High Speed Two Phase 2a: West Midlands to Crewe

Working Draft Environmental Impact Assessment Report

# Volume 2: Community Area report

# CA2: Colwich to Yarlet

September 2016

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Department for Transport

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# Structure of the working draft Environmental Impact Assessment Report

This document is part of the working draft Environmental Impact Assessment (EIA) Report for Phase 2a of the proposed High Speed Two (HS2) rail network between the West Midlands and Crewe (the Proposed Scheme). The working draft EIA Report sets out the current design of the Proposed Scheme, the likely environmental impacts (and, where possible, the potential likely significant environmental effects) of the construction and operation of the Proposed Scheme and proposed mitigation measures. The assessment will be updated for the formal EIA Report to reflect further work on the design, assessment and mitigation between now and when the hybrid Bill is deposited.

The working draft EIA Report documentation comprises the following:

## Non-technical summary

This provides a summary in non-technical language of:

- the Proposed Scheme and reasonable alternatives considered;
- the impacts of the Proposed Scheme (and where possible, the likely significant environmental effects), both beneficial and adverse; and
- the proposed means of avoiding, reducing or managing the likely significant adverse effects.

## Volume 1: Introduction and methodology

This provides:

- a description of HS2, the EIA process and the approach to consultation and engagement;
- details of the permanent features of the Proposed Scheme and generic construction techniques, based on the current level of design;
- a summary of the scope and methodology for the environmental topics; and
- a summary of the strategic, route-wide and route corridor alternatives to the scheme and local alternatives considered prior to November 2015.

Volume 1 also comprises a glossary of terms and list of abbreviations and two appendices which are listed below.

## Volume 2: Community area reports and map books

These cover the following community areas: 1 Fradley to Colton; 2 Colwich to Yarlet; 3 Stone and Swynnerton; 4 Whitmore Heath to Madeley; and 5 South Cheshire. The reports provide the following for each area:

- an overview of the area;
- a description of the construction and operation of the Proposed Scheme within the area, based on the current level of design;

- a summary of the local alternatives considered since November 2015;
- a description of the environmental baseline;
- a description of the environmental impacts of the Proposed Scheme (and where possible, the likely significant environmental effects), both beneficial and adverse; and
- the proposed means of avoiding, reducing or managing the likely significant adverse effects.

The maps relevant to the Colwich to Yarlet area are provided in a separate corresponding document entitled Volume 2, CA2 Map Book, which should be read in conjunction with this report. 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, to be read in conjunction with Section 11, Landscape and visual), noise contour maps (Map Series SV, to be read in conjunction with Section 13, Sound, noise and vibration) and maps showing key water features (Map Series WR, to be read in conjunction with Section 15, Water resources and flood risk).

## Volume 3: Route-wide effects

This describes the impacts and effects that are likely to occur at a geographical scale greater than the community areas described in Volume 2.

## Glossary of terms and list of abbreviations

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

## Appendix: Alternatives report

This describes the evolution of the Proposed Scheme and the reasonable alternatives considered.

## Appendix: Draft Code of Construction Practice (CoCP)

This sets out the measures and standards to provide effective planning, management and control of potential impacts on both individuals, communities and the environment during construction.

# 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 360kph (225 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, Birmingham and the West Midlands, which will become operational in 2026. It was the subject of an Environmental Statement (ES) deposited with the High Speed Two (London – West Midlands) Bill in 2013, and an ES deposited with Additional Provisions to that Bill in 2014 and 2015. The Bill is currently proceeding through Parliament with the aim of achieving Royal Assent by the end of 2016 and commencing construction in 2017.

1.1.3 Phase Two of HS2 would extend the line to the north-west and north-east: to Manchester with connections to the West Coast Main Line (WCML) at Crewe and Golborne, and to Leeds with a connection to the East Coast Main Line approaching York, completing what is known as the 'Y network'.

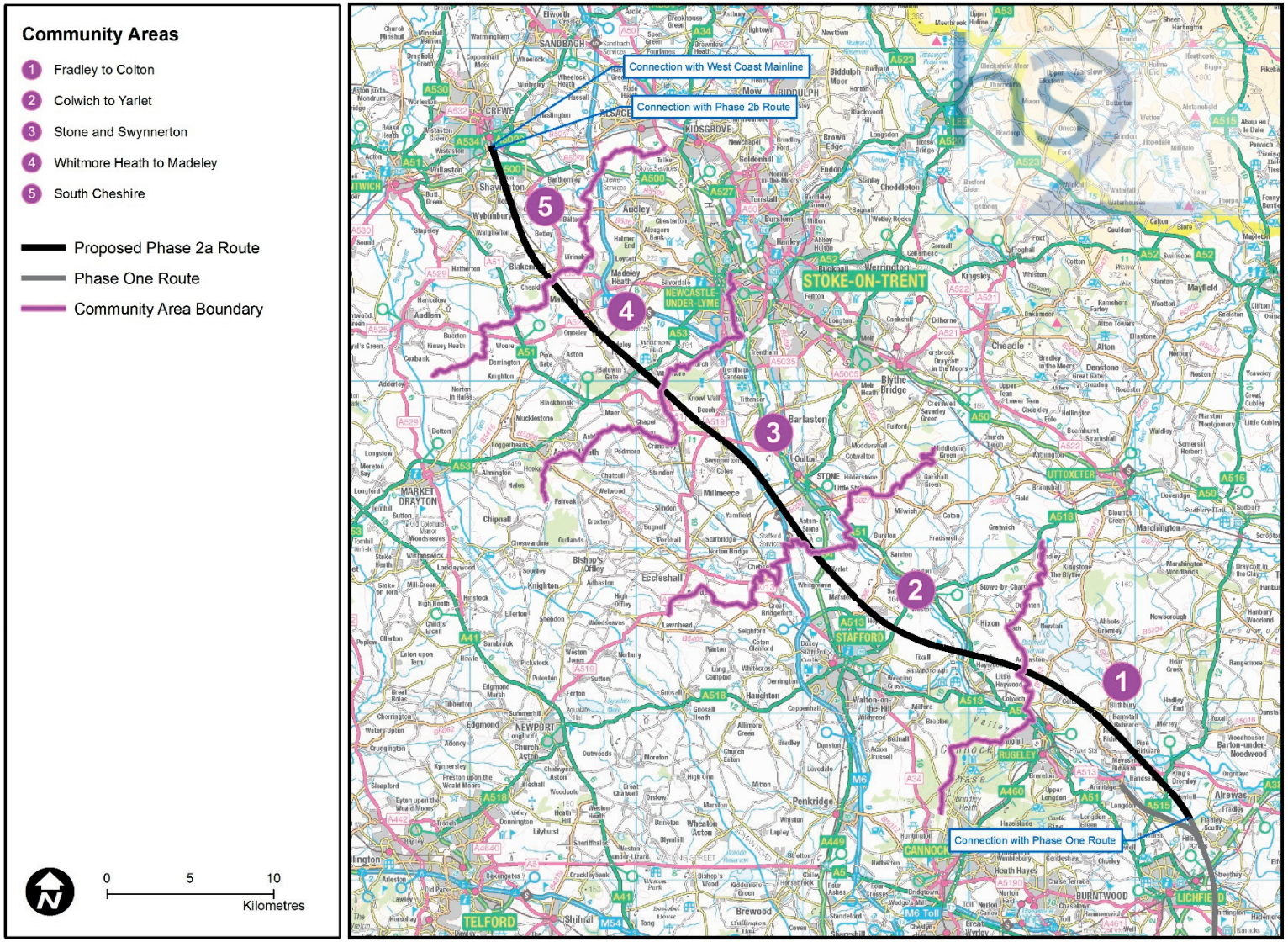
1.1.4 Phase 2a (the Proposed Scheme), the subject of this working draft Environmental Impact Assessment (EIA) Report[1], comprises the first section of the western leg of Phase Two, from the West Midlands to Crewe (approximately 60km (37 miles) in length). It would connect with Phase One near Fradley, to the north-east of Lichfield, and connect to the WCML south of Crewe, to provide onward services beyond the HS2 network, to the north-west of England and to Scotland. Construction of the Proposed Scheme would commence in 2020, ahead of the rest of Phase Two, with operation planned to start in 2027, one year after the opening of Phase One. This is six years earlier than originally planned, bringing some of the benefits of HS2 to the North sooner.

1.1.5 An announcement on the Phase Two route from Crewe to Manchester and from the West Midlands to Leeds, referred to as Phase 2b, is expected in Autumn 2016. Construction of Phase 2b would commence in approximately 2023, with operation planned to start around 2033.

1.1.6 The proposed Phase 2a route has been divided into five community areas (CAs), for environmental assessment and community engagement purposes. These are shown in Figure 1.

[1] Note that Parliament's Standing Order 27A makes reference to production of an environmental statement (ES). Under the EIA Directive 2014/52/EU, the output of the environmental assessment is an Environmental Impact Assessment (EIA) Report. This report uses the term EIA Report where referring to the output of the EIA. This 'working draft' EIA Report provides an initial environmental assessment of the current stage of design.

Figure 1: The HS2 Phase 2a route and community areas



## 1.2 Purpose of this report

1.2.1 This working draft EIA Report sets out the current design of the Proposed Scheme, the current environmental baseline information, and describes the likely impacts (and where practicable, the significant effects) of the construction and operation of the Proposed Scheme on the environment within the Colwich to Yarlet 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.

1.2.2 Consultation on the working draft EIA Report is being carried out early in the development of the Phase 2a proposals. This is to assist the 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 EIA Report. Developing a working draft EIA Report and consulting on it in advance of the statutory formal EIA Report 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 EIA Report, 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 EIA Report to be deposited in accordance with the requirements of Parliamentary Standing Order 27A (SO27A)[2,3]. It is possible that the effects and mitigation described in the formal EIA Report may differ from those presented in this working draft EIA Report, 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.

## 1.3 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;
- 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);

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

- cultural heritage (Section 7);
- ecology and biodiversity (Section 8);
- health (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 comprises:

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

1.3.3 Following consultation on this working draft EIA Report, the proposed mitigation measures may be amended to take account of design changes and comments received. Mitigation measures will be set out in full in the formal EIA Report.

1.3.4 Environmental effects have been assessed in accordance with the methodology set out in Volume 1 and the draft Scope and Methodology Report (SMR)[4]. The draft SMR was consulted on between March and May 2016 and subsequently updated to take into consideration comments received. The revised SMR is published alongside this working draft EIA Report, which will be used to develop the formal EIA Report.

1.3.5 The maps relevant to the Colwich to Yarlet area are provided in a separate corresponding document entitled Volume 2, CA2 Map Book, which should be read in conjunction with this report.

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; climate change, major accidents and natural disasters, and waste and material resources are addressed in Volume 3 on a route-wide basis.

[4] https://www.gov.uk/government/consultations/hs2-phase-two-west-midlands-to-crewe-draft-environmental-impact-assessment-scope-and-methodology-report-consultation

# 2 Overview of the area and description of the Proposed Scheme

## 2.1 Overview of the area

### General

2.1.1 The Colwich to Yarlet area covers an approximately 15km section of the Proposed Scheme passing through the parishes of Colwich, Ingestre with Tixall, Hopton and Coton, Marston and Whitgreave, within the local authority areas of Stafford Borough Council (SBC) and Staffordshire County Council (SCC). The boundary between Colton parish and Colwich parish forms the southern boundary of this section. The boundary between Whitgreave and Marston parishes and Stone Rural parish forms the northern boundary of this section.

2.1.2 As shown in Figure 2, the Fradley to Colton area (CA1) lies to the south and the Stone and Swynnerton area (CA3) lies to the north.

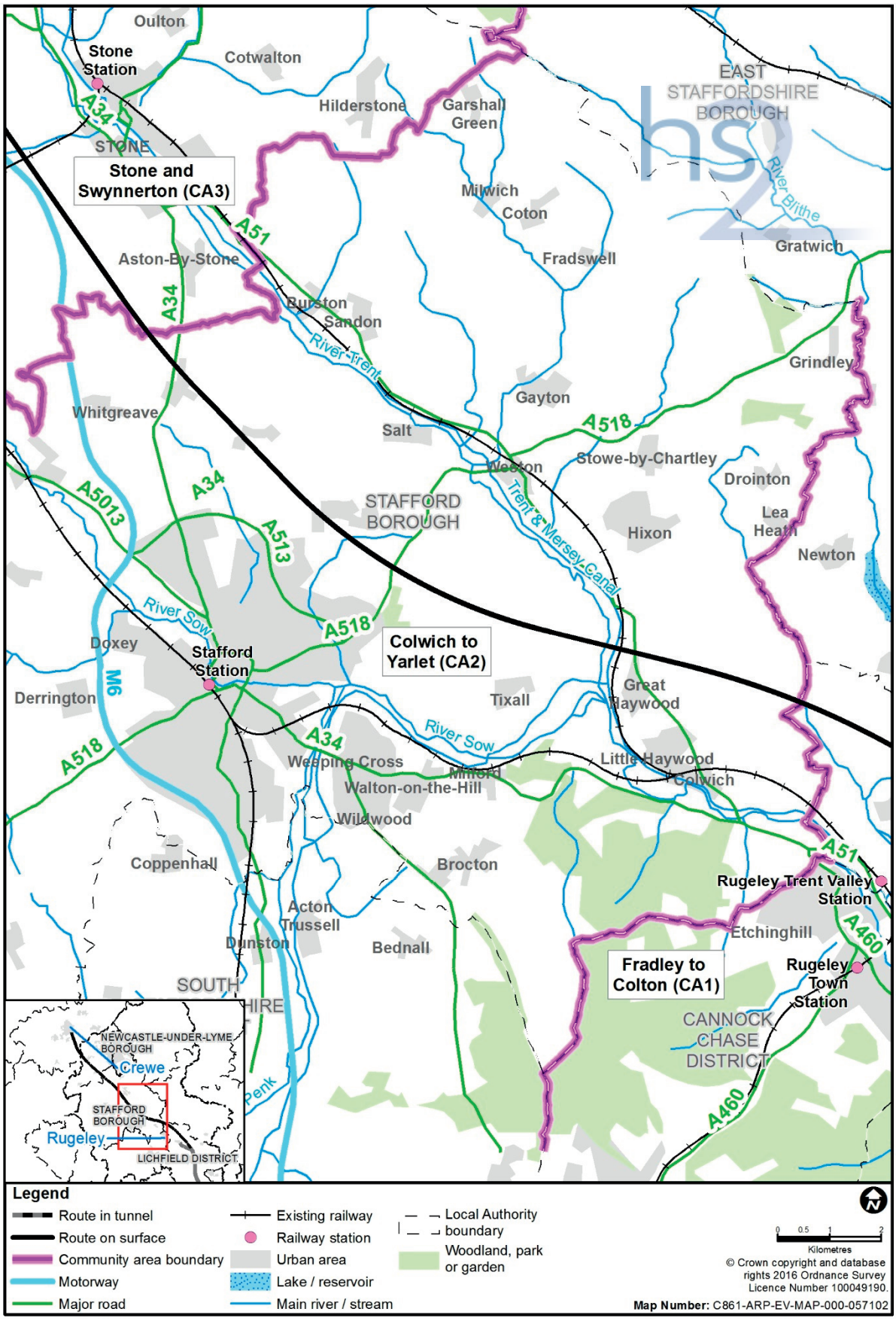
### Settlement, land use and topography

2.1.3 The Colwich to Yarlet area is predominantly rural in character, with agriculture being the main land use, interspersed with small villages and a scattering of isolated dwellings and farmsteads. The main residential areas are Little Haywood, Great Haywood and Stafford. Within the wider rural area there are a number of other residential areas, including Ingestre, Hopton, Marston and Yarlet.

2.1.4 In the southern part of the Colwich to Yarlet area, the route would pass approximately 40m from Grade II listed Moreton House, which is used as a residential site for a specialist school. The route would continue towards the floodplain of the River Trent and adjacent to Great Haywood Marina and cross the Trent and Mersey Canal and River Trent. The route would run adjacent to Ingestre Park and through Ingestre Park Golf Club, with Pasturefields Salt Marsh Site of Special Scientific Interest (SSSI) and Special Area of Conservation (SAC) approximately 1.2km north-east of the Proposed Scheme. The route would continue northwards through the southern part of the Staffordshire County Showground, which is used for community events. It would then continue through the settlement of Hopton and past a number of Ministry of Defence (MoD) residential properties.

2.1.5 The highest ground in the area is a ridge located towards the end of the area adjacent to the A34 Stone Road, which rises to approximately 140m above ordnance datum (AOD). Here, the route would run under the A34 Stone Road in cutting and past Yarlet towards Peasley Bank.

Figure 2: Area context map



## Key transport infrastructure

2.1.6 Principal highways within this area include the M6, A51 Lichfield Road, A518 Weston Road, A34 Stone Road, B5066 Sandon Road and A513 Beaconside, which provide links to Stafford and the wider transport network. The route would cross over the A51 Lichfield Road and beneath both the A34 Stone Road and A518 Weston Road. There would be a minor realignment of the A518 east of its current location. The route would cross over the existing Colwich to Macclesfield Railway and the Trent and Mersey Canal.

2.1.7 Within the area there are a number of footpaths, bridleways and local access roads that provide important links between scattered rural dwellings and villages throughout the area.

## Socio-economic profile

2.1.8 Within the SBC area there is a wide spread of business types reflecting a diverse range of commercial activities. The professional, scientific and technical sector accounts for the largest proportion of businesses (12%), with agriculture, forestry and fishing as the second largest (11%), followed by retail (10%) and construction (10%).

2.1.9 According to the Annual Population Survey (2015)[5], the employment rate[6] within the SBC area was 75% (62,000 people), and unemployment in the SBC area was 3.1%.

2.1.10 According to the Annual Population Survey (2015)[7], 41% of SBC area residents aged 16-64 were qualified to National Vocational Qualification Level 4 (NVQ4) and above, while 5% of residents had no qualifications.

## Notable community facilities

2.1.11 The main concentrations of community facilities are in the larger settlements of Little Haywood, Great Haywood and Stafford. Ingestre, Hopton, Marston and Yarlet are smaller villages and hamlets that are located closer to the Proposed Scheme, and provide a smaller number of local services.

2.1.12 Moreton is a small hamlet located approximately 1.5km north-east of Little Haywood. Moreton has a notable community facility, The Mayfield Children's Home in Moreton House, a children's home associated with Rugeley School. Ingestre is located approximately 2.4km north-west of Great Haywood, and 5km north-east of the centre of Stafford. It includes Ingestre Parish Church, which is historically linked with Ingestre Hall.

2.1.13 Hopton is a small village made up of approximately 160 residences, including an estimated 38 residences located within the secure MoD Stafford Barracks. Community facilities within the village include St Peter's Church, playing fields and a village hall. Marston and Yarlet are small adjoining hamlets that include two churches (one in each hamlet) and Yarlet School.

[5] Annual Population Survey, (2015), NOMIS, Accessed: 26 April 2016.
[6] The proportion of working age (16-64 year olds) residents that is in employment. Employment comprises the proportion of the total resident population who are 'in employment'.
[7] Annual Population Survey, (2015), NOMIS, Accessed: 26 April 2016.

## Recreation, leisure and open space

2.1.14 This is a predominantly rural area, with open space, woodland and some farmland. It is crossed by several public rights of way (PRoW), including the Trent and Mersey Canal Walk, Staffordshire Way, and Two Saints Way. Cannock Chase Area of Outstanding Natural Beauty (AONB) is located to the south of the route, and incorporates a wide range of outdoor recreational facilities, including Shugborough Park. Ingestre Hall is a residential arts centre located in the west of Ingestre. The remnants of the estate grounds form Ingestre Park Golf Club. Staffordshire County Showground is located to the north-east of Stafford, accessed from the A518 Weston Road. The Showground is a large agricultural events centre, which is of regional importance.

## Policy and planning context

### *Planning framework*

2.1.15 HS2 is not included or referred to in many local plans, given that it is being developed on a national basis to meet a national need. Relevant local plan documents and policies have nevertheless been considered in relation to environmental topics, as part of considering the Proposed Scheme in the local context.

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

- Adopted Plan for Stafford Borough 2011 - 2031 (2014)[8];
- Adopted Staffordshire and Stoke-on-Trent Minerals Local Plan 1994 - 2006 (saved policies) (1999)[9]; and
- Adopted Staffordshire and Stoke-on-Trent Joint Waste Core Strategy 2010 - 2026 (2013)[10].

2.1.17 Emerging policies are not generally included within this report unless a document has been submitted to the Secretary of State for approval. This is the case with the SBC Plan for Stafford Borough: Part 2 Publication Submission – 2015[11], which was submitted to the Secretary of State on 27 April 2016, and the new Minerals Local Plan for Staffordshire (2015 to 2030) - Submission Draft - June 2015[12], which was submitted to the Secretary of State on 8 January 2016.

2.1.18 There are a number of key planning designations in the area. These include conservation areas, listed buildings, important archaeological sites, historic parks and gardens and ancient woodland.

[8] http://www.staffordbc.gov.uk/live/Documents/Planning%20Policy/Plan%20for%20Stafford%20Borough/PFSB-Adoption.pdf
[9] https://www.staffordshire.gov.uk/environment/planning/policy/thedevelopmentplan/mineralslocalplan/MineralsLocalPlanadoptedsavedpolicieswebversion1.pdf
[10] https://www.staffordshire.gov.uk/environment/planning/policy/thedevelopmentplan/wastelocalplan/Adopted-Staffordshire-and-Stoke-on-Trent-Joint-Waste-Local-Plan-(2010-to-2026)-(adopted-March-2013).pdf
[11] http://www.staffordbc.gov.uk/live/Documents/Programme%20Officer/Programme%20Officer%202016/P2-A1-The-Plan-for-Stafford-Borough-Part-2---2015.pdf
[12] https://consultation.staffordshire.gov.uk/environment/staffordshire-minerals-local-plan/user_uploads/0100-the-new___---june-2015.pdf

### *Committed development*

2.1.19 Committed developments are defined as developments with planning permission or sites allocated in adopted development plans. Committed developments have not been considered in the assessment for the working draft EIA Report. Those within, or close to, the land required for the Proposed Scheme will be taken into account in the assessment described in the formal EIA Report.

## 2.2 Description of the Proposed Scheme

### General

2.2.1 The following section describes the main features of the Proposed Scheme in the Colwich to Yarlet area, including the proposed environmental mitigation measures that have been identified, based on the current level of design. Further generic 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 permanently for the Proposed Scheme is described in this section and is shown on Map Series CT-06. Land would also be required on a temporary basis for construction. This is set out in Section 2.3 and is shown on Map Series CT-05.

2.2.3 In general, features are described from south to north along the route, and east to west for features that cross the Proposed Scheme.

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

- review of the proposed lengths and heights of viaducts and other river crossing structures and associated replacement floodplain storage areas, following hydraulic modelling[13];
- temporary and permanent utility diversions;
- refinement of the realignment of roads and PRoW crossing the Proposed Scheme;
- refinement of drainage features required for rail and highways;
- refinement of maintenance access routes, access to balancing ponds;
- additional environmental features required to mitigate likely significant environmental effects;
- accommodation works and crossings of the route for private means of access;

[13] The design of viaducts is currently based on flood risk data received from third parties. The effects of any viaducts, bridges, embankments or other structures that intrude into floodplains would be assessed in detail and included in the hybrid Bill and formal EIA Report.

- refinement of construction compound and haul road locations; and
- refinement of auto-transformer station locations.

## Overview

2.2.5 The Proposed Scheme through the Colwich to Yarlet area would be approximately 15km long and lies within the SCC and SBC areas. The route would extend from west of Moreton in the south and travel north towards Hopton and on to Yarlet.

2.2.6 This section of route is illustrated on maps CT-06-209b to CT-06-219a in the Volume 2, CA2 Map Book.

## Colwich to Colwich Footpath 54 overbridge

2.2.7 The Proposed Scheme would continue from the Fradley to Colton area (CA1) north-west towards Moreton House. The first 600m of the route would be located on Moreton North embankment. The rest of this section would be within the Coley cutting and continue to the Colwich Footpath 54 overbridge.

2.2.8 This section of route is illustrated on maps CT-06-209b to CT-06-211 in the Volume 2, CA2 Map Book.

2.2.9 Key features of this approximately 2.4km section would include:

- Moreton North embankment, being approximately 700m in length, of which 100m is in the Fradley to Colton area and 600m is situated in the Colwich to Yarlet area, and up to approximately 6m in height;
- a balancing pond for railway drainage, west of the Proposed Scheme with access from the west via Bishton Lane;
- Moreton viaduct auto-transformer station to be located parallel to the Proposed Scheme on the opposite side to Moreton Grange Farm with access via Bishton Lane, Colwich Bridleway 23 accommodation overbridge and then south east along a new access track;
- Coley cutting, approximately 1.5km in length, between approximately 35m and 120m in width and approximately 5m to 20m in depth;
- Colwich Bridleway 23 accommodation overbridge for the permanent diversion of Colwich Bridleway 23, located approximately 200m south-east of Moreton House;
- Moreton retaining wall, approximately 190m in length and up to approximately 9m in height;
- Colwich Bridleway 35 overbridge for the permanent diversion of Colwich Footpath 36, which would be diverted for approximately 400m to the west of its current alignment;
- grassland habitat creation to the west of the route; and
- eight ecological mitigation ponds.

2.2.10 There would also be maintenance access routes and hedgerow planting throughout this section.

2.2.11 Construction of this section would be managed from the Moreton Brook viaduct satellite compound (in the Fradley to Colton area (CA1)) and the A51 main compound, which is described in Section 2.3, and shown on map CT-05-209b and map CT-05-212 in the Volume 2, CA2 Map Book.

## Colwich Footpath 54 overbridge to Mill Lane auto-transformer station

2.2.12 The route would continue from Colwich Footpath 54 overbridge to Mill Lane auto-transformer station, predominantly on the Trent South embankment. The northern end of this section would continue on the Great Haywood viaduct, approximately 700m in length.

2.2.13 This section of route is illustrated on maps CT-06-211 and CT-06-212 in the Volume 2, CA2 Map Book.

2.2.14 Key features of this approximately 2km section would include:

- Trent South embankment, approximately 1.4km in length and up to approximately 16m in height;
- Colwich Footpath 54 overbridge for the permanent realignment of Colwich Footpath 54 and permanent diversion of Colwich Footpath 26;
- noise barriers along the Proposed Scheme from approximately 250m after the Colwich Footpath 54 overbridge on the south side for approximately 1.4km and from the Great Haywood viaduct for approximately 500m on the northern side;
- two ecological mitigation ponds;
- Tolldish culvert through an embankment for approximately 200m along an unnamed water course;
- permanent diversion of Tolldish Lane by approximately 550m to the northern side of the Proposed Scheme;
- the permanent closure of Colwich Footpath 55;
- widening of the A51 Lichfield Road and construction of the A51 Lichfield Road underbridge;
- a high pressure gas diversion for the length of the Great Haywood viaduct, approximately 700m long from south-east to north-west;
- Great Haywood viaduct approximately 700m in length and up to approximately 17m in height across the Colwich to Macclesfield Railway, adjacent to Great Haywood Marina and across the Trent and Mersey Canal and the River Trent;
- permanent diversion of Hoo Mill Lane for approximately 100m to the northern side of the current road location;

- two balancing ponds for railway drainage west of the Proposed Scheme, with access from the west and east via the A51 Lichfield Road; and
- Mill Lane auto-transformer station, parallel to Ingestre Park Road and with access from the south via Mill Lane or Great Haywood Road.

2.2.15 There would also be maintenance access routes and hedgerow planting throughout this section.

2.2.16 Construction of this section would be managed from the A51 main compound, which is described in Section 2.3 and shown on Map CT-05-212 in the Volume 2, CA2 Map Book.

## Mill Lane auto-transformer station to Hanyards drop inlet culvert

2.2.17 The route would continue from Mill Lane auto-transformer station to Hanyards drop inlet culvert. The first part of the Proposed Scheme in this section would be located on Trent North embankment and continue into Brancote South cutting, followed by a very short section at ground level.

2.2.18 This section of route is illustrated on maps CT-06-212 to CT-06-214 in the Volume 2, CA2 Map Book.

2.2.19 Key features of this approximately 2.8km section would include:

- Trent North embankment, approximately 1.1km in length and up to approximately 10m in height;
- continuation of noise fence barriers along the east side of the Trent North embankment for 1km to the Brancote South cutting at Ingestre;
- two balancing ponds either side of the Proposed Scheme for railway drainage with access from the south via Mill Lane and Great Haywood Road, and access from the north via Ingestre Park Road and Hoo Mill Lane;
- diversion of an unnamed watercourse through Lionlodge culvert for approximately 100m;
- areas of woodland and grassland habitat creation to the east of Trent North embankment;
- Ingestre underbridge adjacent to Ingestre Park Golf Club;
- landscape mitigation bund approximately 500m in length and up to approximately 6m in height adjacent to Ingestre Park Golf Club;
- three ecological mitigation ponds;
- Brancote South cutting, approximately 1.5km in length, up to 100m in width and up to 16m in depth;
- permanent diversion of Tixall Footpath 0.1630(b) and permanent diversion of Tixall Bridleway 0.1628 over Tixall Bridleway 0.1628 accommodation overbridge;

- HS2 access road for railway maintenance from the Tixall Bridleway 0.1628 accommodation overbridge, approximately 400m long; and
- diversion of an unnamed watercourse through Hanyards drop inlet culvert[14] for approximately 150m with access from the east via Hanyards Lane.

2.2.20 There would also be maintenance access routes and hedgerow planting throughout this section.

2.2.21 Construction of this section would be managed from the Mill Lane satellite compound and Tixall Bridleway satellite compound, which are described in Section 2.3 and shown on maps CT-05-212 and CT-05-214 respectively.

### Hanyards drop inlet culvert to Sandon Road auto-transformer station

2.2.22 The route would continue from Hanyards drop inlet culvert to Sandon Road auto-transformer station. The Proposed Scheme in this section would be within Brancote North cutting with a short section continuing onto Hopton embankment. The route would then continue through Hopton South cutting.

2.2.23 This section of route is illustrated on maps CT-06-214 to CT-06-216 in the Volume 2, CA2 Map Book.

2.2.24 Key features of this approximately 3.1km section would include:

- Brancote North cutting, approximately 480m in length, approximately 30m in width and up to approximately 2m in depth;
- diversion of an unnamed watercourse for approximately 40m through Berryhill South culvert;
- Hopton embankment, approximately 300m in length and up to approximately 5m in height;
- Hopton South cutting, approximately 1.4km in length, up to 100m in width and up to approximately 16m in depth;
- landscape mitigation planting to the south-east of the A518 Weston Road overbridge;
- A518 Weston Road overbridge for the permanently realigned A518 Weston Road, adjacent to the Staffordshire County Showground;
- Berryhill North drop inlet culvert beneath the Proposed Scheme and the A518 Weston Road, with access from the A518 Weston Road;
- permanent diversion of Hopton and Coton Footpath 6 and permanent realignment of Hopton and Coton Footpath 24 via the Hopton and Coton Footpath 24 overbridge, 400m north-west of the A518 Weston Road;

[14] A drop inlet culvert comprises a circular pipe or rectangular box culvert, usually with an inlet weir and open stepped 'cascade' on the upstream side to dissipate energy. Drop inlet culverts are used when a watercourse (or dry valley) crosses the route or road in cutting or close to existing ground level.

- three balancing ponds for railway drainage, all on the western side of the Proposed Scheme, with one located approximately 250m south-east of the Hopton retaining wall; one adjacent to the Hopton retaining wall, both with access from the east via the A518 Weston Road; and one at Lower Bridge Farm, with access from the south via Mount Edge;
- diversion of a unnamed watercourse through Hopton culvert for approximately 50m;
- a retaining wall, approximately 300m in length and up to approximately 5m in height, which would also serve as a noise fence barrier for the residents of the village and would include associated landscaping adjacent to Hopton;
- noise fence barriers at a height of approximately 1m on top of the Hopton retaining wall for approximately 600m and at the northern end of Hopton to Sandon Road for approximately 400m;
- permanent diversion of Hopton Lane south-east towards Hopton for approximately 1km;
- landscape mitigation bunds;
- two ecological mitigation ponds;
- permanent diversion of Mount Edge for approximately 200m, 100m south of its existing location; and
- Sandon Road auto-transformer station on the western side of the Proposed Scheme adjacent to Lower Bridge Farm with access from the south via the diverted Mount Edge.

2.2.25 There would also be maintenance access routes and hedgerow planting throughout this section.

2.2.26 Construction of this section would be managed from the A518 satellite compound, and Sandon Road satellite compound, which are described in Section 2.3 and shown on maps CT-05-215 and CT-05-216 in the Volume 2, CA2 Map Book.

### Sandon Road auto-transformer station to Marston Lane underbridge

2.2.27 The route would continue from Sandon Road auto-transformer station to Marston Lane underbridge. The Proposed Scheme would be located in the Hopton North cutting for approximately 1km. The route would then continue on Marston South embankment past Marston.

2.2.28 This section of route is illustrated on maps CT-06-216 to CT-06-218 in the Volume 2, CA2 Map Book.

2.2.29 Key features of this 2.3km section would include:

- Hopton North cutting, approximately 1km in length and between approximately 8m and 14m in depth and up to approximately 90m in width;
- B5066 Sandon Road overbridge accommodating the permanently realigned B5066 Sandon Road, with associated landscaping for approximately 600m;

- Sandon Road drop inlet culvert and three other associated culverts, provided beneath highway diversions adjacent to Sandon Road;
- permanent diversion of Hopton and Coton Bridleway 11 and permanent diversion of Hopton and Coton Bridleway 16 across Hopton and Coton Bridleway 11 accommodation overbridge;
- Marston South embankment, approximately 1km in length and up to approximately 10m in height;
- Marston Bridleway 8 accommodation underbridge;
- Marston culvert for the diversion of an unnamed watercourse for approximately 250m;
- noise fence barriers from 300m south of Marston Bridleway 8 to Marston Lane underbridge for approximately 450m;
- two balancing ponds for railway drainage at Marston and adjacent to Marston Lane, with access from the south-east and north-west via Marston Lane;
- permanent diversion of Marston Lane up to approximately 250m north of its current location;
- Marston Lane underbridge for the permanently diverted Marston Road for approximately 800m; and
- two ecological mitigation ponds.

2.2.30 There would also be maintenance access routes and hedgerow planting throughout this section.

2.2.31 Construction of this section would be managed from the Sandon Road satellite compound and Marston Lane satellite compound, which are described in Section 2.3 and shown on Maps CT-05-216 and CT-05-217 in the Volume 2, CA2 Map Book.

## Marston Lane underbridge to Yarlet

2.2.32 The route would continue from Marston Lane underbridge on the Marston North embankment to the northern boundary of the Colwich to Yarlet area, ending approximately 1km north-west of Yarlet. The Proposed Scheme would continue in Yarlet South cutting, past Yarlet, and at the A34 Stone Road it would enter Yarlet Central cutting. It would then continue in shallow cutting for approximately 770m until the end of the Colwich to Yarlet area at the boundary with the Stone and Swynnerton area (CA3).

2.2.33 This section of route is illustrated on maps CT-06-218 and CT-06-219a in the Volume 2, CA2 Map Book.

2.2.34 Key features of this 2.5km section would include:

- Marston South embankment, approximately 1km in length and up to approximately 3m in height;

- landscape bund approximately 1.2km in length along the west side of the Proposed Scheme;
- permanent diversion of Marston Footpath 2 for approximately 250m to Marston Lane to cross Marston Lane underbridge;
- diversion of an unnamed watercourse through Yarlet Wood drop inlet culvert for 250m with access from the A34 Stone Road;
- Yarlet South cutting approximately 1.2km in length, up to 115m in width and up to 19m in depth;
- one balancing pond for railway drainage south-east of Yarlet, with access from the east via the A34 Stone Road;
- six ecological mitigation ponds;
- Yarlet auto-transformer station, west of the Proposed Scheme and adjacent to the A34 Stone Road, with access from the west via the A34 Stone Road;
- A34 Stone Road overbridge for the A34 Stone Road in a north-south direction across the Proposed Scheme; and
- Peasley Bank drop inlet culvert for the diversion of an unnamed watercourse.

2.2.35 There would also be maintenance access routes and hedgerow planting throughout this section.

2.2.36 Construction of this section would be managed from the A34 East satellite compound and A34 West satellite compound, which are described in Section 2.3 and shown on Map CT-05-219a in the Volume 2, CA2 Map Book.

## 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 Colwich to Yarlet area. It includes:

- an overview of the construction process;
- a description of the advance works;
- a description of the engineering works to build the Proposed Scheme;
- information on construction waste and material resources;
- a description of how the Proposed Scheme would be commissioned; and
- an indicative construction programme.

2.3.2 The construction arrangements described in this section provide the basis for the assessment presented in this working draft EIA Report.

2.3.3 Land would be required permanently for the key features of the Proposed Scheme described in Section 2.2. Land would also be required temporarily for construction. Key temporary construction features are illustrated on the construction Maps Series CT-05 (Volume 2, CA2 Map Book). Land required temporarily would be prepared for

its eventual end use once the construction works in that area are complete. Land would be returned to its pre-construction use, wherever appropriate, or to a condition as agreed with the owner of the land and the relevant planning authority.

2.3.4 During the construction phase, public roads and PRoW routes would be retained wherever reasonably practicable. Where such routes would cross the Proposed Scheme and require diversion, the alternative road or PRoW crossing the Proposed Scheme would normally 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.

2.3.5 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

2.3.6 All contractors would be required to comply with a Code of Construction Practice (CoCP). In addition, Local Environmental Management Plans (LEMPs) would be produced for each local authority area. The CoCP and LEMPs would be the means of controlling the construction works associated with the Proposed Scheme, with the objective of ensuring that the effects of the works on people and the natural environment are reduced as far as reasonably practicable. The CoCP will contain generic control measures and standards to be implemented throughout the construction process.

2.3.7 A draft CoCP has been prepared and is published alongside this document, as an appendix to Volume 1. It will remain under review as the design of the Proposed Scheme develops and further engagement with stakeholders is undertaken.

## Overview of the construction process

2.3.8 Building and preparing the Proposed Scheme for operation would 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.

2.3.9 General information about the construction process is set out in more detail in Volume 1, Section 6, including:

- the approach to environmental management during construction and the role of the CoCP;
- working hours;
- management of construction traffic; and
- handling of construction materials.

## Advance works

2.3.10 General information about advance works can be found in Volume 1, Section 6. Advance works would 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;
- 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*

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

2.3.12 The installation of track in open areas would comprise the laying of ballast and/or slab tracks, rail and sleepers.

2.3.13 The construction of the Proposed Scheme would be subdivided 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. Compounds would either be used for civil engineering works, for railway installation works, or for both.

2.3.14 One main civil engineering compound would be located in the Colwich to Yarlet area, with seven civil engineering satellite compounds, three of which would continue to be used as railway installation satellite compounds following the completion of civil engineering works at those compounds.

2.3.15 Satellite compounds for railway systems works would be managed from the Stone railhead main compound (see Volume 2, CA3 Stone and Swynnerton).

2.3.16 Figure 3 shows the management relationship for civil engineering works compounds and Figure 4 for the railway installation works. Details about individual compounds are provided in subsequent sections of this report.

### *General overview of construction compounds*

2.3.17 The main compound 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 limited numbers of staff, local storage for plant and materials, limited car parking for staff and site operatives, and welfare facilities.

2.3.19 The storage of soil, stripped as part of the works prior to it being re-used when the land is reinstated, requires land for the duration of construction. The location of soil storage areas would generally be adjacent to compounds and areas of construction activity.

2.3.20 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 and transfer nodes*

2.3.21 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. Construction traffic would also utilise the existing rail network. The construction compounds would provide the interface between the construction works and the public road or rail network. The likely road routes to access compounds in the Colwich to Yarlet area are described in the subsequent sections of this report.

2.3.22 Where reasonably practicable, movements between the construction compounds and the work sites would be on designated haul roads within the site, often along the line of the route of the Proposed Scheme or running parallel to it.

2.3.23 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 are referred to as transfer nodes and are shown on maps CT-05-209b to CT-05-219a in the Volume 2, CA2 Map Book.

Figure 3: Construction compounds showing key indicative civil engineering works within the Colwich to Yarlet area

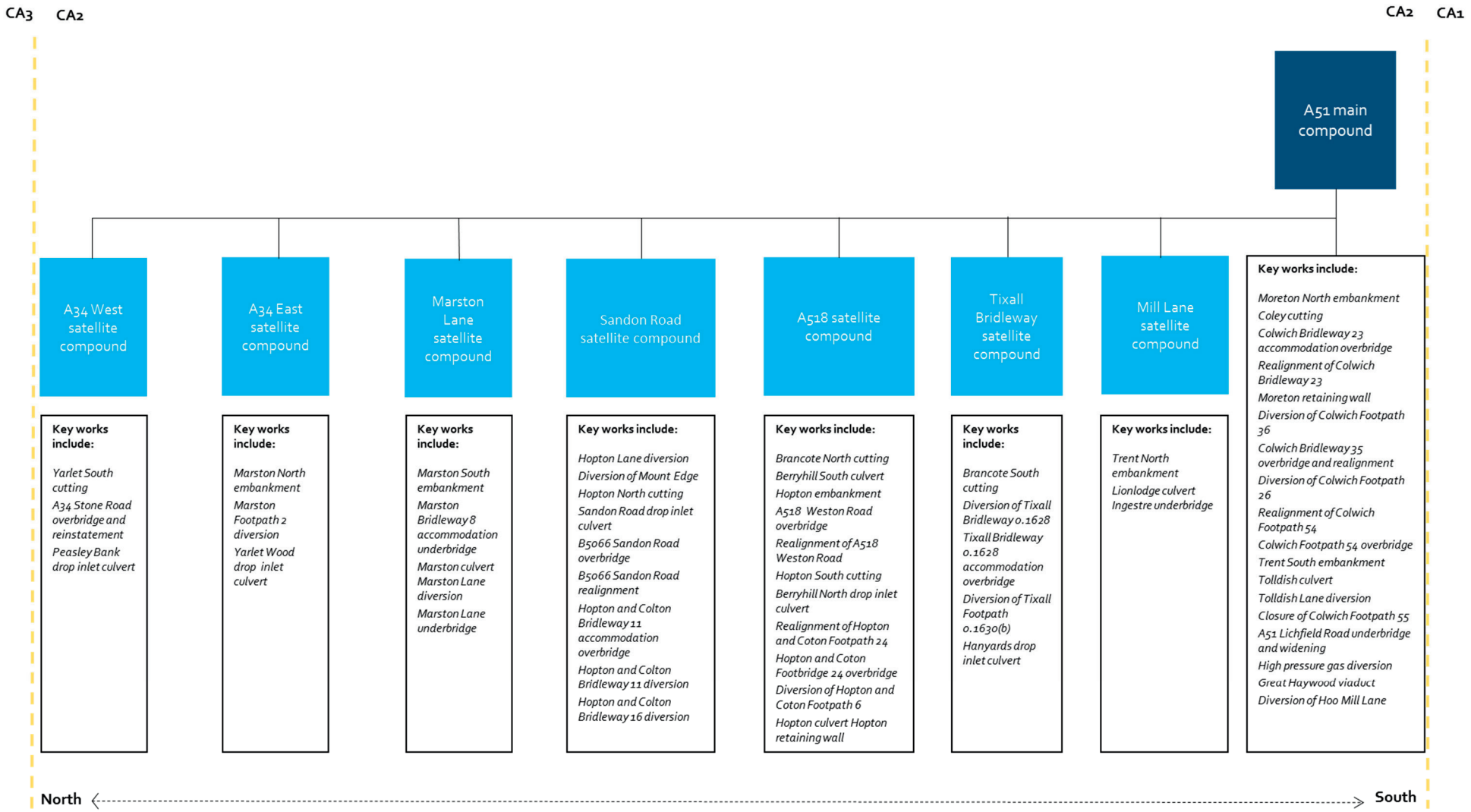
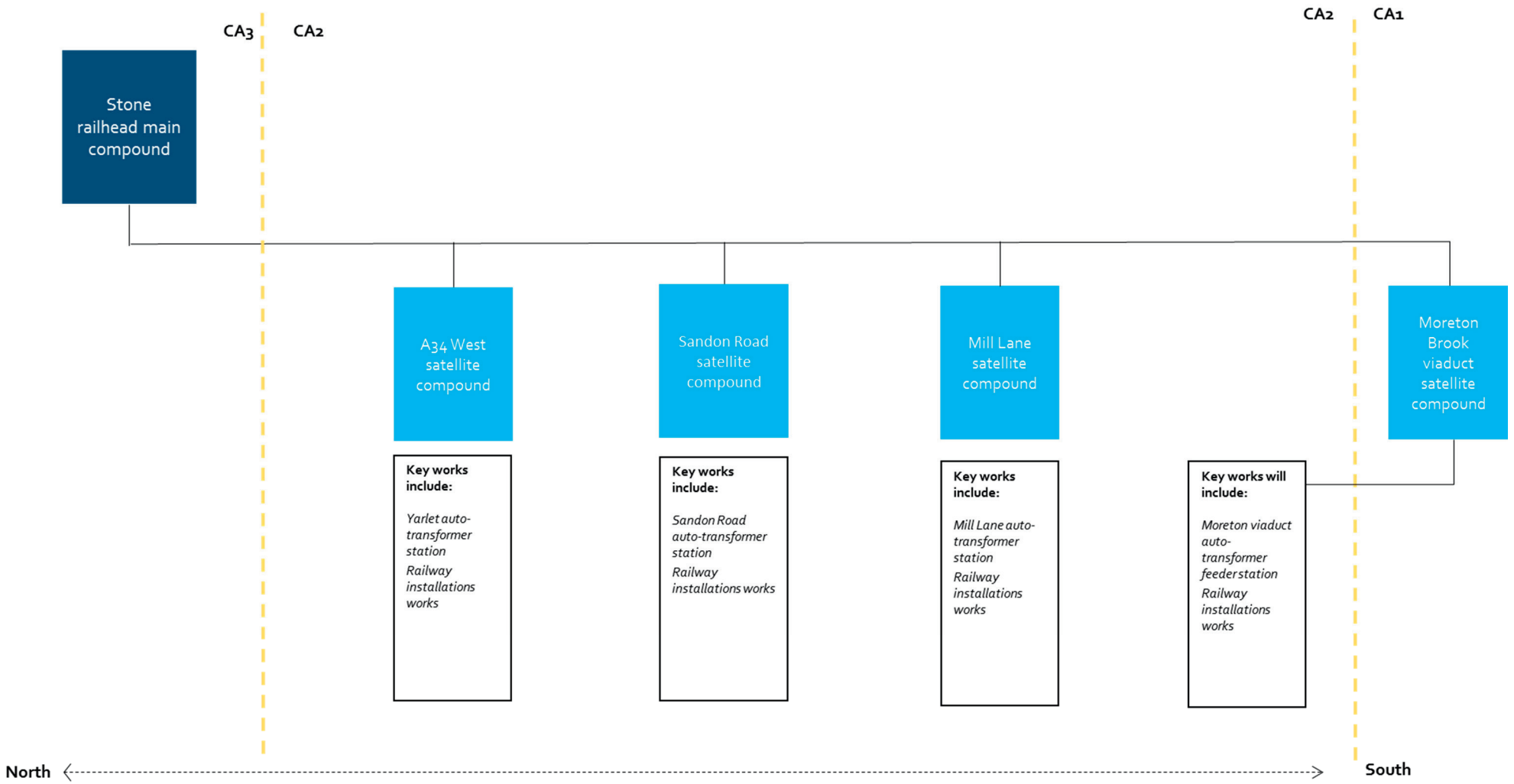


Figure 4: Construction compounds for railway installation works showing key indicative works within the Colwich to Yarlet area



### *Moreton Brook viaduct satellite compound*

2.3.24 This satellite compound (see Map CT-05-209b) is located within the Fradley to Colton area (CA1). The compound would be used to manage the construction of Moreton viaduct auto-transformer station.

### *A51 main compound*

2.3.25 This compound would provide for civil engineering works and support the satellite compounds in the Colwich to Yarlet area and Fradley to Colton area (CA1) (shown on map CT-05-212) and would:

- be operational for approximately six years and nine months, commencing during 2020;
- support approximately 200 civil engineering workers per day (approximately 300 workers at peak times) throughout much of the works period;
- be accessed via the A51 Lichfield Road, approximately 400m from where the A51 Lichfield Road crosses the Proposed Scheme; and
- provide main compound support to seven satellite compounds in the Colwich to Yarlet area, as illustrated in Figure 3 for the civil engineering works. The A51 main compound would also support ten satellite compounds in the Fradley to Colton area.

2.3.26 The compound would be used to manage the construction of the following works:

- Moreton North embankment;
- Coley cutting;
- Moreton viaduct auto-transformer station;
- Colwich Bridleway 23 realignment;
- Colwich Bridleway 23 overbridge;
- Moreton retaining wall;
- Colwich Bridleway 35 overbridge;
- Trent South embankment;
- Colwich Footpath 54 overbridge;
- Tolldish culvert;
- Tolldish Lane diversion;
- A51 Lichfield Road underbridge;
- A51 Lichfield Road widening;
- diversion of a high pressure gas main;
- Great Haywood viaduct;

- Colwich Footpaths 36, 26 and 54 diversions;
- Colwich Bridleways 23 and 35 diversions;
- Hoo Mill Lane diversion;
- railway systems installations; and
- finalisation works including site reinstatement, landscaping and planting.

2.3.27 It is currently anticipated that the demolition of the following buildings and structures would be required as a result of the works to be managed from this compound:

- one residential farmhouse, on Tolldish Lane;
- one residential two storey brick building, on Tolldish Lane;
- two single storey, steel frame commercial/offices;
- two equestrian single storey, steel frame buildings;
- one single storey steel frame barn; and
- three single storey, steel frame outbuildings.

2.3.28 Diversion of the following public roads would be required as a result of the works to be managed from this compound:

- permanent diversion of Tolldish Lane to the eastern side of the Proposed Scheme, approximately 200m away from the current alignment and rejoining approximately 500m from the A51 Lichfield Road; and
- widening of the A51 Lichfield Road, with users diverted under the Proposed Scheme via the A51 Lichfield underbridge, and regrading of the road for approximately 750m.

2.3.29 It is currently anticipated that the following works to PRoW would be required as a result of the works to be managed from this compound:

- permanent diversion of Colwich Bridleway 23 via Moreton Grange towards Moreton House on the Colwich Bridleway 23 accommodation overbridge;
- permanent closure of Colwich Footpath 55;
- a high pressure gas diversion;
- permanent diversion of Colwich Bridleway 35 north-east across the Proposed Scheme on the Colwich Bridleway 35 overbridge;
- permanent realignment of Colwich Footpath 54 to the south of its current alignment via Colwich Footpath 54 overbridge;
- permanent diversion of Colwich Footpath 36 to the west of its current alignment via Colwich Bridleway 35 overbridge; and
- permanent diversion of Colwich Footpath 26 to the east of its current alignment via Colwich Footpath 54 overbridge.

2.3.30 Diversion of an unnamed watercourse would be required through Tolldish culvert for approximately 200m in an east-west direction.

2.3.31 Diversion of a high pressure gas main would be required, diverting it to the north of the Proposed Scheme for approximately 1.5km.

### *Mill Lane satellite compound*

2.3.32 This compound would provide for civil engineering and railway systems works and would:

- be operational for approximately six years and nine months, commencing during 2020;
- support up to approximately 20 civil engineering workers per day (approximately 25 workers at peak times) throughout much of the works period;
- support approximately 30 railway systems staff on average per day (approximately 40 workers at peak times);
- be accessed via Great Haywood Road or Hoo Mill Lane;
- be managed from the A51 main compound for civil engineering works; and
- be managed from Stone railhead main compound for railway systems works.

2.3.33 The compound would be used to manage the construction of the following works:

- Trent North embankment;
- Mill Lane auto-transformer station;
- Lionlodge culvert;
- Ingestre underbridge;
- railway systems installations; and
- finalisation works including site reinstatement, landscaping and planting.

2.3.34 It is currently anticipated that no demolition would be required as a result of the works to be managed from this compound.

2.3.35 Permanent diversion of Hoo Mill Lane approximately 20m east of its existing location for 100m would be required as a result of the works to be managed from this compound.

2.3.36 A permanent diversion of an unnamed watercourse would be required through Lionlodge culvert in a north-south direction.

2.3.37 It is currently anticipated that no diversions of PRoW or utilities would be required as a result of the works to be managed from this compound.

### *Tixall Bridleway satellite compound*

2.3.38 This compound would provide for civil engineering works and would:

- be operational for approximately four years and six months, commencing during 2020;
- support approximately 25 civil engineering workers per day (approximately 40 workers at peak times) throughout much of the works period;
- be accessed via Hanyards Lane; and
- be managed from the A51 main compound for civil engineering works.

2.3.39 The compound would be used to manage the construction of the following works:

- Brancote South cutting;
- Tixall Footpath 0.1630(b) diversion;
- Tixall Bridleway 0.1628 accommodation overbridge and diversion;
- Hanyards drop inlet culvert; and
- finalisation works including site reinstatement, landscaping and planting.

2.3.40 It is currently anticipated that demolition of one residential farmhouse, on Hanyards Lane, and three single storey, steel frame barns, would be required as a result of the works to be managed from this compound.

2.3.41 Tixall Bridleway 0.1628 would be permanently diverted over the Proposed Scheme via a new overbridge, approximately 100m from its current alignment. The diversion would be approximately 600m in length. Tixall Footpath 0.1630(b) would be permanently diverted up to 250m south of its current location and would cross the Proposed Scheme on Tixall Bridleway 0.1628 accommodation overbridge.

2.3.42 A diversion of an unnamed watercourse would be required through Hanyards Lane drop inlet culvert in a north-south direction.

2.3.43 It is currently anticipated that no diversions of roads or utilities would be required as a result of the works to be managed from this compound.

### *A518 satellite compound*

2.3.44 This compound would provide for civil engineering works and would:

- be operational for approximately four years and six months, commencing during 2020;
- support approximately 25 civil engineering workers per day (approximately 40 workers at peak times) throughout much of the works period;
- be accessed via the A518 Weston Road; and
- be managed from the A51 main compound for civil engineering works.

2.3.45 The compound would be used to manage the construction of the following works:

- Brancote North cutting;
- Hopton embankment;

- Berryhill (south) culvert;
- Hopton South cutting;
- A518 Weston Road realignment and overbridge;
- Berryhill North drop inlet culvert;
- Hopton and Coton Footpath 24 diversion;
- Hopton and Coton Footpath 24 overbridge;
- Hopton and Coton Footpath 6 diversion;
- Hopton retaining wall;
- Hopton culvert; and
- finalisation works including site reinstatement, landscaping and planting.

2.3.46 It is currently anticipated that the demolition of one residential farmhouse, on Weston Road accessed via Trent Walk, and a single storey, steel frame barn would be required as a result of the works to be managed from this compound.

2.3.47 Permanent realignment of the A518 Western Road, approximately 10m west of the current alignment, would be required as a result of the works to be managed from this compound. The total length of the realignment would be approximately 900m.

2.3.48 This compound would be used to construct temporary alternative routes and permanent diversion of the Hopton and Coton Footpath 24, which would cross the Proposed Scheme heading north for 400m to join the current Hopton and Coton Footpath 6.

2.3.49 Hopton and Coton Footpath 6 would be diverted approximately 200m south of the Proposed Scheme, heading east for approximately 400m towards the Hopton and Coton Footpath 6 overbridge. To the north of the Proposed Scheme, Hopton and Coton Footpath 6 would be diverted west from the overbridge along the top of Hopton South cutting for approximately 200m. It would then head north for approximately 250m to the existing Hopton and Coton Footpath 6 and Hopton and Coton Footpath 7.

2.3.50 It is currently anticipated that permanent diversion of the following watercourses would be required as a result of the works to be managed from this compound:

- an unnamed watercourse would be diverted via Berryhill South culvert, by approximately 200m from its current location south across both the A518 Western Road and the Proposed Scheme; and
- an unnamed watercourse would be diverted via Hopton culvert across the Proposed Scheme for approximately 50m to the west.

2.3.51 It is currently anticipated that no utilities diversions would be required as a result of the works to be managed from this compound.

### *Sandon Road satellite compound*

2.3.52 This compound would provide for civil engineering works and railway systems works predominantly for the construction of the central section of the Colwich to Yarlet area. The compound would:

- be operational for approximately six years and nine months, commencing during 2020;
- support approximately 25 civil engineering workers per day (approximately 40 workers at peak times) throughout much of the works period;
- support approximately 30 railway systems staff on average per day (approximately 40 workers at peak times);
- be accessed via Sandon Road;
- be managed from the A51 main compound for civil engineering works; and
- be managed from Stone railhead main compound for railway systems works.

2.3.53 The compound would be used to manage the construction of the following works:

- Hopton North cutting and retaining wall;
- Hopton Lane diversion;
- Sandon Road auto-transformer station;
- Sandon Road drop inlet culvert;
- B5066 Sandon Road realignment;
- B5066 Sandon Road overbridge;
- Hopton and Coton Bridleway 11 accommodation overbridge;
- Hopton and Coton Bridleway 16 diversion;
- Mount Edge diversion;
- railway systems installation works; and
- finalisation works including site reinstatement, landscaping and planting.

2.3.54 It is currently anticipated that the demolition of four residential two storey brick buildings and three residential cottages, all on Hopton Lane, would be required as a result of the works to be managed from this compound.

2.3.55 It is currently anticipated that the following works to public highways would be required as a result of the works to be managed from this compound:

- permanent diversion of Hopton Lane, approximately 350m north of the current alignment along the Sandon Road. The diversion would be approximately 550m in length;

- permanent diversion of Mount Edge, approximately 100m south of the current alignment for approximately 200m; and
- permanent realignment of the B5066 Sandon Road for a total of approximately 900m via the B5066 Sandon Road overbridge.

2.3.56 A temporary alternative route and permanent diversion of the Hopton and Coton Bridleway 11 over Hopton and Coton Bridleway 11 accommodation overbridge would be required as a result of the works to be managed from this compound. A permanent diversion of Hopton and Coton Bridleway 16 200m south of its current location via the Hopton and Coton Bridleway 11 accommodation overbridge would also be required.

2.3.57 A permanent diversion of an unnamed watercourse would be required as a result of the works to be managed from this compound, diverting through Sandon Road drop inlet culvert (three separate culverts) in a north-south direction for a total length of approximately 450m.

2.3.58 It is currently anticipated that no temporary closures of roads or utilities diversions would be required as a result of the works to be managed from this compound.

### *Marston Lane satellite compound*

2.3.59 This compound would provide for civil engineering works and would:

- be operational for approximately four years and six months, commencing during 2020;
- support approximately 25 civil engineering workers per day (approximately 30 workers at peak times) throughout much of the works period;
- be accessed via Marston Lane; and
- be managed from the A51 main compound for civil engineering works.

2.3.60 The compound would be used to manage the construction of the following works:

- Marston South embankment;
- Marston Bridleway 8 accommodation underbridge;
- Marston culvert;
- Marston Lane underbridge and diversion; and
- finalisation works including site reinstatement, landscaping and planting.

2.3.61 It is currently anticipated that the demolition of four steel frame outbuildings would be required as a result of the works to be managed from this compound:

2.3.62 Permanent diversion of Marston Lane would be required, approximately 250m north of the current alignment for approximately 900m.

2.3.63 Permanent diversion of the Marston Bridleway 8 for approximately 60m via the Marston Bridleway 8 accommodation overbridge over the Proposed Scheme.

2.3.64 A diversion of a watercourse would be required through the Marston culvert for approximately 300m across the Proposed Scheme in an east-west direction.

2.3.65 It is currently anticipated that no utilities diversions would be required as a result of the works to be managed from this compound.

### *A34 East satellite compound*

2.3.66 This compound would provide for civil engineering works and would:

- be operational for approximately four years and six months, commencing during 2020;
- support approximately 20 civil engineering workers per day (approximately 25 workers at peak times) throughout much of the works period;
- be accessed via the A34 Stone Road eastbound (dual carriageway); and
- be managed from the A51 main compound for civil engineering works.

2.3.67 The compound would be used to manage the construction of the following works:

- Marston North embankment;
- Yarlet Wood drop inlet culvert; and
- finalisation works including site reinstatement, landscaping and planting.

2.3.68 It is currently anticipated that no demolitions would be required as a result of the works to be managed from this compound.

2.3.69 Diversion of an unnamed watercourse would be required through Yarlet Wood drop inlet culvert in a west-east direction for 200m.

2.3.70 It is currently anticipated that no temporary or permanent diversions of roads, PRoW or utilities would be required as a result of the works to be managed from this compound.

### *A34 West satellite compound*

2.3.71 This compound would provide for civil engineering and railway systems installations works and would:

- be operational for approximately six years and nine months, commencing during 2020;
- support approximately 20 civil engineering workers per day (approximately 30 workers at peak times) throughout much of the works period;
- support approximately 30 railway systems staff on average per day (approximately 40 workers at peak times);
- be accessed via the A34 Stone Road westbound (dual carriageway);
- be managed from the A51 main compound for civil engineering works; and
- be managed from Stone railhead main compound for railway systems works.

2.3.72 The compound would be used to manage the construction of the following works:

- Yarlet South cutting;

- A34 Stone Road overbridge;
- A34 Stone Road roadworks;
- Yarlet auto-transformer station;
- Peasley Bank drop inlet culvert;
- railway installation works; and
- finalisation works including site reinstatement, landscaping and planting.

2.3.73 It is currently anticipated that the demolition of two residential farmhouses, located in Yarlet, and two steel frame outbuildings would be required as a result of the works to be managed from this compound.

2.3.74 During construction of the A34 Stone Road overbridge, temporary traffic management measures would be implemented on the A34 Stone Road.

2.3.75 Permanent diversion of an unnamed watercourse would be required through the Peasley Bank drop inlet culvert as a result of the works to be managed from this compound.

2.3.76 It is currently anticipated that no temporary or permanent diversions of roads, PRoW or utilities would be required as a result of the works to be managed from this compound.

## Construction waste and material resources

2.3.77 Excavated material generated across the Proposed Scheme would be reused as engineering fill material or in the environmental mitigation earthworks of the Proposed Scheme, where suitable and reasonably practicable, either with or without treatment.

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

## Commissioning of the railway

2.3.79 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

2.3.80 A construction programme illustrating indicative periods for the construction activities described above is provided in Figure 5.

Figure 5: Indicative construction programme

| Construction activity | 2020 quarters | | | | 2021 quarters | | | | 2022 quarters | | | | 2023 quarters | | | | 2024 quarters | | | | 2025 quarters | | | | 2026 quarters | | | | 2027 quarters | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 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 |
| **Preparatory and enabling works** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Site compound set up, clearance, enabling works | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Drainage and watercourse diversions | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Road, footpath and utility diversions | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| **Main construction works - Earthworks** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Cuttings | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Embankments | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Mitigation earthworks | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| **Main construction works - Structures** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Retaining walls | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Viaducts, underbridges and culverts | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Overbridges and accommodation structures | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Auto-transformer and sub-stations | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Reinstatement, soft landscaping and finishes | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| **Rail infrastructure fit-out** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Track laying and overhhead line equipment | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| **Commissioning** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Commissioning | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Key | |
|---|---|
| | Construction activity that takes place at one or more locations for the majority of the quarter highlighted |
| | Construction activity that takes place at discrete locations for intermittent periods during the quarter highlighted |

## 2.4 Operation of the Proposed Scheme

### Operational specification

#### *Introduction*

2.4.1 Volume 1, Section 4 describes the envisaged operational characteristics of the Proposed Scheme and how they change when the remainder of Phase Two, as a whole, is operational.

#### *HS2 services*

2.4.2 It is anticipated that there would be up to six trains per hour in each direction upon opening in 2027, rising to up to 12 trains per hour each way passing through the Colwich to Yarlet area when the full Phase Two route is operational. Services are expected to operate between 05:00 and 24:00 from Monday to Saturday and 08:00 and 24:00 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 anticipated maintenance regime for the Proposed Scheme.

2.4.5 It is intended that inspections of the route would take place on a regular basis when the railway is not operating. There would be routine preventative maintenance, including grinding and milling of the rails in line with the maintenance strategy to keep them in good condition, and more periodic heavy maintenance as necessary.

2.4.6 Railway maintenance vehicles would be parked either at the defined maintenance loops at Pipe Ridware, in the Fradley to Colton area (CA1) or at the HS2 infrastructure maintenance depot (IMD), currently proposed at Crewe in the South Cheshire area (CA5). The maintenance loops would enable maintenance trains to be stabled temporarily during the day when maintenance activities are being undertaken over a number of nights without returning to the HS2 Crewe IMD. Further information on the maintenance loops can be found in Volume 2, CA1 Fradley to Colton. Further information on the HS2 Crewe IMD can be found in Volume 2, CA5 South Cheshire.

### Operational waste and material resources

2.4.7 Forecasts of the amount of waste arising from track maintenance and ancillary infrastructure and the associated potential significant environmental effects are provided in Volume 3, Section 15.

## 2.5 Route section alternatives

### Introduction

2.5.1 The main strategic and route corridor alternatives to the Proposed Scheme are presented in the Alternatives report as an appendix to the Volume 1. The reasonable

local alternatives considered for the Proposed Scheme within the Colwich to Yarlet area are described in this section.

2.5.2 Since November 2015, as part of the design development process, a series of potentially feasible local alternatives have been reviewed within workshops attended by engineering, planning and environmental specialists. The potential environmental impacts of each design option have been reviewed during these workshops. The purpose of the reviews has been to ensure that the Proposed Scheme draws the appropriate balance between engineering requirements, cost and potential environmental impacts.

2.5.3 The following sub-paragraphs detail the main local alternatives considered in this area and includes a comparison of the environmental effects associated with each option and the main reasons for selecting the option to be taken forward into the Proposed Scheme. In considering the environmental effects all topics have been taken into account, however, only those topics where there is a potential for a moderate or major effect are reported below.

## Route alignment at Moreton House

2.5.4 As part of the design development process since the announcement of the preferred route to Crewe in November 2015 consideration has been given to the proximity of the route to Moreton House, a Grade II listed building, which is used as a residential home for Rugeley School. Rugeley School is a specialist school for young people with autism and learning difficulties. As the Proposed Scheme passes Moreton House it is located in a cutting approximately 100m wide and up to approximately 20m in depth. The closest edge of the cutting is approximately 40m from Moreton House.

2.5.5 A preliminary options appraisal was undertaken and the following four options were not taken forward for further consideration:

- Options A4.1b and A4.2 were slight variations on the alignment of Option A4.1a (which was taken forward and described below), but required an increase in the height of an adjacent embankment, and therefore, were not taken forward for further consideration;
- Option 4.3a used a technique known as 'soil nailing' to steepen the slopes. There were concerns that this technique may not be effective for the whole lifetime of the project, which would lead to increased risk, so this option was not taken forward for further consideration; and
- Option A4.4 included a green tunnel[15] approximately 35m in length to Moreton House. However, further analysis indicated that the area of land between the green bridge and Moreton House would be insufficient to integrate the green bridge into the surrounding landscape. It was, therefore, considered that it would be preferable to consider landscape mitigation associated with the other options, so this option was not taken forward for further consideration.

[15] Green tunnels would be constructed using a cut-and-cover method. Construction would involve excavation, construction of a box structure and backfilling with fill material and soil. The land surface above would be graded to match the natural terrain and landscaped or restored to the original or some alternative use.

2.5.6 The following options were identified, analysed and the impacts assessed:

- Option A4.0: (the route announced in November 2015) a cutting approximately 115m in width and up to approximately 20m in depth, approximately 40m from Moreton House at the closest point. A re-aligned access road to Moreton House would cross the cutting on an overbridge and run parallel to the route resulting in the demolition of one building associated with Moreton House. An auto-transformer station would be located on the southern side of the route;
- Option A4.1a: a cutting approximately 115m in width and up to approximately 20m in depth, approximately 60m from Moreton House. A realigned access road to Moreton House would cross the cutting on an overbridge and run parallel to the route and adjacent to a building associated with Moreton House. An auto-transformer station would be located on the northern side of the route; and
- Option A4.3b: a cutting approximately 100m in width and up to approximately 20m in depth, approximately 40m from Moreton House at the closest point. A retaining wall would be provided on the northern side, approximately 200m in length and approximately 8m in height, to reduce the width of the cutting to the south-east of Moreton House. A realigned access road to Moreton House would cross the cutting on an overbridge and run parallel to the route and adjacent to the building associated with Moreton House. An auto-transformer station would be located on the northern side of the route.

2.5.7 Option A4.0 would result in noise, vibration and visual impacts on vulnerable residents of Moreton House and impacts to the setting of the listed building. There would be visual impacts on the residents of Moreton Grange due to the location of the auto-transformer station. It would also result in the demolition of a building associated with Moreton House.

2.5.8 Option A4.1a would result in noise, vibration and visual impacts and impacts to the setting of the listed building, but these would be reduced as the cutting is further away from Moreton House than in Option A4.0. This option would bring the route closer to Moreton Grange which would introduce visual and noise impacts on residents. Impacts would however be reduced by locating the auto-transformer station on the northern side of the route. This option would also avoid the demolition of a building associated with Moreton House.

2.5.9 Option A4.3b would also result in noise, vibration and visual impacts and impacts to the setting of the listed building, however, these are considered to be slightly reduced compared with Option A4.0 by moving the south-east section of the cutting away from Moreton House. The location of the auto-transformer station on the northern side of the route would reduce visual impacts on residents of Moreton Grange. This option would also avoid the demolition of a building associated with Moreton House.

2.5.10 The option taken forward into the Proposed Scheme is Option 4.3b. This is also the preferred environmental option as it would provide greater environmental benefits when compared with the other options.

## Route alignment at Ingestre Park Golf Club

2.5.11 As part of the design development process since the announcement of the preferred route to Crewe in November 2015 consideration has been given to the route as it passes through Ingestre Park Golf Club. There is a deep cutting in this location, and opportunities to reduce the depth and width of the cutting were considered in order to reduce the impact on the golf club and the wider landscape. The Proposed Scheme passes through Ingestre Park Golf Club, approximately 500m to the south of Ingestre Hall, on an embankment, approximately 1.1km in length and up to 10m in height, before entering a cutting, approximately 1.4km in length, approximately 108m in width and up to approximately 14m in depth.

2.5.12 The following options were identified, analysed and impacts assessed:

- Option A5.0 (the route announced in November 2015): a cutting approximately 1.5km in length, approximately 110m in width and up to approximately 15m in depth;
- Option A5.1: a green tunnel approximately 1.5km in length, including portals, and up to approximately 21m in depth;
- Option A5.2: a cutting approximately 1.6km in length, approximately 85m in width and up to approximately 12m in depth; and
- Option A5.3: a cutting approximately 1.4km in length, approximately 108m in width and up to approximately 14m in depth.

2.5.13 Option A5.0 would result in the loss of agricultural land, woodland and severance of the golf course and historic landscape associated with Ingestre Hall. This option would require a section of an unnamed stream to be diverted into a drop inlet culvert or inverted siphon.

2.5.14 Option A5.1 would enable part of the golf course to be reinstated over the tunnel, albeit with some reconfiguration, or the land to be returned to another use. This has the potential for improvements to landscape, visual and cultural heritage effects and would remove community severance. Option A5.1 is the most complex of all options to construct, and would result in noise, health, community and traffic impacts over a longer construction period.

2.5.15 Option A5.2 would result in the loss of agricultural land, woodland and severance of the golf course and historic landscape, although this would be reduced due to the narrower width of the cutting. The impacts on hydro-morphology and groundwater in this area would be reduced compared to option A5.0, as an unnamed stream would not require a drop inlet culvert or inverted siphon with this option. It is likely that the overhead line equipment would remain visible with this option, leading to visual impacts.

2.5.16 Option A5.3 would result in the loss of agricultural land, woodland and severance of the golf course and historic landscape. The impacts on hydro-morphology and groundwater in this area would be reduced compared to option A5.0 as an unnamed stream would not require a drop inlet culvert or inverted siphon.

2.5.17 Option A5.3 has been taken forward into the Proposed Scheme. Option A5.1 would provide greater environmental benefits during operation when compared with the other options. However on balance these potential environmental benefits were not considered sufficient to justify the additional complexity, the length of construction and the increased duration of environmental impacts and the significant additional cost, compared with Option A5.3. Whilst Option A5.1 would potentially enable the golf course to be reinstated the effects from construction would mean that the club would be unable to function in its current arrangement.

### Route alignment at Hopton

2.5.18 In this area the route of the Proposed Scheme would pass in a cutting, south-west of the majority of properties located in Hopton, then would continue onto an embankment, which would support landscape earthworks and a retaining wall forming a false cutting.

2.5.19 As part of the design development process since November 2015, consideration has been given to the impact of the Proposed Scheme on residents of Hopton and to ensure there is sufficient clearance over an unnamed watercourse.

2.5.20 Further consideration will be given to the construction and engineering options in this area. Further detailed engineering studies are ongoing and will be reported in the formal EIA Report.

### Route alignment between Staffordshire County Showground and Yarlet

2.5.21 During the design development process following the announcement of the preferred route to Crewe in November 2015, further consideration has been given to the route of the Proposed Scheme between Staffordshire County Showground and Yarlet. Options to realign the route as it passes through Hopton and close to the settlements of Marston and Yarlet have also been considered. The route of the Proposed Scheme would be located approximately 30m from the majority of properties located in Hopton, approximately 40m from Marston, approximately 30m from Yarlet and approximately 30m from the Staffordshire County Showground. This option covers a distance of approximately 11km.

2.5.22 A preliminary options appraisal was undertaken and two options were not taken forward for further consideration:

- Option B5-7.2b included a bored tunnel from Ingestre to Hopton, approximately 4.25km in length. The tunnel portal would be located in Ingestre Park Golf Club, which would result in the loss of the golf club and loss of historic landscape and would add significant additional cost to the Proposed Scheme, so this option was not taken forward for further consideration.
- Option B5-7.4a was very similar to Option B5-7.4b, but would be approximately 100m closer to Pasturefields SAC and SSSI. As there was no significant difference between the impacts of the two options, Option B5-7.4a was not taken forward for further consideration.

2.5.23 The following options were identified, analysed and impact assessed:

- Option B5-7.0: (the route announced in November 2015) the route of the Proposed Scheme would run through the settlement of Hopton, with the majority of properties located to the north-east, adjacent to the settlements of Marston and Yarlet and through an area of the Staffordshire County Showground;
- Option B5-7.1: the route would be located approximately 30m from the south-west edge of the majority of the properties in Hopton, approximately 40m from the north-eastern edge of Marston, approximately 30m from the north-eastern edge of Yarlet, and approximately 30m from the south-eastern boundary of Staffordshire County Showground. This option covers a distance of approximately 11km;
- Option B5-7.2a: the route would pass under Hopton and Staffordshire County Showground in a bored tunnel approximately 2km in length. The route would then be located directly adjacent to the settlements of Marston and Yarlet. This option covers a distance of approximately 11km;
- Option B5-7.3a: the route would be located away from Hopton, Marston and Yarlet, and would be located approximately 100m north of Little Ingestre. The route would then pass through Hopton Heath Registered Battlefield and would be located approximately 700m to the south-west of Salt. This option covers a distance of approximately 21km;
- Option B5-7.3b: the route would be located away from Hopton, Marston and Yarlet, and would be located approximately 100m north of Little Ingestre. The route would pass under Hopton Heath Registered Battlefield in a bored tunnel of approximately 2km in length and would be located approximately 700m to the south-west of Salt. This option covers a distance of approximately 21km; and
- Option B5-7.4b: the route would be located away from Hopton, Marston and Yarlet, and would be located approximately 50m north of Little Ingestre. It would then pass under the north-east corner of Hopton Heath Registered Battlefield in a bored tunnel of approximately 500m in length and would be located approximately 50m to the south-west of Salt. This option covers a distance of approximately 21km.

2.5.24 Option B5-7.0 would result in the need to demolish a number of properties and would introduce visual, noise and community impacts, due to the proximity of the route to residential properties at Hopton, Yarlet and Marston. This option would also result in the loss of land from Ingestre Park Golf Club and two other businesses. The loss of part of the Staffordshire County Showground may affect the viability of some of the businesses located with the showground and events at this location.

2.5.25 Option B5-7.1 would result in the need to demolish a number of properties and would introduce visual, noise impacts and community impacts to residential properties at Hopton, Marston and Yarlet, but these would be reduced by moving the route up to 40m further away from these communities. The land required permanently within the Staffordshire County Showground would be reduced and the businesses located within it would be retained.

2.5.26 Option B5-7.2a would reduce the number of properties requiring demolition and reduce the amount of land permanently required from the Staffordshire County Showground, so the businesses located within it would be retained. This option would lead to increased impacts during the construction period, due to the formation of the tunnel and porous portals and associated infrastructure. The increase in excavated material associated with the tunnel would be likely to lead to increased waste generation. There would also be an increase in greenhouse gas emissions and energy use. However, once constructed this option would reduce impacts on the settlements of Hopton, Marston and Yarlet.

2.5.27 Option B5-7.3a would run to the north of Moreton House, Moreton Grange, removing visual and noise impacts at these properties and retaining the setting of these buildings and Shugborough Hall in their existing landscape. Impacts on the setting of Ingestre Conservation Area would also be removed. This option would move the route away from Hopton, Marston and Yarlet and as such would reduce noise, visual and community impacts and the number of properties requiring demolition. It would also avoid Ingestre Park Golf Club and reduce the amount of land required permanently within the Staffordshire County Showground, so the businesses located within it would be retained. However, this option would result in the partial loss of Hopton Heath Registered Battlefield, a nationally significant asset. The setting of the remainder of the battlefield would also be affected. This option would increase the loss of ecological habitats and as the route would be closer to Pasturefields SAC and SSSI and there is the potential for the existing surface and groundwater flow regime to alter the salinity of the springs that support Pasturefields SAC saltmarsh vegetation.

2.5.28 Option B5-7.3b would run to the north of Moreton House, Moreton Grange, removing visual and noise impacts at these properties and retaining the setting of these buildings and Shugborough Hall in their existing landscape. Impacts on the setting of Ingestre Conservation Area would also be removed. This option would move the route away from Hopton, Marston and Yarlet, and by doing so, would reduce noise and visual impacts during operation and the number of properties requiring demolition. The route would also avoid impacts to several local businesses, including Staffordshire County Showground and Ingestre Park Golf Club. Transport impacts would be reduced, as there would be less severance of Hopton and fewer impacts on the A518 Weston Road and PRoW. The loss of agricultural land would be reduced. However, its location close to Little Ingestre and Salt would potentially result in visual and noise impacts on residential properties during construction. This option would lead to increased impacts during the construction period, due to the formation of the tunnel, porous portals and associated infrastructure, and in particular, would have an impact on Hopton Heath Registered Battlefield and the site of a medieval deer park in Ingestre Park. The construction of a tunnel would result in increased energy use, greenhouse gas emissions and generate more waste material. This option would increase the loss of ecological habitats, and as the route would be closer to Pasturefields SAC and SSSI, there would be potential for the surface and groundwater flow regime to alter the salinity of the springs that support Pasturefields SAC saltmarsh vegetation.

2.5.29 Option B5-7.4b would avoid the impact on the setting of Moreton House and Tixall Gatehouse, reduce the number of demolitions required and avoid impacts on Ingestre

Park Golf Course. However, this option would increase the impacts on farm holdings. It is also close to Little Ingestre and Salt, which would potentially result in visual and noise impacts on residential properties. The construction of a longer viaduct and tunnel would result in increased energy use, greenhouse gas emissions and waste generation.

2.5.30 Option B5-7.1 has been taken forward into the Proposed Scheme. Option B5-7.2a would provide greater environmental benefits when compared with the other options, by reducing the number of demolitions required and the amount of land required at Staffordshire County Showground. However, the construction of Option B5-7.2a would be significantly more complex than Option B5-7.1 due to the introduction of a bored tunnel. This would lead to a significant increase in cost, would increase the risk of hazards during construction and would lengthen the construction programme. On balance, the environmental benefits were not considered sufficient to justify these disbenefits.

# 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 This section summarises the engagement and consultation that has been undertaken within the Colwich to Yarlet area, since the route announcement in November 2015. It identifies the stakeholders who have been engaged during this process and how they have informed the design and assessment of the Proposed Scheme to date.

3.1.3 These stakeholders include:

- technical and specialist groups/stakeholders;
- local authorities and parish councils;
- communities; and
- directly affected individuals and landowners.

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

3.1.5 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 EIA Report 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 EIA Report.

## 3.2 Key stages of Phase 2a engagement and consultation

3.2.1 The process of engagement began in 2009, and remains ongoing. A summary of engagement undertaken or underway since the route announcement in November 2015 is provided in Table 1 and reported in this section. This has included the draft SMR, property consultation and a series of meetings with national and local environmental stakeholders, local authorities, parish councils, individual landowners and organisations.

Table 1: Mechanisms and timeline of stakeholder engagement since route announcement

| Date | Engagement and consultation activity and mechanisms | Stakeholders engaged/consulted |
|---|---|---|
| December 2015 - ongoing | Direct engagement for the development of the Proposed Scheme and assessment. | Direct engagement with local authorities and Councils, and with technical and specialist stakeholders. |

| Date | Engagement and consultation activity and mechanisms | Stakeholders engaged/consulted |
|---|---|---|
| 8 March 2016 - 13 May 2016 | Consultation on the draft EIA and Equality Impact Assessment (EQIA) SMR to inform the EIA and EQIA. | Published and made available nationally on HS2 website[16]. Technical and specialist stakeholders, and councils, directly invited to participate. |
| January 2016 - ongoing | Site visits with farmers and growers. | Direct engagement with individual farmers and growers. |
| November 2015-February 2016 | Consultation on property compensation with owners and occupiers | Direct engagement with owners and occupiers. |
| September 2016 - November 2016 | Consultation on the working draft EIA Report, EQIA Report and design refinements. | Direct engagement with communities through public events and documents available at a range of community locations across the route. |

## 3.3 Technical and specialist groups

3.3.1 Engagement has also been undertaken with technical and specialist groups to provide appropriate specialist input, as and where appropriate. Stakeholders engaged in this context include:

- Environment Agency;
- Natural England;
- Historic England;
- Canal & River Trust;
- Staffordshire Wildlife Trust;
- National Trust;
- Department of Environment, Food and Rural Affairs (Defra);
- Food and Environment Research Agency (FERA);
- Woodland Trust;
- British Geological Survey (BGS);
- National Farmers Union;
- Country Land and Business Association;
- Highways England; and
- Cannock Chase AONB.

[16] UK Government: HS2 Phase Two: West Midlands to Crewe Draft Environmental Impact Assessment Scope and Methodology Report consultation. Available online at: https://www.gov.uk/government/consultations/hs2-phase-two-west-midlands-to-crewe-draft-environmental-impact-assessment-scope-and-methodology-report-consultation

3.3.2 Engagement with these stakeholders has been instrumental in providing detailed specialist baseline information to inform the working draft EIA Report and the design development of the Proposed Scheme.

3.3.3 Organisations with a specialist interest, for example National Trust and Historic England's interest in Shugborough Hall, has informed individual technical assessments such as the cultural heritage assessment.

3.3.4 Further information about topic-specific engagement is provided in Sections 4 to 15.

3.3.5 Engagement is also ongoing with utility companies and statutory stakeholders such as Network Rail and the Oil and Pipelines Agency to establish what infrastructure exists in the Colwich to Yarlet area and how it may need to be modified as part of the Proposed Scheme.

## 3.4 Local authorities and parish councils

3.4.1 The Colwich to Yarlet area is represented by the following county, borough, district and parish councils:

- Staffordshire County Council;
- Stafford Borough Council;
- Colwich Parish Council;
- Ingestre with Tixall Parish Council;
- Hopton and Coton Parish Council;
- Marston Parish Council; and
- Whitgreave Parish Council.

3.4.2 Direct engagement has been undertaken with these councils to collate appropriate local baseline information, identify and understand issues and concerns, and provide a mechanism for ongoing dialogue and discussion on the emerging assessment.

3.4.3 Engagement has focused on the technical areas which inform the assessment, including, cultural heritage, ecology and biodiversity, land quality, landscape and visual, sound, noise and vibration, traffic and transport, water and flood risk, amongst others topics.

3.4.4 Some key discussion and inputs gained from engagement with Staffordshire County Council and Stafford Borough Council include:

- discussions with regard to the planned highways and PRoW routes, noting local conditions and concerns regarding traffic, congestion and community impact;
- understanding and gathering information on listed buildings and local sites of archaeological interest;
- gathering information on the potential contamination of local sites to inform the development of the Proposed Scheme and the land quality assessment;

- collating information regarding water resources, flood risk and groundwater issues within the local area and identifying vulnerabilities to flooding or groundwater issues to inform the environmental impact assessment;
- agreeing appropriate viewpoints for assessing impacts as part of the landscape and visual assessment;
- identifying locations for surveying and data collection to inform the sound, noise and vibration assessment; and
- understanding the local community and any particular sensitivities or vulnerabilities of its members, to inform the community and health assessments and the separate equality impact assessment.

3.4.5 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 CoCP.

## 3.5 Communities

3.5.1 Community stakeholders in the area include a range of local interest groups, local facility and service providers, schools and educational establishments. Engagement on the Proposed Scheme has been undertaken with Yarlet and Rugeley Schools, Moreton House, Staffordshire County Showground, Shugborough Hall and Ingestre Park Golf Club.

3.5.2 The purpose of this engagement has been to give affected communities the opportunity to raise issues and opportunities 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.

3.5.3 Engagement has been, and will continue to be, undertaken with schools and educational establishments, in particular, with those within close 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 EIA Report, whilst also informing the separate equality impact assessment (EQIA) being undertaken in parallel to the EIA.

3.5.4 As part of the consultation process for this working draft EIA Report and on refinements to the design, 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, including a mail out to properties along the line of route, newspaper adverts, posters sent to local venues. Documents have been made available online and in community libraries.

## 3.6 Directly affected individuals and landowners

3.6.1 This group includes farmers, growers and those with property potentially affected by the Proposed Scheme.

### Farmers and growers

3.6.2 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 has been refined to reduce the loss of agricultural land and the location of accommodation overbridges across the route have been refined to better reflect the needs of farmers.

3.6.3 Thirty farm visits have been undertaken in this area and these will continue, as appropriate, as the Proposed Scheme develops.

3.6.4 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.

### Property consultation

3.6.5 A property consultation took place between 30 November 2015 and 25 February 2016. Its purpose was to inform the Government's decision on whether the compensation and assistance schemes in place for Phase One would be altered for Phase 2a, based on the views of those individuals and organisations who expressed their opinions on the proposals.

3.6.6 The analysis of consultation responses was summarised in "HS2 Phase Two: West Midlands to Crewe Property Consultation 2015. A Report to HS2 Ltd and the Department for Transport"[17] and the Government response issued in the "Decision Document HS2 Phase Two: West Midlands to Crewe Property Consultation 2015"[18].

3.6.7 A programme of property consultation events has been undertaken route-wide, in parallel to the working draft EIA process. Within the local area, a property consultation event was held for landowners and individuals at Stafford Gatehouse Theatre on the 20 January 2016 and Colwich and Little Haywood Village Hall on the 22 January 2016. The purpose of the property consultation was to give members of the public the opportunity to speak with property, environment and engineering specialists about the details of the Government's proposals for compensation and assistance for property owners living in the Colwich to Yarlet area.

## 3.7 SMR consultation

3.7.1 The draft SMR was formally consulted on in March to May 2016. As set out in Volume 1, the draft SMR 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.

[17] https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/526063/HS2_Phase_2a_Property_Consultation_2015_Response_Summary_Report.pdf

[18] UK Government: HS2 Phase Two: West Midlands to Crewe Property Consultation 2015. Available online at: https://www.gov.uk/government/consultations/hs2-phase-two-west-midlands-to-crewe-property-consultation-2015

3.7.2 Twenty six responses to the draft SMR were received, as a result of which changes were made to the SMR. These are set out in the SMR Consultation Report published alongside this working draft EIA Report, and will be used to inform the assessment methodologies applied for the formal EIA Report.

## 3.8 Informing the Proposed Scheme

3.8.1 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 route announcement in November 2015.

3.8.2 The main themes to emerge from stakeholder engagement in the Colwich to Yarlet area since the route announcement in November 2015, and which are informing the Proposed Scheme are:

- retention or realignment of PRoW;
- temporary and permanent land take required around the Proposed Scheme and during construction;
- the impact of noise on livestock;
- the impact of users of the campsite associated with the Staffordshire County Showground;
- 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; and
- relocation of accommodation bridges close to existing access points.

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

## 3.9 Consultation on the working draft EIA Report and ongoing engagement

3.9.1 As set out in Volume 1, the working draft EIA Report is being formally consulted upon between September 2016 and November 2016. Parallel consultations on the working draft EQIA and refinements to the design are 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 EIA and EQIA Reports which inform it.

3.9.2 These consultations and wider feedback from ongoing stakeholder engagement will continue to be considered as part of the ongoing design of the Proposed Scheme, the assessment and identification of mitigation opportunities for the Colwich to Yarlet area. A consultation summary report will be published with the formal EIA Report explaining how the responses have been taken into consideration.

# 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 as a result of the construction and operation of the Proposed Scheme within the Colwich to Yarlet 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 The quality of agricultural land in England and Wales is assessed according to the Agricultural Land Classification (ALC)[19] 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 the impacts on agricultural land is the extent to which land of best and most versatile (BMV) agricultural quality (Grades 1, 2 and 3a) is affected by the Proposed Scheme.

4.1.3 Forestry is considered as a land use feature, and the impacts have been calculated quantitatively. The qualitative effects on forestry land and woodland are addressed principally in Section 8, Ecology and biodiversity, and Section 11, Landscape and visual.

4.1.4 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, Cultural heritage; Section 8, Ecology and biodiversity; and Section 11, Landscape and visual.

4.1.5 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. Engagement with farmers and landowners has been undertaken. The purpose of the engagement has been to obtain relevant 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 with farmers and landowners will continue as part of the development of the Proposed Scheme, with progress documented in the Farmers Pack[20] for each farm holding.

4.1.6 Maps showing the location of the key environmental features and the key construction and operation features of the Proposed Scheme can be found in the Volume 2, CA2 Map Book.

[19] 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.
[20] HS2 Guide for Farmers and Growers (2016). Available online at https://www.gov.uk/government/publications/hs2-guide-for-farmers-and-growers

## 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 the draft SMR and Volume 1.

4.2.2 The study area for the agriculture, forestry and soils assessment covers all of the open and undeveloped land that would be 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 BMV land and forestry land in the general locality, taken as 2km either side of the centre line of the Proposed Scheme.

4.2.3 Common assumptions that have been used in assessing the effects of the Proposed Scheme are set out in Volume 1. These assumptions include the restoration of agricultural land that is required temporarily for construction to agricultural use, the handing back of land used temporarily to the original landowner and the non-replacement of capital items demolished. There are no assumptions or limitations that are specific to the assessment in this study area.

## 4.3 Environmental baseline

### Introduction

4.3.1 This section sets out the main baseline features that influence the agricultural and forestry use of land within the Colwich to Yarlet 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 The principal bedrock geology mapped by the BGS[21] is that of the Mercia Mudstone Group, which occupies a wide swathe between Colwich and Great Haywood, and continues to the north-west. This group consists of mudstone with subordinate siltstone. There is also an outcrop of the Helsby Sandstone Formation to the west and south-west of Great Haywood. This formation consists of pebbly sandstone and includes interbedded siltstone and mudstone. The Chester Formation flanks the Helsby Sandstone to its west. This comprises sandstone with pebble and quartzite conglomerates and occupies the most steeply sloping valley sides of the outcrop. The Stafford Halite Member is mapped to the north of Yarlet in a band aligned roughly north-west to south-east. This comprises structureless mudstone with halite (rock salt). A full description of the geological characteristics of this area is provided in Section 10, Land quality.

4.3.3 The superficial deposits overlying both the Mercia Mudstone Group and the sandstone formations on the lower valley slopes and the valley bottom west of Great Haywood are of glaciofluvial origin. River Terrace Deposits of sand and gravel are mapped on

[21] British Geological Survey (2016). Geology of Britain viewer. Available online at: http://mapapps.bgs.ac.uk/geologyofbritain/home.html

the footslopes of the valley. Superficial alluvium deposits overlie the Mercia Mudstone within the main channel of the River Trent. These typically comprise consolidated silty clay, but they may also contain silt, sand, peat and gravel. Glaciofluvial sheet deposits are located adjacent to the river terrace deposits to the west of the channel on moderate slopes. These also comprise sand and gravel.

4.3.4 Deposition of glacial till over the mudstone occurred across the valley sides to the east of Great Haywood, comprising unsorted material ranging in size from clay to boulders (hence also commonly referred to as boulder clay). Glacial till is also found across a plateau to the east of Hopton and to the north of the area over the mudstone and halite, forming the higher-altitude mid-slopes.

### *Topography and drainage*

4.3.5 The River Trent and its valley are the main topographical and drainage features within this area. Topography is complex in the south, between Colwich and Great Haywood, with a series of irregular slopes, ridges and terraces at altitudes of between 80m and 120m AOD. Two shallow south-facing valleys are cut into the hillsides in this area in the vicinity of Coley, draining the land towards Colwich and Little Haywood.

4.3.6 To the north-west of Coley, the land falls from around 125m to 80m AOD in the bottom of the River Trent valley (and the Trent and Mersey Canal) at Great Haywood.

4.3.7 The remainder of the area is characterised by series of elongated ridges and more rounded summits with complex, moderate to steep irregular slopes, which drain the land to the River Trent to the north and the Marston Brook to the south.

4.3.8 Flood risk is greatest in the River Trent valley to the west of Great Haywood. Further details are provided in Section 15, Water resources and flood risk.

### *Description and distribution of soil types*

4.3.9 The characteristics of the soils are described by the Soil Survey of England and Wales[22,23] and shown on the National Soil Map[24].

4.3.10 There are three groups of soil associations in this area. The main group is developed in Mercia Mudstone, and comprises clay loam, silty clay loam or sandy clay loam topsoils over clay loam or clay subsoils. This group includes the Flint, Whimple 3, Clifton and Worcester associations. Soil profiles in these associations are mostly imperfectly drained (Wetness Class[25] (WC) III) or, occasionally, as in the Clifton association, poorly drained (WC IV).

4.3.11 There are two subordinate groups. The first comprises clayey and peaty profiles of the Midelney association, which are poorly or very poorly drained (WC IV or V), developed in alluvium deposits and closely associated with the River Trent.

[22] Soil Survey of Great Britain - England and Wales (1964), *The Soils of the West Midlands,* Bulletin No. 2, Harpenden.
[23] 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.
[24] Cranfield University (2001), *The National Soil Map.*
[25] The Wetness Class of a soil is classified according to the depth and duration of waterlogging in the soil profile and has six categories from WCI which is well drained to WCVI which is very poorly drained.

4.3.12 The second subordinate group comprises the shallow, sandy loam profiles of the Bromsgrove association derived from the sandstone bedrock and the Wick association, which in turn are derived from glaciofluvial and terrace drift, both of which are well drained (WC I).

## Soil and land use interactions

### *Agricultural land quality*

4.3.13 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 and the study area.

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

4.3.15 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[26] limitations of the land.

4.3.16 The local agro-climatic data have been interpolated from the Meteorological Office's standard 5km grid point dataset[27] for three points within the area. The data show climate in the area to be moderately cool and moist. The number of Field Capacity Days (FCDs), when the soil moisture deficit is zero, ranges from 178 to 182 days. This is higher than average for lowland England (150 days) and generally constrains agricultural cultivations and soil handling for relatively long periods over winter. Crop moisture deficits are moderate.

4.3.17 Site factors include gradient and microrelief, which are likely to be limiting to agricultural land quality throughout this study area. Flooding of low lying land is a potential limitation, particularly to the west of Great Haywood, within the River Trent valley. Further details are provided in Section 15, Water resources and flood risk.

4.3.18 The main physical limitations that result from interactions between soil, climate and site factors are soil wetness, soil droughtiness and a localised susceptibility to erosion. Each soil can be allocated a WC based on soil structure, evidence of waterlogging and the number of FCDs. The topsoil texture then determines its ALC grade.

4.3.19 Soils within the main group of associations present in the area (the Flint, Whimple 3, Clifton and Worcester associations) comprise imperfectly drained profiles of WC III with medium loamy topsoils. These will be limited by wetness and workability to Subgrade 3a. Imperfectly drained profiles with heavier loamy topsoils will be limited to Subgrade 3b. Poorly drained profiles of WC IV with medium loamy topsoils will be classified as Subgrade 3b, whilst poorly drained profiles with heavier loamy topsoils will be Grade 4.

[26] 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
[27] Meteorological Office (1989), *Gridpoint Meteorological data for Agricultural Land Classification of England and Wales and other Climatological Investigations*.

4.3.20 The Midelney association comprises poorly or very poorly drained clayey profiles. These are limited severely by soil wetness and workability, and will be classified as Grades 4 or 5.

4.3.21 The well drained, coarse, sandy Bromsgrove and Wick soils are likely to be affected slightly by soil droughtiness. Bromsgrove soils are described by the Soil Survey of England and Wales as giving rise to some of the best agricultural land in the region, and are considered likely to be no worse than Grade 2.

4.3.22 Defra mapping[28] shows that there is generally a high likelihood of encountering BMV agricultural land in the locality, which makes such land a resource of low sensitivity in this study area.

### *Other soil interactions*

4.3.23 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[29] and The Natural Choice: securing the value of nature[30], and include:

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

4.3.24 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 8, Ecology and biodiversity.

4.3.25 The floodplain of the River Trent occupies land where water has to flow or be stored in times of flood, as set out in Section 15, Water resources and flood risk. Environment Agency mapping indicates the low-lying land to the west of Great Haywood to be at significant risk of flooding from the River Trent, limiting agricultural land quality to Subgrade 3b and Grade 4. The soils in this area function as water stores for flood attenuation, as well as providing ecological habitat.

## Land use

### *Land use description*

4.3.26 Agricultural land use in this area is mixed arable and pasture, with most of the pasture used for dairy and beef cattle enterprises. The fields are regular in shape and medium

[28] Defra (2005), *Likelihood of Best and Most Versatile Agricultural Land*.
[29] Defra (2009), *Soil Strategy for England*.
[30] HM Government (2011), *The Natural Choice: securing the value of nature*.

to large in scale, reflecting the size of the farm holdings. The area also includes equestrian enterprises near Little Haywood and Ingestre, with other non-agricultural uses being a golf course, a marina, a showground and woodland.

4.3.27 Woodland is predominantly found in the centre of the Colwich to Yarlet area around Ingestre. However, there are also occasional blocks of woodland throughout, including: Spencer's Plantation, Little Covert, Tithebarn Covert and Lionlodge Covert in the south; and The Grove in the north.

4.3.28 A number of environmental designations potentially influence land use within the study area. The whole area is a nitrate vulnerable zone, where statutory land management measures apply that seek to reduce nitrogen losses from agricultural sources to water. 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 replaced Environmental Stewardship. Holdings that have land entered into an agri-environment scheme are identified in Table 2.

### *Number, type and size of holdings*

4.3.29 Table 2 sets out the main farm holdings within this area, as currently understood. The details of holdings have been obtained from face-to-face interviews with farm owners and occupiers. Other farm holdings may be identified as survey work continues and the design develops.

4.3.30 Table 2 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. Smaller, less intensively used units, such as pony paddocks associated with residential properties, have a low sensitivity.

Table 2: Summary characteristics of holdings

| Holding reference/name | Holding type | Holding size (ha) | Diversification | Agri-environment scheme | Sensitivity to change |
|---|---|---|---|---|---|
| Moreton Farm | Arable | 107 | None | ELS | Medium |
| Upper Moreton Farm | Cattle and sheep, small bale hay sales | 24 | Care farm for disadvantaged adults and children | HLS for species rich grassland and ridge-and-furrow grassland<br>Other ELS | Medium |
| Woodruff Barn | Residential, equestrian | 1 | None | None | Low |

| Holding reference/name | Holding type | Holding size (ha) | Diversification | Agri-environment scheme | Sensitivity to change |
|---|---|---|---|---|---|
| Bottom End Cottage | Residential, equestrian | 2 | None | None | Low |
| Moreton House Farm | Arable/beef | 136 | Arable contracting, fishing pond, wind turbine | ELS and HLS | Medium |
| Tithe Barn Farm | Arable and store cattle | 162 | On-farm shoot | Formerly within ELS. May apply for CSS | Medium |
| Land to the south of Tolldish Lane | Let grassland | 2 | None | None | Low |
| Farley Farm | Cattle, sheep, ponies | 57 | Farmhouse rented out; 4ha grassland rented out | None | Medium |
| Land at Green Barn | Sheep, ponies | 15 | Farriery | None | Low |
| Canalside Farm | Horticulture - strawberries in Spanish polytunnels[31] | 10 | Mainly farm shop, café and land let as narrow-boat marina | None | High |
| Land north of Mill Lane, Great Haywood | Pasture - let | 5 | None | None | Low |
| Hoo Mill Lane Farm | Suckler beef selling finished cattle | 113 | Some land rented to others | Formerly in ELS. May apply for CSS | Medium |
| Tixall Manor Farm | Beef suckler herd and arable | 117 | None | None | Medium |
| Ingestre Manor Farm | Arable, sheep and store cattle | 526 | Current aspiration to develop a Do-it-Yourself and full livery yard with a cross-country course around the farm | HLS and ELS across the farm | Medium |
| Upper Hanyards Farm | Dairy and sheep | 360 | 2 wind turbines and farm shoot | None | High |

[31] But ceasing if proposals to extend the marina on to polytunnel land proceed

| Holding reference/name | Holding type | Holding size (ha) | Diversification | Agri-environment scheme | Sensitivity to change |
|---|---|---|---|---|---|
| Park Farm, Stafford | Permanent grass cut for hay/haylage for sale | 79 (including share farmed land) | British Eventing 3-day eventing course; space let for rail engineering firm; 4 barn conversions let | Just finished ELS; not applying for CSS | Medium |
| Brick House Farm | Arable and sheep (with share farming partner) | 168 | Land let to showground for car parking | None | Medium |
| Land south-east of Hopton | Let grassland | 4.5 | None | None | Low |
| Land south-west of Hopton | Let grassland | 7.5 | None | None | Low |
| Lower Bridge Farm | Equestrian | 13 | None | None | Low |
| Oaklands | Sheep | 18 | Boarding kennels, agricultural contracting (hedge cutting), trailer repair | None | Medium |
| Kents Barn Farm | Beef cattle and sheep | 32 | Agricultural contracting (fencing) | None | Medium |
| New Buildings Farm | Dairy | To be confirmed in formal EIA Report | To be confirmed in formal EIA Report | To be confirmed in formal EIA Report | High |
| Marston Farm | Arable | 50 | Agricultural contracting; property lets | ELS | Medium |
| Sunnyhill Farm | Arable | 39 | None | ELS | Medium |
| Park Farm, Marston | Dairy | 118 | None | None | High |
| The Barn | Residential, equestrian | 2 | None | None | Low |
| Long Enson Farm | Dairy and beef (affected land not part of grazing block) | 74 | None | None | Medium |

| Holding reference/name | Holding type | Holding size (ha) | Diversification | Agri-environment scheme | Sensitivity to change |
|---|---|---|---|---|---|
| Yarlet Hall Farm | Dairy and beef | 121 | None | None | High |
| Greenwood Farm | Dairy | 162 | None | None | High |

## 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 draft CoCP would avoid or reduce environmental impacts during construction. Those measures that are particularly relevant relate to: the handling of soils and their reinstatement to subsequent agricultural, forestry or other open land uses; and arrangements to ensure that agriculture can continue to function adjacent to the works during and following the construction period.

4.4.3 There would be no reduction in the long-term capability or quality of land where agricultural or forestry uses are to be resumed, provided good practice techniques are used to handle, store and reinstate soils. Some land with heavier textured soils (particularly the Midelney and Whimple 3 association soils) may also require careful management during the aftercare period to achieve this outcome.

### Assessment of impacts and effects

#### *Introduction*

4.4.4 The acquisition and use of land for the Proposed Scheme would interfere with existing uses of that land and, in some locations, would preclude existing land uses or sever and fragment individual fields and operational units of agricultural and forestry land. This would result in potential effects associated with the ability of affected agricultural 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 minimise this disruption and, where appropriate and reasonably practicable, to incorporate inaccessible severed land as part of environmental mitigation works.

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

- part of the operational railway and kept under the control of the operator;
- returned to agricultural use (with aftercare management to ensure stabilisation of the soil structure, to be undertaken normally by the owner

and/or occupier, except where remedial operations are required which may be undertaken by the nominated undertaker);

- used for drainage or replacement floodplain storage areas, which may also retain some agricultural use; or
- used for ecological and/or landscape mitigation; the ownership and responsibility for managing agricultural land reinstated to landscape planting, new woodland and new ecological habitats would be the subject of agreements with existing land owners.

### *Temporary effects during construction*

#### Impacts on agricultural land

4.4.6 ALC surveys are ongoing, however current indications show that the Proposed Scheme is likely to require approximately 320ha of agricultural land within the Colwich to Yarlet area during the construction phase, of which approximately 260ha (80%) is likely to be classified as BMV land (Grades 2 and 3a). In addition, there are approximately 17ha of woodland within the area required for construction within the Colwich to Yarlet area.

4.4.7 As BMV land in this local area is a receptor of low sensitivity, the potential effect of the Proposed Scheme on BMV land during the construction phase is assessed as a likely moderate adverse effect, which is significant.

4.4.8 Following completion of construction, temporary facilities would be removed and the topsoil and subsoil would be reinstated in accordance with the agreed end use for the land. Based on the current design, overall for the Proposed Scheme, it is estimated that there would not be any significant surplus of topsoil or subsoil material arising. Some permanently displaced soils may be used to restore land to agriculture or other uses with slightly deeper topsoil and subsoil layers, where appropriate. This could improve the quality of agricultural land locally, for example where droughty soils are limited by soil depth, subject to the soil resource plans that would be prepared during the detailed design stage.

#### Nature of the soil to be disturbed

4.4.9 The sensitivity of the soils that would be disturbed by construction activity reflects their textural characteristics, in the light of local rainfall conditions, as set out in the draft SMR. Soils with high clay and silt fractions in areas of heaviest rainfall 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 of lowest rainfall are the least susceptible.

4.4.10 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[32]. These principles will be followed throughout the construction period. The clayey and seasonally waterlogged

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

Midelney and Whimple 3 associations are least able to remain structurally stable when moved in wet conditions or by inappropriate equipment. They are susceptible to compaction and smearing, which could affect successful reinstatement.

4.4.11 The disturbance of peat soils has implications for carbon emissions and biodiversity. Design development of the Proposed Scheme would seek to reduce disturbance of any deep peat soils as far as possible. Where disturbance cannot be avoided, the peat soils would be handled with particular care and when reinstated, opportunities would be taken to use them to create habitats and enhance biodiversity.

#### Impacts on holdings

4.4.12 Land may be required from holdings both permanently and temporarily (i.e. the latter just during the construction period). 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. In due course some agricultural land would be restored and the impact on individual holdings would be reduced.

4.4.13 The effects of the Proposed Scheme on individual agricultural and related interests during the construction period will be reported in the formal EIA Report. The assessment will consider 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 scale of effect will be based on the proportion of the holding required rather than the absolute area of land.

4.4.14 The effects of severance during construction will be judged on the ease and availability of access to severed land. These would mostly be the same during and post construction, but occasionally they would differ between the two phases. The disruptive effects, principally of construction noise and dust, will be assessed in the formal EIA Report according to their effects on land uses and enterprises.

### *Permanent effects of construction*

#### Impacts on agricultural and forestry land

4.4.15 The extent of land required permanently for the Proposed Scheme by ALC grade, following construction and restoration to the agreed end use, is currently unknown but will be reported in the formal EIA Report.

#### Impacts on holdings

4.4.16 The potential permanent effects from the construction of the Proposed Scheme on individual agricultural and related interests are summarised for those holdings that have been surveyed in Table 3. The scale of effect of the land potentially required 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.

Table 3: Summary of potential permanent effects on holdings from construction

| Holding reference/name | Land potentially required | Potential severance impact | Potential impact on farm infrastructure | Potential scale of effect |
|---|---|---|---|---|
| Moreton Farm | Low | Low | Negligible | Minor adverse |
| Upper Moreton Farm | Negligible | Negligible | Negligible | Negligible |
| Woodruff Barn | Medium | Low | Low | Minor adverse |
| Bottom End Cottage | High | Negligible | Negligible | Moderate adverse |
| Moreton House Farm | Low | Low | Medium | Moderate adverse |
| Tithe Barn Farm | Medium | Medium | High | Major/moderate adverse |
| Land to the south of Tolldish Lane | High | Negligible | High | Moderate adverse |
| Farley Farm | Medium | Negligible | Negligible | Moderate adverse |
| Land at Green Barn | Negligible | Negligible | High | Moderate adverse |
| Canalside Farm | Negligible | Negligible | Negligible | Negligible |
| Land north of Mill Lane, Great Haywood | Negligible | Negligible | Negligible | Negligible |
| Hoo Mill Lane Farm | Negligible | Negligible | Negligible | Negligible |
| Tixall Manor Farm | Negligible | Negligible | Negligible | Negligible |
| Ingestre Manor Farm | Negligible | Negligible | Negligible | Negligible |
| Upper Hanyards Farm | Medium | Low | High | Major adverse |
| Park Farm, Stafford | Negligible | Low | Medium | Moderate adverse |
| Brick House Farm | Medium | Low | Negligible | Moderate adverse |
| Land south-east of Hopton | Low | Negligible | Negligible | Negligible |
| Land south-west of Hopton | Low | Negligible | Negligible | Negligible |
| Lower Bridge Farm | Medium | Medium | High | Moderate adverse |
| Oaklands | Low | Low | Low | Minor adverse |
| Kents Barn Farm | Low | Low | Low | Minor adverse |

| Holding reference/name | Land potentially required | Potential severance impact | Potential impact on farm infrastructure | Potential scale of effect |
|---|---|---|---|---|
| New Buildings Farm | To be confirmed and will be reported in the formal EIA Report | | | |
| Marston Farm | Medium | Negligible | Negligible | Moderate adverse |
| Sunnyhill Farm | Medium | Medium | High | Major/moderate adverse |
| Park Farm, Marston | Low | High | High | Major adverse |
| The Barn | High | High | Negligible | Moderate adverse |
| Long Enson Farm | Medium | Low | Low | Moderate adverse |
| Yarlet Hall Farm | Medium | Low | Low | Major/moderate adverse |
| Greenwood Farm | Negligible | Low | Negligible | Moderate adverse |

4.4.17 Overall, the construction of the Proposed Scheme could potentially affect 30 holdings in this area. On the basis of information currently available, 17 could experience moderate, major/moderate or major adverse permanent effects from construction, which would be significant.

4.4.18 Two farms are currently anticipated to incur major adverse permanent effects from construction. Both are dairy farms and of high sensitivity, with Upper Hanyards Farm incurring high impacts on farm infrastructure with the demolition of the farm dwelling and livestock accommodation buildings; and Park Farm, Marston incurring high severance impacts and the demolition of dairy buildings.

4.4.19 Three farms are anticipated to incur major/moderate adverse permanent effects. In relation to two arable holdings (Tithe Barn Farm and Sunnyhill Farm), this is due to the effects on farm infrastructure. In the case of Yarlet Hall Farm (which is a dairy and beef cattle farm), it is due to the proportion of the farm's land required for the Proposed Scheme.

4.4.20 Seven holdings could incur demolition, with three of those potentially losing the residential property (Tithe Barn Farm, Upper Hanyards Farm and Lower Bridge Farm); the other units could lose buildings or structures.

4.4.21 High impacts arising from the proportion of land required are currently anticipated at Bottom End Cottage, land to the south of Tolldish Lane and The Barn, all small holdings of approximately 2ha.

4.4.22 High severance impacts are currently anticipated at Park Farm, Marston and The Barn.

4.4.23 Although financial compensation would be available, there can be no certainty that this would be used to reduce the above adverse effects by the purchase of

replacement land or 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

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

### Summary of likely residual significant effects

4.4.25 Although the extent of land required permanently by ALC grade is unknown, current indications are that the effect on BMV agricultural land during construction will be moderate adverse in the Colwich to Yarlet area, and significant.

4.4.26 Seventeen of the 30 farm holdings identified are anticipated to experience moderate, major/moderate or major adverse permanent effects from construction. Two of these would experience major adverse effects, three would experience major/moderate adverse effects, and the remaining 12 would experience moderate adverse effects.

## 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, although further work is required to assess potential noise effects on livestock units.

### 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 The potential for significant effects on sensitive livestock receptors from noise will be assessed and reported in the formal EIA Report. Four sets of farm buildings at Great Haywood and Marston lie within 100m of the Proposed Scheme. Further work is required to identify whether any significant effects on the use of these buildings are anticipated.

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 which 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 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.

# 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 Colwich to Yarlet area.

5.1.2 Nitrogen dioxide ($NO_2$), oxides of nitrogen ($NO_x$), fine particulate matter (PM10, PM2.5) and dust[33] were considered in the assessment. Emissions of these air pollutants are likely to arise from construction activities, demolition, site preparation works and the use of haul routes. Emissions would also arise from road traffic during construction and operation of the Proposed Scheme.

5.1.3 Engagement with SBC has been undertaken. The purpose of this engagement has been to obtain relevant baseline information. Engagement with SBC will continue as part of the development of the Proposed Scheme.

5.1.4 Maps showing the location of the key environmental features and the key construction and operational features of the Proposed Scheme can be found in the Volume 2, CA2 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 and the draft SMR.

5.2.2 The study area for the air quality assessment has been determined on the basis of where impacts on local air quality may occur from construction activities, from changes in the nature of traffic during construction and operation, or where road alignments have changed.

## 5.3 Environmental baseline

### Background air quality

5.3.1 The main sources of air pollution in the Colwich to Yarlet area are emissions from road vehicles and agricultural activities. The main roads within the area are the A34 Stone Road, A518 Weston Road, the A51 Lichfield Road, A513 Beaconside and the M6. There are industrial emission sources in the region, however, none of these are considered likely to have a significant effect on local air quality in the area.

5.3.2 Estimates of background air quality have been obtained from Defra for the baseline year of 2015. The data are estimated for 1km grid squares for $NO_x$, $NO_2$, PM10 and PM2.5. Background concentrations are within the air quality standards for all pollutants within the area.

[33] PM2.5 and PM10 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.

### Local monitoring data

5.3.3 There are currently two diffusion tube sites located within the Colwich to Yarlet area for monitoring $NO_2$ concentrations. Measured concentrations in 2014[34] were within the air quality standard.

### Air quality management areas

5.3.4 There are no air quality management areas within the Colwich to Yarlet area.

### Receptors

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

5.3.6 Most of the receptors located close to the route are residential. However, other receptors include the Staffordshire County Showground, Moreton House, Ingestre Hall, Ingestre Park Golf Club, Great Haywood Marina and Yarlet School. Indirect effects from changes in air quality, such as that arising from increased levels of construction traffic, will be considered for ecological sites within 200m of construction routes where habitats are considered to be sensitive to air quality changes. These effects will be reported in the formal EIA Report.

## 5.4 Effects arising during construction

### Avoidance and mitigation measures

5.4.1 Emissions to the atmosphere would be controlled and managed during construction through the route-wide implementation of the CoCP. The draft CoCP includes a range of mitigation measures that are accepted by the Institute of Air Quality Management as being suitable to reduce impacts 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 draft CoCP also makes provision for the preparation of LEMPs. These plans would set out how, during construction of the Proposed Scheme, the environmental and community protection measures required for each area would be delivered, including through the implementation of specific measures required to control dust and other emissions from activities in the area.

5.4.3 The assessment has assumed that the general measures detailed in the draft CoCP would be implemented. These include:

- contractors being required to manage dust, air pollution, odour and exhaust emissions during construction works;

[34] Monitoring data for 2015 is not yet available. This will be included in the formal EIA Report.

- inspection and visual monitoring after engagement with the local authorities to assess the effectiveness of the measures taken to control dust and air pollutant emissions;
- cleaning (including watering) of haul routes and designated vehicle waiting areas to suppress dust;
- keeping soil stockpiles away from sensitive receptors where reasonably practicable, also taking into account the prevailing wind direction relative to sensitive receptors;
- using enclosures to contain dust emitted from construction activities; and
- undertaking soil spreading, seeding and planting of completed earthworks as soon as reasonably practicable following completion of earthworks.

## 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 soiling and exposure to $NO_2$, PM10 and PM2.5 concentrations.

5.4.5 Construction activities, such as demolition, earthworks, construction and trackout[35], have been assessed for their risk to have an effect on dust soiling and human health[36]. There are residential receptors located within 350m of these activities in this area.

5.4.6 In the absence of mitigation, there is a medium risk of dust effects and a low risk of human health effects arising from demolition activities at receptors around Staffordshire County Showground and in the Hopton area, with a low risk at receptors around the Marston and Yarlet area. For earthworks, there is a medium risk of dust soiling but low risk of human health effects at receptors close to the works along the route. There is also a medium risk of dust soiling and low risk of human health effects from construction activities at receptors close to the proposed compound locations and other areas of construction. For trackout, there is a medium risk for dust soiling and low risk for human health effects at receptors along the construction routes and close to the works.

5.4.7 With the application of the mitigation measures contained in the draft CoCP, no significant effects are anticipated from these dust generating activities.

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

5.4.9 It is expected that the A51 Lichfield Road, the M6, A34 Stone Road, A518 Weston Road and A513 Beaconside would provide the primary access for construction vehicles

[35] 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.
[36] Human health effects relate mainly to short-term exposure to particles of size between 2.5µm to 10µm, measured as $PM_{10}$.

in this area. An increase in traffic flows as a result of construction traffic, temporary closures or diversions is expected on the A51 Lichfield Road, A34 Stone Road, A518 Weston Road, A513 Beaconside, B5066 Sandon Road, Mill Lane, Marston Lane and Tixall Road. A detailed assessment of air quality impacts from traffic emissions along these roads will be undertaken and reported in the formal EIA Report.

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 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 EIA Report.

#### *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 are considered effective at reducing dust and construction traffic emissions, and therefore, no significant residual effects are considered likely.

## 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 could arise from vehicle emissions due to changes in the volume, composition and distribution of traffic in the area.

5.5.3 Where the changes in traffic emissions require it, a detailed assessment of the air quality impacts will be undertaken and reported in the formal EIA Report.

### Other mitigation measures

5.5.4 In the event that significant effects on local air quality are identified from the assessment of traffic emissions during operation of the Proposed Scheme, relevant mitigation measures will be proposed and reported in the formal EIA Report.

### Summary of likely residual significant effects

5.5.5 A summary of the likely residual significant effects on local air quality will be reported in the formal EIA Report.

# 6 Community

## 6.1 Introduction

6.1.1 This section of the report describes the impacts and likely significant effects on local communities resulting from the construction and operation of the Proposed Scheme within the Colwich to Yarlet area.

6.1.2 Engagement with Ingestre Park Golf Club, Staffordshire County Showground, Rugeley School and Yarlet School has been undertaken. The purpose of this engagement has been to understand how the facilities are used and to obtain relevant baseline information. Engagement with these and other relevant stakeholders will continue as part of the development of the Proposed Scheme.

6.1.3 Maps showing the location of the key environmental features and the key construction and operation features of the Proposed Scheme can be found in the Volume 2, CA2 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 the draft SMR and Volume 1.

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 effects on community facilities and resources will be reported in the formal EIA Report.

6.2.3 The study area includes the areas 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, heavy goods vehicle (HGV) traffic and visual intrusion. These in-combination effects will be identified in the formal EIA Report. 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.

## 6.3 Environmental baseline

6.3.1 The Colwich to Yarlet area covers approximately 15km of the Proposed Scheme in Staffordshire. The Proposed Scheme in this area would extend from north of Colton in the south-east, to west of Yarlet in the north-west. It would pass through Hopton and near to the settlements of Moreton, Ingestre, Marston, Great Haywood and Yarlet. The area is characterised by small clusters of dwellings and individual dwellings within rural areas close to the Proposed Scheme.

6.3.2 Hopton is a small village made up of approximately 160 residences, including an estimated 38 residences located within the secure MoD Stafford Barracks. Community facilities within the village include St Peter's Church, playing fields and a village hall. Marston and Yarlet are small adjoining hamlets made up of an estimated 56 residences in total.

6.3.3 Ingestre Park Golf Club is located in the village of Ingestre. It is a private members' club with approximately 650 members. The course has 18 holes and is currently a 70/72-par course (men/women). In addition to the course there is a club house that includes a bar, restaurant and a pro-shop. The club house facilities are used for a variety of social and recreational events and can cater for up to 200 people.

6.3.4 Staffordshire County Showground is a multi-purpose venue, comprising exhibition halls, conference suites, a 600-seat grandstand and caravan and camping facilities for use on show days. It hosts a number of community events each year, such as a motor show, an animal show, a toy fair and the Staffordshire County Show. A bridge club and a Young Farmers group meet within the Showground on a weekly basis.

6.3.5 Mayfield Children's Home is a specialist residential home for students at Rugeley School located in the Fradley to Colton area (CA1). Mayfield Children's Home is located within Morton House, a Grade II listed building. The home has facilities for up to 23 children aged between 5 and 19, with 40-50 staff. Children stay on site up to 52 weeks a year, with some children on 40 week packages. All of the children are severely autistic, with many having special behavioural, learning or communication needs in addition. The site includes a small outdoor playground, football pitch, trampoline, gardening areas and a sensory garden. The children at the home often take walks in the local area and regular trips to local towns, particularly to Rugeley, Stafford and Cannock, and to the Wolesley Centre and Shugborough Hall. Access to Rugeley School, and other local services are important.

6.3.6 There are four promoted[37] PRoW in the area: Sabrina Way; Stone Circles Challenge; the Trent and Mersey Canal Walk; and the Two Saints Way.

## 6.4 Effects arising during construction

### Avoidance and mitigation measures

6.4.1 As described in Section 2, the route has been moved further away from residential properties and community facilities at Moreton and Hopton. The route has also been moved slightly east at Marston and Yarlet to avoid residential receptors.

6.4.2 An additional crossing of the route (Colwich Bridleway 23 accommodation overbridge) has been added to maintain access to Bishton Lane.

6.4.3 The construction areas in the following locations have been designed to reduce the loss of residential properties:

- around Trent South embankment and works to Tolldish Lane, the construction area around Hoo Mill Lane, for the Great Haywood viaduct, and the extent of the A51 main compound;
- Hopton embankment; and
- Marston Lane diversion and the location of Marston Lane satellite compound.

[37] Promoted ProW refers to those PRoWs which are "promoted" destinations in their own right as a recreational resource.

6.4.4 PRoW routes would be maintained and would remain operational wherever reasonably practicable.

## Assessment of impacts and effects

### *Temporary effects*

#### Residential properties

6.4.5 The area required for the construction of Trent South embankment, the works to the A51 Lichfield Road, and the construction of the Great Haywood viaduct would be adjacent to 11 residential properties to the north and north-west of Great Haywood. Associated works would also be located in proximity to these residences, including the Tolldish Lane diversion and the Hoo Mill Lane diversion; construction of the A51 Lichfield Road underbridge, the Mill Lane auto-transformer station, the A51 main compound and Mill Lane satellite compound; and the diversion of a high pressure gas main. This would result in a major adverse isolation effect for the residents, which would be significant.

6.4.6 Hopton embankment would sever Trent Walk, which provides access to five residential properties at Park Farm, including Park Farm B&B. Stafford is located to the south of the properties and is likely to be accessed on a regular basis for services and community facilities. Access to the properties could continue to be taken from the north via Trent Walk and Hopton and Coton Bridleway 19; however, residents of Park Farm trying to access Stafford would be required to travel along the A518 Weston Road, adding approximately 2km to their journey. During works to divert the A518 Weston Road it is likely that journeys would be disrupted. This would result in a moderate adverse isolation effect for the residents, which would be significant.

6.4.7 Marston South embankment would be constructed to the south-west of five properties in Marston, and would form a barrier between these five properties and the rest of Marston and Yarlet. The area required for the Marston South embankment, the Marston Lane diversion, the Marston Bridleway 8 accommodation underbridge, and the Marston Lane satellite compound would be located in proximity to these residences. The existing Marston Lane would also be used as a construction traffic route. This would result in a moderate adverse isolation effect for the residents, which would be significant.

6.4.8 A small area of outside space at one residential property on Yarlet Lane, Yarlet would be located within the land required temporarily for the construction of the Marston North embankment, including landscape earthworks. The limited duration for which this land is likely to be required means this is not considered to have a significant community effect.

6.4.9 An area of outside space at one residential property along the A34 Stone Road, Yarlet would be located within the land required temporarily for the construction of an access road to a balancing pond related to the Yarlet South cutting. Part of this area would be required permanently, as described below. These areas of land are likely to be required for a short period and therefore this is not considered to have a significant community effect.

### Community facilities

6.4.10 No temporary effects have been identified as a result of the land required for construction or due to isolation.

6.4.11 No significant effects associated with isolation or from land required for the Proposed Scheme have been identified at Mayfield Children's Home at this stage.

### Recreational facilities

6.4.12 The Staffordshire County Showground and the facilities within the site are accessed only from the A518 Weston Road, which would be diverted as part of the Proposed Scheme via the A518 Weston Road overbridge. During construction, access to the showground via the A518 Weston Road would likely be disrupted, reducing access to the showground. Disruption is likely to be worst during larger events when a large number of people would be likely to attempt to access the site. Traffic disruption impacts will be described in the traffic and transport assessment in the formal EIA Report. For the working draft EIA Report a worst case has been assumed, that access to the site would be temporarily disrupted for the duration of the road works. The works would be managed to ensure access is maintained to the site. Due to the disruption to access at the facilities at the showground, including those used on a weekly basis, there is likely to be a major adverse isolation effect at the Staffordshire County Showground, which would be significant.

### Open space and PRoW

6.4.13 Land required for the construction and operation of the Proposed Scheme would result in severance of four promoted PRoW, which are considered to provide a recreational resource. The Proposed Scheme includes permanent, and as required, temporary, realignments for each PRoW. The effect on these PRoW would not be significant.

## *Permanent effects*

### Residential properties

6.4.14 The construction and operation of the Coley cutting would require the demolition of one isolated residential property, accessed via a private track and Colwich Footpath 26. This residential property would be permanently lost.

6.4.15 Trent South embankment and its associated earthworks would require the demolition of one residential property, which is set back from Tolldish Lane. This residential property would be permanently lost.

6.4.16 Brancote South cutting would require the demolition of Upper Hanyards Farm. This residential property would be permanently lost.

6.4.17 The land required for the construction and operation of the Hopton embankment would require the demolition of one residential property accessed via Trent Walk. This residential property would be permanently lost.

6.4.18 Areas of outside space at four residential properties would be located within the land required for landscape mitigation associated with the Hopton retaining wall. These areas would total approximately 60% of the rear garden space of the properties.

Although the impact on the individuals is likely to be significant, due to the loss of garden, it would not result in a significant effect at a community level.

6.4.19 There would be a permanent requirement for land within Hopton as a result of Hopton North cutting and the diversion of Hopton Lane. This would require the demolition of seven residential properties on Hopton Lane, which would result in a major adverse effect, which would be significant.

6.4.20 Hopton North cutting would separate the majority of the residential properties and the community facilities in the north from approximately 10 residential properties on Mount Edge and approximately 38 residential properties within the MoD Stafford Barracks off Spode Avenue in the south. The route of the Proposed Scheme would be in cutting, resulting in limited views of the Proposed Scheme, however, this would result in a barrier between the two parts of the village. The route of the Proposed Scheme would also sever Hopton Lane and the B5066 Sandon Road, which would be diverted. This would increase the distance that would need to be travelled from residences south of the Proposed Scheme to access the community facilities in the north by approximately 1.2km. The presence of the Proposed Scheme through Hopton would result in a permanent perception of isolation for the residents and would result in a moderate adverse effect, which would be significant.

6.4.21 Two residential properties in Yarlet are located within the land required for construction and operation of the Yarlet south cutting, Yarlet auto-transformer station, and localised works to the A34 Stone Road including the A34 Stone Road overbridge. These residential properties would be permanently lost.

6.4.22 An area of outside space at one residential property located off the A34 Stone Road, Yarlet would be located within the land required permanently for an access road to a balancing pond related to the Yarlet South cutting. Although the impact on the resident is likely to be significant, due to the loss of garden, it would not result in a significant effect at a community level.

### Community facilities

6.4.23 It is currently anticipated that there would be no permanent effects on community facilities as a result of the Proposed Scheme.

6.4.24 No significant permanent isolation effects or effects arising from land required for the Proposed Scheme have been identified at Mayfield Children's Home at this stage.

### Recreational facilities

6.4.25 Trent North embankment, Brancote South cutting and associated landscaping would require a total of approximately 21ha (approximately 40%) of Ingestre Park Golf Club to be either lost, or severed from the clubhouse during construction. This area would cover seven holes of the course. There are alternative golf clubs in easy travelling distance, although there are no alternatives that would have similar qualities and characteristics, in terms of the landscape and heritage value. The club house facilities are used for a variety of social and recreational events, including the local bridge club, and can cater for up to 200 people. This loss of land during construction would mean that the club would be unable to function in its current arrangement. A major adverse

effect, which would be significant, has been identified at this stage, in the absence of mitigation.

#### Open space and PRoW

6.4.26 Land required for the construction and operation of the Proposed Scheme would result in severance of four promoted PRoW, which are considered to provide a recreational resource. The Proposed Scheme would include permanent and, as required, temporary realignments for each PRoW. The effect on these PRoW would not be significant.

### Other mitigation measures

6.4.27 HS2 Ltd will continue to work with Ingestre Park Golf Club.

### Summary of likely residual significant effects

6.4.28 It is currently anticipated that there would be a major adverse significant temporary effect on 11 properties located north and north-west of Great Haywood; a moderate adverse significant effect for five properties on Marston Lane, Marston; and a moderate adverse significant effect for five properties at Park Farm. This is due to isolation of the properties during construction.

6.4.29 The village of Hopton would be subject to a permanent moderate adverse and significant isolation effect due the presence of the Proposed Scheme through two parts of the village.

6.4.30 There would be a major adverse significant effect due to impacts on accessibility at the Staffordshire County Showground during construction. This is expected to affect the operation of the showground, particularly when larger events are held.

6.4.31 Seven holes of Ingestre Park Golf Club would be lost or severed from the club house which would mean that during construction the club would be unable to function in its current arrangement. This would be a major adverse permanent significant effect.

6.4.32 Seven residential properties would be demolished on Hopton Lane, resulting in a major adverse permanent significant effect on this community.

## 6.5 Effects arising from operation

### Avoidance and mitigation measures

6.5.1 As described in Section 2, the route has been moved further away from residential facilities and community facilities in Moreton, the Staffordshire County Showground and the majority of properties at Hopton. The route has also been moved to the east at Marston and Yarlet to avoid residential receptors.

### 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 EIA Report.

## Other mitigation measures

6.5.3 Specific mitigation measures, where required, will be described in the formal EIA Report.

## Summary of likely residual significant effects

6.5.4 A summary of any likely residual significant effects will be reported in the formal EIA Report.

# 7 Cultural heritage

## 7.1 Introduction

7.1.1 This section of the report provides a description of the current baseline for heritage assets and of the likely impacts and significant effects resulting from the construction and operation of the Proposed Scheme within the Colwich to Yarlet area. Consideration is given to the extent and heritage value (significance) of heritage assets including archaeological and palaeo-environmental remains; historic buildings and the built environment.

7.1.2 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.

7.1.3 Maps showing the location of the key environmental features and the key construction and operational features of the Proposed Scheme can be found in the Volume 2, CA2 Map Book. Only designated heritage assets within the Colwich to Yarlet area are shown on maps CT-10-106b to CT-10-111a[38]. Non-designated heritage assets have also been assessed as part of this work, although they are not illustrated on these maps. A gazetteer of designated and non-designated heritage assets with accompanying maps will be included in the formal EIA Report.

7.1.4 Engagement has been undertaken with Historic England and SCC with regard to the nature of the cultural heritage assets within the area. The purpose of this engagement has been to understand the local environment, discuss the assessment approach and obtain relevant baseline information. Engagement with stakeholders will continue as part of the development of the Proposed Scheme.

## 7.2 Scope, assumptions and limitations

7.2.1 The assessment scope, key assumptions and limitations for the cultural heritage assessment are set out in Volume 1 and the draft SMR.

7.2.2 Detailed assessment of the effects on the historic landscape will be considered in the formal EIA Report.

7.2.3 A detailed assessment of all known heritage assets, designated and non-designated, has been carried out within a study area defined as the land required, temporarily or permanently, to construct and operate the Proposed Scheme plus 500m.

7.2.4 The setting of all designated heritage assets up to 2km from the land required, temporarily or permanently, to construct and operate the Proposed Scheme has been considered.

7.2.5 In undertaking the assessment the following limitations were identified:

[38] Recent changes to the boundaries of the Ingestre, Tixall and Staffordshire and Worcestershire Canal Conservation Areas are taken into account in this assessment. The boundaries shown on the accompanying Map Series CT-10, based on the latest available spatial datasets, do not yet include these revisions. The updated conservation area boundaries will be included in the formal EIA Report.

- although the LiDAR[39] data examined covers the majority of the study area, there were some areas for which data was unavailable; and
- not all areas within the study area were available for field survey (due to limited land access and site conditions), such as site reconnaissance visits and geophysical survey. This work is ongoing and will be included as part of the formal EIA Report.

7.2.6 Information from other sources of data, including the Historic Environment Record (HER) and local archives, has been used to provide information relating to the potential heritage assets that may be present.

7.2.7 Where noise is considered, this is within the context of the contribution that this makes to the heritage significance 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 visit the area.

## 7.3 Environmental baseline

7.3.1 Documentary baseline data were collected from a variety of sources in compiling this assessment including:

- Staffordshire HER;
- Staffordshire Record Office collections;
- material held at the William Salt Library, Stafford;
- historic Ordnance Survey mapping; and
- other published sources.

7.3.2 In addition to collating this baseline data, the following surveys were undertaken:

- detailed and systematic transcription of remote sensing data including LiDAR and aerial photographs;
- walkover and site reconnaissance from areas of public access. This was undertaken to understand the character and form of heritage assets and the historic landscape; and
- settings assessments of all designated heritage sites within 2km of the Proposed Scheme.

### Designated assets

7.3.3 Designated heritage assets are set out below under three categories: those located partially or wholly within the land required, temporarily or permanently, for the construction and operation of the Proposed Scheme; those within 500m of the land required for construction and operation and those between 500m and 2km away.

[39] Light detection and ranging (LiDAR) is a high resolution remote sensing technique to capture 3D data.

7.3.4 The following designated heritage assets are located partially or wholly within the land required, temporarily or permanently, for the construction of the Proposed Scheme:

- Trent and Mersey Canal Conservation Area; and
- Ingestre Conservation Area[40].

7.3.5 The following designated heritage assets are located partially or wholly within 500m of the land required, temporarily or permanently, for the construction and operation of the Proposed Scheme (from south to north):

- Moreton House, Grade II listed building;
- Great Haywood and Shugborough Conservation Area, which contains 40 listed buildings, 26 of which lie within Shugborough registered park and garden. Six of those 40 listed buildings lie within 500m of the land required, temporarily or permanently, for the construction and operation of the Proposed Scheme:
- Abbey House at Great Haywood, Grade II listed building;
- Barn to the north-east of Abbey House, Great Haywood, Grade II listed building;
- Haywood House, Great Haywood, Grade II listed building;
- Roman Catholic Church of St John the Baptist, Great Haywood, Grade II listed building;
- Churchyard Cottage, Great Haywood, Grade II listed building;
- Mill Lane Railway Bridge, Great Haywood, Grade II listed building;
- Trent and Mersey Canal Milepost at Heywood Junction, immediately north of Mill Lane Crossing, Grade II listed building;
- Trent and Mersey Canal Middle Bridge Number 75, Grade II listed building;
- Trent and Mersey Canal Hoomill Bridge Number 76, Grade II listed building;
- Trent and Mersey Canal Milepost north of Hoomill Lock, Grade II listed building;
- Tixall Conservation Area;
- K6 telephone kiosk, Ingestre, Grade II listed building;
- Ingestre Hall, Grade II* listed Jacobean building;
- Church of St Mary, Ingestre, Grade I listed building;

[40] This assessment is based on the revised Ingestre Conservation Area boundary published in the March 2015 Conservation Area Appraisal. Map CT-10-108, which uses existing official spatial data, shows the old Conservation Area boundary. The revised boundary includes Lionlodge Covert and Ingestre Wood and therefore falls within the land required, temporarily or permanently, for the construction and operation of the Proposed Scheme. This will be updated in the formal EIA Report.

- Old Stables at Ingestre Hall, Grade II listed building;
- Stables at Ingestre Hall to the east of Old Stables, Grade II listed building;
- The Pavilion in Ingestre Park, Grade II listed building;
- Battle of Hopton Heath 1643, registered battlefield; and
- Church of St Leonard, Marston, Grade II listed building.

7.3.6 The following designated heritage assets are located between 500m and 2km from the land required, temporarily or permanently, for the construction and operation of the Proposed Scheme (from south to north):

- five scheduled monuments: bowl barrow approximately 360m east of Bishton Hall; moated site approximately 160m south-west of St Michael and All Angels' Church, Colwich; Essex Bridge, Great Haywood; Great Haywood canal bridge No 109; and St Thomas' Priory, Tixall;
- one Grade I registered park and garden: Shugborough;
- seven Grade I listed buildings: Essex Bridge, Great Haywood; Shugborough Hall; Garden Bridge at Shugborough Hall; Chinese House at Shugborough Hall; Doric Temple at Shugborough Hall to north of the House; Dark Lantern at Shugborough Hall; The Gatehouse, Tixall;
- eight Grade II* listed buildings: Bishton Hall; Doric screen, garden walls, terrace and parterre curb north of Bishton Hall; parish church of St Michael and All Angels, Colwich; Shepherd's Monument at Shugborough Hall; Temple of the Winds at Shugborough Hall; Farmhouse of Shugborough Park Farm; south range of outbuildings of Shugborough Park Farm; Walled Garden and Gardener's Cottage at Shugborough Hall;
- seventy six Grade II listed buildings, predominantly within the settlements of Little Haywood, Great Haywood, Tixall and Hixon, but also associated with grand houses, namely Shugborough (seven buildings), Ingestre (three buildings) and Bishton Hall; dispersed farmsteads and village properties; three canal bridges, two canal mileposts and one canal lock contained within the Trent and Mersey Canal Conservation Area, and two canal bridges contained within the Staffordshire and Worcestershire Canal Conservation Area [41]; two railway bridges, three road bridges, a road milepost and a quarry engine house; and
- two conservation areas: Colwich and Little Haywood; and the Staffordshire and Worcestershire Canal.

[41] The bridge crossing the Staffordshire and Worcestershire Canal at its junction with the Trent and Mersey Canal, together with the wharves and mill buildings to the north, now falls within the extended boundaries of the Staffordshire and Worcestershire Canal Conservation Area as published in the appraisal of October 2015. This is not reflected on Map CT-10-107, which uses existing official spatial data, and shows the bridge, mill and wharves as falling outside of the adjacent conservation areas. This will be updated in the formal EIA Report.

## Non-designated assets

7.3.7 The following non-designated heritage assets are located partially or wholly within the land required, temporarily or permanently, for the construction and operation of the Proposed Scheme:

- linear features of unknown purpose and date seen as cropmarks on aerial photographs to the west of Moreton House;
- part of a post-medieval water meadow on each side of the River Trent depicted on historic mapping and which may retain subsurface remains but which has no surviving above-ground elements;
- part of a post-medieval water meadow visible on aerial photographs on the western side of the River Trent that retains well-preserved earthwork remains of its carrier drains;
- a non-designated finger post on Hoo Mill Lane, Tixall, recorded in the Staffordshire HER;
- buried archaeological remains of two Bronze Age round barrows and a field boundary of probable Iron Age or Roman date, visible as cropmarks on aerial photographs at Hoo Mill, Ingestre;
- a possible salt spring/well and area of associated former saltmarsh on the southern edge of Lionlodge Covert, as indicated by historic maps and field names;
- buried archaeological remains of one probable and one possible Iron Age square barrow, visible as cropmarks on aerial photographs to the south of Lionlodge Covert, Ingestre;
- buried archaeological remains of a pit alignment and continuous field boundaries of probable Iron Age date, visible as cropmarks on aerial photographs to the south-east of Lionlodge Covert, Ingestre;
- buried archaeological remains of a square enclosure, trackway and field boundaries of probable Iron Age or Roman date, visible as cropmarks on aerial photographs to the south of Lionlodge Covert, Ingestre;
- buried archaeological remains of a curved enclosure of probable post-medieval date, visible as a cropmark on aerial photographs within the grounds of Ingestre Golf Club;
- a medieval and post-medieval agricultural landscape comprising a complex of field boundaries visible as cropmarks and earthworks on aerial photographs within and to the west of Church Field, Ingestre;
- post-medieval marl pits visible as earthworks on aerial photographs within and to the west of Church Field, Ingestre;
- earthwork remains of a carriageway in Church Field leading to Ingestre Hall visible on aerial photographs and LiDAR;

- the former post-medieval landscape park at Ingestre Hall, shown on historic maps;
- the former post-medieval landscape park at the former Tixall Hall, shown on historic maps;
- extant Second World War military road and site of demolished military building adjacent to the road at Ingestre, recorded in the Staffordshire HER;
- complex of extant and former medieval and post-medieval field boundaries visible as earthworks on aerial photographs to the south and west of Hopton;
- Lowerhouse Farm, Hopton, a non-designated historic farmstead recorded in the Staffordshire HER;
- Mount Farm, a non-designated historic farmstead recorded in the Staffordshire HER;
- Lower Bridge Farm, a non-designated historic farmstead recorded in the Staffordshire HER;
- the route of the former Stafford and Uttoxeter Railway, which opened in 1867 and closed in 1951, shown on historic maps;
- earthwork and cropmark remains of Marston Deserted Medieval Village (DMV)[42], visible on aerial photographs;
- earthwork and cropmark remains of Yarlet DMV, visible on aerial photographs; and
- the site of the medieval Yarlet Hall, visible on aerial photographs and LiDAR, demolished and replaced by the current Yarlet Hall on a new site to the north during the 19th century.

7.3.8 The following non-designated heritage assets are located partially or wholly within 500m of the land required, temporarily or permanently, for the construction and operation of the Proposed Scheme:

- Moreton Grange, a non-designated historic farmstead recorded in the Staffordshire HER;
- likely site of Moreton DMV, visible on aerial photographs;
- potential remains, preserving evidence for prehistoric human settlement and/or contemporary environmental conditions, sealed below or within terraces of sand and gravel that flank the River Trent and which were laid down during the ice ages, between 400,000 and 10,000 BC (the Pleistocene), and similar material sealed within clay, silt and peat (alluvium) dating from 10,000 BC to the present day (the Holocene) that flanks Moreton Brook and the River Trent;

[42] A medieval village settlement typically abandoned in the later fourteenth century as the result of depopulation brought about by, among other things, the Black Death

- three aligned round barrows, one of either Neolithic or Bronze Age date, and two of Bronze Age date, visible as cropmarks on aerial photographs to the north-east of Lionlodge Covert;
- Iron Age or Roman double pit alignment, continuing as a continuous holloway[43] visible as cropmarks on aerial photographs to the east of Lionlodge Covert;
- medieval and post-medieval field boundaries visible as cropmarks on aerial photographs at Little Ingestre;
- a 19th century brick-and-timber saw mill and attached cart shed at Little Ingestre, recorded in the Staffordshire HER;
- a red-brick office block of 19th century date that served the needs of the saw mill at Little Ingestre;
- a group of post-medieval haystack stands visible as cropmarks on aerial photographs within Church Field, Ingestre; post-medieval marl pits, sandstone quarry and field boundaries, visible as earthworks and cropmarks on aerial photographs at and to the west of Upper Hanyards;
- site of a former Second World War military camp at Ingestre, recorded in the Staffordshire HER;
- a Neolithic or Bronze Age round barrow called "Weetman's Ring Ditch", visible as a cropmark on aerial photographs to the east of Park Farm, Tixall;
- post-medieval milepost at the County Showground, Stafford, recorded in the Staffordshire HER;
- post-medieval milepost on Baswich Road, Stafford, recorded in the Staffordshire HER;
- Hopton Pools, two fish ponds that predate 1775, recorded in the Staffordshire HER;
- complex of medieval and post-medieval field boundaries surviving as cropmarks to the south of Hopton, visible on aerial photographs;
- Ravensbank, Hopton, a non-designated historic farmstead recorded in the Staffordshire HER;
- Hoptonhall Farm, Hopton, a non-designated historic farmstead recorded in the Staffordshire HER;
- earthwork and cropmark remains of ridge and furrow to the south and west of Hopton;
- Hopton Railway Cutting Quarry of 19th century date, recorded in the Staffordshire HER;

[43] A historic routeway, sunken in relation to surrounding the ground-level as the result of use over a long period of time.

- the site of the medieval Chapel of St Peter and associated burial ground, Hopton, recorded in the Staffordshire HER;
- Kent's Barn Farm, Hopton, a non-designated historic farmstead recorded in the Staffordshire HER;
- Milepost at Hopton Heath, dated 1893, recorded in the Staffordshire HER;
- Ranslow Farm, Sandon Bank, a non-designated historic farmstead recorded in the Staffordshire HER;
- Milepost at Hopton Farm, dated 1893, recorded in the Staffordshire HER;
- Hopton Farm, Sandon Road, Hopton, a non-designated historic farmstead recorded in the Staffordshire HER;
- Newbuildings Farm, Marston, a non-designated historic farmstead recorded in the Staffordshire HER;
- Marston Farm, Marston, a non-designated historic farmstead recorded in the Staffordshire HER;
- Marston New Farm, a non-designated historic farmstead recorded in the Staffordshire HER, the only surviving element of which is a barn, now converted to domestic use;
- earthwork and cropmark remains of Marston deserted settlement;
- earthwork remains of ridge and furrow north and south of Marston; and
- the landscaped park associated with the current Yarlet Hall.

## Cultural heritage overview

7.3.9 There are a number of river and stream valleys along the route containing Pleistocene (Ice Age) river terrace deposits and/or deposits of Holocene (post-Ice Age) alluvium. The largest and that with the greatest potential for archaeological significance is Trent Valley. The upper Trent Valley is known to contain Pleistocene terrace gravels dating back to around 450,000 years ago, which have the potential to contain stone tools as well as important palaeo-environmental information. Holocene alluvium and waterlogged peat have the potential to contain exceptionally well-preserved prehistoric archaeological and palaeo-environmental remains dating back over the past 10,000 years. Moreton Brook is also known to contain similar Holocene deposits.

7.3.10 There are no certain Mesolithic sites within the study area. An axe-hammer of Neolithic date was found in the Hopton area, and Neolithic artefacts were recovered from the Pool Farm area of Weston in the 1950s. Weetman's Ring Ditch to the east of Park Farm, Tixall is of late Neolithic or Bronze Age date, as is a large round barrow visible as a cropmark on aerial photographs to the east of Lionlodge Covert. Beyond the study area, there are two causewayed enclosures of Neolithic date downstream within the Trent Valley at Mavesyn Ridware and Fradley and Streethay, and a possible Neolithic mortuary enclosure is known at Pipe Ridware.

7.3.11 There is cropmark evidence of two Bronze Age round barrows within the land required, temporarily or permanently, for the construction and operation of the Proposed Scheme on the Trent gravels east of Lionlodge Covert, Ingestre, and two or three additional barrows of that date within 500m of the route. Weetman's Ring Ditch may be of this date, and there were formerly two additional Bronze Age round barrows on Tixall Heath (King's Low and Queen's Low), which were subject to archaeological excavation ahead of removal in the 1980s and 90s.

7.3.12 One probable and one possible Iron Age square barrow are visible as a cropmark within the land required for construction of the Proposed Scheme to the south of Lionlodge Covert. There are also numerous pit alignments and continuous-ditch boundaries and enclosures of probable Iron Age or Roman date within the land required for construction, the wider study area and beyond. These reflect intensive settlement and agricultural occupation which appears to have extended across the river valleys and up onto the adjacent valley slopes.

7.3.13 There are no known remains of early or mid-Anglo Saxon date within or adjacent to the study area. By the end of the Anglo Saxon period, the essential settlement pattern of the study area that would exist throughout the medieval period was probably already established. The Domesday Book indicates that there were two estates present by 1086 at Moreton, which were likely to have been centred upon modern-day Moreton and upon Upper Moreton, which lies 500m south-east of Moreton Grange. These two estates were small, and need have been no more than hamlets at that time. Great Haywood was a large estate in 1086 likely to be associated with an already medium-sized nucleated village. At Ingestre, Tixall, Hopton and Marston there was a single estate in each township, and the settlements there are likely to have been small nucleated hamlets.

7.3.14 Each of these settlements is likely to have prospered and expanded between the 11th and early 14th centuries, with the exception of the settlement at Yarlet, which was depopulated by the monks of Combermere who turned it into grange, probably in the mid-12th century. In the late medieval period, from 1300 until about 1550, adverse climatic events followed by the Black Death of 1348 and recurrent outbreaks of plague thereafter led to population decline, which increased labour costs and reduced the demand for grain. As a consequence, much arable land was enclosed piecemeal by agreement and was laid down to grass, and many rural settlements shrank or were deserted. It is likely that Moreton was deserted at this time, and the site of a deserted settlement is conjectured to be close to Moreton House. Marston village was also deserted at this time, and the earthwork remains of the village survive in fields to the north, south and east of the parish church there.

7.3.15 In the post-medieval period, the enclosure of the former open fields[44] crossed by the study area was completed. Many farmsteads previously located within villages or hamlets dispersed to their now-consolidated landholdings, and it is to the post-medieval period that the dispersed farmsteads within the study area date. This period also saw the rise of country houses and the laying out of their parks and gardens, including those at Tixall, Ingestre and Shugborough. The Tudor Tixall Hall was built

[44] The typical medieval pattern of cultivation under which each village had two or three large fields divided into strips, each of which was cultivated by individual householders

around 1560, and the associated Grade I listed Tixall Gatehouse was built approximately 15 years later. Bottle Lodge, located approximately 500m east, may be contemporary with the Gatehouse. The Tudor Hall was associated with a deer park, located a short distance to the north-west. In August 1586, the Hall was the temporary prison of Mary Queen of Scots, while her quarters at Chartley were being searched for incriminating evidence.

7.3.16 In the 18th century, the Tudor Hall was demolished and a Georgian country house was built a short distance to the east. This faced south towards the Trent Valley. Consent was given to build the Staffordshire and Worcestershire Canal through the estate on condition that where the canal would run past the Georgian Hall it would be widened, to give the illusion of a lake when viewed from the Hall. Thus in 1771, Tixall Wide was formed. Capability Brown remodelled the landscape park at this time, levelling the ground between the Hall and Tixall Wide to enhance the view. The Georgian Hall was demolished in the 1920s, although the Tudor Gatehouse and Bottle Lodge and the 19th century stables built behind the main house survive.

7.3.17 The Grade II* listed Jacobean Ingestre Hall was built in around 1613, and in 1676 St Mary's Grade I listed church was built adjacent to the Hall to a design by Christopher Wren (this is the only Christopher Wren church to be built outside London). In the late 17th century, the Hall was surrounded by formal gardens, and Celia Fiennes, writing in the late 17th century, described formal gardens surrounding the Hall, and a tree-lined avenue one mile long running north-north-west from the Hall to Old Lodge Covert. In the early 18th century, a walled wilderness was laid out in Ingestre Wood to the north-west of the Hall, with formal grand walks and radiating alleys. A number of classical buildings were erected in the wilderness at this time, of which the only surviving one is the Pavilion. The formal gardens surrounding the Hall were removed in the early 18th century, and Capability Brown naturalised the parkland to the north, by removing or softening the geometric planting. The parkland to the south of the Hall where crossed by the Proposed Scheme would appear to have been integrated into the landscape park more fully in the 19th century, after the road in front to the hall continuing the line of Hanyards Lane was closed in 1802. The Ingestre estate was broken up and sold in the 1960s; the parkland to the south of the Hall is now home to Ingestre Park Golf Club, Ingestre Hall is now a residential arts centre, while the stables and other farm buildings have been subdivided and converted to residential use.

7.3.18 The Grade I listed Shugborough Hall lies approximately 1km from the land required, temporarily or permanently, for the construction and operation of the Proposed Scheme. It was built in the late 17th century, and was remodelled and amended in the 18th century and early 19th century. The Hall is located within a Grade I registered park and garden that contains a number of nationally important early- to-mid-18th-century garden buildings, including the Chinese House, the Ruins, and the Shepherd's Monument and Cat's Monument. The parkland beyond contains a number of nationally important mid-18th century Neoclassical Greek parkland buildings and monuments designed by James 'Athenian' Stuart, including Hadrian's Arch, the Tower of the Winds, the Choragic Monument and the Doric Temple. The Shugborough estate was donated to the National Trust in 1960.

7.3.19 The post-medieval period also witnessed the turbulent events of the English Civil War (1642-1651), and the south-eastern corner of the Hopton Heath 1643 registered

battlefield site falls within the study area, to the east of MoD depot located within the boundary of the asset. On the afternoon of Sunday 19th March 1643, Parliamentarian forces under the command of Sir John Gell and Sir William Brereton did battle with Royalist forces led by the Earl of Northampton upon Hopton Heath. The Parliamentarian forces, who advanced via Salt Heath, occupied the battlefield first and deployed along the high ground either side of Heathyards. After the initial skirmishing, the Royalist forces, who had advanced from Stafford, made two charges before nightfall. When the Royalists returned to the battlefield the next morning, the Parliamentarians had decamped during the night. The battle was indecisive, although the Earl of Northampton was killed. The site is a registered battlefield, which lies on the elevated plateau to the north of Hopton, on the opposite side of the village from Proposed Scheme, at a distance of approximately 500m or more.

7.3.20 The Trent and Mersey Canal was authorised in 1766 and completed in 1777, the Staffordshire and Worcestershire Canal was also authorised in 1766 and completed in 1772, and the Trent Valley Line railway, which runs through the study area, opened in 1847.

7.3.21 The 20th century witnessed significant changes in landscape character within the study area. Tixall Hall was demolished and Ingestre Hall and Shugborough Hall ceased to be domestic residences. The designed landscapes of the first two of those three assets were converted to agricultural or leisure use. In the middle and later years of the 20th century, the increased mechanisation of farming led to the amalgamation of many hitherto small fields with the consequential loss of historic hedgerows, for example at Colwich and Hopton.

7.3.22 A number of military establishments were built along the Proposed Scheme in the middle decades of the 20th century, such as the former military depot at Ingestre. Finally, most of the villages and many of the hamlets within the study area expanded within the 20th and 21st centuries, as settlements hitherto serving the rural economy transitioned to dormitory settlements, housing people who increasingly worked in the region's towns, such as Rugeley, Stafford and Stone.

## 7.4 Effects arising during construction

### Avoidance and mitigation measures

7.4.1 The draft CoCP sets out the measures that would be adopted to control effects on cultural heritage assets. These include:

- management measures that would be implemented for heritage assets that are to be retained within the land required for the construction of 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.

7.4.2 The design of the Proposed Scheme avoids the following impacts on heritage assets within the Colwich to Yarlet area:

- physical impacts on any scheduled monuments, registered parks or gardens, registered battlefields or listed buildings;
- physical and setting impacts upon Hopton Heath 1643 registered battlefield;
- physical impacts on the Tixall Conservation Area; and
- physical impacts on the Trent and Mersey Canal and Staffordshire and Worcestershire Canal, and associated structures, which would be protected during temporary works.

## Assessment of impacts and effects

7.4.3 Impacts on all heritage baseline assets described above have been assessed. However, only those leading to significant effects are described in the construction assessment set out below.

### *Temporary effects*

7.4.4 Impacts would occur to assets within the land required for the construction of the Proposed Scheme. In addition, heritage assets in the wider study area may be affected due to the visibility of plant, cranes and equipment, or the presence of other construction elements. The duration of construction impacts has yet to be confirmed and will be reported in the formal EIA Report.

7.4.5 The following significant effects are currently expected to occur as a result of temporary impact on the setting of designated or non-designated heritage assets.

7.4.6 Moreton Grange, a non-designated 19th century farmstead, appears little altered from the layout depicted on 19th century Ordnance Survey mapping. It is an asset of low value that would experience temporary disruption of its immediate setting during construction. The land required, temporarily or permanently, for the construction and operation of the Proposed Scheme would be approximately 10m from the farmyard buildings and approximately 15m from the farmstead. Construction activities would introduce noise and visual impacts into the quiet rural setting of the heritage asset. This would constitute a high adverse impact and a moderate adverse effect.

7.4.7 Moreton House, a Grade II listed building and an asset of moderate value, would be subject to a change in its setting. It is a substantial hilltop late 18th century house, originally set within a formal garden, its main façade looking south in the direction of the Proposed Scheme. Views across fields to the south of the asset would be obstructed during construction of the Coley cutting; the land required for construction at this location is approximately 17m from the main façade of Moreton House, within the boundary of its historic garden. Construction activities would also introduce noise into the rural sound environment of the heritage asset, affecting its rural character. This would constitute a high adverse impact and a major adverse effect.

7.4.8 The Trent and Mersey Canal Conservation Area, a designated heritage asset of moderate value, would also be subject to a change in its setting where the Proposed Scheme would cross it to the north of Great Haywood. The most significant elements

of the setting of the canal in this section of the Trent Valley lie in its relationship to the surrounding largely rural river valley landscape as well as the roads and river that run parallel to it. Construction of the Great Haywood viaduct across the asset would introduce new noise and visual impacts into the setting. This would constitute a medium adverse impact and a moderate adverse effect.

7.4.9 Ingestre Conservation Area, a designated heritage asset of moderate value would be subject to a change in its setting. Key elements of its setting include outward and inward views from the park's historic perimeter and the key buildings associated it, as well as its historic relationship with Tixall Park to the south. Construction plant would be visible from the eastern boundary of the conservation area during the construction of the Trent north embankment and the Brancote cutting, and would also introduce noise into its quiet rural setting. These changes would affect its historic landscape context and would, therefore, constitute a medium adverse impact and a moderate adverse effect.

7.4.10 Lowerhouse Farm, Hopton, a non-designated early 19th century farmstead that retains most of the buildings depicted on the 1836 Ordnance Survey map, an asset of low value, would be subject to a change in its immediate farmyard setting. The boundary of the land required, temporarily or permanently, for the construction and operation of the Proposed Scheme would lie within the farmyard depicted on 1902 Ordnance Survey mapping, and would be less than 10m from farmyard buildings and approximately 70m from the farmhouse, which faces south-west toward the Proposed Scheme. Construction activities would introduce noise and visual impacts into the quiet rural farmyard setting of the asset. This would constitute a high adverse impact and a moderate adverse effect.

7.4.11 The Church of St Leonard, Marston, has been the religious centre of a quiet rural parish since the late 18th century. The land required, temporarily or permanently, for the construction and operation of the Proposed Scheme would lie approximately 115m to the north of the church; the northern side is the principle side of the church, in that access is gained to the church through the churchyard that lies to the north of the church. Construction activities would introduce noise and visual impact into the quiet rural setting of the church. This would constitute a medium adverse impact and a moderate adverse effect.

### *Permanent effects*

7.4.12 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.

7.4.13 The buried archaeological remains of two Bronze Age round barrows and an Iron Age or Roman field boundary, visible as cropmarks on aerial photographs at Hoo Mill, Ingestre, heritage assets of moderate value, would be completely removed during construction. This would constitute a high adverse impact and a major adverse effect.

7.4.14 The buried archaeological remains of one probable and one possible Iron Age square barrow, visible as a cropmark on aerial photographs to the south of Lionlodge Covert, Ingestre, assets of moderate value, would be completely removed during construction of the Trent North embankment. This would constitute a high adverse impact and a major adverse effect.

7.4.15 The buried archaeological remains of an Iron Age pit alignment and continuous field boundary, visible as cropmarks on aerial photographs to the south-east of Lionlodge Covert, Ingestre, an asset of moderate value, would be completely removed during construction. This would constitute a high adverse impact and a major adverse effect.

7.4.16 All of the buried archaeological remains of a ditched trackway and field boundaries and approximately 50% of the known extent of a square ditched enclosure, of probable Iron Age or Roman date, assets of moderate value visible as cropmarks on aerial photographs to the south of Lionlodge Covert, Ingestre, would be removed during construction. This would constitute a high adverse impact and a major adverse effect.

7.4.17 The Proposed Scheme would impinge on the southern part of the recently extended Ingestre Conservation Area, an asset of moderate value, at two points. It would remove the southern part of Lionlodge Covert and, further west, would impinge on the southern edge of Ingestre Wood adjacent to The Mounts, as a result of the construction of the Tixall Bridleway 0.1628 accommodation overbridge. These impacts together would constitute a medium adverse impact and a moderate adverse effect.

7.4.18 A curved enclosure within Church Field, Ingestre, visible as a cropmark on aerial photographs and likely to be of post-medieval date, an asset of low value, would be completely removed during construction. This would constitute a high adverse impact and a moderate adverse effect.

7.4.19 Mount Farm, Hopton Lane, Hopton, a non-designated historic farmstead of low value, would be demolished during construction. Any associated buried archaeological remains would be completely removed. This would constitute a high adverse impact and a moderate adverse effect.

7.4.20 Lower Bridge Farm, Hopton, a non-designated historic farmstead of low value, would be demolished during construction. Any associated buried archaeological remains would be completely removed. This would constitute a high adverse impact and a moderate adverse effect.

7.4.21 The following significant effects would occur as a result of permanent impact on the setting of designated or non-designated heritage assets:

7.4.22 The setting of Moreton Grange, a non-designated 19$^{th}$ century farmstead that survives little altered from the form that is depicted on early Ordnance Survey mapping, an asset of low value, would experience change as the result of the construction of the Proposed Scheme immediately to the north. The land required, temporarily or permanently, for the construction and operation of the Proposed Scheme would be approximately 10m from the farmyard buildings and approximately 15m from the farmstead. The rural, agrarian character of the farmhouse would be fundamentally changed by the adjacent railway development. This would constitute a high adverse impact and a moderate adverse effect.

7.4.23 Moreton House, a heritage asset of moderate value, would be subject to a change in its setting. The Coley cutting, which would be approximately 40m from the house and approximately 20m from the current boundary of the asset, would remove part of the former gardens of Moreton House, which are bordered to the south by a partially

surviving ha-ha[45] and would be in full view of the southern aspect of the asset. The house faces south across the garden, the southern boundary of which, planted with oak trees, would have formed an important part of its designed setting. Extensive views across lower ground to the south are likely to be curtailed by associated noise fence barriers, security fencing and mitigation planting. This would constitute a high adverse impact and major adverse effect.

7.4.24 The Trent and Mersey Canal Conservation Area, a heritage asset of moderate value, would be subject to change in its setting. The most significant elements of the setting of the canal in this section of the Trent Valley lie in its relationship to the surrounding largely rural river valley landscape, as well as the roads and river that run parallel to it. The Great Haywood viaduct would be prominent in views along the canal and in views across the heritage asset's rural setting. This would constitute a medium adverse impact and a moderate adverse effect.

7.4.25 Ingestre Conservation Area, a heritage asset of moderate value, would be subject to a change in its setting. The south-western end of Lionlodge Covert would be severed by the Trent north embankment, which would be in full view of the asset as it transitions to the Brancote cutting, where it passes the southern end of the tree-lined carriageway that leads from Ingestre House to the Lion Lodges, which now lies within the conservation area. The railway, overhead gantries, noise fence barriers, security fencing and mitigation planting would be in full view from the heritage asset at these locations. The railway is in the Brancote cutting as it passes the more northerly parts of the conservation area and may not be visible, but associated structures, including the Tixall Bridleway 0.1628 overbridge would be visible. The railway would run between the historic parklands of Ingestre and Tixall that were formerly set out partially in relation to one another, although both parks were substantially degraded during the 20th century. The core area around Ingestre hall, church and stables, however, would remain largely unaffected. Taken together, these changes would constitute a medium adverse impact and a moderate adverse effect.

7.4.26 Lowerhouse Farm, Hopton, a non-designated heritage asset of low value, would be subject to a change in its immediate farmyard setting. The boundary of the land required, temporarily or permanently, for the construction and operation of the Proposed Scheme would lie within the farmyard depicted on 1902 Ordnance Survey mapping, and would be fewer than 10m from farmyard buildings and approximately 70m from the farmhouse, which faces south-west toward the Proposed Scheme. The construction of a substantial embankment immediately to the south of the farm, blocking views across the fields towards Beacon Hill, would adversely affect the significance of the farm and its historic relationship with adjacent farmland. This would constitute a high adverse impact and a moderate adverse effect.

## Other mitigation measures

7.4.27 Refinements to the mitigation measures incorporated into the design of the Proposed Scheme and the draft CoCP will continue to be made through the development of the

[45] A ditch with a wall on its inner side below ground level, forming a boundary to a park or garden without interrupting the view

design to reduce further the significant effects described above. These refinements will include the identification of:

- suitable locations for advance planting, to reduce impacts on the setting of heritage assets; and
- locations where the physical impact on below ground heritage assets can be reduced through the design of earthworks.

### Summary of likely residual significant effects

7.4.28 The temporary effects of construction activity on the setting of heritage assets are largely reversible in nature and last for the duration of the construction works, and therefore are not considered to result in residual significant effects. The physical impacts of construction on heritage assets are permanent and not reversible where heritage assets would be removed. This would result in significant effects on a number of archaeological remains, including those of prehistoric and Roman date visible as cropmarks on the River Trent gravels at Tixall and Ingestre, and upon a number of historic farmsteads, namely Mount Farm and Lower Bridge Farm, both at Hopton. There would also be a physical impact upon the Ingestre Conservation Area, and permanent residual effects on the setting of Morton House, Moreton Grange, Lowerhouse Farm, the Trent and Mersey Canal Conservation Area and the Ingestre Conservation Area.

## 7.5 Effects arising from operation

### Avoidance and mitigation measures

7.5.1 The following measures have been incorporated into the design of the Proposed Scheme to reduce the impacts and effects on heritage assets as shown on the CT-06 Map Series within the Volume 2, CA2 Map Book:

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

### Assessment of impacts and effects

7.5.2 The assessment considers the Proposed Scheme once operational and all effects are considered to be permanent. There would be no physical impacts on buried archaeological remains or other heritage assets arising from the operation of the Proposed Scheme. Impacts on the setting of heritage assets arising from the physical presence of the Proposed Scheme are described as permanent occurring within the construction phase and are not repeated in detail here, although they would endure through the operation of the Proposed Scheme. Where there is a combined effect on the setting of an asset from the presence of the constructed Proposed Scheme and its operation, this is reported in the assessment of operation.

7.5.3 It is expected that significant effects would occur as a result of permanent changes to the setting of the following assets arising from the impacts of railway operation:

7.5.4 Moreton House, as a Grade II listed building, is a heritage asset of moderate value which would be subject to a change in its setting as a result of the noise of the passing trains from the Coley cutting, approximately 40m away. Its historic significance as a country house set within a designed garden within a rural landscape would be changed and adversely affected by the operation of the railway line. In combination with the permanent construction impacts of the Proposed Scheme, this would result in a high adverse impact resulting in a moderate adverse effect.

7.5.5 The setting of Moreton Grange, a non-designated asset of low value, would be adversely affected by noise as the result of the operation of the proposed Scheme immediately to the north. There would also be a high adverse permanent construction impact as a result of changes to the physical setting of the heritage asset. In combination with the permanent construction impacts of the Proposed Scheme this would result in a high adverse impact resulting in a moderate adverse effect.

7.5.6 The Trent and Mersey Canal Conservation Area, an asset of moderate value, would be subject to change in its setting. Trains running on the Great Haywood viaduct would be prominent in views along the canal and in views across the asset's rural setting. However, the effects would be experienced intermittently over a relatively short section of the canal. This would result in a medium adverse impact resulting in a moderate adverse effect.

7.5.7 Trains running on the Trent North embankment would run across the landscape between the Ingestre Conservation Area, an asset of moderate value, and the Trent Valley beyond. This would affect the historic parkland character of the asset, in outward and inward views, although there are already numerous other modern elements of transport infrastructure in this landscape. Together, the presence and operation of the Proposed Scheme would adversely alter the significance of the setting of this asset, resulting in a medium adverse impact and moderate adverse effect.

7.5.8 There would be an effect on the setting of Lowerhouse Farm, Hopton, a non-designated heritage asset of low value, as a result of noise effects from the Proposed Scheme immediately to the south. The boundary of the land required, temporarily or permanently, for the construction and operation of the Proposed Scheme would lie less than 10m from farmyard buildings and approximately 70m from the farmhouse, which faces south-west toward the Proposed Scheme. There would also be a high adverse permanent construction impact as a result of changes to the physical setting of the heritage asset. In combination with the permanent construction impacts of the Proposed Scheme, this would result in a high adverse impact resulting in a moderate adverse effect.

## Other mitigation measures

7.5.9 The Proposed Scheme includes a number of design measures to address potential impacts and significant effects. No additional operational mitigation measures beyond those included within the Proposed Scheme design have been identified at this stage, although potential opportunities for further mitigation will continue to be considered through the design process.

## Summary of likely residual significant effects

7.5.10 The settings of the Trent and Mersey Canal Conservation Area, Lowerhouse Farm, Moreton House, Moreton Grange and the Ingestre Conservation Area are expected to be permanently significantly affected once the Proposed Scheme becomes operational. This would be the result of their heritage significance being adversely affected by noise and visual impacts on their settings. Over time, some visual effects would reduce as planting matures and the new railway assimilates into the landscape, although the overall residual effect on these heritage assets is likely to remain significant.

# 8 Ecology and biodiversity

## 8.1 Introduction

8.1.1 This section of the report provides a summary of the predicted impacts and significant effects upon species and habitats in the Colwich to Yarlet area as a consequence of the construction and operation of the Proposed Scheme. This includes effects upon sites recognised or designated on the basis of their importance for nature conservation.

8.1.2 Engagement with stakeholders including Natural England, Environment Agency, Forestry Commission, Staffordshire Wildlife Trust, Royal Society for the Protection of Birds, Woodland Trust, SCC and landowners has been undertaken. 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.

8.1.3 Maps showing the location of the key environmental features and the key construction and operational features of the Proposed Scheme can be found in the Volume 2, CA2 Map Book.

## 8.2 Scope, assumptions and limitations

8.2.1 The scope, methodology and key assumptions for the ecological assessment are set out in the draft SMR and Volume 1. The assessment methodology is summarised in Section 8 of Volume 1, along with route-wide assumptions and limitations. In the absence of field surveys and fully developed mitigation, the assessment has been undertaken on a precautionary basis.

8.2.2 Field surveys are ongoing, but are limited to locations where landowner permission has been obtained or 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, dormouse surveys, otter and water vole surveys. The findings from these ongoing surveys will be reported in the formal EIA Report.

## 8.3 Environmental baseline

### Existing baseline

8.3.1 This section presents the environmental baseline that is relevant to the consideration of impacts and effects reported in Sections 8.4 and 8.5.

8.3.2 Land in and adjacent to the Proposed Scheme in this section consists mainly of agricultural land, woodland, floodplain, and villages.

8.3.3 The topography is undulating including lowland meadows either side of the Moreton Brook (to the north-east of Colwich) and floodplain grazing marsh within the valley of the River Trent (near Great Haywood). There are direct effects on 16 woodlands within the area.

8.3.4 Statutory and non-statutory designated sites are shown on Map Series CT-10, Volume 2, CA2 Map Book.

8.3.5 Pasturefields Salt Marsh SAC is an internationally important site located approximately 650m north of the Proposed Scheme. The SAC supports Annex 1 inland salt meadow habitat and is the best example in the UK of a natural salt spring with inland saltmarsh vegetation. The vegetation consists of red fescue with common saltmarsh-grass, lesser sea-spurrey, saltmarsh rush and sea arrowgrass. Pasturefields Salt Marsh is also a SSSI (i.e. of national importance), and the saltmarsh forms part of the qualifying interest of the SSSI along with breeding waders (snipe, redshank and lapwing).

8.3.6 There are no other statutory sites located within 500m of the land that would be required for the Proposed Scheme.

8.3.7 Two Local Wildlife Sites (LWS) and an Ancient Woodland Inventory Site (AWIS) are located within the extent of the Proposed Scheme, adjacent to it, or with the potential to be subject to significant effects, and are therefore relevant to the assessment (see below). Due to the habitats and species present, these sites are considered to be up to county/metropolitan value.

8.3.8 Lount Farm LWS is designated for its unimproved neutral grassland, and the western end of the site would be partially within the land that would be required for construction of the Proposed Scheme. The site is partially within the Fradley to Colton area (CA1).

8.3.9 Lionlodge Covert LWS is designated for its broad-leaved woodland and degraded inland saltmarsh. The southern end of the site would be partially within the land that would be required for the construction of the Proposed Scheme.

8.3.10 Lambert's Coppice AWIS is a plantation ancient woodland approximately 200m north of the Proposed Scheme.

8.3.11 A review of woodlands not currently listed on the AWI, but that are either within the land that would be required for construction of the Proposed Scheme, or within 500m of it, has been undertaken based on historical mapping. The review found the following woodland sites to be potentially ancient woodland, all of which would be partially lie within the land required for construction of the Proposed Scheme:

- an unnamed woodland belt to the south-west of Hoo Mill, Ingestre;
- Flushing Covert to the west of Lionlodge Covert;
- Town Field Plantation within Ingestre Golf Course;
- Ingestre Wood; and
- Yarlet Wood.

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

8.3.13 In addition to the aforementioned woodlands, there are seven other areas of semi-natural lowland deciduous woodland (which may qualify as habitats of principal

importance, and local biodiversity action plan (BAP) habitats), which would be within or partly within the land that would be required for construction of the Proposed Scheme. These are woodland areas near Tithebarn Farm, Little Covert, Upper Hanyards, Upper Berryhill, Lower Berryhill, Yarlet Hill and Yarlet Hall. On a precautionary basis pending the findings of field surveys, these woodlands are considered to be of up to district/borough value.

8.3.14 Watercourses that are located outside the designated sites and which are relevant to the assessment include the River Trent and tributary, Moreton Brook, and several smaller watercourses, all of which are crossed by the Proposed Scheme. The two aforementioned watercourses may qualify as habitats of principal importance and local BAP habitats, and on a precautionary basis in the absence of survey information, are considered to be of up to county/metropolitan value. The smaller watercourses are considered to be of up to district/borough value. These require compliance assessment under the Water Framework Directive (WFD) and relevant surveys, such as fish, invertebrate and invasive plant species will be undertaken.

8.3.15 There are 17 ponds within, or partly within, the land that would be required for construction of the Proposed Scheme, and a further 62 ponds within 250m of the area required for construction of the Proposed Scheme. It is assumed that all ponds are of district/ borough value unless they are found to be habitats of principal importance, or local BAP habitats, in which case, on a precautionary basis, they would be assumed to be of up to county/metropolitan value.

8.3.16 Many of the hedgerows 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[46]. In addition they could also provide commuting corridors for wildlife and nesting and feeding habitat. On a precautionary basis, in the absence of surveys, the hedgerow network is considered to be of up to district/borough value.

8.3.17 Grasslands outside designated sites that are within the land that would be required for construction of the Proposed Scheme include the floodplain grazing marsh on the Trent floodplain near Great Haywood. On the precautionary basis these grasslands may qualify as a habitat of principal importance and local BAP habitat. Unless the field surveys identify unimproved grasslands, these grasslands are considered to be of up to district/borough value.

8.3.18 A summary of the likely value of protected and/or notable species is provided in Table 4.

Table 4: Species potentially relevant to the assessment within the Colwich to Yarlet area

| Resource/feature | Value | Rationale |
|---|---|---|
| Bats | Up to county/metropolitan for the majority of bat species, with potential | Bats are recorded as concentrated near Great Haywood and Marston within 100m of land that would be required for the Proposed Scheme.<br><br>There are records of four maternity roosts from two locations that are approximately 2km south of land that would be required for construction of the Proposed Scheme: brown long eared and unidentified pipistrelle roosts |

[46] "*Statutory Instrument 1997 No. 1160*" Hedgerows Regulations 1997.

| Resource/feature | Value | Rationale |
|---|---|---|
| | for up to regional for some rarer species | in Shugborough, and unidentified pipistrelle and common pipistrelle roosts in Stafford.<br><br>Records confirm there are at least six other species of bat throughout the area: noctule, soprano pipistrelle, Daubenton's bat, Natterer's bat, whiskered bat and Brandt's bat. |
| Otter and water vole | Up to county/metropolitan | Populations of otter are rare in Staffordshire. Habitat suitable for this species is present along the watercourses and drainage ditches, and there are records of their presence along the River Trent and the Trent and Mersey Canal. Two field signs of otter were recorded within 100m of land that would be required for the construction of the Proposed Scheme.<br><br>Populations of water vole are rare in Staffordshire and are declining. Habitat suitable for water vole is present along the watercourses and drainage ditches, and there are records of their presence along the Trent and Mersey Canal approximately 100m from land that would be required for construction of the Proposed Scheme. |
| Hazel dormouse | Up to county/metropolitan | Populations of hazel dormice are rare in Staffordshire. There are no previous records for the Colwich to Yarlet area, and there is little habitat suitable for this species. |
| Polecat | Up to county/metropolitan | Populations of polecats are rare in Staffordshire. Habitat suitable for this species is present, including hedgerows, farmland and woodland, and there is a single record at Pasturefields SAC and SSSI. |
| Great crested newt | Up to county/metropolitan | There are records of great crested newt from four areas within 500m of land that would be required for the construction of the Proposed Scheme: approximately 250m north and south at Hopton, approximately 250m south-west near Yarlet and approximately 500m south near Great Haywood. |
| Birds | Up to county/metropolitan | Birds associated with farmland that are present in the area include lapwing, barn owl, skylark, tree sparrow, yellow wagtail, linnet and yellowhammer. The woodlands are likely to support a range of common woodland species. |
| Aquatic and terrestrial invertebrates | Up to district/borough | Aquatic invertebrates are likely to be present in watercourses including the Moreton Brook, River Trent, smaller watercourses, and in water bodies.<br><br>There is a record of white-letter hairstreak (a Section 41[47] and local BAP species) from Yarlet on land that would be required for the Proposed Scheme. |
| Fish | Up to district/borough | There are records in the river catchments affected by the Proposed Scheme, of spined loach and European bullhead (which are listed on Annex II of the Habitats Directive [48]) within the river catchments affected by the Proposed Scheme. There are also records of eel and brown trout. |

[47] Section 41 of the Natural Environment and Rural Communities (NERC) Act 2006 - Habitats and Species of Principal Importance in England.
[48] The EC Directive 92/43/EEC on the conservation of natural habitats and of wild fauna and flora (http://eur-lex.europa.eu/eli/dir/1992/43/2013-07-01 )

| Resource/feature | Value | Rationale |
|---|---|---|
| Reptiles | Up to district/borough | There are records of grass snake within 1km of the Proposed Scheme within the Trent valley. Suitable habitat is likely to be present for reptiles, including grass snake near the River Trent and Moreton Brook. |
| Badger | Up to local/parish | Badgers are widespread and common. There are records of from near Great Haywood, Hopton and Yarlet, and there is suitable habitat for badgers throughout the area. |

## 8.4 Effects arising during construction

### Avoidance and mitigation measures

8.4.1 The following measures have been included as part of the design of the Proposed Scheme (additional to the landscape planting as shown on the Map Series CT-06 along the rail corridor, which would be largely a mixture of woodland/scrub and grassland), and would contribute towards offsetting the losses of habitat and effects on species:

- construction of viaducts over the River Trent and the Trent and Mersey Canal would avoid direct effects to these watercourses and allow free passage for wildlife beneath them including along the rivers and their banks;
- new woodland planting would help towards offsetting the losses of semi-natural broadleaved woodland (e.g. Lionlodge Covert LWS, south of Ingestre, and Upper Berryhill), and to enhance connectivity between remaining woodlands;
- provision of two ponds for those lost if they support great crested newts (e.g. south of Upper Moreton Brook, north and south of Lionlodge Covert LWS, several locations south of Ingestre, north of Hopton, north and south of Marston, and around Yarlet) would form part of the measures required for great crested newts;
- provision of some new species-rich hedgerows, using appropriate native species, to help to offset the loss of hedgerows, and re-connecting the ecological network in the surrounding areas, including along the margins of the route, but also in specific areas such as south of Moreton Grange, north of Great Haywood, south of Ingestre, and around Yarlet; and
- provision of new grassland habitats, including some species rich grasslands to help towards offsetting the losses from the Proposed Scheme.

8.4.2 The assessment assumes implementation of the measures set out within the draft CoCP, which includes translocation of protected species where appropriate.

### Assessment of impacts and effects

8.4.3 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 8.3 of this report.

8.4.4 A Habitats Regulations Screening Assessment was undertaken for Pasturefields Salt Marsh SAC (HS2, 2012). The HRA concluded that the alignment of the Proposed Scheme would not be likely to cause a significant effect on the SAC, and this conclusion was agreed with Natural England and the Environment Agency. As neither the saltmarsh nor the breeding waders would be affected by the Proposed Scheme, the Pasturefields Salt Marsh SSSI would not be affected.

8.4.5 Construction of Moreton North embankment would result in the permanent loss of approximately 3ha (28%) of unimproved grassland at Lount Farm LWS. This would comprise 1.4ha (13% of the LWS) in this area, and 1.6ha (15%) from the adjacent Fradley to Colton area. Habitat loss would result in a permanent adverse effect on site integrity that would be significant at the county/metropolitan level.

8.4.6 Construction of Trent North embankment would result in the permanent loss of approximately 5ha (approximately 30%) of Lionlodge Covert LWS, which is designated for its broad-leaved woodland and its degraded inland saltmarsh. Habitat loss would result in a permanent adverse effect on site integrity that would be significant at the county/metropolitan level.

8.4.7 Lambert's Coppice AWIS is the nearest AWIS to the land that would be required for the construction of the Proposed Scheme. It lies approximately 200m to the north of the Proposed Scheme, and indirect effects on the site would not be significant.

8.4.8 The Proposed Scheme would result in the total or partial permanent loss of five other woodland sites that are potentially ancient: one near to Hoo Mill, Flushing Covert, Town Field Plantation, Ingestre Wood and Yarlet Wood. Loss of such woodland sites would result in a permanent adverse effect on site integrity that would be significant at the county/metropolitan level.

8.4.9 Construction would result in the loss of approximately 18.5ha of other broadleaved woodland from this section of the route. The permanent loss of these woodlands would result in an effect that would be significant at up to the district/borough level.

8.4.10 The Proposed Scheme crosses the River Trent and Trent and Mersey Canal on viaducts. These watercourses would not be directly affected, and indirect effects would not be significant as they would be controlled through the implementation of measures in the draft CoCP. However, the Proposed Scheme would result in the loss of sections of other smaller watercourses and severance of river corridors due to culverts, which would result in a permanent effect that would be significant at up to the district/borough level.

8.4.11 Seventeen ponds would be lost due to the Proposed Scheme. The loss of these ponds could result in an impact that would be significant at up to county/metropolitan level depending on the findings of field surveys (e.g. if they support great crested newts).

8.4.12 The Proposed Scheme would cross 121 hedgerows that are located throughout the area, some of which may be 'important' hedgerows. The land that would be required for construction of the Proposed Scheme would result in the permanent loss of approximately 17km of hedgerows, and would result in severance of the network in many places, adversely affecting connectivity with the surrounding area. The Proposed Scheme includes new hedgerow planting, which would help offset losses. Further hedgerow planting would be proposed as part of the design development. In

the absence of this additional mitigation, the impact 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.

8.4.13 Construction of the Proposed Scheme would result in the loss of grassland outside designated sites, including approximately 7ha of floodplain grazing marsh adjacent to the River Trent near Great Haywood. In the absence of field survey information, it has been assumed that none of the grassland lost would be unimproved, and hence the loss would be significant at up to the district/borough level.

8.4.14 Otters and water voles have been recorded along the River Trent and the Trent and Mersey Canal within 100m of the Proposed Scheme. The proposed viaducts over the River Trent and Trent and Mersey Canal would avoid loss of habitat along the river corridor. Indirect effects from construction activities such as increased light and noise may result in disturbance to these species during the construction period, and prevent them from moving along the watercourse. However, it is anticipated that such indirect effects would be controlled through measures in the draft CoCP. Habitat loss would result to several smaller watercourses crossed by the Proposed Scheme. On a precautionary basis in the absence of survey information, impacts to otters and water voles would result in an adverse effect on the conservation status of these species that would be significant up to the county/metropolitan level.

8.4.15 The loss of deciduous woodland and hedgerows in particular could affect hazel dormouse if this species is found to be present. The loss of these habitats along with grassland and arable land could also affect polecat, a species which has been recorded from the Hopton area. On a precautionary basis in the absence of survey information, the effects of permanent habitat loss on these mammals are assumed to be of up to county/metropolitan significance.

8.4.16 Habitat loss may have impacts on bats, as it would reduce the availability of foraging resource, and potentially result in the loss of roosts and fragmentation of commuting routes. This could particularly affect breeding populations of eight bat species 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. On a precautionary basis in the absence of mitigation there could be impacts on significant populations of bats which may be up to regional level. However the majority of impacts on bats would be expected to be at a lower level.

8.4.17 It has been assumed that all 17 ponds and surrounding terrestrial habitat within the land required for construction of the Proposed Scheme may support great crested newts, and would be lost during construction. The loss of ponds supporting great crested newts could result in the isolation and severance of breeding populations of great crested newts across this area. On a precautionary basis in the absence of survey information, it has been assumed that all ponds which would be lost support great crested newts. The design incorporates the creation of some new ponds at this stage, but additional ponds would also be required subject to the outcome of surveys. Suitable terrestrial habitat would also be required to fully mitigate the effects. In the absence of the full mitigation, the loss of the ponds and surrounding land 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.

8.4.18 The Proposed Scheme would result in the loss of nesting and foraging habitat for a range of farmland and woodland birds. These are likely to include barn owl, a Schedule 1 species which has been recorded at Great Haywood within 500m of land that would be required for the construction the Proposed Scheme. On a precautionary basis in the absence of survey information, it has been assumed that the Proposed Scheme would result in a permanent adverse effect that would be significant at up to the county/metropolitan level.

8.4.19 The land that would be required for construction of the Proposed Scheme would result in loss of habitat suitable for aquatic and terrestrial invertebrates (including Section 41 species). On a precautionary basis in the absence of survey information, it has been assumed that Proposed Scheme would result in permanent adverse effect that would be significant at up to the district/borough level.

8.4.20 The Proposed Scheme would pass over main watercourses on viaducts, and indirect impacts to fish living in the watercourses would be controlled through measures set out in the draft CoCP, and will be assessed for compliance with the WFD. However, other smaller watercourses would still be affected and may require compliance assessment under the WFD. On a precautionary basis in the absence of survey information, it has been assumed that the Proposed Scheme would result in permanent adverse effect on fish that would be significant up to the district/borough level.

8.4.21 On the precautionary basis, there may be permanent adverse effects on common reptiles that may be present along the River Trent in areas of grassland and scrub that would be significant at up to the district/borough level.

8.4.22 Effects on all other habitats and species would be likely to be significant at the local/parish level during construction. These effects and consideration of the potential cumulative effects will be described in the formal EIA Report.

8.4.23 Indirect effects from changes in air quality from increased levels of construction traffic will be considered for sites within 200m of construction routes, where habitats are considered to be sensitive to air quality changes. These effects will be reported in the formal EIA Report.

## Other mitigation measures

8.4.24 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, include:

- options to mitigate the loss of the degraded saltmarsh surrounded by broadleaved woodland at Lionlodge Covert LWS;
- offsetting for total or partial permanent loss of five woodland sites that are potentially ancient: one near Hoo Mill, Flushing Covert, Town Field Plantation, Ingestre Wood and Yarlet Wood;
- provision of additional broadleaved woodland (non-ancient) to replace those 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 Lount Farm LWS, and to offset losses of floodplain grazing marsh;
- 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; 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.

8.4.25 Some of the above may also be achieved through strategic mitigation in locations outside of the land required for the Proposed Scheme, which are currently being discussed with relevant stakeholders and are subject to agreement.

## Summary of likely residual significant effects

8.4.26 Taking into account mitigation proposed in the design of the Proposed Scheme set out above, anticipated significant residual ecological effects during construction are detailed in Table 5.

Table 5: Residual significant effects on ecological resources/features during construction

| Resource/feature | Residual effect | Level at which the effect would be significant |
|---|---|---|
| Lount Farm LWS | Permanent adverse effect on site integrity due to loss of approximately 3ha (approximately 28%) of lowland meadows (unimproved grassland). | County/metropolitan |
| Lionlodge Covert LWS | Permanent adverse effect on site integrity due to loss of approximately 5.2ha (approximately 30%) of broad-leaved woodland and degraded inland saltmarsh. | County/metropolitan |
| Potentially ancient woodland sites Hoo Mill, Flushing Covert, Town Field Plantation, Ingestre Wood and Yarlet Wood | Permanent adverse effect on site integrity due to total or partial loss of potential ancient woodland. | Up to county/metropolitan |
| Broadleaved woodland | Permanent loss of approximately 18.5ha of broadleaved woodland. | Up to district/borough |

| Resource/feature | Residual effect | Level at which the effect would be significant |
|---|---|---|
| Watercourses | Permanent adverse effect to the smaller watercourses, due to habitat loss and severance of the river corridors. | Up to district/borough |
| Ponds | Permanent loss of 17 ponds. | Up to county/metropolitan |
| Hedgerows | Permanent loss of sections of 121 hedgerows, some of which may be important hedgerows, and loss of approximately 17km in total. Adverse effects on connectivity with the wider area. | Up to district/borough |
| Grassland | Permanent loss of grassland including approximately 7ha of floodplain grazing marsh. | Up to district/borough |
| Bats | Potential permanent adverse effect on conservation status due to loss of roosts (including maternity roosts), foraging habitat and fragmentation. | Up to country/metropolitan for the majority of bat species, with potential for up to regional for some rarer species |
| Otter and water vole | Potential adverse effect due to construction activities and disturbance along main rivers, and loss of habitat, and habitat fragmentation on smaller watercourses. | Up to county/metropolitan |
| Hazel dormouse | Loss of habitat suitable for dormouse. | Up to county/metropolitan |
| Polecat | Loss of habitat suitable for polecat. | Up to county/metropolitan |
| Great crested newts | Loss of 17 ponds and surrounding terrestrial habitat, which may support great crested newts. | Up to county/metropolitan |
| Birds | Loss of nesting and foraging habitat for a range of birds, especially of farmland and woodland. Barn owl, a Schedule 1 species, may be affected. | Up to county/metropolitan |
| Aquatic and terrestrial invertebrates | Permanent loss of suitable habitat. | Up to district/borough |
| Fish | Permanent loss of habitat from smaller watercourses. | Up to district/borough |
| Reptiles | Permanent loss of habitat suitable for reptiles. | Up to district/borough |

## 8.5 Effects arising from operation

### Avoidance and mitigation measures

8.5.1 Within this section of the Proposed Scheme the following elements of the design would avoid or reduce impacts on features of ecological value during operation: Construction of a viaduct over the River Trent and Trent and Mersey Canal would

avoid direct effects to these watercourses and allow free passage for wildlife beneath them including along the rivers and their banks.

## Assessment of impacts and effects

8.5.2 The following 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 and take account of the baseline value presented in Section 8.3 of this report.

8.5.3 Bats are at risk of mortality from passing trains, particularly at frequently used commuting/foraging routes across the Proposed Scheme. On a precautionary basis, in the absence of mitigation there could be significant impacts on populations of bats which may be up to regional level. However the majority of impacts on bats would be expected to be at a lower level.

8.5.4 Barn owls are slow moving and often hunt low over rough grassland habitats that occur along road and railway corridors. As a result they may be killed by cars and trains. Mortality 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.

8.5.5 Effects on all other habitats and species would be likely to be significant at the local/parish level during operation. These effects and consideration of the potential cumulative effects will be described in the formal EIA Report.

## Other mitigation measures

8.5.6 Additional mitigation measures currently being considered include:

- the development of a barn owl action plan to provide off-site mitigation to reduce the likelihood of barn owls foraging in proximity to the line (informed by species dispersion modelling being undertaken for HS2 Ltd by the British Trust for Ornithology); and
- green bridges, culverts of sufficient size, and underpasses to reduce the likelihood of bat mortality at key locations.

## Summary of likely residual significant effects

8.5.7 Taking into account mitigation included as part of the Proposed Scheme design, the anticipated significant residual ecological effects during operation are detailed in Table 6.

Table 6: 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 country/metropolitan for the majority of bat species, with potential for up to regional for some rarer species. |
| Barn owl | Potential permanent adverse effect on conservation status due to collision with trains. | Up to county/metropolitan. |

# 9 Health

## 9.1 Introduction

9.1.1 This section identifies the communities within the Colwich to Yarlet area that would be subject to impacts associated with the Proposed Scheme and describes how the changes may affect the health and wellbeing of people within these communities. The scope, assumptions and limitations for the health assessment are set out in Volume 1 and the draft SMR.

9.1.2 The assessment considers the potential for impacts on a range of environmental and socio-economic 'health determinants', which would result in adverse or beneficial effects on the health of people in communities. The geographic extent of the health assessment covers those areas where impacts on health determinants are predicted to occur.

9.1.3 A socio-economic model of health is adopted for this assessment in which the health status of a population, or changes to the health status, is attributed to a series of health determinants. An individual's health may be determined by genetics and lifestyle factors, but for a large enough population many other factors are known to be important and these factors may be affected by the Proposed Scheme.

9.1.4 No engagement has been undertaken with key public health bodies to date. Engagement with key public health bodies will be undertaken as part of the development of the Proposed Scheme. The purpose of the engagement will be to increase the understanding of health issues that may not be identified solely through a review of publicly available data.

## 9.2 Scope, assumptions and limitations

9.2.1 The scope, assumptions and limitations for the health assessment are set out in Volume 1 and the draft SMR.

9.2.2 This section deals specifically with impacts at a local level within the Colwich to Yarlet area. Health effects across the Proposed Scheme as a whole are assessed in the route-wide health assessment contained in Volume 3.

9.2.3 The health determinants of relevance within the Colwich to Yarlet area are:

- social capital;
- neighbourhood quality;
- access to green space, recreation and physical activity; and
- access to services.

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

9.2.5 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 literature review and included in the formal EIA Report. The evidence that relates health outcomes to changes in determinants varies in strength. For example, the

evidence relating to health effects of physical activity is strong, whereas that relating to social capital is considered weak. The strength of evidence does not necessarily determine the importance of the health effect in the assessment.

9.2.6 The certainty that can be attached to any conclusion regarding effects on health will depend on the strength of the evidence for a given determinant and also the confidence attached to the prediction of an impact on a determinant. There will be greater certainty for the existence of an impact on a health determinant than a consequent effect on health.

9.2.7 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 EIA Report.

9.2.8 No engagement has been undertaken with key public health bodies to date. Engagement with key public health bodies will be undertaken as part of the development of the Proposed Scheme. The purpose of the engagement will be to increase the understanding of health issues that may not be picked up through a review of publicly available data.

9.2.9 Maps showing the location of the key environmental features and the key construction and operational features of the Proposed Scheme can be found in the Volume 2, CA2 Map Book.

## 9.3 Environmental baseline

9.3.1 The Colwich to Yarlet area has a relatively small population, commensurate with the rural nature of the land use. Data provided by the Office of National Statistics[49] and the Association of Public Health Observatories[50] show that this population across all four wards[51] is, by comparison with national (England) averages, in good health and experiences low levels of deprivation.

9.3.2 The population as a whole is considered to be more resilient than average nationally, with regard to changes in the relevant health determinants. The exception to this overall picture is that some of rural wards in the Colwich and Yarlet area are ranked in the 10% most deprived in the country for access to affordable housing and good quality services.

9.3.3 The available data permits a profile to be made of the whole population of approximately 15,000 in the Colwich to Yarlet area and provides detail down to ward level. The description of the whole population and the populations within wards does not, of course, exclude the possibility that there will be some individuals or small groups of people who do not conform to the overall profile. Stakeholder engagement will be undertaken and this will provide further information of relevance to the community profile.

[49] 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.
[50] http://www.apho.org.uk/
[51] Electoral wards are the spatial units used to elect local government councillors.

## 9.4 Effects arising during construction

### Avoidance and mitigation measures

9.4.1 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. Adverse impacts on health determinants have been reduced as far as reasonably practicable through mitigation measures incorporated into the design of the Proposed Scheme to reduce adverse effects on people. Examples of the mitigation measures incorporated into the design of the Proposed Scheme include the following:

- reducing the loss of property and community assets, as far as reasonably practicable;
- reducing visual intrusion and noise, as far as reasonably practicable; and
- incorporating landscape design and screening into the design.

9.4.2 As described in Section 2, the route has been moved further away from residential properties and community facilities in Moreton, at the Staffordshire County Showground and in Hopton. The route has also been moved slightly eastwards at Marston and Yarlet to avoid residential receptors. In addition, the locations of construction compounds and haul routes have been selected to reduce exposure to construction impacts as far as reasonably practicable.

9.4.3 HS2 Ltd would require its contractors to comply with the environmental management regime for the Proposed Scheme, which will include the following core documents:

- the CoCP, which provides a generic basis for route-wide construction environmental management; and
- LEMPs, which apply the environmental management strategies at a local level.

9.4.4 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.

9.4.5 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

### *Social capital*

9.4.6 The connections between the 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. Impacts on social capital could arise from changes to community facilities and community connectivity, and from changes in community demographics during the construction stage of the Proposed Scheme and the presence of the temporary construction workforce. 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.

9.4.7 When homes are lost from within a community, there is a potential for the remaining community to experience changes to their social environment and loss of social networks. 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 community. There is a potential for such effects to occur at Hopton Lane, where seven residential properties would be demolished. 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.

9.4.8 Road closures and diversions temporarily required for the construction of the Proposed Scheme would have the potential to reduce community connectivity by increasing journey times between rural communities. Potential impacts on connectivity have been identified in the following locations:

- eleven residential properties to the north of Great Haywood would experience increased isolation for a prolonged period as a result of works required for the construction of the Trent South embankment, the realignment of the A51 Lichfield Road, works to Tolldish Lane, diversion of Hoo Mill Lane and the construction of the Great Haywood viaduct;
- the Hopton embankment would sever Trent Walk, which provides access to five residential properties at Park Farm, including Park Farm bed and breakfast. Alternative access for residents would be provided to Stafford via the A518 Weston Road. However, this would increase the existing journey of less than 0.5km by approximately 2km, through the roadworks; and
- the Marston South embankment would be constructed to the south-west of five properties in Marston, and would form a barrier between these five properties and the rest of Marston and Yarlet. The existing Marston Lane would also be used as a construction traffic route.

9.4.9 Permanent impacts on community connectivity would also occur as a result of the construction of the Hopton North cutting, which would cut through the village of Hopton, separating the majority of the residential properties and the community facilities in the north from approximately 10 properties on Mount Edge and

approximately 38 properties within the barracks off Spode Avenue in the south. Hopton Lane would be diverted to join the B5066 Sandon Road north of the proposed alignment. This would increase the distance by road between the north and south parts of the village by approximately 1.2km.

9.4.10 Residents of these properties would experience increased journey times to nearby social and/or family networks, as well as community facilities such as public houses, churches and village halls, which may deter people from travelling, potentially reducing levels of social interaction. Should this occur, it would result in a reduction of the beneficial health effects that are gained through access to community facilities, social contact and support.

9.4.11 The temporary workforce could comprise a mixture of local people and workers from further afield. Where workers who live outside commuting distance of the site choose to seek accommodation within the local community, this could mean that local communities see temporary changes to the local population size and demographics. An assessment of any adverse or beneficial effect these changes would have on social capital will be undertaken and reported on in the formal EIA Report. There is potential for the presence of the temporary workforce to have a beneficial effect on local communities through increased spending, thereby increasing income and employment opportunities.

### *Neighbourhood quality*

9.4.12 The term 'neighbourhood quality' is used in this assessment to describe a combination of aspects that have the potential to affect residents' feelings about their local environment and thereby affect their quality of life, mental health and wellbeing. Communities could experience a number of effects during the construction of the Proposed Scheme, including construction traffic, construction noise and dust, and visual effects of the temporary and permanent works. The environmental and community impacts of these changes are assessed in the relevant sections of this report. This section assesses how changes to neighbourhood quality may affect people's levels of satisfaction with their local environment and perceptions about issues such as personal safety and security, and considers how these issues may in turn affect wellbeing.

9.4.13 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. The construction works and permanent structures would be visible from a large number of locations due to the scale of the Proposed Scheme. Section 11, Landscape and visual, identifies locations that would experience changes in existing views, including country roads, PRoW and views from properties close to the Proposed Scheme. Effects on views of the rural landscape may have negative effects on residents' perceptions of the quality and character of their local environment, leading to a reduction in wellbeing.

9.4.14 The quality of outside space for four residential properties to the south of Hopton, which would lose approximately 60% of their rear garden space for landscape mitigation associated with the Hopton retaining wall, has potential to result in a reduction in wellbeing for those affected.

9.4.15 Traffic and transport impacts in the Colwich to Yarlet area would include:

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

9.4.16 At this stage, it is not anticipated that construction traffic emissions ($NO_2$, $NO_x$, PM10 and PM2.5) would have adverse health effects. However, the presence of additional HGV traffic on the road network could raise concerns about potential health effects, and perceived concerns about safety and frustration resulting from increased journey times. These perceptions could have a negative effect on people's levels of satisfaction with their local environment.

9.4.17 Noise from construction traffic and construction activities can cause annoyance and disturbance and lead to temporary effects on quality of life. Section 13, Sound, noise and vibration, has identified the community of residential properties along the B5066 Sandon Road, between Hopton and the A513 Beaconside, as being potentially adversely affected by construction traffic noise.

9.4.18 Noise from construction sites could also cause annoyance and disturbance and contribute to a perceived reduction in neighbourhood quality. Section 13 identifies communities that may be affected by construction noise, on the basis of their proximity to the proposed works. These include the following areas: Moreton, Great Haywood, Ingestre (Ingestre Park Road/Hoo Mill Lane), Park Farm, Hopton East, Hopton West, Marston, Yarlet and Pirehill Grange Farm.

9.4.19 Construction sites have the potential to give rise to emissions of dust and particulate matter. Section 5, Air quality, identifies no adverse effects with respect to the effects of construction activities on dust soiling and human health within the Colwich to Yarlet area, taking account of mitigation measures contained in the draft CoCP. Therefore, it is not expected that any direct health and wellbeing effects would arise as a result of air quality around construction sites.

9.4.20 Construction sites are sometimes perceived as having the potential to attract activities such as vandalism, fly-tipping and theft of materials. Those living close to construction compounds may experience increased fear of crime and anti-social behaviour associated with the presence of the sites. Additionally, the diversion of footpaths around construction sites has the potential to affect actual or perceived personal safety, both in terms of road safety and environmental changes, such as sight lines and lighting. Fear of crime has been linked to health effects, such as anxiety, and changes in behaviour, such as reduced participation in activities that are beneficial to health. The effects of increased crime and antisocial behaviour resulting from the Proposed Scheme are likely to be extremely low, as construction sites would be appropriately fenced and secured, and the potential for crime and anti-social behaviour would be minimised through measures set out in the draft CoCP.

9.4.21 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 EIA Report.

### *Access to green space, recreation and physical activity*

9.4.22 Environmental factors have been shown to influence participation in physical activity, which in turn affects health. This includes issues such as opportunities for active travel, the accessibility of facilities for physical exercise, perceived safety, and amenity of outdoor areas and parks.

9.4.23 There is moderate evidence to suggest that physical activity can be encouraged by improving accessibility to green spaces, and by ensuring green spaces are attractive and of a high quality. Access to green space also contributes to good mental health and reduced stress.

9.4.24 At Ingestre Park Golf Club, the Proposed Scheme would, as currently designed, require seven holes (40% of the total area) either to be permanently lost, or cut off from the clubhouse. The club would no longer be able to function in its current arrangement. As the club is not open to the public, the majority of the community will not be exposed to these effects, and no adverse effects on community health and wellbeing are predicted.

9.4.25 The realignment of the A518 Weston Road and works to construct the Weston Road overbridge would disrupt access to the Staffordshire County Showground. This would particularly affect larger events when a large number of people are likely to attempt to access the site via the A518 Weston Road. The showground hosts a wide variety of outdoor events and is used by a large community across the county and beyond, and will be considered in the formal EIA Report.

9.4.26 No adverse effects on publicly accessible areas of green space have been identified within the Colwich to Yarlet area.

9.4.27 Fear of traffic is identified as the most common barrier to cycling, although the level of fear is often exaggerated in comparison with the likelihood of injury. Fear of walking on PRoWs and crossing roads with increased HGV traffic is also likely to deter walkers, particularly those with young children.

9.4.28 There may be some reduction in the number of active travel journeys (cyclists and pedestrians) during construction as a result of increased volumes of HGV traffic on parts of the road network. These impacts, should they arise, have the potential to reduce levels of active travel during the construction period, particularly in rural areas where there are fewer alternative routes available. These effects will be reported in the formal EIA Report.

9.4.29 It is expected that the A51 Lichfield Road and the A34 Stone Road/A513 Beaconside/A518 Weston Road would provide the primary HGV access routes for construction vehicles. Compounds would be accessed primarily off the A51 Lichfield Road, the A518 Weston Road and the A34 Stone Road. One compound would be accessed via the B5066 Sandon Road. Elsewhere, HGVs would use the haul road to reduce the impact on the local road network.

9.4.30 There would be temporary alternative routes for a number of PRoW during construction. Non-motorised users would be re-routed around construction compounds, which is likely to increase travel distance. Reduced amenity on PRoW due to the presence of construction sites may result in a temporary reduction in their use, resulting in some reduction in levels of physical activity.

### *Access to services, health and social care*

9.4.31 Impacts on access to services may arise as a result of increased demand for services (e.g. from the construction workforce), direct impacts on local services and facilities, and changes in journey times due to road closures and diversions, which have the potential to affect access to services and emergency vehicle access.

9.4.32 There is strong evidence linking access to healthcare facilities with health outcomes, and there is also evidence to suggest that transport problems are a key barrier to people's ability to access these services. Therefore, changes in journey times to healthcare services have the potential to result in adverse health effects, if the delays are sufficient to deter people from attending appointments or seeking advice.

9.4.33 In the event that construction workers from outside the local area reside in the vicinity of the Proposed Scheme, it is considered likely that the majority of these workers would continue to be registered with their existing GPs rather than registering with a GP in the local area. The small minority who may choose to relocate to the area and register with a GP would be accommodated within the existing healthcare funding systems, which allocates funds to local health authorities on the basis of population size. Workers choosing to live in the local area for the purpose of accessing construction employment would remain in the area on a temporary basis for the duration of the works, and would not contribute to long term population growth.

9.4.34 As set out in the draft CoCP, HS2 Ltd or the nominated undertaker would provide occupational health care to its workers, including health assessment, health monitoring, preventative treatment where necessary, and first aid. This is expected to help to reduce additional demand for local services, including accident and emergency services.

9.4.35 HS2 Ltd would work with emergency services to ensure that any effects on emergency response times are reduced as far as reasonably practicable. This would include consideration of strategies for temporary and permanent traffic arrangements and construction routes, to reduce any potential effects.

9.4.36 There is weak to 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 (see the assessment of social capital above), as well as accessing basic needs such as food shopping. The Colwich to Yarlet area is a rural area, where communities rely on shops and services in nearby towns and villages, and where opportunities for short alternative routes are limited, resulting in longer diversions. There is potential for communities to experience increased difficulty in accessing shops and community services (such as post offices, banks, libraries) as a result of increased journey times during construction. This will be assessed in the formal EIA Report.

### Other mitigation measures

9.4.37 Other mitigation identified to reduce adverse impacts on health determinants during the construction of the Proposed Scheme will be described in the formal EIA Report.

## 9.5 Effects arising from operation

### Avoidance and mitigation measures

9.5.1 As described in Section 9.4, 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. Mitigation measures will be described in the formal EIA Report.

### Assessment of impacts and effects

9.5.2 Any health effects of operational train noise will be assessed in the formal EIA Report. No other operational effects additional to the permanent construction effects have been identified at this stage.

### Other mitigation measures

9.5.3 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 EIA Report.

# 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 Colwich to Yarlet area in relation to land quality, and reports the likely impacts and significant effects 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 SSSI and local geological sites (LGS), areas of historical brine extraction and areas of designated mineral resources. Consideration is also given to petroleum (gas) prospect and licencing. Mitigation measures are presented and any likely residual significant effects are summarised.

10.1.2 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 the 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. The potential effects from operation of the Proposed Scheme are expected to be mitigated by operational and management controls.

10.1.3 Engagement has been undertaken with the BGS, SCC, SBC, Staffordshire County Showground, the Environment Agency and FERA. 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.

10.1.4 Maps showing the location of the key environmental features and the key construction and operation features of the Proposed Scheme can be found in the Volume 2, CA2 Map Book.

## 10.2 Scope, assumptions and limitations

10.2.1 The scope, assumptions and limitations for the land quality assessment are set out in the draft SMR and Volume 1.

10.2.2 In accordance with the draft SMR, a risk based approach is being undertaken to identify contamination that may have an impact upon the construction of the Proposed Scheme. To support this, an initial desk based assessment has been undertaken for the study area, defined as the land required for the Proposed Scheme plus a 250m buffer from the edge of proposed construction activities, but in the case of groundwater data, this is increased up to 1km. Selected site visits will be used to supplement desk-based information.

10.2.3 A conceptual site model (CSM) approach has been used to provide an initial 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.

10.2.4 Baseline data collection is ongoing and the results of that work, in conjunction with ongoing engineering design development and further surveys, will inform the formal EIA Report and provide refinement, where necessary, to the assessment of effects during construction and operation.

## 10.3 Environmental baseline

### Data collection

10.3.1 Baseline data has been collected from a range of sources including Ordnance Survey mapping, the BGS, Coal Authority, SBC, SCC, Public Health England, the Environment Agency, Natural England and FERA records, as well as web sources such as local geological trusts.

### Field surveys

10.3.2 A familiarisation visit to the study area was made in March 2016, where the route of the Proposed Scheme was viewed from points of public access only.

10.3.3 Following the familiarisation visit and review of the baseline data, it was apparent that for many historical infill areas identified from the data, there are few obvious signs of these features on the ground when viewed from publicly accessible areas. On this basis, further surveys are likely to be required to confirm the exact location and condition of the identified infill areas and will be reported in the formal EIA Report.

### Geology

10.3.4 This section describes the underlying ground conditions within the Colwich to Yarlet area. Recent changes in lithostratigraphic classifications by the BGS have been incorporated where appropriate[52].

#### *Made ground*

10.3.5 Made ground is a term used to denote man-made deposits such as landfill, 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.

#### *Superficial geology*

10.3.6 An area of peat is located approximately 1km south-west of Hopton. Patches of peat also occur to the south of the Proposed Scheme at Marston.

[52] 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

10.3.7 Alluvial deposits of silty clay, silt, sand, peat and gravel occur along the courses of streams and rivers. Alluvium is present in the study area associated with the River Trent near Ingestre and its tributaries.

10.3.8 River terrace deposits comprising sand and gravel are present associated with the River Trent valley near Ingestre.

10.3.9 Glaciofluvial sheet deposits comprising sand and gravel are present around Tixall; in the vicinity of Stafford and Hopton; and along the River Trent valley near Yarlet and Salt. Some of the sands and gravels within the area have been worked for construction materials both historically and currently.

10.3.10 Glacial till is present to the east of Great Haywood and also across a plateau to the east of Hopton and to the north of the study area. These deposits comprise sandy, silty clay, which historically has been extracted from marl pits, with the material being used locally as a soil improver for agriculture.

### *Bedrock geology*

10.3.11 The bedrock geology in this area comprises rocks of the Mercia Mudstone Group and the Sherwood Sandstone Group.

10.3.12 Mercia Mudstone Group underlies the majority of the Proposed Scheme in this study area and is present from the southern end of the area to Lambert's Coppice. The Mercia Mudstone Group also continues west of Hopton to the north of the route. The Hopton fault runs north-south through the centre of Hopton and forms an abrupt divide between the Mercia Mudstone Group to the west and the Helsby Sandstone Formation (part of the Sherwood Sandstone Group) to the east. The Mercia Mudstone is typically described as mudstone and siltstone with some halite-bearing units and sandstone.

10.3.13 West of Lambert's Coppice, the geology becomes faulted and rocks of the Helsby Sandstone Formation are present beneath the superficial deposits. To the south of Hopton and in the area of Salt and further north, the near surface geology is the Chester Formation (part of the Sherwood Sandstone Group). Rocks of the Sherwood Sandstone Group typically comprise red, brown and grey sandstone and conglomerate interbedded with red and brown siltstones and mudstones.

10.3.14 At the northern end of the study area from Yarlet to Sandonbank, the Stafford Halite Member of the Mercia Mudstone Group is present. The Stafford Halite comprises mudstone and halite stone. Halite stone is a sedimentary rock comprising greater than 50% rock salt.

### *Radon*

10.3.15 Radon is a radioactive gas formed by the radioactive decay of naturally occurring uranium in rocks and soils. Two sections of the route lie within a radon affected area, as defined on Public Health England's UK Radon online maps[53]:

- the section of the route to the north of Great Haywood; and

[53] www.ukradon.org/information/ukmaps

- the section of the route from Staffordshire County Showground to Hopton Pools.

10.3.16 In both of these areas, it is stated that between 1 and 3% of homes have radon levels above the action level of 200 becquerels per cubic metre of air (Bq/m$^3$) for residential properties. For the remainder of the area between Colwich and Yarlet, radon levels are reported to be less than 1% of homes above the action level.

## Groundwater

10.3.17 Five categories of aquifer have been identified within the study area, as defined by the Environment Agency. Where present, the river terrace deposits, glaciofluvial sheet deposits and alluvium are classified as Secondary A aquifers. The glacial till is designated as a Secondary (undifferentiated) aquifer and the peat as an Unproductive aquifer.

10.3.18 The Mercia Mudstone Group underlying the majority of the study area and the Stafford Halite Member at the northern end of the study area have been designated as Secondary B aquifers. The Sherwood Sandstone Formation (including the Helsby Formation) is designated as a Principal aquifer.

10.3.19 There are six known groundwater abstractions located within 1km of the Proposed Scheme, at Moreton Grange, Ingestre Park Golf Club, Staffordshire County Showground (two records), Upper Hanyards Farm and Lower Hanyards Farm.

10.3.20 No public water supplies have been identified within the study area and no groundwater source protection zones (SPZs)[54] have been identified within 250m of the route, although there is a Total Catchment (Zone 3) groundwater SPZ located approximately 1km south-west of the route at Great Haywood associated with public water supply sources.

10.3.21 At the northern end of the route, the interaction of groundwater with halite deposits within the Stafford Halite Member has resulted in the natural dissolution of the salt. This gives rise to brine where the saliferous deposits are close to the surface.

10.3.22 Groundwater bodies in the Colwich to Yarlet area are described in more detail in Section 15, Water resources and flood risk.

## Surface water

10.3.23 The River Trent is the most significant watercourse within the area and would be crossed by the Proposed Scheme near Ingestre. The Proposed Scheme would also cross the Trent and Mersey Canal, close to the location where it would cross the River Trent, approximately 70m north of Great Haywood Marina.

10.3.24 Moreton Brook and a number of unnamed streams, tributaries, drains, ponds and culverts are also located within the study area.

10.3.25 Surface water bodies in the Colwich to Yarlet area are described in more detail in Section 15, Water resources and flood risk.

[54] 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 from the potable source.

10.3.26 There are no licensed surface water abstractions located within 1km of the Proposed Scheme. No surface water discharge permits or private water supplies from surface water sources have been identified within 1km of the Proposed Scheme.

## Current and historical land use

10.3.27 Current potentially contaminative land uses within the study area include an authorised landfill site within a former railway cutting at Hopton, and the MoD Stafford site at Within Lane, together with several farms along the route.

10.3.28 Historical land uses identified within the study area with the potential to have caused contamination include five historical landfill sites, with one at Staffordshire County Showground and several infilled extraction pits. The infilled pits and ponds may have been filled with a variety of waste materials, but have not been licensed.

10.3.29 Contaminants commonly associated with landfill sites could include metals, semi-metals, asbestos, organic and inorganic compounds. Infilled pits could also give rise to landfill gases such as methane or carbon dioxide, and leachate.

## Other regulatory data

10.3.30 The regulatory data reviewed include pollution incidents, radioactive and hazardous substances consents and environmental permits (previously landfill, integrated pollution control and integrated pollution prevention and control licences). Of note is a significant pollution incident (Category 2), which occurred on 29 May 2009 and involved the release of an unknown substance to a water course between Yarlet and Marston, 100m north of the route.

10.3.31 There are no ecological designations as defined in the land quality section of the draft SMR[55] located within the study area.

## Mining/mineral resources

10.3.32 SCC is responsible for the overall mineral and waste local plans for the county. The new Minerals Local Plan (MLP) for Staffordshire 2015 to 2030 (final draft 2015)[56] is currently being reviewed and is expected to replace the current Staffordshire and Stoke-on-Trent Minerals Local Plan in 2016. It will set out the Council's policies aimed at controlling mineral related developments within Staffordshire up to the year 2030.

10.3.33 There are two proposed mineral safeguarding areas (MSA) covering large parts of the study area; one is for superficial sand and gravel covering an area of 55,048ha, which includes land around Moreton, Ingestre, Hopton and Colwich. The second is for bedrock sand, which covers an area of 16,689ha and includes land around Hopton and Staffordshire County Showground.

10.3.34 There are three mineral consultation areas (MCA) for sand and gravel: at Hopton, extending from Mount Farm to Hopton Pools; at Ingestre extending from the western edge of Lionlodge Covert to Hoo Mill; and at Great Haywood, extending from the Trent and Mersey Canal to the A51.

[55] Sensitive ecological receptors are defined as national designations such as SSSIs.
[56] Staffordshire County Council (2015) *New Minerals Plan for Staffordshire (2015-2030). Final draft 2015.*

10.3.35 There are no MLP allocations within the study area.

10.3.36 There are no mineral sites with permitted reserves within the Colwich to Yarlet area.

10.3.37 Coal seams of the Pennine Coal Measures Group are present at depth beneath the area, and the available records from the Coal Authority show that the route from the boundary of the Colwich to Yarlet area to the Hopton Fault overlies an extension of the South Staffordshire Coalfield. The MLP identifies the entire study area as a potential source of coal bed methane (CBM) gas. Whilst the MLP states that there has been recent interest in CBM across Staffordshire, to date interest has mainly been in relation to the North Staffordshire Coalfield.

10.3.38 The Stafford Halite Formation, which occurs within the study area, has been exploited commercially for brine production in the past. This led to subsidence problems, which occurred outside the study area to the south-west. A broader solution zone is present parallel to the line of the Hopton Fault; however, a BGS plan dated 1995[57] stated that the Halite deposits "are unlikely to be of future economic importance".

10.3.39 The Staffordshire and Stoke-on-Trent Minerals Local Plan 1994-2006[58] stated that "there is no evidence to suggest that there is any commercial interest in further brine pumping in the Plan area". The proposed new MLP does not make reference to halite as a mineral resource.

## Geo-conservation resources

10.3.40 No geological SSSI or LGS sites have been identified within the study area. Therefore, no assessment of geo-conservation resources is required.

## Receptors

10.3.41 The sensitive receptors that have been identified within this study area are summarised in Table 7.

Table 7: Summary of sensitive receptors

| Issue | Receptor type | Receptor description | Receptor sensitivity |
|---|---|---|---|
| Land contamination | People | Residents at existing properties , schools and study centres | High |
| | | Workers and visitors at nearby facilities | Moderate |
| | | Public using PRoW | Low |
| | Groundwater | Principal aquifer | High |
| | | Secondary A aquifers | Moderate |

[57] British Geological Survey (1995) *Staffordshire (excluding the Peak District National Park) A Summary of Mineral Resource Information for Development Plans. Mineral Resources (other than sand and gravel).* Plan at 1:100,000 scale.
[58] Adopted in December 1999, now withdrawn pending adoption of the Draft 2015 new Minerals Local Plan for Staffordshire (2015-2030).

| Issue | Receptor type | Receptor description | Receptor sensitivity |
|---|---|---|---|
| | | Secondary B aquifers and undifferentiated aquifers | Low to moderate |
| | Surface waters | River Trent, Moreton Brook | Moderate |
| | | Trent and Mersey Canal | Low |
| | Built environment | Underground structures and buried services | Low |
| | | Buildings and property | Low to high |
| | Natural environment | SSSI, LGS (none identified at this stage) | High |
| Impacts on mining/mineral sites (severance and sterilisation of mineral sites) | Mining/mineral sites | Sand and gravel MSAs | Moderate |
| | | Coal deposits, including CBM | Low |
| | | Mineral resource of halite (salt) | Low |
| Land contamination | People | Occupants and workers | Moderate |
| | | Residents | High |
| | | Schools and study centres | High |
| | Groundwater | Principal aquifer | High |
| | | Secondary A aquifers | Moderate |
| | | Secondary B aquifers and undifferentiated aquifers | Low to moderate |
| | Surface waters | River Trent | Moderate |
| | | Trent and Mersey Canal | Low |
| | | Kingston Brook | Moderate |
| | Built environment | Underground structures and buried services | Low |
| | | Buildings and property | Low to high |
| | Natural environment | AWIS | High |
| Impacts on mining/mineral sites (severance and | Mining/mineral sites | Sand and gravel MSAs<br>Coal deposits, including CBM<br>Mineral resource of halite (salt) | Moderate<br>Low<br>Low |

| Issue | Receptor type | Receptor description | Receptor sensitivity |
|---|---|---|---|
| sterilisation of mineral sites) | | | |

## 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 CoCP. 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 draft CoCP requires that prior to and during construction, a programme of further detailed investigations, which may include both desk based and site based 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[59] and British Standards BS10175[60] and BS8576[61].

10.4.3 With the application of measures in the draft CoCP during the construction phase, no significant adverse effects on land quality are likely to result from the Proposed Scheme.

10.4.4 If remediation of contaminated soils or groundwater is required, there could be a beneficial effect for the environment in the long term, with respect to contamination.

10.4.5 Where significant contamination is encountered, a remedial options appraisal would be undertaken to define the most appropriate remediation techniques. 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[62]. The preferred option would then be developed into a remediation strategy.

### Assessment of impacts and effects

10.4.6 Construction of the Proposed Scheme through this section of the route would require earthworks, utility diversions, deep foundations, temporary dewatering 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 CT-05 Map Series in Volume 2, CA2 Map Book.

[59] Environment Agency, (2004), *CLR11 Model Procedures for the Management of Land Contamination*.
[60] British Standard, (2011), *BS10175+A1:2013 Investigation of Potentially Contaminated Sites*.
[61] British Standard, (2013) *BS8576 Guidance on investigations for ground gas – Permanent gases and Volatile Organic Compounds (VOCs).*
[62] Sustainable Remediation Forum UK, (2010), *A Framework for Assessing the Sustainability of Soil and Groundwater Remediation.*

### *Land contamination*

10.4.7 In line with the assessment methodology, as set out in the draft 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 process. 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 undergoing the more detailed risk assessments are historical or current landfills, MoD land and infilled pits/ponds.

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 have been grouped, and assessed together, where appropriate.

10.4.10 A summary of the baseline CSM is provided in Table 8. The potential impacts and baseline risks quoted are those before any mitigation is applied. Further sites may be included in the formal EIA Report.

Table 8: Summary of baseline CSM for sites which may pose a contaminative risk for the Proposed Scheme

| Area ref[63] | Area name | Main potential impacts | Main baseline risk |
|---|---|---|---|
| CA2- 65 | Lower Hanyards Farm landfill site | Potential impact on human health on-site (direct contact, ingestion, inhalation of dusts and vapours from contaminated soils and groundwater and inhalation of ground gases). | Low |
| | | Potential impact on human health off-site (direct contact, ingestion, inhalation of dusts and vapours from contaminated soils and groundwater and inhalation of ground gases). | Low |
| | | Potential impact on groundwater quality (leaching, vertical and lateral migration from soils and water). | Low |
| | | Potential impact on surface water quality (lateral migration through groundwater, direct runoff from site). | Very low |

[63] Each potentially contaminated site is allocated a unique reference number.

| Area ref[63] | Area name | Main potential impacts | Main baseline risk |
|---|---|---|---|
| | | Potential impact on property receptors on-site and off-site (direct contact with soils and water, exposure to explosive gases). | Moderate/low |
| CA2-147 | New Farm landfill site | Potential impact on human health on-site (direct contact, ingestion, inhalation of dusts and vapours from contaminated soils and groundwater and inhalation of ground gases). | Moderate/low |
| | | Potential impact on human health off-site (direct contact, ingestion, inhalation of dusts and vapours from contaminated soils and groundwater and inhalation of ground gases). | Moderate/low |
| | | Potential impact on groundwater quality (leaching, vertical and lateral migration from soils and water). | Moderate/low |
| | | Potential impact on surface water quality (lateral migration through groundwater, direct runoff from site). | Very low |
| | | Potential impact on property receptors on-site and off-site (direct contact with soils and water, exposure to explosive gases). | Moderate/low |
| CA2-177 | Yarlet Bank former garage/petrol station | Potential impact on human health on-site (direct contact, ingestion, inhalation of dusts and vapours from contaminated soils and groundwater and inhalation of ground gases). | Moderate/low |
| | | Potential impact on human health off-site (direct contact, ingestion, inhalation of dusts and vapours from contaminated soils and groundwater and inhalation of ground gases). | Low |
| | | Potential impact on groundwater quality (leaching, vertical and lateral migration from soils and water). | Very low |
| | | Potential impact on surface water quality (lateral migration through groundwater, direct runoff from site). | Very low |
| | | Potential impact on property receptors on-site and off-site (direct contact with soils and water, exposure to explosive gases). | Very low |
| CA2-72 | Elmstar Plant landfill at Staffordshire County Showground | Potential impact on human health on-site (direct contact, ingestion, inhalation of dusts and vapours from contaminated soils and groundwater and inhalation of ground gases). | Moderate |
| | | Potential impact on human health off-site (direct contact, ingestion, inhalation of dusts and vapours from contaminated soils and groundwater and inhalation of ground gases). | Low |
| | | Potential impact on groundwater quality (leaching, vertical and lateral migration from soils and water) | Moderate/low |

| Area ref[63] | Area name | Main potential impacts | Main baseline risk |
|---|---|---|---|
| | | Potential impact on surface water quality (lateral migration through groundwater, direct runoff from site). | Low |
| | | Potential impact on property receptors on-site and off-site (direct contact with soils and water, exposure to explosive gases). | Moderate |
| CA2-89 | Hopton railway cutting landfill | Potential impact on human health on-site (direct contact, ingestion, inhalation of dusts and vapours from contaminated soils and groundwater and inhalation of ground gases). | Low |
| | | Potential impact on human health off-site (direct contact, ingestion, inhalation of dusts and vapours from contaminated soils and groundwater and inhalation of ground gases). | Moderate/low |
| | | Potential impact on groundwater quality (leaching, vertical and lateral migration from soils and water). | Moderate/low |
| | | Potential impact on surface water quality (lateral migration through groundwater, direct runoff from site). | Moderate/low |
| | | Potential impact on property receptors on-site and off-site (direct contact with soils and water, exposure to explosive gases). | Moderate |

10.4.11 A screening assessment of the effects of contamination has been completed by comparing the detailed CSM developed for potential contaminated areas at baseline, construction and post-construction stages.

### Temporary effects

10.4.12 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.

10.4.13 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 mitigation through both the application of the draft CoCP and any necessary site-specific remediation.

10.4.14 Table 9 presents the summary of the resulting construction effects. This shows that based upon the assessment, no significant effects have been identified during the construction phase in relation to potential land contamination. 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 (non-significant) during the construction period, particularly from ground disturbance in areas of localised backfilling.

Table 9: Summary of temporary (construction) effects

| Area ref[64] | Main baseline risk | Main construction risk | Temporary effect and significance (Y/N) |
|---|---|---|---|
| CA2-65 Lower Hanyards Farm landfill site | Potential impact on human health on-site = low | Low | Neutral effect (N) |
| | Potential impact on human health off-site = low | Low | Neutral effect (N) |
| | Potential impact on groundwater quality = low | Moderate/low | Minor adverse effect (N) |
| | Potential impact on surface water quality = very low | Very low | Neutral effect (N) |
| | Potential impact on property receptors on-site and off-site = moderate/low | Moderate/low | Neutral effect (N) |
| CA2-147 New Farm landfill site | Potential impact on human health on-site = moderate/low | Moderate/low | Neutral effect (N) |
| | Potential impact on human health off-site = moderate/low | Moderate | Minor adverse effect (N) |
| | Potential impact on groundwater quality = moderate/low | Moderate/low | Neutral effect (N) |
| | Potential impact on surface water quality = very low | Very low | Neutral effect (N) |
| | Potential impact on property receptors on-site and off-site = moderate/low | Moderate | Minor adverse effect (N) |
| CA2-177 Yarlet Bank former garage/petrol station | Potential impact on human health on-site = moderate/low | Moderate/low | Neutral effect (N) |
| | Potential impact on human health off-site = low | Low | Neutral effect (N) |
| | Potential impact on groundwater quality = very low | Low | Minor adverse effect (N) |
| | Potential impact on surface water quality = very low | Very low | Neutral effect (N) |
| | Potential impact on property receptors on-site and off-site = very low | Very low | Neutral effect (N) |

[64] Each potentially contaminated site is allocated a unique reference number.

| Area ref[64] | Main baseline risk | Main construction risk | Temporary effect and significance (Y/N) |
|---|---|---|---|
| CA2-72 Elmstar Plant landfill at Staffordshire County Showground | Potential impact on human health on-site = moderate | N/A (assume no access during construction) | N/A |
| | Potential impact on human health off-site = low | Moderate | Moderate adverse effect (Y) |
| | Potential impact on groundwater quality = moderate/low | Moderate | Minor adverse effect (N) |
| | Potential impact on surface water quality = low | Moderate/low | Minor adverse effect (N) |
| | Potential impact on property receptors on-site and off-site = moderate | Moderate | Neutral effect (N) |
| CA2-89 Hopton railway cutting landfill | Potential impact on human health on-site = low | Low | Neutral effect (N) |
| | Potential impact on human health off-site = moderate/low | Moderate | Minor adverse effect (N) |
| | Potential impact on groundwater quality = moderate/low | Moderate | Minor adverse effect (N) |
| | Potential impact on surface water quality = moderate/low | Moderate/low | Neutral effect (N) |
| | Potential impact on property receptors on-site and off-site = moderate | Moderate | Neutral effect (N) |

## Permanent effects

10.4.15 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. As noted above, worsening risk would result in negative effects and an improvement will result in positive effects.

10.4.16 Table 10 provides the summary of the permanent (post-construction) effects obtained from a comparison of the baseline and post-construction impacts and whether these are significant. It also shows the receptors to be subject to detailed risk assessment in the formal EIA Report.

Table 10: Summary of permanent (post-construction) effects

| Area ref | Main baseline risk | Main post-construction risk | Post-construction effect and significance (Y/N) |
|---|---|---|---|
| CA2-65 Lower Hanyards Farm landfill site | Potential impact on human health on-site = low | Low | Neutral effect (N) |

| Area ref | Main baseline risk | Main post-construction risk | Post-construction effect and significance (Y/N) |
|---|---|---|---|
| | Potential impact on human health off-site = low | Low | Neutral effect (N) |
| | Potential impact on groundwater quality = low | Low | Neutral effect (N) |
| | Potential impact on surface water quality = very low | Very low | Neutral effect (N) |
| | Potential impact on property receptors on-site and off-site = moderate/low | Moderate/low | Neutral effect (N) |
| CA2-147 New Farm landfill site | Potential impact on human health on-site = moderate/low | Moderate/low | Neutral effect (N) |
| | Potential impact on human health off-site = moderate/low | Moderate/low | Neutral effect (N) |
| | Potential impact on groundwater quality = moderate/low | Moderate/low | Neutral effect (N) |
| | Potential impact on surface water quality = very low | Very low | Neutral effect (N) |
| | Potential impact on property receptors on-site and off-site = moderate/low | Moderate/low | Neutral effect (N) |
| CA2-177 Yarlet Bank former garage/petrol station | Potential impact on human health on-site = moderate/low | Moderate/low | Neutral effect (N) |
| | Potential impact on human health off-site = low | Low | Neutral effect (N) |
| | Potential impact on groundwater quality = very low | Very low | Neutral effect (N) |
| | Potential impact on surface water quality = very low | Very low | Neutral effect (N) |
| | Potential impact on property receptors on-site and off-site = very low | Very low | Neutral effect (N) |
| CA2-72 Elmstar Plant landfill at Staffordshire County Showground | Potential impact on human health on-site = moderate | Very low | Moderate beneficial effect (Y) |
| | Potential impact on human health off-site = low | Very Low | Minor beneficial effect (N) |

| Area ref | Main baseline risk | Main post-construction risk | Post-construction effect and significance (Y/N) |
|---|---|---|---|
| | Potential impact on groundwater quality = moderate/low | Very Low | Moderate beneficial effect (Y) |
| | Potential impact on surface water quality = low | Very Low | Minor beneficial effect (N) |
| | Potential impact on property receptors on-site and off-site = moderate | Very Low | Moderate beneficial effect (Y) |
| CA2-89 Hopton railway cutting landfill | Potential impact on human health on-site = low | Low | Neutral effect (N) |
| | Potential impact on human health off-site = moderate/low | Moderate/low | Neutral effect (N) |
| | Potential impact on groundwater quality = moderate/low | Moderate/low | Neutral effect (N) |
| | Potential impact on surface water quality = moderate/low | Moderate/low | Neutral effect (N) |
| | Potential impact on property receptors on-site and off-site = moderate | Moderate | Neutral effect (N) |

10.4.17 Following remediation for sites located within the study area, there would generally be overall neutral or minor adverse effects (non-significant), except for the landfill at Staffordshire County Showground, where moderate beneficial effects (which are significant) are expected post-construction, as landfilled waste would be required to be removed to create the cutting in that location. If the majority of the landfilled waste was to be removed, the beneficial effects would be expected to include an improvement in groundwater quality and a reduction in risk to human health as a result of removal of impacted material which may also be producing gas.

### *Mining/mineral resources*

10.4.18 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[65] or isolation that may occur during the construction phase of the Proposed Scheme, possibly continuing through to its operation.

#### Temporary effects

10.4.19 The majority of effects on mining and mineral sites would be permanent. However, temporary adverse effects may occur where construction compounds are proposed

[65] 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.

within MSA. In such cases, there may be a temporary sterilisation of the resource during construction works, but this is not considered to represent a significant effect, as there would only be a delay in being able to access the resource, and the resource would not be lost permanently.

### Permanent effects

10.4.20 The Proposed Scheme would cross two MSA; one for sand and gravel extraction and one for bedrock sand extraction. It is possible that mineral extraction could be undertaken either in advance or as part of the works for the Proposed Scheme. Mitigation measures (if any) would be discussed in advance of the works with the Mineral Planning Authority, SCC, and the mineral owner.

10.4.21 The Proposed Scheme would cross an area in which brine could potentially be extracted, near Stafford; however, it is understood that brine is not considered to be a mineral resource by SCC.

10.4.22 The Proposed Scheme would cross an area underlain by coal reserves of the South Staffordshire Coalfield. Construction of the Proposed Scheme may require the sterilisation of a strip of land in which future coal mining or CBM extraction could be constrained.

10.4.23 Table 11 reports the assessment of permanent effects from construction on the mining and mineral resources identified.

Table 11: Summary of effects for mining and mineral resources

| Site name | Status | Description | Sensitivity/ value | Magnitude of impact | Effect and significance (Y/N) |
|---|---|---|---|---|---|
| MSA – bedrock sand | MSA | MSA for bedrock sand extraction, defined by SCC[66] | Medium | Minor | Negligible (N) |
| MSA – sand and gravel | MSA | MSA for sand and gravel extraction, defined by SCC | Medium | Minor | Negligible (N) |
| Stafford Halite Formation | Unknown | Brine resource in the Stafford area | Low sensitivity | Minor | Negligible (N) |
| South Staffordshire Coalfield | Extent of hydrocarbons | Extent of hydrocarbon resource. Deep coal defined as between 50m and 1,200m by SCC | Likely to be of low sensitivity | Negligible | Negligible (N) |

10.4.24 On this basis all the potential effects identified are negligible and it is assessed that there are no significant effects with respect to mineral resources.

[66] Staffordshire County Council, (2015) *New Minerals Local Plan for Staffordshire 2015-2030*

### Other mitigation measures

10.4.25 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 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.

10.4.26 In addition to the excavation and/or treatment of contaminated soils as described above, it may also be necessary to install ground (landfill) gas and leachate control systems within affected old landfill sites, such as that at Staffordshire County Showground, on a temporary or permanent basis, to ensure that ground (landfill) gas and leachate migration pathways are controlled and do not adversely affect the Proposed Scheme or the wider environment as a consequence of the Proposed Scheme.

10.4.27 Mitigation of the effects on mineral resources within the proposed MSA could include extraction of the resource, for use within the Proposed Scheme, or elsewhere. Extraction may be limited to landscaping areas within the Proposed Scheme adjacent to rather than beneath the trackbed, which would require good founding conditions. A plan will be discussed in advance of the construction works with the landowner, the mineral planning department at SCC, and any other relevant parties to assist in achieving an effective management of minerals within the affected location of the MSA.

### Summary of likely residual significant effects

10.4.28 Based on the information currently available and with the application of the mitigation measures detailed above, there is one significant beneficial effect anticipated, associated with remediation of the Elmstar Plant landfill at Staffordshire County Showground. Otherwise, no likely significant residual effects are anticipated with respect to land quality.

## 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 four auto-transformer stations, located at Moreton Viaduct, Mill Lane, Sandon Road and Yarlet. An auto-transformer station can, in principle, be a source of contamination through accidental discharge or

leaks of coolant. However, in common with other modern substations, 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.

10.5.5 It is unlikely that there would be any cumulative effects on land quality receptors due to the environmental controls that would be placed on operational procedures.

## Other mitigation measures

10.5.6 No other mitigation measures are expected to be required beyond what has already been outlined relating to land quality in the study area. No significant residual effects associated with operation of the Proposed Scheme are anticipated.

## Summary of likely residual significant effects

10.5.7 No significant residual effects are anticipated associated with operation of the Proposed Scheme.

# 11 Landscape and visual

## 11.1 Introduction

11.1.1 This section of the report presents the assessment of the likely significant landscape and visual effects within the Colwich to Yarlet area, based on known scheme information to date. It summarises the baseline conditions found within and around the route of the Proposed Scheme and describes the likely impacts and potential significant effects that may arise during construction and operation on landscape and visual receptors.

11.1.2 In this section, the operational assessment section refers not just to the running of the trains, vehicles on roads and associated lighting but also the presence of the new permanent infrastructure associated with the Proposed Scheme.

11.1.3 Principal landscape and visual issues in this area include:

- potential temporary effects to landscape and visual receptors during construction arising from the presence of construction plant and compounds including the main construction compound off the A51 Lichfield Road, construction of viaducts, embankments, overbridges and underbridges, road diversions and realignments, the removal of existing trees and vegetation, excavation of cuttings and PRoW diversions; and
- permanent landscape and visual effects during operation arising from moving trains and vehicles and the presence of new structures in the landscape, including the viaducts over the Moreton Brook and the Trent and Mersey Canal, embankments and noise fence barriers, as well as overbridges, auto-transformer stations, overhead line equipment and PRoW diversions.

11.1.4 A separate, but related, assessment of effects on the setting of heritage assets is included in Section 7, Cultural heritage.

11.1.5 Winter surveys for the landscape and visual assessment were undertaken from January to March 2016 to inform the assessment. Further surveys will be undertaken to inform the assessment and will be reported in the formal EIA Report.

11.1.6 Engagement with SCC, the Cannock Chase AONB Unit, the Canal & River Trust and the National Trust has been undertaken. The purpose of this engagement has been to discuss the extent of the landscape and visual study area, the distribution of visual receptor viewpoints and the location of verifiable photomontages[67]. Engagement with these stakeholders will continue as part of the development of the Proposed Scheme.

11.1.7 Maps showing the location of the key environmental features and the key construction and operation features of the Proposed Scheme can be found in the LV-11 Map Series in the Volume 2, CA2 Map Book.

[67] The working draft EIA Report does not contain photomontages, these will be produced to inform the formal EIA Report.

## 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 and the draft SMR.

11.2.2 The extent of the study area has been informed by construction and operational phase zones of theoretical visibility (ZTV). The ZTVs have been produced in line with the methodology described in the draft SMR, and are an indication of the theoretical visibility of the Proposed Scheme. In some locations, extensive vegetation cover will mean the actual visibility is substantially less than that shown in the ZTVs, and professional judgement on site has been used to refine the study area to focus on likely significant effects. 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 is excluded from the ZTV for the operational phase as inclusion indicates widespread visibility; however this rarely gives rise to significant effects if it is the only element visible. Overhead line equipment is described and taken into account in the assessment of effects on landscape character areas (LCA) and visual receptors. With the exclusion of overhead line equipment, the operational phase ZTV gives a better indication of the possible spread of significant effects and therefore better informs the assessment.

11.2.3 Landscape and visual receptors within approximately 500m 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 Stafford.

11.2.4 Trees would be retained where reasonably practicable, in line with the draft CoCP, and disturbance minimised.

11.2.5 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 covers the situation in winter and summer of year 1 and summer of year 15. Likely significant effects for year 60 will be reported in the formal EIA Report.

11.2.6 The assessment in this report does not consider cumulative impacts or future baseline. These will be addressed in the formal EIA Report. This will also be the case for consideration of night time visual effects, although where general night time visual effects can be substantiated they are discussed in the relevant part of this section. The findings from the night time surveys will be included in the formal EIA Report.

11.2.7 Professional judgements on landscape value are summarised in the baseline descriptions. The draft assessment of sensitivity is summarised for each LCA however the judgements on susceptibility have been excluded from this report due to incomplete baseline survey data at the time. Full judgement on susceptibility and the resulting sensitivity assessment for each LCA will be provided in the formal EIA Report.

## 11.3 Environmental baseline

### Landscape baseline

11.3.1 The study area extends from Colwich in the south to Yarlet in the north. It includes a section of the WCML, as well as the Trent Valley and part of the Trent and Mersey Canal, which follows a northerly course towards Stafford. The study area encompasses lowland and settled river valley landscapes and valley sides, as well as areas of remnant lowland heathland around Hopton. Other key features are the registered park and garden of Shugborough Park within the northern-most part of the Cannock Chase AONB, plus remnant designed landscapes and parklands at Tixall and Ingestre. A number of historic settlements are associated with the rural lane network, notably Hopton, Yarlet and Whitgreave, along with larger nucleated villages such as Little Haywood.

11.3.2 The LCAs have been determined with reference to published landscape character assessments, supporting GIS data, aerial photography and Ordnance Survey mapping, plus desk study and fieldwork to confirm the appropriateness of area boundaries and subdivisions. Landscape character assessments reviewed include the relevant National Landscape Character Areas[68], Staffordshire Landscape Guidelines[69] and the landscape characterisation developed as part of the Cannock Chase AONB Management Plan[70].

11.3.3 For the purposes of this assessment, the study area for Colwich to Yarlet has been subdivided into 12 LCAs. A summary of these is provided below.

#### *Colton Riparian Alluvial Lowlands*

11.3.4 This LCA (partly within the Fradley to Colton area (CA1)) is a mostly intact and flat, lowland landscape with an intricate network of tree-lined watercourses as well as detracting infrastructure elements. The Colton Riparian Alluvial Lowlands is assessed as having an overall medium landscape value and is reported in full in Volume 2: Community Area Report – CA1 Fradley to Colton.

#### *Great Haywood Settled Plateau Farmland Slopes*

11.3.5 This LCA is defined by a rolling plateau and upper valley slope landform. The area is characterised by a patchwork of largely intact small- to medium-scale irregular fields, which are bound by well-maintained field hedgerows with trees. The LCA has a dispersed settlement pattern of small farmsteads. Overhead power lines form a prominent feature crossing the character area from the south-east to the north and north-west. There are long distance views of the modern settlement of Great Haywood. The area is intersected by an extensive network of local PRoW, such as in the vicinity of Moreton House and Swansmoor. The LCA is largely intact, but there is also a level of man-made changes within the landscape, including modern farm buildings, two overhead power line routes and associated pylons and loss of field

[68] Natural England (2013, 2014), *National Character Area profiles*. Available online at: https://www.gov.uk/government/publications/national-character-area-profiles-data-for-local-decision-making/national-character-area-profiles

[69] Staffordshire County Council, Development Services Department (2000), *Planning for Landscape Change*. Available online at: https://www.staffordshire.gov.uk/environment/eLand/planners-developers/landscape/NaturalEnvironmentLandscapeCharacterTypes.aspx

[70] Cannock Chase AONB Unit, Stafford Borough Council (2014), *Cannock Chase AONB Management Plan 2014–2019.* Available online at: http://www.cannock-chase.co.uk/Publications/Management_Plan/

boundaries. Long distance views are available towards Great Haywood and Rugeley Power Station. Therefore this LCA is assessed as having a low to medium landscape value in view of the above.

### *Great Haywood Settled Farmlands*

11.3.6 This LCA lies to the south of Hixon and is an undulating landscape with a high point at Egg Lane to the east. The land slopes down towards the Trent and Mersey Canal to the south-west, where the topography becomes flat. This is a largely open landscape with long vistas towards nearby character areas to the south, such as the Great Haywood Settled Plateau Farmland Slopes, Ingestre Riparian Alluvial Lowlands, Shugborough Riparian Alluvial Lowlands, Shugborough Designed Parkland and Cannock Chase LCAs. The intensely farmed (arable and pastoral) medium to large sized fields are bounded by well-maintained hedges. There are some hedgerow and field trees as well as small areas of mature broadleaved woodland. The field boundary hedges and mature trees are largely intact, although the landscape is influenced by the abrupt settlement edge of Hixon and the industrial estate to the south as well as busy transport links including the WCML, A51 Lichfield Road and the main roads into Hixon, Church Lane and New Road. These all detract from the overall rural character of this landscape. This LCA is assessed as having a medium landscape value due to the above.

### *Ingestre Riparian Alluvial Lowlands*

11.3.7 This LCA is defined by a flat, low lying valley floor landscape associated with the meandering, partly tree lined course of the River Trent. The river runs broadly parallel to the Trent and Mersey Canal at this point with the north facing valley slopes defined in part by remnant parkland belts associated with Ingestre Park. Part of the valley floor includes areas of lowland pasture within the Pasturefields SAC and SSSI. A network of local PRoW follows much of the course of the river within the LCA and the A51 Lichfield Road forms a prominent feature to the LCA's northern boundary. The condition and intactness of the landscape is variable due the rural landscape and medium sized fields allied to the presence of detracting features, including the WCML, overhead power lines and polytunnels at the Canalside Shop and Cafe. This LCA is assessed as having a medium landscape value due to the above.

### *Ingestre Park Sandstone Estatelands*

11.3.8 This LCA lies north of the AONB and Shugborough Hall. This landscape is defined primarily by the designed parkland of Ingestre and also by the adjacent remnant designed landscape of Tixall Park to the south-west. Ingestre Park incorporates remains of an 18$^{th}$ century Capability Brown designed landscape overlaid on a medieval and later deer park. It forms the setting for the Grade II* listed Ingestre Hall, a Jacobean mansion with later additions and the adjacent distinctive Wren church. Parkland belts and coppices/small woodlands are notable, as is the former Park Pool at Tixall; the historic gatehouse to Tixall Park; and an early 20$^{th}$ century lime avenue at Ingestre. Much of the parkland core at Ingestre is overlaid by a late 20$^{th}$ century 18-hole golf course. Other elements in the wider character area include an overhead power line and the county showground and associated grandstands, which detract from the historic setting of this LCA. Therefore, the condition and intactness of the

landscape is variable despite the remnants of historic features. This LCA is assessed as having a medium to high landscape value due to the above.

### *Shugborough Riparian Alluvial Lowlands*

11.3.9 This LCA is partially located within the Cannock Chase AONB and is a rural landscape forming part of the wider planned estate landscape of Shugborough. This LCA is defined by a flat, low lying valley floor landscape associated with the meandering, partly tree lined course of the River Sow. Land cover comprises primarily pastoral fields as well as smaller areas of riparian woodlands. The Trent and Mersey Canal and associated canal architecture and infrastructure are also clearly apparent within the character area, contributing to its scenic quality. This is a largely unsettled landscape with only a few groups of residential houses associated with Tixall Lock and the former Priory of St Thomas. This is a landscape in good condition, with a strong sense of intactness due to being largely unchanged since 1880, with medium to large scale fields, woodlands and ditches. This LCA is assessed as having a high landscape value due to the above.

### *Shugborough Designed Parkland*

11.3.10 This LCA forms the northern edge of the Cannock Chase AONB and is a registered designed landscape at Grade 1 on the Register of Historic Parks and Gardens. It dates predominantly from the 18th century with early 19th-century work, and forms the setting to the Grade I listed Shugborough Hall. The character area encompasses extensive parkland, including an early example of a model farm plus an extensive collection of monuments and follies. The park is enclosed by a dense, primarily deciduous tree belt and comprises fenced pastures with many individual, mature trees. This designed parkland is a landscape of high scenic quality due to the many listed buildings and features within a maintained historic parkland setting. There are many well used recreational facilities, such as the Staffordshire Way long distance route, other accessible footpaths, a bridleway, museum, tea room, garden and visitor parking. This LCA is assessed as having a high landscape value due to the above.

### *Stafford Sandstone Estatelands*

11.3.11 This LCA is a slightly undulating landscape on the urban fringe of Stafford with a local highpoint at the Staffordshire Technology Park. This landscape is dominated by the modern buildings associated with Staffordshire University, the technology park and industrial estate to the south as well as barracks, drill grounds, warehouses and residential properties associated with the MoD within the central and northern part of the LCA. The landscape surrounding the MoD buildings is primarily of ornamental parkland character with large areas of grassland and mature trees. There are also areas of scrub within MoD land, areas of broadleaved woodland and small arable fields within this LCA. The presence of this primarily urban character, which is defined by an absence of distinctive character and historic reference detracts from the scenic quality of this undulating landscape. This LCA is assessed as having a low landscape value due to the above.

### *Hopton Sandstone Estatelands*

11.3.12 This LCA is an arable landscape partly defined by MoD Stafford and by defence facilities on the site of the Registered Battlefield (Civil War battle of Hopton Heath). A

small- to medium-scale, rolling arable and pasture landscape of partly wooded character. The small, irregular shaped woodlands are primarily deciduous with some coniferous plantation. This is a mostly intact rural, tranquil and accessible landscape of some scenic quality due to the presence of mature field trees and woodland blocks set within the rolling landscape. There is some degree of man-made changes within the landscape due to modern settlement edges and MoD depots. The condition of field hedgerows varies across this landscape, with areas of intact hedges, fragmented hedgerows as well as hedgerow removal. Therefore, the overall condition and intactness of this landscape is judged to be medium. This LCA is assessed as having a medium landscape value due to the above.

### *Stone and Whitgreave Settled Farmlands*

11.3.13 This LCA (extending partly into the Stone and Swynnerton area (CA 3)) lies to the north-west of Stafford and Stone. This is an undulating arable landscape with small- to medium-scale fields and few settlements. Settlement pattern is primarily defined by individual farms and residential houses, small linear collections of houses such as Yarlet and Marston and the small village of Whitgreave. The M6 corridor, which divides the LCA, is a locally prominent feature. There is some evidence of scenic qualities such as the small village of Whitgreave, mature and prominent field and hedgerow trees and well maintained hedges. These elements are generally in a good condition and of local value. Features such as the M6, A34 dual carriage way and the hard settlement edge of Stafford reduce landscape value. Therefore, this LCA is assessed as having a medium landscape value due to the above.

### *Stone Riparian Alluvial Lowlands*

11.3.14 This LCA (extending partly into the Stone and Swynnerton area (CA 3)) lies due north of the Stone and Whitgreave Settled Farmlands LCA, and is a largely flat lowland farmed landscape, with some irregular and historic field boundaries. The LCA has a number of farmsteads to the edges and is partly intersected by a local PRoW network and cycle route (National Cycle Route 5). Some scenic quality is provided by the meandering River Trent, surrounded by pastures set within a historic field pattern as well as hedgerow and tree lined roads. The condition of this rural landscape is generally good, despite the influence of noise from the A51 Lichfield Road and embankments and overhead line equipment of the WCML railway, which both lie outside the study area. This LCA is assessed as having a medium landscape value due to the above.

### *Sow Valley Riparian Alluvial Lowlands*

11.3.15 This LCA is located to the periphery of the study area, west of the valley in which the Proposed Scheme would be sited and west of the M6. This is a relatively flat riparian landscape along the meandering River Sow, which flows from the countryside into the urban area of Stafford. This LCA mainly comprises small- to medium-sized, irregular shaped pastoral and arable fields, which are mostly enclosed by hedges, trees and ditches. There are many individual field trees and woodland blocks as well as ponds, tributary streams and ditches dispersed across the landscape. A large area of rough grassland, lakes and ditches can be found at the Doxey Marshes Nature Reserve. Smaller settlements such as the villages of Great Bridgeford and Norton Bridge and the hamlet of Cresswell are located within this LCA. There is some recreational access

including a number of PRoW, such as the Stone Circle Challenge long distance route, within this area. This landscape is heavily influenced by the hard urban edges of Stafford and busy transport corridors, such as the WCML and the M6, as well as a network of smaller roads. This LCA is assessed as having a medium landscape value due to the above.

### Visual baseline

11.3.16 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 landscape character areas and viewpoint locations maps (see Volume 2, CA2 Map Book, Map Series LV-11). 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[71], 4: Transport, 5: Hotels/healthcare (none within this area) and 6: Employment (none within this area).

11.3.17 Residential visual receptors within the area are located at large settlements, including Great Haywood, Little Haywood and Stafford, as well as at villages such as Hopton and a scattering of smaller villages and hamlets such as Little Ingestre and numerous farmsteads.

11.3.18 A range of recreational visual receptors are located at Shugborough Park, within the Cannock Chase AONB, along the Trent and Mersey Canal and associated cycle path, and at the Great Haywood Marina and Ingestre Park Golf Course.

## 11.4 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 in 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 establishment of compounds, main earthworks and structure works.

11.4.2 The potential effects associated with the peak construction phase in this area are generally considered to be medium-term, given the anticipated length of the construction programme. The majority of the main and satellite compounds are assumed to be in place for this phase. Further information will be provided in the formal EIA Report.

11.4.3 The construction works that have been taken into account in determining the potential effects on landscape and visual receptors includes, ordered from south to north where relevant:

[71] 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.

- construction of the route of the Proposed Scheme and associated overhead line equipment;
- construction and use of the haul route alongside the route for construction traffic and plant;
- pile driving and construction of viaducts and associated abutments/embankments at Moreton Brook (located within CA1 Fradley to Colton area), and Great Haywood viaduct north of Great Haywood Marina plus associated road diversions;
- construction of Tolldish culvert to accommodate proposed railway embankments;
- construction of Lionlodge culvert at Ingestre Park, Berryhill (South) culvert, Berryhill (North) culvert, Hanyards drop inlet culvert, and Sandon Road drop inlet culvert at Hopton;
- construction of Hopton culvert, Marston culvert, Yarlet Wood drop inlet culvert and Peasley Bank drop inlet culvert;
- construction of a retaining wall for the false cutting;
- diversion or realignment of highways including Tolldish Lane and Hopton Lane;
- construction of balancing ponds/replacement floodplain storage areas;
- construction of accommodation overbridges: Colwich Bridleway 23 accommodation overbridge, Hopton and Coton Bridleway 11 accommodation overbridge, Marston Bridleway 8 accommodation overbridge and Tixall Bridleway 0.1628 accommodation overbridge;
- diversion or realignment of PRoW including Tixall Footpath 0.1630(b) diversion;
- main construction compound off the A51 and seven satellite compounds. For the location of compounds refer to Map Series CT-05;
- construction of auto-transformer stations at Moreton, Mill Lane and Sandon Road, and Yarlet;
- construction of transfer nodes;
- construction of underbridges: A51 Lichfield Road underbridge, Ingestre underbridge, and Marston Lane underbridge;
- construction of overbridges including the A518 Weston Road overbridge, the B5066 Sandon Road overbridge, the A34 Stone Road overbridge, Footpaths 26 and 36 at Colwich (Colwich civil parish), Colwich Bridleway 35 overbridge, Colwich Footpath 36 diversion, Colwich Footpath 54 overbridge, Colwich Footpath 26 diversion, Hopton and Coton Footpath 24 overbridge and Hopton and Coton Footpath 6 diversion;

- demolition of one isolated residential property accessed via a private track off the Colwich Footpath 26, one residential property which is set back from Tolldish Lane, Upper Hanyards Farm, one residential property accessed via Trent Walk, seven residential properties on Hopton Lane and two residential properties in Yarlet; and
- diversion of utilities.

## Avoidance and mitigation measures

11.4.4 Measures that have been incorporated into the draft CoCP to avoid or reduce landscape and visual effects during construction include the following:

- measures to reduce landscape and visual impacts associated with temporary site offices, vehicles, construction plant and compounds;
- 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[72];
- 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 and;
- 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.

## Assessment of impacts and effects

### *Introduction*

11.4.6 The most apparent changes to landscape and visual receptors during construction would relate to the presence of construction plant, the excavation of cuttings, pile driving and erection of viaducts, construction of embankments, soils and material storage and stockpiling; and the removal of existing landscape elements, including trees and hedgerows, as well as the closure and diversion of existing roads, lanes and PRoW. Other key changes include the construction of overbridges and underbridges, compounds and transfer nodes and property demolitions. Significant landscape effects and visual effects on Shugborough Park are not anticipated due to the local topography and the enclosed nature of the park. The dense tree belt, which surrounds the park, would effectively screen views even in winter months.

11.4.7 Effects in relation to landscape and visual receptors are summarised below.

[72] BS 5837:2012 Trees in relation to design, demolition and construction – Recommendations, 2012, British Standard.

### *Landscape assessment*

11.4.8 The following section describes the likely significant effects on LCA during construction.

11.4.9 Based on current data it is anticipated that potentially significant effects on landscape character would occur to the following LCAs:

- Ingestre Riparian Alluvial Lowlands LCA is a landscape of medium susceptibility and medium overall sensitivity to change resulting from the Proposed Scheme. The LCA would be directly affected by construction works associated with the Trent and Mersey Canal viaduct, the Trent South embankment, the A51 main construction compound, the Mill Lane satellite compound, the high pressure gas diversion, the Hoo Mill Lane private accommodation track diversion, construction of balancing ponds and temporary material stockpiles. These works would result in the removal of mature trees and hedgerows. Earthworks and stock piles would introduce alterations to the existing flat landform. The presence of equipment and movement of construction vehicles and the erection of viaduct piers and spans would also introduce considerable change in this rural, tranquil landscape. Therefore these changes would result in a high magnitude of change and a major adverse effect on the character of the landscape within this LCA during the construction phase;

- Ingestre Park Sandstone Estatelands LCA is a landscape of medium to high susceptibility and high overall sensitivity to change resulting from the Proposed Scheme. The central part of the LCA would be directly impacted by construction works associated with the Hopton cutting south, Hopton embankment, Brancote cutting north, Brancote cutting south and Trent north embankment. Also construction of the A518 Weston Road overbridge and associated road realignment, Trent Walk overbridge, Tixall bridleway 0.1628 diversion and accommodation overbridge, Tixall Footpath 0.1630(b) diversion, CA2/03 Tixall bridleway satellite compound, Ingestre underbridge, Mill Lane auto-transformer station, temporary material stockpiles and demolition of buildings at Upper Hanyards and a residential prooprty and buildings accessed via Trent Walk. These works would result in the removal of trees and hedgerows at Lionlodge Covert, Ingestre Park Golf Club, Upper Hanyards and Park Farm. Earthworks and stock piles would introduce alterations to the existing undulating landform. The presence of equipment and movement of construction vehicles would also introduce considerable change in this historic landscape which has few existing infrastructure influences. Therefore these changes would result in a high magnitude of change and a major adverse effect on the character of the landscape within this LCA during the construction phase; and

- Hopton Sandstone Estatelands LCA is a landscape of high susceptibility and high overall sensitivity to change resulting from the Proposed Scheme. The central part of the LCA would be directly impacted by construction works associated with the Hopton cutting north and south, B5066 Sandon Road overbridge and Sandon Road auto-transformer station. Also the Hopton Lane

diversion, Mount Edge diversion, Hopton and Coton footpath 6 diversion, Hopton and Coton footpath 24 accomodation overbridge, CA2/04 A518 satellite compound and A518 transfer node, temporary material stockpiles and demolition of buildings at Hopton. These works would result in the removal of trees and hedgerows primarily to the south and west of Hopton. Earthworks and stockpiles would introduce alterations to the existing rolling landform. The presence of equipment and movement of construction vehicles would also introduce considerable change in a landscape with few existing infrastructure influences. Therefore these changes would result in a high magnitude of change and a major adverse effect on the character of the landscape within this LCA during the construction phase.[73].

11.4.10 The Sow Valley Riparian Alluvial Lowlands LCA is judged highly unlikely to experience even indirect effects on character resulting from the construction of the Proposed Scheme due to the distance from the Proposed Scheme and intervening landform. This LCA has, therefore, not been assessed any further.

11.4.11 The above effects have been determined based on the level of severance that the construction of the Proposed Scheme would introduce (principally through excavation of cuttings) in relation to:

- potential loss of landscape connectivity;
- in the case of Ingestre, loss of legibility of the designed landscape pattern; and
- in the case of Hopton, potential for significant adverse effect on settlement setting.

### *Visual assessment*

#### Introduction

11.4.12 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. Where residential receptors experience significant effects at night time arising from additional lighting, these are also presented in this section.

11.4.13 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.

11.4.14 In most cases, additional lighting is not considered to give rise to significant effects due to the anticipated nature of the construction programme, except in areas in which 24 hour working is anticipated to take place (see below for further detail of construction lighting effects).

[73] In the Formal EIA Report , professional judgement will be exercised to determine the likelihood of significant effects on further LCA immediately west of Hopton due to the potential severing effects in relation to landscape character and landscape pattern

### Views south from residences at Moreton Farm and north from Upper Moreton

11.4.15 From viewpoints 007.03.008 and 007.03.007 (Map LV-11-107b in Volume 2, CA2 Map Book) receptors would experience elevated views of potential construction works associated with the Moreton Brook viaduct and associated embankments approximately 100-200m from the view. From viewpoints 007.03.005, 007.03 013 and 008.03.001 (Map LV-11-107b in Volume 2, CA2 Map Book) there would be the potential for close range views to the south of large scale works associated with the excavation of the cutting for the Proposed Scheme at this point. Whilst some of the construction works would be screened from the recreational and residential receptors by the proposed cutting and the local topography, a large extent of the works would be experienced in proximity across the majority of the view. It is anticipated that in particular from the upper storeys at Moreton House, open views of the works would be experienced. In both instances it is anticipated that there would be the potential for a high magnitude of visual change and potentially major adverse (significant) effects on these sensitive receptors.

### Views north and south from the Trent and Mersey Canal

11.4.16 Receptors at viewpoints 009.03.003, 009.03.004, 009.03.007, 009.03.008 and 009.02.24 (Map LV-11-109 in Volume 2, CA2 Map Book) would potentially experience views of wide ranging construction activity associated with the construction of the viaduct over the Trent and Mersey Canal and Great Haywood Marina in the middle ground of the view. Pile driving, construction of viaduct piers and structural works associated with the building of the viaduct spans would have the potential to form dominant features above intervening vegetation in these views. These elements would give rise to a large potential magnitude of visual change and it is anticipated that these activities would give rise to potentially major adverse (significant) visual effects.

### Views south from Ingestre Park

11.4.17 Receptors at viewpoints 010.03.005 and 010.03.008 (from the bridleway linking Ingestre and Tixall, Tixall Bridleway 0.1628), (Map LV-11-110 in Volume 2, CA2 Map Book) would experience close range views of excavation works associated with construction of the Brancote South cutting and associated works to re-align Tixall Bridleway 0.1628 and construct the overbridge, demolition of the Upper Hanyards farm and the removal of vegetation. The works would change the rural, tranquil view of the gently undulating landscape. A high magnitude of change is anticipated due to the proximity of the proposed works. Potential major adverse (significant) effects are anticipated in these locations.

### Views south from residences and PRoW at Hopton

11.4.18 From viewpoints 011.03.002, 011.02.005, 011.02.006, 012.02.003, 011.03.011 and 011.02.005 (Map LV-11-111 in Volume 2, CA2 Map Book) receptors would potentially experience close to medium range views to the south of the excavation of Hopton North cutting and Hopton South cutting and the formation of embankments and a false cutting south of Hopton, together with road re-alignments and construction of associated overbridges for the A518 Weston Road and the B5066 Sandon Road. The

works would change the rural, tranquil view of the gently undulating landscape. This construction activity would result in a substantial alteration of the view in proximity of the viewpoint. The works would be highly visible across the majority of the view. Receptors would have open views of the works with limited screening provided by the undulating landscape and intervening vegetation. A high potential magnitude of visual change is anticipated in relation to these locations. Therefore, a potentially major (significant) adverse visual effect is anticipated due to the prominence of the excavation works and construction works in relation to the false cutting, embankments and overbridges.

#### Views from the Stone Circles Challenge long distance path

11.4.19 From viewpoint 012.02.008 (Map LV-11-112 in Volume 2, CA2 Map Book) receptors would potentially experience close range views of the construction of the road re-alignments and overbridge on the approach to Hopton, together with excavation of railway cuttings. The construction activities would result in a substantial alteration of the rural view of the gently undulating landscape in proximity to the receptor. The works would be highly visible across much of the view. A high potential magnitude of visual change is anticipated resulting in potentially major adverse (significant) visual effects.

#### Views north from residences at Marston and Yarlet

11.4.20 From viewpoints 013.02.004, 013.02.005, 013.03.002 and 013.03.006 (Map LV-11-113 in Volume 2, CA2 Map Book) receptors would experience close-range views of construction activity, approximately 100m away. The construction of low embankments, at grade sections of the Proposed Scheme and the Yarlet South cutting would substantially alter the rural, tranquil view across the undulating landscape. Whilst from the road most of the construction works would be obscured from Yarlet Lane due to the roadside hedgerow and local topography, there would be open views of the works in particular from the upper storeys of residential properties. Therefore, a high potential magnitude of potential visual change is anticipated resulting in potential major adverse (significant) visual effects to these receptors.

#### Views north from residences at Pire Hill

11.4.21 This will be reported in the Stone and Swynnerton area (Volume 2, CA3 report). This is due to the orientation of the viewpoint on the edge of this area resulting in the majority of the visual effect being experienced within the Stone and Swynnerton area (viewpoint 014.03.009, Map LV-11-114a in Volume 2, CA2 Map Book).

### *Night time effects*

11.4.22 Night time surveys will be undertaken for the formal EIA Report. Potential visual impacts arising from additional lighting at night during construction within the area may arise from continuous working and/or overnight working at the A51 main compound.

11.4.23 The addition of lighting could give rise to significant effects in relation to a number of receptors. More detail will be provided in the formal EIA Report on completion of the night time assessment.

### Other mitigation measures

11.4.24 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. This may include consideration of early planting in ecological mitigation sites, which would have the additional benefit of providing some visual screening. However, not all landscape and visual effects can be mitigated due to the visibility of construction activity and the sensitivity of surrounding receptors. Therefore, no other mitigation measures are considered practicable during construction.

### Summary of likely residual significant effects

11.4.25 These effects would be temporary and reversible in nature lasting only for the duration of the construction works. Any residual effects would generally arise from the widespread presence of construction activity and construction plant within the landscape and viewed from surrounding residential receptors, and users of PRoW and main roads within the study area

11.4.26 It is anticipated that the following significant effects would remain after implementation of construction phase mitigation:

- major adverse effects in relation to Ingestre Riparian Alluvial Lowlands LCA, the Ingestre Park Sandstone Estatelands LCA and the Hopton Sandstone Estatelands LCA; and
- major adverse visual effects for residential and recreational receptors at Upper Moreton, residential receptors at Moreton Farm, residential and recreational receptors at the Trent and Mersey Canal, recreational receptors at Ingestre Park, recreational and residential receptors at Hopton, recreational receptors using the Stone Circles Challenge long distance path and residential receptors at Marston and Yarlet.

## 11.5 Effects arising from operation

11.5.1 The specific elements of the Proposed Scheme that have been taken into account in determining the effects arising during operation on landscape and visual receptors in this area include:

- the presence of railway viaducts together with associated noise fence barriers over Moreton Brook (partly also within the Fradley to Colton area (CA1)) and over the River Trent and the Trent and Mersey Canal at Great Haywood, together with associated road realignment;
- the permanent severance of landscape connectivity (parkland tree belts) at Ingestre and Tixall landscape parks and the permanent loss of localised parts of the historic designed landscape;
- the permanent severance of intact small scale historic field patterns around Marston and Yarlet;
- the permanent effects on the landscape setting and approach to Hopton from the south and west;

- the presence of overhead line equipment, most prominently from the proposed viaducts and proposed at grade sections of the route (short sections north of Marston and Yarlet);
- the presence of fences and barriers;
- the presence of trains, track and supporting infrastructure such as auto transformer stations;
- the presence of embankments at Moreton North, Trent South, Trent North, Hopton, Marston South and Marston North;
- the presence of accommodation overbridges including Colwich Bridleway 23 accommodation overbridge, Hopton and Coton Bridleway 11 accommodation overbridge and Tixall Bridleway 0.1628 accommodation overbridge and associated earthworks;
- the presence of overbridges including the A518 Weston Road overbridge, the B5066 Sandon Road overbridge, the A34 Stone Road overbridge, Colwich Bridleway 35 overbridge, Trent Walk over bridge, Colwich Footpath 54 overbridge and Hopton and Coton Footpath 24 overbridge associated earthworks; and
- loss of structural vegetation.

## Avoidance and mitigation measures

11.5.2 The operational assessment of impacts and effects is based on year 1 (2027), and year 15 (2042) of the Proposed Scheme. Operational impacts and effects for year 60 (2087) of the Proposed Scheme will be assessed and reported in the formal EIA Report. A process of iterative design and assessment has been employed to avoid or reduce adverse effects during the operation of the Proposed Scheme. Measures that would be incorporated into the design of the Proposed Scheme include:

- design of earthworks to tie the engineering earthworks for embankments and cuttings into their wider landscape context and to mitigate views of structures and overhead line equipment from sensitive receptors where reasonably practicable. Earthworks also consider the relationship to surrounding land uses and management, such as agriculture;
- compensatory woodland planting in areas of loss of the same species composition and planting types and to provide enhanced landscape and green infrastructure connectivity, as well connectivity of historic designed landscape features where reasonably practicable;
- hedgerow replacement and restoration in areas of loss to restore connectivity and landscape pattern where reasonably practicable and to tie Proposed Scheme mitigation into the wider landscape character; and
- compensation for loss of field ponds with new wetlands, water balancing and biodiversity wetland features.

## Assessment of impacts and effects

### *Introduction*

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 the viaduct over the River Trent and Trent and Mersey Canal at Great Haywood, the presence of earthworks and new landforms at Hopton, plus the severance of landscape connectivity at Ingestre and Tixall. Other aspects include the presence of overhead line equipment, noise fence barriers, and the presence of auto-transformer stations.

11.5.4 Significant landscape effects and visual effects on Shugborough Park are not anticipated due to the local topography and the enclosed nature of the park. The dense tree belt, which surrounds the park would effectively screen views even in winter months.

### *Landscape assessment*

11.5.5 Based on the current Proposed Scheme design it is assessed that, in both summer and winter of year 1 of operation, there is the potential for major adverse (significant) effects on landscape character in relation to the Ingestre Park Sandstone Estatelands LCA and the Hopton Sandstone Estatelands LCA (both of which are landscapes of high sensitivity to change) and the Ingestre Riparian Alluvial Lowlands LCA (medium sensitivity to change) resulting from the operation of the Proposed Scheme. This is due to the level of permanent severance the Proposed Scheme would introduce and associated potential loss of connectivity and loss of legibility of landscape pattern at Ingestre and Tixall. In the case of Hopton, it is anticipated that there would be potential for a major (significant) adverse effect on settlement setting and character resulting from the operational stage of the Proposed Scheme. In relation to Ingestre Riparian Alluvial Lowlands LCA the scale of the Trent and Mersey viaduct and the Trent South embankment would introduce a large change to this rural landscape. The new structures would be visible above the existing vegetation.

11.5.6 By summer of year 15, due to the establishment of landscape planting, the above landscape effects would potentially be slightly reduced although they would still be significant due to the level of severance created by the Proposed Scheme (moderate adverse).

11.5.7 Whilst the Trent South embankment in relation to Ingestre Riparian Alluvial Lowlands LCA would become more screened and integrated within the landscape by summer of year 15, the effects on the landscape as a result of the Trent and Mersey viaduct would remain. Therefore it is likely that major adverse (significant) effects would persist.

11.5.8 The Sow Valley Riparian Alluvial Lowlands LCA is judged highly unlikely to experience even indirect perceptual effects on character resulting from the operation of the Proposed Scheme. This LCA has therefore not been assessed further.

## *Visual assessment*

### Introduction

11.5.9 The following section describes the likely significant effects on visual receptors during operation year 1 and year 15. 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. Likely significant effects on residential receptors from additional lighting at night time are also identified.

11.5.10 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.

11.5.11 In most cases, additional lighting is not considered to give rise to significant effects due to the operational nature of the Proposed Scheme. Where there would be no direct foreground visibility of additional lighting, no further assessment has been undertaken.

### Views south from residences at Moreton Farm and north from Upper Moreton

11.5.12 In winter and summer of year 1 receptors would experience elevated views from viewpoints 007.03.007 and 007.03.008 (Map LV-11-107b in Volume 2, CA2 Map Book) of the Moreton Brook viaduct, associated embankments, noise fence barriers and overhead line equipment. There would be the potential for close range views of the proposed Coley cutting from viewpoints 007.03.005, 007.03 013 and 008.03.001 (Map LV-11-107b in Volume 2, CA2 Map Book), which would alter the current setting of Moreton House (Grade II listed building) within the foreground of the view. Moreton House is set within remnants of a historic parkland landscape, of which elements remain visible. Most of the proposed earth formation as well as the overhead line equipment and the passing trains would be screened by the cutting from recreational and residential receptors at the ground floor of Moreton House. However, receptors at the upper storey of Moreton House would experience open views of the Proposed Scheme due to the proximity of the Proposed Scheme. The operation of the Proposed Scheme would result in a substantial alteration of key characteristics of the view such as the local landform and vegetation. These new features in the view are anticipated to give rise to a high magnitude of visual change and potential major adverse (significant) effects on these sensitive receptors.

11.5.13 Although views of the proposed cutting would become slightly more filtered and the cutting would become more integrated within the view by the summer of year 15, due to its proximity, the Proposed Scheme would remain very apparent within the view. Therefore, it is anticipated that the effect would remain major adverse (significant) at year 15.

### Views north from the Trent and Mersey Canal

11.5.14 In both summer and winter of year 1 from viewpoints 009.03.003, 009.03.004, 009.03.007, 009.03.008 and 009.02.24 (Map LV-11-109 in Volume 2, CA2 Map Book)

receptors would potentially experience views of Great Haywood viaduct together with the associated noise fence barriers and overhead line equipment within the near to middle distance. The viaduct and embankment has the potential to form a dominant feature above intervening vegetation across most of the view. Therefore, a major adverse (significant) visual effect is anticipated.

11.5.15 It is likely that major adverse (significant) effects in relation to the viaduct would remain at year 15, albeit partly integrated by mitigation planting to tie the abutments and embankments into their context.

### Views south from Ingestre Park

11.5.16 In both summer and winter of year 1 receptors at viewpoints 010.03.005 and 010.03.008 (Map LV-11-110 in Volume 2, CA2 Map Book) would experience the potential for views of the cutting and associated earthworks and vegetation loss at Lionlodge Covert, plus the potential for views of the upper parts of the overhead line equipment in proximity to the viewpoint. The Proposed Scheme would substantially change the rural, tranquil view of the gently undulating landscape. A high magnitude of visual change is anticipated at year 1 resulting in potentially major adverse (significant) effects given the proximity to the Proposed Scheme.

11.5.17 It is likely that visual effects would reduce by year 15 as the new planting reaches maturity and the mitigation planting would also provide a degree of benefit in terms of landscape and visual connectivity. Views of the cutting, overhead line equipment and frequently passing trains would become partially screened and the earthworks would become more integrated within the view. Therefore, it is anticipated that there would be a medium magnitude of visual change resulting in a moderate significant adverse effect in relation to these receptors at year 15, which would result in a moderate adverse (significant) effect.

### Views south from residences and PRoW at Hopton

11.5.18 In both summer and winter of year 1, receptors at viewpoints 011.03.002, 011.02.005, 011.02.006, 012.02.003 and 011.02.005 (Map LV-11-111 in Volume 2, CA2 Map Book) would experience views of the embankments and a false cutting, together with associated noise fence barriers and overhead line equipment, road re-alignments and construction of associated over bridges for the A518 Weston Road and the B5066 Sandon Road. The Proposed Scheme would result in a substantial alteration of the rural, tranquil view of a gently undulating landscape in proximity of the receptors. The Proposed Scheme would be highly visible across the majority of the view. Receptors would have open views of the works with limited screening provided by the undulating landscape and intervening vegetation. Elevated views would also be experienced from viewpoint 011.03.011. The Proposed Scheme would, therefore, introduce a high magnitude of visual change, and except for viewpoint 011.03.002 (from the Staffordshire County Showground), receptors at all the viewpoints above would experience a major adverse (significant) effect due to the prominence of the Proposed Scheme.

11.5.19 It is likely that major (significant) adverse effects would remain at year 15, due to the remaining visual severance and the degree of visual change that would persist in relation to the setting of Hopton.

### Views west from the Stone Circles Challenge long distance path

11.5.20 In both summer and winter of year 1, receptors at viewpoint 012.02.008 (Map LV-11-112 in Volume 2, CA2 Map Book) would experience potential close range views of the road re-alignments and overbridge on the approach to Hopton, together with the presence of railway cuttings and associated security fencing and overhead line equipment. The Proposed Scheme would result in a substantial alteration of the rural view of the gently undulating landscape in proximity to the receptor. This would be highly visible across much of the view. A high magnitude of visual change is anticipated resulting in potential major adverse (significant) visual effects.

11.5.21 It is likely that visual effects would reduce to moderate adverse (significant) by year 15 as mitigation planting matures and integrates the road re-alignment and over bridge more within the landscape.

### Views north from residences at Marston and Yarlet

11.5.22 In both summer and winter of year 1, receptors at viewpoints 013.03.002, 013.02.005, 013.03.002 and 013.03.006 (Map LV-11-113 in Volume 2, CA2 Map Book) would experience views of the operation of the railway including at grade track sections, low embankment, visibility of operational trains and overhead line equipment at a distance of approximately 100m in the middle ground of the views. The Proposed Scheme would substantially alter the rural, tranquil view across the undulating landscape. From Yarlet Lane, most of the Proposed Scheme would be obscured due to the roadside hedgerow and local topography, but there would be open views of the works in particular from the upper storeys of residential properties. A high magnitude of change and significant (potentially major) adverse visual effects are, therefore, anticipated in relation to these receptors.

11.5.23 It is likely that moderate adverse (significant) visual effects would persist at year 15 due to the proximity of the Proposed Scheme.

### Views north from residences at Pire Hill

11.5.24 This will be reported in the Stone and Swynnerton area. This is due to the orientation of the viewpoint on the edge of this area resulting in the majority of the visual effect being experienced within the Stone and Swynnerton area (viewpoint 014.03.009, Map LV-11-114a in Volume 2, CA2 Map Book).

## *Night time effects*

11.5.25 Night time surveys will be undertaken for the formal EIA Report. Potential visual impacts arising from additional lighting at night in operation in the Colwich to Yarlet area may arise at new road junctions such as A51/Tolldish Lane junction, B5066 Sandon Road/ Hopton Lane junction and B5066 Sandon Road/ Mount Edge junction. However, as new road junctions would generally sit in proximity to areas/roads that are already lit throughout the night these are not considered as part of the night time assessment.

11.5.26 In most instances, lighting is not considered to give rise to significant effects. Where the addition of lighting could give rise to significant effects in relation to a number of receptors more detail will be provided in the formal EIA Report on completion of the night time assessment.

## Other mitigation measures

11.5.27 The permanent effects of the Proposed Scheme on landscape and visual receptors have been substantially reduced through incorporation of the measures described in this section. Effects in year 1 of operation may be further reduced by establishing planting early in the construction programme. Additional planting will be considered as part of the ongoing development of the design. This would provide additional screening and greater integration of the Proposed Scheme into the landscape. However, no other mitigation measures are considered practicable due to the high visibility of elements of the Proposed Scheme and the sensitivity of the surrounding receptors.

## Summary of likely residual significant effects

11.5.28 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:

- major adverse effects on the Ingestre Riparian Alluvial Lowlands LCA, due to the scale and permanent presence of the Trent and Mersey viaduct in this rural landscape, which cannot be mitigated;
- moderate adverse effects on the Ingestre Park Sandstone Estatelands LCA, due to the permanent severance of features of the historic landscape at Ingestre and Tixall, although this will be mitigated to some degree by new native and parkland planting provided as part of the Proposed Scheme;
- moderate adverse effects upon the Hopton Sandstone Estatelands LCA, which will be at variance with the existing landscape character and setting of Hopton due to the presence of cuttings, embankments and false cuttings. There is potential for this level of effect to reduce as mitigation planting reaches maturity;
- major adverse visual effects in relation to receptors at and around Moreton House (viewpoints 007.03.005, 007.03.013 and 008.03.001) due to the presence of the cutting, associated visual severance and effect on the setting of the listed buildings, albeit mitigated to some degree by replacement planting and features to restore landscape and visual connectivity;
- major adverse visual effects in relation to recreational receptors in proximity to the Proposed Scheme on the Trent and Mersey Canal (viewpoints 009.03.003 and 009.03.004 at Hoo Mill Lock and 009.03.007, 009.03.008 and 009.02.24) due to the presence of the viaduct and associated changes to the view above intervening vegetation;
- moderate adverse visual effects in relation to receptors at Ingestre Park (viewpoints 010.03.005 and 010.03.008) due to the proximity of the Proposed Scheme and the partial screening provided by the maturing mitigation planting;

- major adverse visual effects in relation to receptors at Hopton (viewpoints 011.03.002, 011.02.005, 011.02.006, 012.02.003 and 011.03.011) due to the scale and prominence of Proposed Scheme;
- moderate adverse visual effects in relation to receptors at the Stone Circle Challenge long distance path (viewpoint 012.02.008) due to the proximity of the Proposed Scheme and integration provided by the maturing mitigation planting; and
- with the exception of the users of the showground (viewpoint 011.03.002), receptors at the southern edge of Hopton (viewpoints 011.02.005, 011.02.006 and 012.02.003) would continue to experience a major adverse visual effect due to the degree of visual severance and change to visual setting that would remain. Users of Staffordshire County Showground would experience a moderate adverse (significant) visual effect due to the distance towards the Proposed Scheme and their focus of attention. There would be moderate adverse (significant) visual effects in relation to receptors at Marston and Yarlet due to the proximity of the Proposed Scheme.

# 12 Socio-economics

## 12.1 Introduction

12.1.1 This section provides a summary of the environmental baseline and likely economic and employment impacts and significant effects during construction and operation of the Proposed Scheme within the Colwich to Yarlet area.

12.1.2 The need for a socio-economic assessment results from the potential for the Proposed Scheme to affect:

- existing businesses and community organisations and thus the amount of local employment;
- local economies, including employment; and
- planned growth and development.

12.1.3 The beneficial and adverse socio-economic effects of the Proposed Scheme are reported at two different levels: route-wide and by community area. Effects on levels of employment are reported at a route-wide level in Volume 3. Localised effects on businesses and observations on potential local economic effects for the Colwich to Yarlet area are reported within this section.

12.1.4 Engagement with SBC has been undertaken. The purpose of this engagement has been to obtain relevant baseline information. Engagement with SBC and SCC will continue as part of the development of the Proposed Scheme.

12.1.5 Maps showing the location of the key environmental features and the key construction and operational features of the Proposed Scheme can be found in the Volume 2, CA2 Map Book.

### Construction

12.1.6 The proposed construction works will have the following relevance in terms of socio-economics:

- premises demolished with their occupants and employees needing to relocate to allow for construction of the Proposed Scheme; and
- potential employment opportunities arising from construction in the local area (including in adjacent community areas).

### Operation

12.1.7 The operation of the Proposed Scheme will have relevance in terms of socio-economics, in relation to the potential employment opportunities created by new business opportunities.

## 12.2 Scope, assumptions and limitations

12.2.1 The assessment scope, key assumptions and limitations for the socio-economics assessment are set out in the draft SMR and in Volume 1.

# 12.3 Environmental baseline

## Introduction

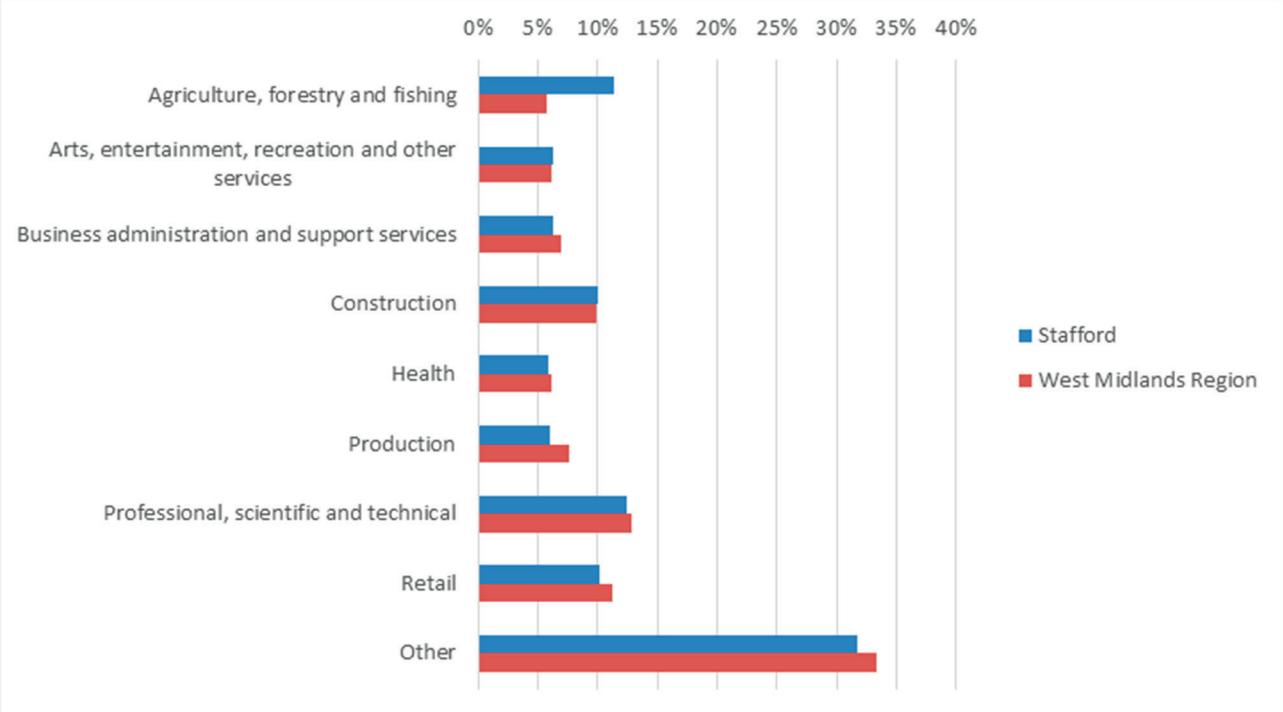
12.3.1 The following provides a brief overview in terms of employment, economic structure, labour market, and business premises availability within the area.

12.3.2 The Colwich to Yarlet area lies within the administrative area of Stafford Borough within the County of Staffordshire. The area also falls within the Stoke-on-Trent and Staffordshire Local Enterprise Partnership (LEP) area[74].

## Business and labour market

12.3.3 Within the SBC area there is a wide spread of business types reflecting a diverse range of commercial activities. The professional, scientific and technical sector accounts for the largest proportion of businesses (12%), with agriculture, forestry and fishing as the second largest (11%) followed by retail and construction (10% each). This is shown in Figure 6. For comparison within the West Midlands region, the largest sectors were professional, scientific and technical (13%), followed by retail (11%) and construction (10%)[75].

Figure 6: Business sector composition in SBC and the West Midlands[76]

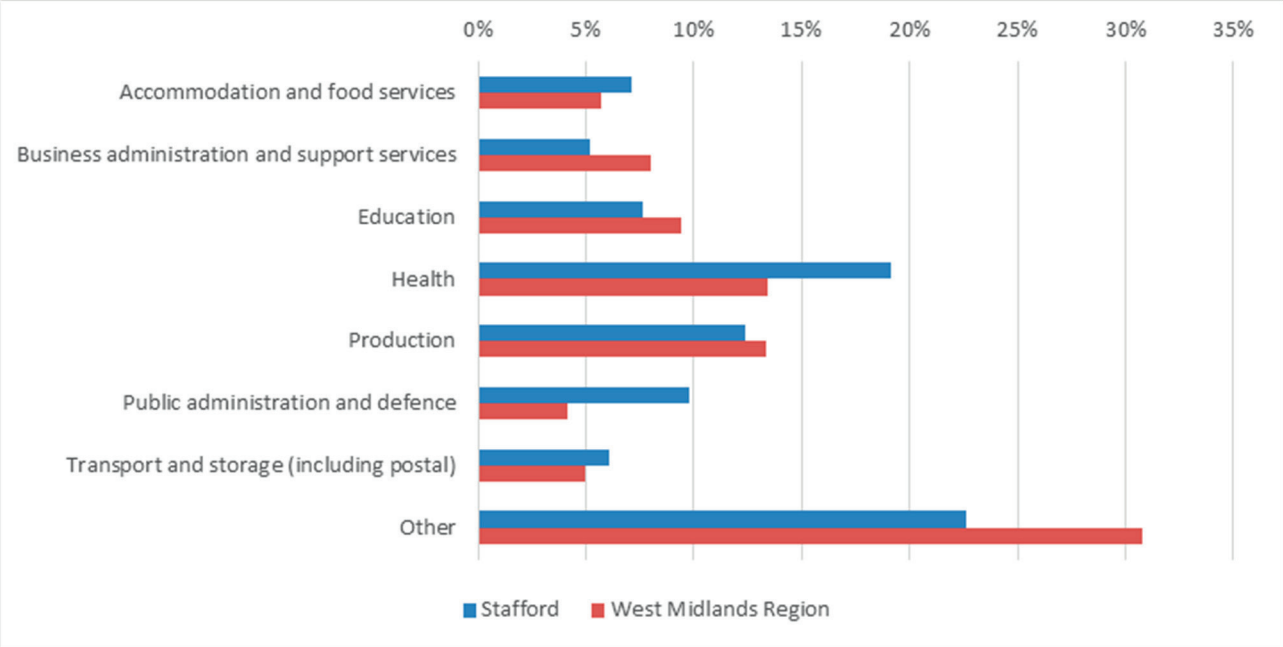



Source: Office for National Statistics; UK Business: Activity, Size and Location 2014; accessed: 11 January 2016.

[74] Stoke on Trent and Staffordshire Local Enterprise Partnership, (2014), Strategic Economic Plan Summary March 2014.
[75] Office for National Statistics ; UK Business: Activity, Size and Location 2014. Available online at: https://www.ons.gov.uk/businessindustryandtrade/business/activitysizeandlocation/datasets/ukbusinessactivitysizeandlocation; Accessed: 11 January 2016. Please note 2014 data has been presented to provide an appropriate comparison with 2014 Census data.
[76] "Other" includes: motor trades; transport and storage; finance and insurance; public administration and defence; and education sectors.

12.3.4 In 2014[77], approximately 58,000 people worked in the SBC area. According to the Office of National Statistics Business Register and Employment Survey 2014, the top five sectors in terms of share of employment in Stafford are: health (19%) reflecting the ageing population; production (12%), which is still important despite the decline in low-value added manufacturing; retail (10%); public administration and defence (10%) and education (8%). These compare with the top five sectors for the West Midlands region, which are: health (13%); production (13%); retail (10%); education (9%) and business administration and support services (8%). This is shown in Figure 7[78].

Figure 7: Employment by industrial sector in the SBC area and the West Midlands[79]




Source: Office of National Statistics; BRES Employment 2014, accessed: 11 January 2016.

12.3.5 According to the Annual Population Survey (2016)[80] , the employment rate[81]within the SBC area was 75% (61,000 people), which is higher than that recorded for both the West Midlands (70%) and England (74%). In 2015, unemployment[82] in the SBC area was 3.1%, which was lower than the West Midlands (6%) and England (5%).

12.3.6 According to the Annual Population Survey (2015)[83], 41% of Stafford Borough's residents aged 16-64 were qualified to National Vocational Qualification Level 4 (NVQ4) and above, compared to 31% in the West Midlands and 37% in England, while

[77] Office of National Statistics, (2014) Business Register and Employment Survey; Available online at: http://www.ons.gov.uk/employmentandlabourmarket/peopleinwork/employmentandemployeetypes/bulletins/businessregisterandemploymentsurveybresprovisionalresults/previousReleases. Accessed 11 January 2016.
[78] Office of National Statistics, (2014) Business Register and Employment Survey; Accessed: 11 January 2016
[79] Other' includes retail, construction, wholesale, information and communication, motor trades, public administration and defence, property, financial and insurance, and agriculture, forestry and fishing sectors.
[80] Annual Population Survey, (2015), NOMIS, Accessed: 26 April 2016.
[81] The proportion of working age (16-64 year olds) residents that is in employment. Employment comprises the proportion of the total resident population who are 'in employment'.
[82] 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.
[83] Annual Population Survey, (2015), NOMIS, Accessed: 26 April 2016.

5% of residents had no qualifications, which was lower than that recorded both for West Midlands (13%) and England (8%).

### Property

12.3.7 A review of employment land in 2012 identified a need for 8.9ha per year to 2026 for general business land in the SBC area. It is not clear whether the borough experienced a historic shortfall or surplus of employment land provision up to 2012[84]. The importance of developing a range of employment sites to support growth has been highlighted in the LEP Strategic Economic Plan[85].

12.3.8 The average vacancy rate for industrial and warehousing property in SBC area in May 2016 has been assessed as 10% based on marketed space against known stock[86].

## 12.4 Effects arising during construction

### Avoidance and mitigation measures

12.4.1 Businesses displaced by the Proposed Scheme would be compensated in accordance with the National Compensation Code. HS2 Ltd recognises the importance of displaced businesses being able to relocate to alternative premises and would, therefore, provide additional support over and above statutory requirements to facilitate this process.

12.4.2 The construction of the Proposed Scheme offers considerable opportunities to businesses and residents along the line of route in terms of supplying goods and services and obtaining employment. HS2 Ltd is committed to working with its suppliers to build a skilled workforce that fuels further economic growth across the UK.

### Assessment of impacts and effects

12.4.3 Businesses directly affected, comprising those that lie within land that will be used for the construction of 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.

12.4.4 Four employment areas are described below where the scale of employment change and/or the capacity of businesses to find alternatives or adapt in other ways to changes brought about by the Proposed Scheme raises issues for the assessment.

12.4.5 Construction of the Proposed Scheme would require the acquisition of land within an area containing a number of buildings used by an equestrian services business between Moreton Lane and Bishton Lane. However, from an employment perspective, no significant direct effects on non-agricultural employment have been identified within the area.

[84] Stafford Borough Council (2012) Employment Land Review 2012.Based on 10 year average build rate projected forward for 2012-2036.
[85] Stoke-on-Trent & Staffordshire LEP (undated), Stoke-on-Trent & Staffordshire Economic Growth Strategy 2012 - 2026, v2.1.
[86] 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).

12.4.6 Construction would also require the acquisition of land supporting activities of the Great Haywood Marina in the vicinity of Great Haywood providing leisure/ recreational and tourism services. The Proposed Scheme would require the temporary acquisition of land supporting the operation of Great Haywood Marina during construction impairing the operation of this facility. The effect on this resource and its employees is assessed to be moderate adverse and would therefore be significant.

12.4.7 Construction would also require the acquisition of land currently occupied by the Ingestre Park Golf Club, impairing the operation of this facility. The effect on this resource and its employees is assessed to be moderate adverse and would, therefore, be significant.

12.4.8 Construction would also require the acquisition of land within the Yarlet area, including accommodation occupied by a consultancy business. However, from an employment perspective, no significant direct effects on non-agricultural employment have been identified within the area.

12.4.9 Across all the employment areas reviewed, an estimated 35 jobs[87] would either be displaced or possibly lost in the wider West Midlands region. There is a reasonable probability that businesses would be able to relocate to places that would still be accessible to residents within the areas due to the general availability of vacant premises. However, there are still a number of cases where alternative locations are considered to be problematic and unlikely to be replaced on a like-for-like basis within the area. The impact on the local economy from the loss and/or relocation of jobs is considered to be relatively modest compared to the scale of economic activity and employment opportunity in the SBC area (approximately 58,000 jobs).

12.4.10 Seven satellite construction compounds would be located in the Colwich to Yarlet area, and a main construction compound would be located adjacent to the A51 Lichfield Road. These sites could result in the creation of up to 1,500 person years of construction employment[88] opportunities, equivalent to 150 full-time equivalent permanent jobs[89], 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 (Volume 3, Route-wide effects).

12.4.11 Direct construction employment created by the Proposed Scheme could also 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 (Volume 3, Route-wide effects).

12.4.12 The combined effects of noise, vibration, visual, air quality or HGV congestion impacts and isolation on businesses will be reported in the formal EIA Report.

[87] 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 2nd Edition (2010). The estimate is calculated using standard employment density ratios and estimates of floor areas and may vary significantly from actual employment at the sites.

[88] 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.

[89] Based on the convention that 10 employment years is equivalent to one full time equivalent job.

### Other mitigation measures

12.4.13 No other mitigation measures have currently been identified.

### Summary of likely residual significant effects

12.4.14 Any likely residual significant socio-economic effects will be reported in the formal EIA Report.

## 12.5 Effects arising from operation

### Avoidance and mitigation measures

12.5.1 No mitigation measures during operation of the Proposed Scheme are proposed in relation to business resources.

### Assessment of impacts and effects

12.5.2 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.

12.5.3 The Proposed Scheme would create direct and wider operation employment opportunities across the route. These are considered unlikely to be accessed by residents of this area.

12.5.4 Operation effects are assessed and reported at a route-wide level in Volume 3.The combined effects of noise, vibration, visual, air quality or large goods vehicles congestion impacts and isolation on businesses will be reported in the formal EIA Report.

### Other mitigation measures

12.5.5 No mitigation measures during operation of the Proposed Scheme are proposed in relation to business resources.

### Summary of likely residual significant effects

12.5.6 Any likely residual significant socio-economic effects will be reported in the formal EIA Report.

# 13 Sound, noise and vibration

## 13.1 Introduction

13.1.1 This section reports the initial assessment of the potential likely noise and vibration significant effects arising from the construction and operation of the Proposed Scheme within the Colwich to Yarlet area on:

- people, primarily where they live ('residential receptors') in terms of individual dwellings and on a wider community basis, including any shared community open areas[90]; and
- community facilities such as schools, hospitals, places of worship, and also commercial properties such as offices and hotels, collectively described as 'non-residential receptors' and 'quiet areas'[91].

13.1.2 In this assessment 'sound' is used to describe the acoustic conditions which people experience as a part of their everyday lives. The assessment considers how those conditions may change through time and how sound levels and the acoustic character of an area is likely to be modified through the introduction of the Proposed Scheme. Noise is taken as unwanted sound and hence adverse effects are noise effects and mitigation is, for example, by noise fence barriers.

13.1.3 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.

13.1.4 Consistent with Government noise policy[92] and the approach taken to the EIA of HS2 Phase One, this working draft EIA Report reports how, in the context of Government sustainable development policy, the Proposed Scheme, through the effective management and control of noise, would:

- avoid significant adverse impacts on health and quality of life from the Proposed Scheme;
- mitigate and minimise adverse impacts on health and quality of life from the Proposed Scheme; and
- where possible, contribute to the improvement of health and quality of life.

13.1.5 Engagement with SBC has been undertaken. The purpose of this engagement has been to obtain relevant information regarding residential and non-residential

[90] 'Shared community open areas' are those that the National 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.
[91] Quiet areas are defined in the Scope and Methodology Report as either Quiet Areas as identified under the Environmental Noise Regulations or are resources which are prized for providing tranquillity.
[92] https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/69533/pb13750-noise-policy.pdf

resources and existing baseline information. Engagement with SBC will continue as part of the development of the Proposed Scheme.

13.1.6 Maps showing the location of the key environmental features and the key construction and operational features of the Proposed Scheme can be found in the Map Series CT-10 in the Volume 2, CA2 Map Book. Map Series SV-01 shows areas of impact and proposed noise mitigation in the Colwich to Yarlet area.

## 13.2 Scope, assumptions and limitations

13.2.1 The approach to assessing sound, noise and vibration and appropriate mitigation is outlined in Volume 1. The scope and methodology are defined in the draft SMR.

13.2.2 The effects of construction sound, noise and vibration are assessed qualitatively, based on construction worksite locations, construction routes, initial construction estimates and professional judgement. No quantitative assessment has been undertaken at this stage. This assessment will be reported in the formal EIA Report.

13.2.3 The effects on operational sound, noise and vibration are assessed quantitatively. As, baseline information is limited at this stage, the quantitative assessment will be reported in the formal EIA Report.

## 13.3 Environmental baseline

13.3.1 The area is characterised by a mix of small towns, villages, hamlets and isolated residential properties in a predominantly rural setting. The sound environment is generally dominated by local and distant road traffic, with trains (on the WCML), overflying aircraft and local neighbourhood sources, with natural and agricultural sounds also contributing.

13.3.2 There are several main roads within the Colwich to Yarlet area: the A51 Lichfield Road that runs through Little Haywood, Great Haywood and Pasturefields; the A518 Weston Road; and the A34 Stone Road that runs through Yarlet. Other main roads that contribute to the sound environment are:

- the A513 Beaconside that connects the A518 Weston Road to the A34 Stone Road and the M6; and
- the B5066 Sandon Road that runs through Hopton.

13.3.3 Sound levels close to these main transportation routes are high during the daytime, but are lower at night. Further away from the main roads, the sound levels are lower and some areas, particularly villages distant from busy roads, experience low daytime sound levels.

13.3.4 It is likely that the majority of receptors adjacent to the Proposed Scheme are not currently subject to appreciable vibration. No baseline vibration monitoring has been undertaken as part of the assessment presented in this report. The effects of vibration at all receptors have been assessed using the absolute vibration criteria defined in the draft SMR.

## 13.4 Effects arising during construction

### Avoidance and mitigation measures

13.4.1 The assessment assumes the implementation of the principles and management processes set out in the draft CoCP, which are:

- best practicable means (BPM) as defined by the Control of Pollution Act 1974 (CoPA) and Environmental Protection Act 1990 (EPA), which would be applied during construction activities to minimise noise (including vibration) at neighbouring residential properties;
- 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; 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 in accordance with the draft CoCP's noise insulation and temporary re-housing policy;
- lead contractors would seek to obtain prior consent from the relevant local authority under Section 61 of the CoPA for the proposed construction works. The consent application would set out BPM measures to minimise construction noise, 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 would be made available to the local authorities; and
- contractors would be required to comply with the terms of the CoCP and appropriate action will be taken by the nominated undertaker as required to ensure compliance.

13.4.2 Noise insulation would be offered for qualifying buildings as defined in the noise insulation and temporary re-housing policy in the draft CoCP. Noise insulation or ultimately temporary re-housing would avoid residents being significantly affected by levels of construction noise inside their dwellings. Further work is being undertaken to provide an estimate of the buildings that are likely to qualify for such measures, which will be reported in the formal EIA Report.

13.4.3 Qualification for noise insulation and temporary re-housing would be confirmed, as required in the draft CoCP, as part of seeking prior consent from the local authorities

under Section 61 of the CoPA. Qualifying buildings would be identified, as required in the draft CoCP so that noise insulation could be installed, or any temporary re-housing provided, before the start of the works predicted to exceed noise insulation or temporary re-housing criteria. Noise insulation, where required, would be installed as early as possible to reduce internal sound levels from construction activities and also when the Proposed Scheme comes into operation.

## Assessment of impacts and effects

13.4.4 Potential construction noise effects could occur due to the increase in noise levels around the following communities closest to the Proposed Scheme in the following locations, as a result of the construction works illustrated on Map Series CT-05 (Volume 2, CA2 Map Book):

- Moreton, arising from construction activities such as earthworks and track base installation;
- Great Haywood, arising from construction activities such as earthworks, viaduct, road works and track base installation;
- Ingestre Park Road/Hoo Mill Lane, Ingestre, arising from construction activities such as earthworks, viaduct and track base installation;
- Park Farm, arising from construction activities such as earthworks and track base installation;
- Hopton East, arising from construction activities such as earthworks, retaining walls and track base installation;
- Hopton West, arising from construction activities such as earthworks and track base installation;
- Marston, arising from construction activities such as earthworks and track base installation;
- Yarlet, arising from construction activities such as earthworks and track base installation; and
- Pirehill Grange Farm, arising from construction activities such as earthworks and track base installation.

13.4.5 Construction traffic has the potential to cause adverse noise effects on occupants of residential properties through the additional traffic generated on local roads. The B5066 Sandon Road, between Hopton and the A513 Beaconside, have been identified on a precautionary basis as having the potential for an adverse noise effect on occupants of any residential communities along this section of the road.

13.4.6 Track laying, power system and signalling installation works would be unlikely to result in significant construction noise effects, given the short duration close to any communities and the presence of the permanent noise fence barriers.

### Other mitigation measures

13.4.7 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 EIA Report and will 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

13.4.8 Further work is being undertaken to confirm significant construction noise and vibration effects, including any temporary effects from construction traffic. 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. Any further assessment would be reported in the formal EIA Report.

## 13.5 Effects arising from operation

### Avoidance and mitigation measures

13.5.1 As described in Section 2, the route has been moved further away from receptors at Moreton, Staffordshire County Showground and Hopton. The route has also been moved slightly eastwards at Marston and Yarlet to avoid residential receptors.

13.5.2 The development of the Proposed Scheme has sought to keep the route as low as is reasonably practicable and away from main communities. These avoidance measures would protect many communities in this area from likely significant noise or vibration effects.

#### *Airborne noise*

13.5.3 HS2 trains are assumed to be quieter than the relevant current European Union specifications, as assumed for the HS2 Phase One Environment Statement. Assuming quieter trains than the Technical Specification for Interoperability (TSI) Noise is consistent with Phase One and will be detailed in a technical appendix to the formal EIA Report. 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. The track would be specified to reduce noise, as would the maintenance regime. Overall these measures would reduce noise emissions by approximately 3dB at 360kph compared to a current European high speed train operating on the new track.

13.5.4 The Proposed Scheme would incorporate noise fence barriers in the form of landscape earthworks and/or noise fence barriers to avoid or reduce significant 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 to the side of the outer rail. The envisaged noise fence barrier locations based upon the currently available information are shown on Map Series SV-01 (Volume 2, CA2 Map Book).

13.5.5 In practice, barriers may differ from this generic assumption while maintaining the required acoustic performance. For example, where noise fence barriers are in the

form of landscape earthworks, they 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.

13.5.6 Noise effects would be reduced in other locations along the route by landscape earthworks provided to avoid or reduce significant visual effects and engineering structures such as cuttings and safety fences on viaducts (where noise fence barriers are not required).

13.5.7 Significant noise effects from the operational static sources such as line-side equipment would be avoided through their design and the specification of noise emission requirements.

13.5.8 Noise insulation measures would be offered for qualifying buildings as defined in the Noise Insulation (Railways and Other Guided Transport Systems) Regulations 1996 (the Regulations). The assessment reported in this section provides an estimate of the buildings that are likely to qualify under the Regulations based upon the currently available information. Qualification for noise insulation under the Regulations would be formally identified and noise insulation offered should the Proposed Scheme become operational. Where noise insulation is required, as well as improvements to noise insulation of windows facing the railway, ventilation would be provided so that windows can be kept closed to protect internal sound levels.

13.5.9 Noise insulation would avoid any residual significant effects on health and quality of life arising inside dwellings taking into account mitigation incorporated into the design of the Proposed Scheme.

13.5.10 Following the Government's National Planning Practice Guidance[93], where the noise from the use of the Proposed Scheme measured outside a dwelling exceeds the Interim Target defined by the World Health Organization (WHO)'s Night Noise Guidelines for Europe[94], residents are considered to be significantly affected by the resulting noise inside their dwelling. The effect on people at night due to the maximum sound level as each train passes has also been assessed[95]. The Interim Target is a lower level of noise exposure than the Regulations trigger threshold for night noise. In these particular circumstances, where night time noise levels for the use of new or additional railways authorised by the Bill are predicted following the methodology set out in the Regulations to exceed 55dB[96], or the maximum noise level (dependent on the number of train passes) as a train passes exceeds the criterion. Noise insulation would be offered for these additional buildings.

### *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.

[93] National Planning Practice Guidance – Noise; http://planningguidance.planningportal.gov.uk.
[94] World Health Organization (2010), *Night time Noise Guidelines for Europe*.
[95] During the night (2300-0700) a significant effect is also identified where the Proposed Scheme results in a maximum sound level at the façade of a building at or above: 85dB $L_{pAFmax}$ (where the number of train pass-bys exceeding this value is less than or equal to 20); or 80dB $L_{pAFmax}$ (where the number of train pass-bys exceeding this value is greater than 20).
[96] Equivalent continuous level, $L_{pAeq,23:00-07:00}$ measured without reflection from the front of buildings.

## Assessment of impacts and effects

13.5.12 Map Series SV-01 (Volume 2, CA2 Map Book) indicates the likely long-term daytime sound level (defined as the equivalent continuous sound level from 07:00 to 23:00 or LpAeq,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 sound level (defined as the equivalent continuous sound level from 23:00 to 07:00 or LpAeq,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 sound level would be 40dB. This contour represents where the lowest observed community noise effects would be expected to occur during the day (with respect to annoyance) and night (with respect to sleep disturbance). It is unlikely that there would be any adverse noise effects outside of the area within this contour. With regard to sleep disturbance the assessment has also taken account the maximum sound levels generated by each train pass by.

13.5.13 Residential receptors within the daytime 65dB contour, and therefore the night time 55dB contour, have been identified as being likely to experience a significant adverse effect from Proposed Scheme noise alone. This is in line with the daytime threshold in the Noise Insulation Regulations and the Interim Target defined in the WHO's Night Noise Guidelines.

13.5.14 The potential for significant noise effects on communities in areas between the 50dB and 65dB daytime sound contours, or 40dB and 55dB night time contours, would be dependent on the baseline in that area and the change in sound level brought about by the Proposed Scheme.

13.5.15 The criteria used for the working draft EIA Report to assess whether an effect is potentially significant include factors such as the number and magnitude of impacts on a community as well as the existing sound environment. The further significance criteria set out in the draft SMR will be taken into account in the formal EIA Report. These include the character of the existing sound environment, any unique features of the Proposed Scheme's sound or impacts, and the potential combined impacts of sound and vibration.

13.5.16 In the case of PRoW, they are by their nature transitory routes, with users not staying in any one location for long periods. Train sound from the Proposed Scheme would be intermittent and its level would vary as the PRoW moves closer to and further from the Proposed Scheme. Noise effects would generally be reduced by the landscape earthworks envisaged to reduce visual impact of the scheme and envisaged noise mitigation to protect other receptors. No significant noise effects have therefore been identified on PRoW within the Colwich to Yarlet area.

13.5.17 A number of potential minor ground-borne noise and vibration impacts have been forecast at a small number of properties very close to the route. Further assessment would be undertaken for the formal EIA Report to confirm whether the impacts currently forecast are likely to occur. Vibration from the operation of the Proposed Scheme would present no risk of any building damage.

13.5.18 It is currently anticipated that there would be no potentially significant noise or vibration effects arising from changes to existing roads. This will be confirmed in the formal EIA Report.

## Other mitigation measures

13.5.19 Further work is being undertaken to confirm the extent of the noise mitigation included within the Proposed Scheme, which will be confirmed within the formal EIA Report.

## Summary of likely residual significant effects

13.5.20 The envisaged mitigation, including landscape earthworks and noise fence barriers, described in this chapter, and presented in Map Series SV-01 (Volume 2, CA2 Map Book), would substantially reduce the potential airborne sound impacts and noise effects that would otherwise arise from the Proposed Scheme. Nonetheless, this initial assessment has identified potential significant adverse airborne noise effects due to increased noise levels around the following communities:

- Moreton: occupants of residential properties located closest to the Proposed Scheme, identified by OSV02-C01 on Map SV-01-106b;
- Great Haywood: occupants of residential properties on Tolldish Lane, located closest to the Proposed Scheme, identified by OSV02-C02 on Map SV-01-107;
- Ingestre Park Road/Hoo Mill Lane, Ingestre: occupants of residential properties located closest to the Proposed Scheme, identified by OSV02-C03 on Map SV-01-108;
- Park Farm, occupants of residential properties located closest to the Proposed Scheme, identified by OSV02-C04 on Map SV-01-109;
- Hopton – East: occupants of residential properties on Kings Drive, Lowser Lane and Battle Ridge, located closest to the Proposed Scheme, identified by OSV02-C05 on Map SV-01-109;
- Hopton – West: occupants of residential properties on Mount Edge and Ridgeway Close, located closest to the Proposed Scheme, identified by OSV02-C06 on Map SV-01-109;
- Marston: occupants of residential properties on Marston Lane and Yarlet Lane, located closest to the Proposed Scheme, identified by OSV02-C07 on Map SV-01-110; and
- Pirehill Grange Farm: occupants of residential properties at Pirehill Grange Farm, Green Lane, near Whitgreave, located closest to the Proposed Scheme, identified by OSV02-C08 on Map SV-01-111a.

13.5.21 The initial assessment indicates that, on a precautionary basis, 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 level criteria set out in the WHO (1999) Guideline from Community Noise, at individual residential properties closest to the Proposed Scheme in the vicinity of Hopton and Marston. These properties are identified in Map Series SV-01 (Volume 2, CA2 Map Book).

13.5.22 The initial assessment indicates that, on a precautionary basis, at Yarlet School, the predicted airborne sound levels would be greater than the relevant screening criteria. Additionally this initial assessment has identified a potential airborne noise effects on the Mayfield Children's Home, a children's home associated with Rugeley School at Moreton House, Staffordshire County Showground, St Leonard's Church, Marston and St. Peter's Church, Hopton. This initial assessment is in the absence of detailed baseline sound levels, and specific information regarding these resources including their construction, layout, day-to-day requirements and uses.

13.5.23 The envisaged mitigation (especially track and track-bed) described in this chapter, substantially reduces the potential groundborne noise and vibration effects that would otherwise arise from the Proposed Scheme. Nonetheless, this initial assessment has identified a potential significant adverse groundborne noise effect due to increased groundborne noise levels for occupants of residential properties at Park Farm located closest to the Proposed Scheme. The vibration and airborne noise significant effect is identified by OSV02-C04 on Map SV-01-109.

13.5.24 Further assessment work is being undertaken to confirm operational sound and vibration significant effects, especially those at non-residential receptors and quiet areas (as necessary, on a receptor-by-receptor basis). This will be reported in the formal EIA Report, which will present baseline levels, forecasts for the Proposed Scheme and the change in sound levels brought about by the Proposed Scheme both as impact plans and tables. There would be no risk of any building damage due to vibration from the operation of the Proposed Scheme.

13.5.25 Map Series SV-01 (Volume 2, CA2 Map Book) shows the draft list of non-residential locations to be considered in the sound, noise and vibration assessment as part of the formal EIA Report. This list will be developed further incorporating consultation feedback and ongoing stakeholder engagement.

# 14 Traffic and transport

## 14.1 Introduction

14.1.1 This section describes the likely impacts on all forms of transport and the consequential effects on transport users arising from the construction and operation of the Proposed Scheme through the Colwich to Yarlet area.

14.1.2 The main issues associated with traffic and transport are expected to be increased traffic as a result of the construction of the Proposed Scheme, road diversions and realignments, temporary and permanent road closures, and temporary alternative routes and permanent realignments of PRoW.

14.1.3 Engagement with SCC and Highways England has been undertaken. An important focus of this engagement has been to obtain relevant baseline information. Engagement with these other relevant stakeholders will continue as part of the design development of the Proposed Scheme.

14.1.4 Maps showing the location of the key environmental features and the key construction and operational features of the Proposed Scheme can be found in the Volume 2, CA2 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 and the draft SMR.

14.2.2 The study area for traffic and transport includes all roads affected by the Proposed Scheme including: the M6, the A51 Lichfield Road (as it passes through Great Haywood), the A518 Weston Road (as it passes through Staffordshire County Showground), the B5066 Sandon Road, the A513 Beaconside through Stafford, the A34 Stone Road and local roads serving the settlements of Colwich, Little Haywood, Great Haywood, Tixall, Hixon and Hopton.

14.2.3 The effects on traffic and transport are assessed qualitatively, based on proposed construction routes, initial estimates of construction traffic and professional judgement.

14.2.4 No quantitative assessment has been undertaken at this stage. A quantitative assessment will be presented in the formal EIA Report.

## 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 and liaison with SCC (including provision of information on public transport, PRoW and accident data) and desktop analysis.

14.3.2 Traffic surveys of roads crossing the route or potentially affected by the Proposed Scheme were undertaken in November 2015 and February and March 2016, comprising of automatic traffic counts, junction turning counts and queue surveys. This data has been supplemented by existing traffic data from other sources where

available, including from SCC. Assessment of the data indicates that the peak hours in the area are 08:00 – 09:00 and 17:00 – 18:00.

14.3.3 PRoW surveys were undertaken in May, June and July 2016 to establish their nature and usage by non-motorised users (pedestrians, cyclists and equestrians). The surveys included all 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 surveys were undertaken during the weekend, when usage is expected to be highest, but some were undertaken on a weekday where routes may be influenced by commuting or other localised uses.

14.3.4 The Proposed Scheme would intersect 15 PRoW, although others in the area could also be affected. The Proposed Scheme would also cross 10 roads and roadside footways including: Tolldish Lane; the A51 Lichfield Road; Hoo Mill Lane; Ingestre Park Road; Trent Walk; the A518 Weston Road; Hopton Lane; the B5066 Sandon Road; Marston Lane; and the A34 Stone Road.

14.3.5 The M6 is the only strategic road that runs through the area. The M6 runs along a north-south alignment through the north-western section of the area, and connects Stafford with Stoke-on-Trent in this locality. The Proposed Scheme would not intersect the M6 in this area. There are three primary 'A' roads in this area: the A34 Stone Road, which connects Stafford to Stone; the A51 Lichfield Road, which connects Stone with Rugeley via Little Haywood, Great Haywood and Sandon; and the A518 Weston Road, which connects Uttoxeter with Stafford. The strategic and primary road network, particularly around Stafford, can get busy at peak times and delays can be experienced.

14.3.6 The main local roads that would be affected by the Proposed Scheme are the A513 Beaconside and B5066 Sandon Road. The A513 Beaconside connects Stafford and the outskirts of Rugeley, passing through the village of Milford and the northern part of Cannock Chase. The B5066 Sandon Road follows a north to south alignment and connects the A513 Beaconside in Stafford with the A51 Lichfield Road near the village of Sandon. The road also passes through the smaller settlements of Hopton and Salt. The local road network generally operates well although some localised delays can be experienced particularly at peak times.

14.3.7 Relevant accident data for the road network subject to assessment has been obtained from SCC. Data for the latest three year period (2012 to 2015) has been assessed and any identified clusters have been examined. Two accident clusters were identified within the Stafford area: at the A513 Beaconside/A34 Stone Road roundabout (nine accidents in the last three years, including one fatality); and the A34 Lichfield Road/Riverway junction (12 accidents in the last three years, but with no serious casualties or fatalities).

14.3.8 There are four bus corridors that would cross the Proposed Scheme in this area, these are the A51 Lichfield Road between Rugeley and Stone, the A518 Weston Road from Stafford to Weston, the A34 Stone Road between Stafford and Rugeley, and the B5066 Sandon Road from Stafford to Sandon. The A51 Lichfield Road corridor is served by nine services, which provide connections to Lichfield, Newport, Stafford, Great Haywood, Little Haywood, and Hixon. The A518 Weston Road corridor is served by four bus services and provides connections to Weston, Stafford, Rugeley and

Brereton. The A34 Stone Road corridor between Stafford and Stone is served by one bus service and provides connections to Stoke-on-Trent, Yarlet and Whitgreave. Four bus services operate along the B5066 Sandon Road corridor and provide connections to Hopton, Salt and Sandon.

14.3.9 The Proposed Scheme would cross the Colwich to Macclesfield Railway to the north of the A51 Lichfield Road. National and local rail services are accessible via Stafford railway station. Stafford provides connections to national destinations including London, Manchester and Glasgow and local centres including Birmingham.

14.3.10 There are pedestrian footways in the built up areas of Colwich, Little Haywood, Great Haywood, and Weston. In the Colwich and Little Haywood area, the Trent and Mersey Canal towpath running adjacent to the south of Main Road provides an off-road cycle route. This route continues along the canal towpath and through Great Haywood, providing a traffic-free route to Stafford, Rugeley and Aston-by-Stone. In the Yarlet and Marston area, there are a number of advisory cycle routes including Whitgreave Lane, Green Lane and March Lane. In addition, National Cycle Network Route 5 passes through Marston, approximately 1.5km south-east of Yarlet, and can be accessed via Yarlet Lane.

14.3.11 There are two navigable waterways in the area, the Trent and Mersey Canal and the Staffordshire and Worcestershire Canal. Great Haywood Marina is located to the west of Great Haywood village and has capacity for up to 200 boats.

## 14.4 Effects arising during construction

### Avoidance and mitigation measures

14.4.1 The following measures have been included as part of the design of the Proposed Scheme and would avoid or reduce effects on transport users:

- creation of a haul route adjacent to the route of the proposed Scheme;
- construction materials and equipment would be transported along the haul route where reasonably practicable to reduce HGV movements on the public highway;
- new highways to be constructed and operational prior to the permanent closure of any existing highways, where reasonably practicable;
- the majority of roads crossing the Proposed Scheme will be maintained or locally diverted during construction to limit the need for diversions of traffic onto alternative routes;
- restricting road closures to overnight and weekends where reasonably practicable;
- HGV routeing, as far as reasonably practicable, along the strategic and/or primary road network;
- temporary alternative routes for PRoW during construction; and
- provision of on-site welfare facilities to reduce daily travel by site workers.

14.4.2 The draft CoCP includes measures that seek to reduce the impacts and effects of deliveries of construction materials and equipment, including where appropriate reducing construction HGV trips during peak background traffic periods. The draft CoCP includes HGV management and control measures.

14.4.3 Where reasonably practicable, the number of private car trips to and from the site (both workforce and visitors) would be reduced by encouraging alternative sustainable modes of transport or vehicle sharing. This will be supported by an overarching framework travel plan that would require construction workforce travel plans to be produced along with a range of potential measures to mitigate the impacts of traffic and transport movements associated with construction of the Proposed Scheme.

14.4.4 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, generic and site specific traffic management measures will be implemented during the construction of the Proposed Scheme on or adjacent to public roads and PRoW affected by the Proposed Scheme.

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 and site staff and workers would, therefore, generally arrive before the morning peak hour and depart after the evening peak hour; and
- excavated material reused wherever reasonably practicable along the route of the Proposed Scheme.

14.4.6 Where works potentially affect Network Rail assets, disruption to travelling passengers and freight movements will be reduced as far 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 as far as reasonably practicable the number of passengers affected.

## Assessment of impacts and effects

14.4.7 The following section considers the impacts on traffic and transport and the likely consequential effects resulting from construction of the Proposed Scheme.

14.4.8 The temporary traffic and transport impacts within this area will include:

- construction vehicle movements to and from the various worksites;
- road closures and associated diversions; and
- alternative routes for PRoW.

14.4.9 The construction assessments have also considered any impacts in this 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 will 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 There would be eight construction compounds in this area, including one main compound and seven satellite compounds. The A51 main compound would also manage works in the adjoining Fradley to Colton area.

14.4.12 Details of construction compounds are provided in Section 2.3.

14.4.13 It is expected that the M6, the A51 Lichfield Road, the A34 Stone Road, the A513 Beaconside, and the A518 Weston Road would provide the primary HGV access routes for construction vehicles. HGVs would access compounds primarily from the A51 Lichfield Road, the A518 Weston Road and the A34 Stone Road. Mill Lane satellite compound would be accessed via Tixall Road and the Sandon Road satellite compound would be accessed via the B5066 Sandon Road. Where reasonably practicable, HGVs would use the haul road alongside the proposed route to reduce the impact on the local road network.

14.4.14 Construction of the Proposed Scheme is expected to result in increases in traffic flows on parts of the following roads as a result of construction traffic, temporary closures and diversions or realignments:

- M6;
- A34 Stone Road;
- A51 Lichfield Road;
- A518 Weston Road;
- A513 Beaconside; and
- B5066 Sandon Road.

14.4.15 The expected increases in traffic have the potential to result in increased congestion and delays and, on some roads, increased traffic severance for non-motorised users. The assessment of these will be reported in the formal EIA Report.

14.4.16 The construction of the Proposed Scheme would be likely to require temporary traffic management measures in the vicinity of the works. Any lane restrictions would be scheduled to reduce as far as reasonably practicable the impacts on traffic in the peak periods, with advance notice provided to travellers.

14.4.17 The Proposed Scheme would require the permanent stopping up of Colwich Footpath 55. The direct impacts of this PRoW being stopped up are reported under operational impacts.

14.4.18 There would be temporary alternative routes for a number of PRoW in the vicinity of the Proposed Scheme. The following PRoWs would be temporarily diverted:

- Colwich Bridleway 23;
- Colwich Bridleway 35;
- Colwich Footpath 26;
- Colwich Footpath 36;
- Colwich Footpath 54;
- Colwich Footpath 63;
- Tixall Bridleway Footpath 0.1630(b);
- Tixall Bridleway 0.1628;
- Hopton and Coton Bridleway 11;
- Hopton and Coton Bridleway 16;
- Hopton and Coton Footpath 6;
- Hopton and Coton Footpath 24;
- Marston Bridleway 8; and
- Marston Footpath 2.

14.4.19 Non-motorised users would also be re-routed around construction compounds. The changes to PRoW are likely to result in some increases in travel distance with the potential for adverse significant effects. These will be reported in the formal EIA Report.

## Other mitigation measures

14.4.20 The implementation of the draft CoCP in combination with the construction workforce travel plan will, to some degree, mitigate the transport related effects during construction of the Proposed Scheme. In order to provide a robust assessment, the reductions in effects arising from the travel plan measures have not been included in the assessment, which would mean any adverse effects may be overstated.

14.4.21 Any further traffic and transport mitigation measures required during the construction of the Proposed Scheme will be considered as necessary based on the outcomes of the assessment. These will be reported in the formal EIA Report.

## Summary of likely residual significant effects

14.4.22 Construction of the Proposed Scheme has the potential to lead to additional congestion and delays for road users on a number of routes including the M6, the A34 Stone Road, the A51 Lichfield Road, the A518 Weston Road, the A513 Beaconside and the B5066 Sandon Road. Increases in traffic could also result in increased traffic severance for non-motorised users of the routes. These will be reported in the formal EIA Report.

14.4.23 Fourteen PRoW would be affected and users would be temporarily diverted at different times during the construction period. This could result in significant adverse effects on users. These will be reported in the formal EIA Report.

## 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 most roads on or close to their existing alignments; and
- replacement, diversion or realignment of PRoW.

### Assessment of impacts and effects

14.5.2 The following section describes the impacts on traffic and transport and the consequential effects resulting from the operational phase of the Proposed Scheme.

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 Colwich to Yarlet 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 related to permanent diversion, realignment and stopping up of roads and the diversion of PRoW.

14.5.5 In the village of Hopton, Hopton Lane south of the Proposed Scheme would be permanently stopped up before it connects with the B5066 Sandon Road. Access into Hopton would be maintained via the Hopton Lane diversion to the north of the Proposed Scheme. A new link road, Mount Edge diversion, is proposed just to the south of the current alignment, which would provide access from the adjoining residential area to the B5066 Sandon Road. These diversions are not expected to change journey times substantially or result in significant effects for vehicles but may have an effect on non-motorised users of these routes. These will be reported in the formal EIA Report.

14.5.6 It is proposed to permanently realign or divert the A51 Lichfield Road, Tolldish Lane, the A518 Weston Road, the B5066 Sandon Road, Hopton Lane and Marston Lane. The A34 Stone Road would bridge the Proposed Scheme on its existing alignment. Minor amendments would be made to the A51 Lichfield Road on its current alignment. These realignments and diversions are not expected to substantially change journey times or result in a significant effect for vehicles, but may have an effect on non-motorised users of these routes. These will be reported in the formal EIA Report.

14.5.7 Colwich Footpath 55 would be permanently stopped up. Colwich Footpath 55 connects Colwich Bridleway 58 to Tolldish Lane over a distance of around 550m. With the stopping up of Colwich Footpath 55, non-motorised users to/from the northern section of Tolldish Lane would be able to access Colwich Bridleway 58 via Colwich Footpath 54 from the existing access to Colwich Footpath 54 approximately 600m north along Tolldish Lane. Non-motorised users to/from the southern section of Tolldish Lane would be able to access Colwich Bridleway 58 via Colwich Footpath 56.

The rerouting of non-motorised users of Colwich Footpath 55 may locally increase the journey distance and travel time. However, the increase in overall journey time may not be substantial as there are no connecting footpaths or destinations on Tolldish Lane and non-motorised users diverting via the alternative routes may not experience any increased travel time.

14.5.8 A number of PRoW would be either permanently realigned or diverted including:

- Colwich Bridleway 23 would be diverted over the Colwich Bridleway 23 accommodation overbridge as it crosses the Proposed Scheme;
- Colwich Footpath 36 would be diverted along the Colwich Footpath 36 diversion and combined locally with Colwich Bridleway 35 over the Colwich Bridleway 35 overbridge as it crosses the Proposed Scheme before rejoining its existing alignment via Colwich Bridleway 23;
- Colwich Bridleway 35 would be locally realigned over the Colwich Bridleway 35 overbridge as it crosses the Proposed Scheme;
- Colwich Footpath 26 would be diverted along the Colwich Footpath 26 diversion and combined with Colwich Footpath 54 over the Colwich Footpath 54 overbridge as it crosses the Proposed Scheme before rejoining its existing alignment;
- Colwich Footpath 54 would be locally realigned over the Colwich Footpath 54 overbridge as it crosses the Proposed Scheme;
- Tixall Footpath 0.1630(b) would be diverted over the Tixall Footpath 0.1628 accommodation overbridge as it crosses the Proposed Scheme;
- Tixall Bridleway 0.1628, which presently joins Tixall Footpath 0.1630(b) would be diverted via the Tixall Bridleway 0.1828 diversion and along Tixall Footpath 0.1630(b) and over the Tixall Footpath 0.1628 accommodation overbridge as it crosses the Proposed Scheme;
- Hopton and Colton Footpath 24 would be locally realigned over the Hopton and Colton Footpath 24 accommodation overbridge as it crosses the Proposed Scheme;
- Hopton and Colton Footpath 6 would be diverted along Hopton and Colton Footpath 6 diversion and combined with Hopton and Colton Footpath 24 over the Hopton and Colton Footpath 24 accommodation overbridge as it crosses the Proposed Scheme before rejoining its existing alignment;
- Hopton and Colton Bridleway 11 would be locally realigned over the Hopton and Colton Bridleway 11 accommodation overbridge as it crosses the Proposed Scheme;
- Hopton and Colton Bridleway 16 would be diverted along the Hopton and Colton Bridleway 16 diversion and combined with Hopton and Colton Bridleway 11 over the Hopton and Colton Bridleway 11 accommodation overbridge before re-joining its existing alignment;

- Marston Bridleway 8 would be locally realigned under the Marston Bridleway 8 accommodation underbridge as it crosses the Proposed Scheme; and
- Marston Footpath 2 would be diverted along the Marston Footpath 2 diversion and would be realigned via the new Marston Lane underbridge and Marston Footpath 9 before rejoining its existing alignment on Yarlet Lane.

14.5.9 For Tixall Bridleway 0.1628, users travelling to and from the north-west and for Hopton and Colton Footpath 6 to and from the north-west would have an increase in travel distance of over 500m. Marston Footpath 2 users travelling to and from the north would also have an increase in travel distance of over 500m, while users travelling to and from the north-west would have a reduction in travel distance. Hopton and Colton Bridleway 11 users would have a reduction in travel distance.

14.5.10 The realignment of some of the PRoW would increase journey distance and time for non-motorised users and may result in significant effects. These will be reported in the formal EIA Report.

14.5.11 Colwich Footpath 63 would not be permanently affected by the Proposed Scheme as it passes under the Trent and Mersey Canal viaduct.

## Other mitigation measures

14.5.12 Any further traffic and transport mitigation measures required during the operation of the Proposed Scheme will be considered as necessary based on the outcomes of the assessment. These will be reported in the formal EIA Report.

## Summary of likely residual significant effects

14.5.13 The Proposed Scheme would require the permanent stopping up of Colwich Footpath 55, although this is not expected to result in any residual significant effects in the area due to the availability of alternative routes.

14.5.14 Thirteen PRoW would be permanently realigned or diverted and there could be an increase of over 500m in distance for some users on three of these routes. Any significant effects will be reported in the formal EIA Report.

# 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 Colwich to Yarlet area. The likely impacts and significant effects of the Proposed Scheme's construction and operation on surface and groundwater bodies and their associated water resources are assessed. The likely impacts and significant effects of the Proposed Scheme on flood risk and land drainage are also considered.

15.1.2 Engagement has been undertaken with the Environment Agency, SCC (who are the Lead Local Flood Authority (LLFA)), SBC, the Canal & River Trust and Severn Trent Water Limited (who are 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 environmental features and the construction and operational components of the Proposed Scheme can be found in the Volume 2, CA2 Map Book.

## 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 the draft SMR and Volume 1 of this working draft EIA Report.

15.2.2 Unless indicated otherwise, the spatial scope of the assessment is based upon the identification of surface water and groundwater features between Colwich and Yarlet that are within 1km of the centre line of the proposed route. This the definition of the study area.

15.2.3 The assessment of surface waters focuses on the watercourses that would be crossed by the Proposed Scheme, including the River Trent, Kingston Brook and relevant tributaries.

15.2.4 The groundwater assessment focuses on the Sherwood Sandstone Group, a Principal aquifer, which outcrops in the central part of the study area, the Mercia Mudstone Group, and a Secondary B aquifer and the predominant bedrock in the Colwich to Yarlet area. Superficial deposits are also present within the study area. Some of these have been designated Secondary A aquifers and consequently they have also been included in the assessment.

15.2.5 Impacts on biological receptors such as aquatic fauna and flora are assessed in Section 8, Ecology and biodiversity.

15.2.6 The assessment is primarily based on desk study information due to land access limitations. However, surveys of accessible water features within the study area are currently in progress. Hydraulic modelling of rivers and watercourses is also currently being undertaken. The assessment will be updated, as required, in the formal EIA to reflect the findings of these surveys and modelling studies.

## 15.3 Environmental baseline

15.3.1 The Proposed Scheme would be constructed in sections of cuttings and embankments, interspersed with short sections at existing ground level. The only exception to this pattern would be where the Proposed Scheme crosses the River Trent and the Trent and Mersey Canal on the Great Haywood viaduct. The study area would not include any tunnelled sections. It is proposed that there would be one main construction compound (A51 main compound) and seven satellite compounds within the Colwich to Yarlet area.

### Water resources and Water Framework Directive (WFD) baseline

15.3.2 All water bodies in the Colwich to Yarlet area fall within the Staffordshire Trent Valley catchment of the Humber River Basin District (RBD).

15.3.3 The River Basin Management Plan (RBMP)[97] identifies the chemical[98] and ecological[99] condition of all surface water bodies, and the quantitative[100] and chemical[101] status of all groundwater bodies within this RBD.

15.3.4 The statutory objective of the RBMP is to prevent deterioration of all water bodies at good or high status and to prevent water bodies at less than good status from deteriorating further. Pending the results of detailed site surveys, all water bodies, other than minor ponds and ditches, have been identified within this draft assessment as being of either high or very high value, sensitive to impacts that could affect any one of the individual elements that are used to define their WFD status in the long term.

15.3.5 An indication of the crossing locations, current overall WFD status and future overall status objectives associated with the key surface water bodies within the Colwich to Yarlet area are summarised in Table 12.

Table 12: Key surface water bodies and their WFD status

| Water body name and identification number[102] | Crossing location description | Current WFD status | WFD status objective |
|---|---|---|---|
| Trent from Tittensor to River Sow | Great Haywood viaduct over the River Trent<br>Tributary watercourse crossings, as follows:<br>- Tolldish culvert; | Bad | Poor by 2027 |

[97] Environment Agency (2015), Water for life and livelihoods Part 1: Humber river basin district: River basin management plan.
[98] The **chemical status** of surface waters reflects concentrations of priority and hazardous substances present.
[99] 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.
[100] 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.
[101] The **chemical status** of a groundwater body reflects effects on drinking water protected areas (DWPA), 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.
[102] The Environment Agency has attributed each surface water and groundwater body a unique water body identification (ID) number.

| Water body name and identification number[102] | Crossing location description | Current WFD status | WFD status objective |
|---|---|---|---|
| GB104028053272 | - Lionlodge culvert;<br>- Marston culvert; and<br>- Yarlet Wood drop inlet culvert | | |
| Sow-Doxey Brook to River Penk<br><br>GB104028046790 | Tributary watercourse crossings:<br>- Hopton culvert; and<br>- Berryhill (South) culvert. | Moderate | Moderate by 2015 (sic) |

15.3.6 Records of private unlicensed water abstractions, which comprise those for quantities of less than 20m$^3$ per day, have been obtained from the local authorities. This data indicates that there are no private unlicensed surface water abstractions registered within the study area. However, as there is no obligation to register private water supplies, there remains the possibility that others exist. Those that are registered are assumed to be from groundwater sources, as discussed below. Unregistered surface water supplies may be present that would also need to be protected.

15.3.7 No licensed surface water abstractions or surface water discharge permits have been identified in the study area.

15.3.8 The geology of the area is described in detail in Section 10, Land quality, and summarised below.

15.3.9 The main bedrock geology consists of the Mercia Mudstone Group, which is classified as a Secondary B aquifer. The Stafford Halite Member of the Mercia Mudstone Group outcrops in the vicinity of Yarlet.

15.3.10 The Sherwood Sandstone Group (sandstone of the Helsby Sandstone Formation and the Chester Formations) outcrops and extends to the north and south of the route in the vicinity of Hopton. This formation has been classified as a Principal aquifer by the Environment Agency and is, therefore, a receptor of very high value.

15.3.11 Superficial deposits underlying the Proposed Scheme, where present, consist of alluvium, river terrace gravels and glaciofluvial sheet deposits, all classified as Secondary A aquifers, which may be capable of supporting water supplies at a local rather than strategic scale and may form an important source of baseflow to rivers.

15.3.12 Glacial till deposits that would be crossed by the route are classified as Secondary undifferentiated aquifers, which may supply baseflow or store and yield limited amounts of groundwater.

15.3.13 Peat is present within the area located 1km to the south-west of Hopton. Patches of peat also occur to the south of the Proposed Scheme at Marston. Deposits of peat are classified as Unproductive in this area, and therefore, have low value in terms of water resources.

15.3.14 An indication of the aquifer outcrop locations, current WFD status and future status objectives associated with the key groundwater bodies within the Colwich to Yarlet area are summarised in Table 13.

Table 13: Groundwater bodies and their WFD status

| **Water body name and identification number** | **Location** | **Current WFD status** | **WFD status objective** |
|---|---|---|---|
| Staffordshire Trent Valley - PT Sandstone Staffordshire<br><br>GB40401G300500 | Across the eastern portion of the Colwich to Yarlet area | Poor | Good by 2027 |
| Staffordshire Trent Valley - Mercia Mudstone East & Coal Measures<br><br>GB40402G300300 | In the vicinity of Hopton | Good | Good by 2027 |
| Staffordshire Trent Valley – Mercia Mudstone West<br><br>GB40402G300400 | Across the western portion of the Colwich to Yarlet area | Good | Good by 2027 |

15.3.15 There are two Source Protection Zones (SPZ) located to the south of Great Haywood that extend into the study area. However, there are no licensed public water supply abstractions.

15.3.16 There are three licensed private groundwater abstractions in the study area, at Moreton Grange (60m from the Proposed Scheme), Ingestre Park Golf Club (100m from the Proposed Scheme), and Staffordshire County Showground (510m from the Proposed Scheme).

15.3.17 There are three unlicensed private groundwater abstractions within the study area. The local authority data provided only indicates the location of the taps from which the supplies are drawn. This information indicates abstractions are at Upper Hanyards Farm, Lower Hanyards Farm and Staffordshire County Showground. However, as there is no obligation to register private water supplies, there remains the possibility that others exist, which would need to be protected.

15.3.18 Twenty-eight features have been identified from Ordnance Survey Maps that have potential to be springs, all of which are likely to contribute flows to surface water bodies. In the absence of site surveys all of these features will assume to comprise springs, which are high value receptors.

15.3.19 There are no designated groundwater dependent terrestrial ecosystems (GWDTEs) in the study area. The Proposed Scheme has been designed to avoid impacts on Pasturefields SAC and SSSI, which is an inland saltmarsh located approximately 650m north of the Proposed Scheme, as outlined in Section 8, Ecology and biodiversity.

### Flood risk and land drainage baseline

15.3.20 The Environment Agency's Flood Maps are the principal data set that has been used to define the baseline for river, surface water and infrastructure failure flood risks. River and surface water flood risk zones are shown on Map WR-01 in Volume 2, CA2 Map Book.

15.3.21 The LLFA for the Colwich to Yarlet area is SCC. The following reports were used to help determine the baseline flood risk within the study area:

- Staffordshire Preliminary Flood Risk Assessment (PFRA) (2011)[103];
- South Staffordshire, Cannock Chase, Lichfield and Stafford Strategic Flood Risk Assessment (SFRA) (2014)[104]; and
- Shropshire and Staffordshire Local Flood Risk Management Strategy (2015)[105]:

15.3.22 This report identifies the key communities in urban and rural locations at risk of flooding from surface water and smaller watercourses within Staffordshire. These includes the areas of significant flooding in the Great Haywood area, as well as surface water flow paths in the vicinity of the Proposed Scheme, which contribute to surface water flood risk downstream in Stafford.

15.3.23 There are two fish ponds upstream of the route at Hopton, which are impounded by embankments, above surrounding ground level. Failure of these embankments would release their contents. The ponds are approximately 800m upstream of the Proposed Scheme, the nearest existing property is approximately 2km downstream of the existing ponds.

15.3.24 The Trent and Mersey Canal passes along the corridor of the River Trent at Great Haywood, where the Proposed Scheme would be elevated well above the level of the canal on a viaduct.

15.3.25 Existing topography, soils and land drainage systems within the 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 are important for crop productivity, are 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 draft CoCP[106] includes a range of mitigation measures that are suitable to reduce impacts to as low a level as is reasonably practicable. The measures that are of particular relevance to water resources and flood risk during construction are described below.

[103] Staffordshire Preliminary Flood Risk Assessment (PFRA) (2011) Staffordshire County Council
[104] South Staffordshire, Cannock Chase, Lichfield and Stafford Strategic Flood Risk Assessment (SFRA) (2014) Capita
[105] Shropshire and Staffordshire Local Flood Risk Management Strategy (LFRMS) (2015) Staffordshire County Council
[106] Volume 1, Appendix: Draft code of construction practice

### *Water resources and WFD*

15.4.2 The principal strategy adopted to limit the temporary and permanent effects of the Proposed Scheme on water bodies and their associated water resources, is to avoid sensitive receptors wherever reasonably practicable, recognising the wider constraints on route selection. This strategy has reduced the risks associated with the Proposed Scheme not complying with the requirements of the WFD. Examples of this avoidance strategy include:

- avoidance of floodplain areas: the route would avoid passing along river or stream valleys, such as that of the River Trent and Marston Brook, and their associated floodplains. Instead it would pass over the larger watercourses (rivers and streams) on viaduct spanning the floodplain. The only permanent structures within river floodplain areas would be where the viaducts require intermediate piers, and these would be placed so as to avoid the river channel;
- avoidance, where reasonably practicable, of GWDTEs, 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 and groundwater.

15.4.3 Where permanent watercourse diversions and/or realignments are proposed, the aim will be to design these with equivalent hydraulic capacity to the existing channels. The design of the Proposed Scheme will 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 will aim to incorporate appropriate features to retain, and where reasonably practicable, enhance, their hydromorphological status. For watercourses that are not in their natural condition, the design will aim, where reasonably practicable, to incorporate measures to improve their hydromorphological status, provided this is compatible with the watercourse's flood risk and land drainage functions.

15.4.4 To protect water bodies and their associated water resources from the potential impacts of polluting materials within construction site runoff, the practices detailed in the relevant pollution prevention guidelines and Construction Industry Research and Information Association (CIRIA) publications would be adhered to in so far as is reasonably practicable. The draft CoCP also requires contractors to comply, as far as reasonably practicable, with BS 6031 code of practice for earthworks[107] regarding the general control of site drainage including, for example, all washings, dewatering, abstractions and surface water runoff, unless otherwise agreed with the Environment Agency. Specific measures referred to in the draft CoCP to protect the water environment include, as appropriate:

- provision of maps showing sensitive areas and buffer zones where no pollutants are to be stored or used; and

[107] BS 6031:2009 Code of practice for earthworks. British Standards Institute.

- preparation of method statements for: silt management and site drainage at compounds and satellite compounds; 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 regulators as part of the approvals process. These method statements would cover, where applicable:
  - the avoidance of discharges of site runoff to ditches, watercourses, drains, sewers or soakaways without the prior agreement of the appropriate authority;
  - 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.

15.4.5 Where watercourses would be permanently culverted under the route or beneath proposed highway realignments or diversions, or to allow maintenance access to features such as balancing ponds, temporary channel diversions may be required to allow new culverts to be constructed in dry conditions. Where such diversions are required these would be established in advance of stopping up the existing channel. The relevant watercourse crossings include:

- Tolldish, Lionlodge and Marston culverts, including a diversion proposed to the south-east of Marston Lane, and Yarlet Wood drop inlet culvert. All of these are on minor unnamed tributaries of the River Trent; and
- the culverts at Berryhill (south) and Hopton, which are tributaries of Kingston Brook.

15.4.6 Existing groundwater abstraction boreholes or points would be protected from physical damage, in so far as reasonably practicable. If boreholes are to be decommissioned and replaced with alternatives, contractors would adopt the latest good practices, as far as reasonably practicable. This would also be applicable to springs potentially affected by construction works, although additional measures may be required to mitigate temporary construction impacts on springs that are to be re-located.

15.4.7 Measures would be introduced to mitigate the temporary and permanent effects on groundwater flows and water quality during excavation and construction of foundations and cuttings as far as is reasonably practicable. The types of measure likely to be adopted could include:

- installing cut-off 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 abstracted 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.

15.4.8 In accordance with the draft CoCP, monitoring would be undertaken in consultation with the Environment Agency prior to, during and post construction, if required, to establish baseline conditions for surface water and groundwater and to confirm the effectiveness of agreed construction impact mitigation measures.

### *Flood risk and land drainage*

15.4.9 The contractors would, as far as reasonably practicable, ensure that flood risk is managed safely throughout the construction period and consider flooding when planning sites and storing materials. If necessary, temporary provision would be made to manage impacts on existing land drainage systems during construction. Some of the specific measures referred to in the draft CoCP include, as appropriate:

- preparation of flood risk assessments and method statements for temporary works, including main compound and satellite compound drainage, watercourse crossings and realignments and temporary diversions in consultation with the Environment Agency, and if appropriate, 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 diversions 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 significant increases in flood risk.

15.4.10 In accordance with 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 permits, and that impacts on existing land drainage systems are limited as far as is reasonably practicable.

15.4.11 The design of the Proposed Scheme will aim to mitigate permanent significant impacts on flood risk and land drainage as follows:

- the floodplain avoidance strategy outlined above would aim to ensure that impacts on flood flows within rivers and streams, and their floodplains, would be limited to those associated with the intermediate pier structures. The impacts of intermediate piers on upstream flood levels are assessed as being unlikely to result in significant effects;

- the design will make precautionary allowances for replacement floodplain storage areas to mitigate for the impact of intermediate piers situated in floodplain areas. This is in case detailed hydraulic modelling indicates that the effects of these losses of floodplain would be significant in terms of the magnitude of any increase in peak flow downstream or increase in water level upstream, and the sensitivity of any receptors potentially affected. The location of some of these replacement floodplain storage areas is still under consideration and will be identified in the formal EIA Report;
- on watercourses where new culverts are to be installed beneath the route, the culvert length would be reduced as far as is reasonably practicable, and would be designed with invert levels below the firm bed of the watercourse to mitigate impact on flows and sediment transfer. Culverts would be designed in general accordance with CIRIA and Environment Agency guidance, and in consultation with the Environment Agency. The mitigation specifically proposed for the ecology of the watercourses is considered in Section 8, Ecology and biodiversity;
- provision has been made to pass surface water runoff and land drainage flows beneath sections of raised embankment that cross dry valleys. This would be achieved using perimeter drains 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 would be for structures to accommodate flood flows up to and including the 1 in 100 (1%) annual probability storm with an allowance for climate change based on latest guidance issued by the Environment Agency[108]; runoff from the footprint of the new infrastructure may occur more rapidly post-construction due to steeper slope angles and the permeability of the newly-created surfaces. The design of drainage systems would aim to ensure that there are 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 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 reasonably practicable, drainage would be designed to encourage water to soak back into the ground, for example where cuttings intercept groundwater flows;
- at cutting locations, drainage measures would be provided with the aim of preventing flow into the cutting and diverting this water into its natural catchment. Where reasonably practicable, runoff from the cuttings would also be drained to the catchments to which this water would naturally drain,

[108] Environment Agency (2016) Adapting to Climate Change. Advice for Flood and Coastal Erosion Risk Management Authorities

avoiding transfers 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 as far 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.

## Assessment of impacts and effects

15.4.12 The majority of the potential temporary effects on the water environment during construction would be mitigated by the working methods outlined in the draft CoCP. Permanent effects would be mitigated by a range of measures incorporated into the design that have been informed by the environmental assessment process.

### *Water resources and WFD*

15.4.13 Potential impacts on surface water quality, due to site runoff and increased pollution risk are a key concern during construction and have potential to affect abstractions and the water environment more generally. However, the practices outlined in the draft CoCP are considered to mitigate any associated effects on water quality, such that no significant effects are anticipated.

15.4.14 The proposed cuttings in the study area would intersect the Sherwood Sandstone Group Principal aquifer, the Mercia Mudstone Group Secondary B aquifer, the Stafford Halite Member Secondary B aquifer and the glacial till Secondary undifferentiated aquifer. Whilst there are likely to be minor localised impacts, the implementation of the measures outlined in the draft CoCP would mean that any effects on the overall status of these aquifers are unlikely to be significant. The implications of localised impacts on these aquifers for features such as springs and abstractions are assessed below.

15.4.15 Staffordshire and Birmingham Agricultural Society's licensed private groundwater abstraction is unlikely to be affected, given its distance from the Proposed Scheme. The Proposed Scheme does have potential to result in moderate adverse effects associated with impacts on the licensed private groundwater abstractions at Ingestre Park Golf Club and Moreton Grange.

15.4.16 Existing data on the private unlicensed groundwater abstractions in the study area has resulted in the following assessment:

- Lower Hanyards Farm tap location is 650m away from the proposed route and the Proposed Scheme is therefore unlikely to give rise to significant effects related to this water supply;
- Staffordshire Showground tap location is 190m away from the proposed route and has potential to result in moderate adverse significant effects related to this water supply; and
- Upper Hanyards Farm tap location would be demolished as a result of the Proposed Scheme, resulting in a major adverse significant effect.

15.4.17 The impacts on water resources associated with construction of the Great Haywood viaduct, culverts (Tolldish culvert, Lionlodge culvert, Berryhill (south) culvert, Hopton culvert and Marston culvert ) and Yarlet Wood drop inlet culvert, including any temporary diversions or realignments required, would be mitigated, as far as is reasonably practicable, by the measures outlined in the draft CoCP. These measures should ensure that the construction impacts are temporary and unlikely to have permanent significant effects on WFD physico-chemical quality elements.

15.4.18 The route would bisect the catchment of a tributary of the River Trent with a confluence in the vicinity of Great Haywood. This watercourse would be crossed by the Proposed Scheme at Tolldish culvert. Construction works would require diversion of minor tributaries of this watercourse, such that they would enter the channel approximately 1.6km further downstream. This may result in approximately 15% less baseflow in this short section of the watercourse following construction. This has been assessed as having a potentially moderate impact on this high value receptor and as such is considered a moderate adverse effect.

15.4.19 The viaduct design at Great Haywood would ensure that the structures do not prevent the River Trent achieving good status in line with the WFD objectives in the RBMP. This viaduct would have no significant permanent effects related to water resources and WFD.

15.4.20 Tolldish culvert, Lionlodge culvert, Berryhill (south) culvert, Hopton culvert, Marston culvert and Yarlet drop inlet culvert would aim to maintain the flow in permanent watercourses beneath the Proposed Scheme. These watercourses have been attributed a high value, pending the results of site survey. The culverts would have a minor impact on their hydromorphological status. These crossings are therefore assessed as having potential to result in moderate adverse effects at this stage on the hydromorphology of these watercourses.

15.4.21 Hanyards drop inlet culvert, Berryhill (north) drop inlet culvert and Sandon Road drop inlet culvert would be required to maintain connectivity of existing overland flow routes and land drainage systems. There are no existing channel features in these locations, so these structures have no implications for hydromorphology and would not result in significant effects.

15.4.22 The design of the permanent watercourse realignments associated with the watercourse crossings at Lionlodge culvert, Berryhill (south) culvert, Hopton culvert, Marston culvert and Yarlet Wood drop inlet culvert would aim to incorporate natural hydromorphological features within the constraints imposed by the need to accommodate flood and land drainage functions. This would also apply to the proposed channel diversion of the watercourse served by Tolldish culvert and a channel diversion proposed to the south-east of Marston Lane. These permanent realignments and diversions are, therefore, unlikely to result in significant adverse effects on the relevant watercourses' WFD hydromorphology element status.

15.4.23 Pasturefields SAC and SSSI is located approximately 650m upstream of the Proposed Scheme in the floodplain of the River Trent. All existing evidence suggests that the hydraulic gradient within groundwaters in this area is away from, rather than towards, the Proposed Scheme. It is, therefore, very unlikely that any potential pollution arising from construction activities could affect Pasturefields. The distance between

Pasturefields and the route means that the Proposed Scheme is very unlikely to affect groundwater elevations at Pasturefields. The viaduct across the River Trent, approximately 650m downstream of Pasturefields, would be designed to ensure that there would be no impacts on the depth and frequency of flooding at the Pasturefields site. This would ensure that salinity levels would not be affected by the Proposed Scheme. Potential impacts on Pasturefields SAC and SSSI are discussed further in Section 8, Ecology and biodiversity, including reference to a Habitats Regulations Screening Assessment (HS2, 2012[109]).

15.4.24 There may be a permanent loss of groundwater catchment to the spring at Lower Bridge Farm due to the cutting at Hopton. This has potential to result in a moderate adverse significant effect.

### *Flood risk and land drainage*

15.4.25 Construction of viaducts over the River Trent and its associated floodplain crossings would require temporary working within flood zones. This would also apply to construction works associated with the proposed culverts (Tolldish culvert, Lionlodge culvert, Berryhill (South) culvert, Hopton culvert and Marston culvert) and Yarlet Wood drop inlet culvert, including any temporary or permanent channel diversions. Construction sequencing and temporary works design would need to be carefully considered and assessed in terms of impacts on flood risk. Measures defined in the draft CoCP would result in the flood risk and land drainage effects of construction being reduced as far as is reasonably practicable. These activities would be implemented in consultation with the Environment Agency, and where applicable the LLFA. It is not anticipated that these activities would result in significant temporary adverse effects on flood risk and land drainage.

15.4.26 The watercourse crossing point of the River Trent at Great Haywood would be on viaduct spanning the floodplain. The hydraulic design of this viaduct would aim to reduce impacts on upstream flood levels as far as is reasonably practicable. It is very unlikely that the impacts of the piers on flood levels would extend upstream to Pasturefields SAC and SSSI. It is anticipated that the design would incorporate areas where provision can be made to replace losses of replacement floodplain storage associated with the footprint of the piers, in case these losses are shown to result in significant effects on flood risk downstream. Piers would be located to avoid the river channel and allow access for channel inspection and maintenance, where necessary. As a result, it is unlikely that the proposed viaducts would result in significant permanent adverse effects related to flood risks at these sites.

15.4.27 The design aim for all culverts (Tolldish culvert, Lionlodge culvert, Berryhill (south) culvert, Hopton culvert and Marston culvert) and drop inlet culverts (Hanyards drop inlet culvert, Berryhill (north) drop inlet culvert, Sandon Road drop inlet culvert and Yarlet Wood drop inlet culvert), would be to accommodate the peak 1 in 100 (1%) annual probability flow within the relevant watercourse, with an explicit allowance for future increases caused by climate change in accordance with current Environment

[109] HS2 (2012). *HRA Screening Report for Pasturefields Salt Marsh SAC*.

Agency guidance. These structures are, therefore, unlikely to have a significant effect on flood risk.

15.4.28 The design aim for the permanent realignment of the watercourses at Lionlodge culvert, Berryhill (south) culvert, Hopton culvert, Marston culvert and Yarlet drop inlet culvert, and the proposed diversions at Tolldish culvert and south east of Marston Lane, would be for these new sections of channel to have equivalent capacity to the existing channels. The aim would be to design these so that any existing field subsurface drainage systems can be connected-in. These works are, therefore, unlikely to have a significant effect on flood risk or land drainage.

15.4.29 It is likely that additional measures would be required to mitigate the flood risks associated with a potential breach in the fish ponds at Hopton, as this has potential to result in a significant effect.

15.4.30 The design aim for the balancing ponds would be to ensure that the quantity and peak rate of runoff from the Proposed Scheme is attenuated to present greenfield runoff rates, including an explicit allowance for the projected impacts of climate change on peak rainfall intensity. None of the potential effects associated with these features and their associated receptors have, therefore, been assessed as being significantly adverse.

## Other mitigation measures

15.4.31 Additional mitigation measures may be required to minimise the impact of the permanent works, particularly with regard to demonstrating that:

- all reasonably practicable measures have been taken to mitigate the impacts of the proposed culverts on the WFD element status of the relevant watercourses; and
- the proposals would not result in significant increases in flood risks from any source for a range of events up to and including the 1 in 100 annual probability, including allowance for climate change.

15.4.32 The precise form of these will be site-specific and based on the outcome of site survey, hydraulic modelling work and ongoing consultation with the Environment Agency and LLFA, as appropriate, and reported in the formal EIA Report.

15.4.33 These surveys will include inspection of watercourses affected by the Tolldish culvert, Lionlodge culvert, Berryhill (south) culvert, Hopton culvert, Marston culvert and Yarlet drop inlet culvert crossings so that the relative value of these watercourses can be confirmed and an approach to mitigating the impacts of these culverts on the natural hydromorphology of these watercourses can be developed.

15.4.34 Other specific studies will include investigation of, and development of any additional mitigation required, related to the following :

- the impacts on Ingestre Park Golf Club and Moreton Grange private licensed groundwater abstractions;

- the impacts on the private unlicensed groundwater abstractions at Upper Hanyards Farm and South Staffordshire Showground. The source of the supply at Lower Hanyards Farm would also be verified;
- the potential for a breach to occur in the fish ponds at Hopton;
- the issues related to losses of groundwater flows to the spring at Lower Bridge Farm; and
- the impact of the slight flow reduction in the 1.6 km of watercourse affected by the flow diversion adjacent to Tolldish culvert.
- These issues and any additional mitigation proposed will be reported in the formal EIA Report.

## Summary of likely residual significant effects

15.4.35 Without additional mitigation, the anticipated residual significant effects related to construction would be as follows:

- construction of Tolldish culvert, Lionlodge culvert, Berryhill (south) culvert, Hopton culvert, Marston culvert and Yarlet drop inlet culvert are assessed as having potential to result in moderate adverse significant effects related to hydromorphological impacts on these watercourses;
- the Proposed Scheme is likely to give rise to moderate adverse significant effects related to the licensed private abstractions at Ingestre Park Golf Club and Moreton Grange;
- the Proposed Scheme is likely to give rise to moderate adverse significant effects related to the unlicensed private abstraction at Staffordshire County Showground and major adverse significant effects related to the unlicensed private abstraction at Upper Hanyards Farm;
- the potential for a breach to occur in the existing embankments at Hopton Ponds has potential to result in a major adverse significant effect;
- the permanent loss of groundwater catchment to the spring at Lower Bridge Farm, due to the cutting at Hopton, has potential to result in a significant moderate adverse effect; and
- the proposed diversion near to the Tolldish culvert, which would result in approximately 15% less baseflow in a 1.6km section of the watercourse following construction, would potentially have a moderate adverse significant effect on the hydromorphology of this watercourse.

15.4.36 It is currently anticipated that it should be possible to develop the means of mitigating these impacts, to ensure that there are no residual effects of significance.

## 15.5 Effects arising from operation

### Avoidance and mitigation measures

15.5.1 Generic examples of design measures that would reduce potentially significant adverse effects on the quality and flow characteristics of surface water and groundwater bodies during operation and management of the Proposed Scheme are described in Volume 1. A draft operation and maintenance plan for water resources and flood risk will be prepared and included in the formal EIA Report.

### Assessment of impacts and effects

15.5.2 The principal issue of concern during operation is the potential for accidental spillages to occur that result in the release of contaminants into the water environment. This issue is considered in the route-wide assessments outlined in Volume 3.

15.5.3 Adherence to the policies in the National Planning Policy Framework (NPPF) with regard to flood risk will 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 NPPF will be provided on a route-wide basis in the route-wide assessment in Volume 3.

15.5.4 Sustainable drainage systems (SuDS) would be used where reasonably practicable. These will also help to remove any suspended material within runoff from the Proposed Scheme through filtration, vegetative adsorption or settlement.

15.5.5 The operational impacts of the Proposed Scheme on surface and groundwater bodies are unlikely to be significant, once the construction stage mitigation measures outlined above have been implemented. A route-wide WFD compliance assessment will be conducted and reported in Volume 3 of the formal EIA Report.

### Other mitigation measures

15.5.6 It is considered unlikely that further measures will be required to mitigate effects on surface water resources, groundwater resources or flood risk.

### Summary of likely residual significant effects

15.5.7 It is not anticipated that there would be any significant residual effects on water resources and flood risk resulting from operation of the Proposed Scheme, subject to development of the mitigation strategies required to address the issues identified in this working draft EIA Report, which will be reported in the formal EIA Report.

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