepted by the Proposed Scheme. Where the impacts of the cuttings on the aquifers could affect additional local receptors that rely on the groundwater resource, for example springs and abstractions, the impacts on these have been assessed below.

Abstractions

15.4.37 The assessment has not identified any permanent significant effects on licensed groundwater abstractions.

Groundwater - surface water interactions

15.4.38 The Proposed Scheme may result in the permanent loss of the three potential spring features south of Body Moor Heath, central Kingsbury and near Cliff. These features are assumed to be high value receptors on a precautionary basis. The loss of these features would therefore potentially result in a permanent moderate adverse effect related to flows from this spring, which would be significant.

Permanent effects - flood risk and land drainage

15.4.39 With the provision of replacement floodplain storage areas along the route of the Proposed Scheme, no significant permanent effects have been identified in relation to fluvial flood risk. A detailed assessment of fluvial flood risk and replacement floodplain storage in the area will be undertaken and reported in the formal ES.

Water dependent habitats

15.4.40 The Proposed Scheme would not permanently impact on groundwater or surface flows or quality at Whitcare Heath SSSI or Kettle Brook LNR. There are no permanent hydrological impacts on these sites.

Other mitigation measures

15.4.41 Additional mitigation measures to further reduce the temporary and permanent impacts of construction stage activities, where there is potential for the Proposed Scheme to result in significant effects are described in the sections below.

Surface water

15.4.42 The embedded mitigation proposed in the realignments of the tributary of the River Tame (1) at Bodymoor Heath, Thistlewood Brook, Tributary of Thistlewood Brook (2) and Kettle Brook will be developed further in consultation with the Environment Agency.

15.4.43 The embedded mitigation proposed in the design of the culverts on the A51 Tamworth Road realignment for Thistlewood Brook and Freasley embankment for Kettle Brook will also be developed further in consultation with the relevant LLFA.

Groundwater

15.4.44 A survey of the three potential spring features south of Body Moor Heath, central Kingsbury and near Cliff will be undertaken to determine their value and to identify whether further mitigation is required due to construction. If they are confirmed as springs, measures would be implemented to re-establish these springs nearby if possible. If it is not possible to relocate the springs this would lead to a potentially significant adverse effect.

Groundwater - surface water interactions

15.4.45 Additional mitigation measures will be considered for the management of groundwater baseflows to Kettle Brook during excavation of the Wilnecote cutting located south-east of Tamworth and preceding the Kettle Brook embankment. Mitigation measures will be designed in detail following ground investigation and monitoring of surface water and groundwater levels. Mitigation could take the form of:

- a wider buffer strip, or shallower batter on the excavations;
- installation of a groundwater cut-off;
- creation of a temporary section of lined channel on Kettle Brook; and
- adoption of wet working techniques that avoid the need for dewatering.

15.4.46 Any such additional measures will be designed in consultation with the Environment Agency, NWBC and TBC acting as the LLFAs.

Summary of likely residual significant effects

15.4.47 In the absence of the other mitigation measures set out above, the Proposed Scheme would potentially result in residual significant effects as follows:

- a moderate adverse effect related to the installation of a new culvert of Thistlewood Brook, which is significant;
- a moderate adverse effect related to the installation of the local realignment of Thistlewood Brook, which is significant;
- a moderate beneficial effect related channel hydromorphology as a result of a new stretch of open channel from the removal of an existing highway culvert along Thistlewood Brook, which is significant; and
- moderate adverse effects related to the permanent loss of the three spring features south of Body Moor Heath, central Kingsbury and near Cliff, which are significant.

15.4.48 It is currently anticipated that it should be possible to develop the means of mitigating these impacts, to ensure that there are no residual significant effects arising from construction of the Proposed Scheme.

15.5 Effects arising from operation

Avoidance and mitigation measures

15.5.1 The principal issue of concern during operation of the Proposed Scheme is the potential for accidental spillages to occur that could result in the release of contaminants into the water environment. This issue has been assessed on a route-wide basis in Volume 3: Route-wide effects (Section 16), where the mitigation measures associated with this risk are described. A draft operation and maintenance plan for water resources and flood risk will be provided in the formal ES.

15.5.2 The design takes into account the policies in the NPPF and will aim to ensure that the Proposed Scheme is safe from flooding without increasing flood risk elsewhere. Evidence of application of the Sequential Test and Exception Tests in the NPPF is provided on a route-wide basis in Volume 3: Route-wide effects.

15.5.3 Sustainable drainage systems will be used where reasonably practicable. These will help to remove any suspended material within runoff from the Proposed Scheme through filtration, vegetative adsorption or settlement. The drainage systems proposed will aim to ensure that the quantity and quality of water draining from the Proposed Scheme during its operational phase would have a negligible impact on the water environment.

15.5.4 A summary of the route-wide WFD compliance assessment process is provided in Volume 3: Route-wide effects. This describes the ongoing assessment process and how measures will be embedded into the design that is specifically designed to ensure that the Proposed Scheme complies with the requirements of the WFD, where reasonably practicable. It is currently anticipated that the Proposed Scheme will be compliant with WFD legislation.

Assessment of impacts and effects

15.5.5 There are considered to be no significant adverse effects related to water resources and flood risk arising from operation of the Proposed Scheme.

Other mitigation measures

15.5.6 There are considered to be no further measures required to mitigate adverse effects on surface water resources, groundwater resources or flood risk.

Summary of likely residual significant effects

15.5.7 The assessment shows that there would be no residual significant effects on surface water, groundwater or flood risk during operation of the Proposed Scheme.

Monitoring

15.5.8 Volume 1, Section 9 sets out the general approach to monitoring of water resources and flood risk during operation of the Proposed Scheme.

15.5.9 There are no area-specific requirements for monitoring water resources and flood risk during operation of the Proposed Scheme.

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