



High Speed Rail (West Midlands - Crewe)

Environmental Statement

Volume 2: Community Area report
CA3: Stone and Swynnerton



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(West Midlands - Crewe)
Environmental Statement
Volume 2: Community Area report
CA3: Stone and Swynnerton



Department for Transport

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

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Preface

The Environmental Statement

This document forms part of Volume 2 of the Environmental Statement (ES) that accompanies the deposit of the hybrid Bill for Phase 2a of High Speed Two (HS2). Phase 2a comprises the second section of the proposed HS2 rail network, between the West Midlands and Crewe, and is referred to in this ES as the 'Proposed Scheme'. The ES sets out the Proposed Scheme, its likely significant environmental effects and the measures proposed to mitigate those effects.

Phase 2b comprises the remainder of Phase Two, between Crewe and Manchester and between the West Midlands and Leeds, completing what is known as the 'Y network'. Phase 2b will be the subject of a separate hybrid Bill and therefore is not the subject of this ES.

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

Consultation on the Environmental Statement

The public has an opportunity to comment on this ES as part of the hybrid Bill submission. The period of public consultation on the ES extends for at least 56 days (eight weeks) following the first newspaper notices that follow deposit of Bill documents in Parliament.

Structure of the HS2 Phase 2a Environmental Statement

This report is part of the suite of documents that make up the Environmental Statement (ES) for Phase 2a of the proposed High Speed Two (HS2) rail network between the West Midlands and Crewe (the Proposed Scheme). The structure of the ES is shown in Figure 1.

The ES documentation comprises the following:

Non-technical summary

This provides:

- a summary in non-technical language of the Proposed Scheme and the reasonable alternatives studied;
- the likely significant effects of the Proposed Scheme;
- the means to avoid, prevent or reduce likely significant environmental effects; and
- an outline of the monitoring measures to manage the effects of construction and the effectiveness of mitigation post construction, as well as appropriate monitoring during operation.

Glossary of terms and list of abbreviations

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

Volume 1: Introduction and methodology

This provides:

- a description of HS2, the environmental impact assessment (EIA) process and the approach to consultation and engagement;
- details of the permanent features of the Proposed Scheme and general construction techniques;
- a summary of the scope and methodology for the environmental topics;
- an outline of the general approach to mitigation;
- an outline of the approach to monitoring, including measures to manage the effects of construction, the effectiveness of mitigation post construction, as well as the approach to monitoring during the operational phase; and
- a summary of the reasonable alternatives studied (including local alternatives studied prior to the November 2015 route announcement). Local alternatives studied post November 2015 are discussed in the relevant Volume 2 community area reports.

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;
- a summary of the local alternatives studied since November 2015;
- a description of the environmental baseline;
- a description of the likely significant environmental effects of the Proposed Scheme;
- the proposed means to avoid, prevent or reduce the likely significant adverse environmental effects; and
- the proposals for monitoring, including measures during and post construction, and during the operational phase.

The maps relevant to each community area are provided in separate Volume 2 map books. These maps should be read in conjunction with the relevant community area report. These maps include the location of the key environmental features (Map Series CT-10), key construction features (Map Series CT-05) and key operational features (Map Series CT-06) of the Proposed Scheme. There are also specific maps showing viewpoint and photomontage locations (Map Series LV, to be read in conjunction with Section 11, Landscape and visual of the Volume 2: community area reports) and noise contours (Map Series SV, to be read in conjunction with Section 13, Sound, noise and vibration of the Volume 2: community area reports).

Volume 3: Route-wide effects

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

Volume 4: Off-route effects

This provides an assessment of the likely significant environmental effects of the Proposed Scheme at locations beyond the Phase 2a route corridor and its associated local environment. The maps relevant to the assessment of off-route effects are provided in a separate map book.

Volume 5: Appendices and map books

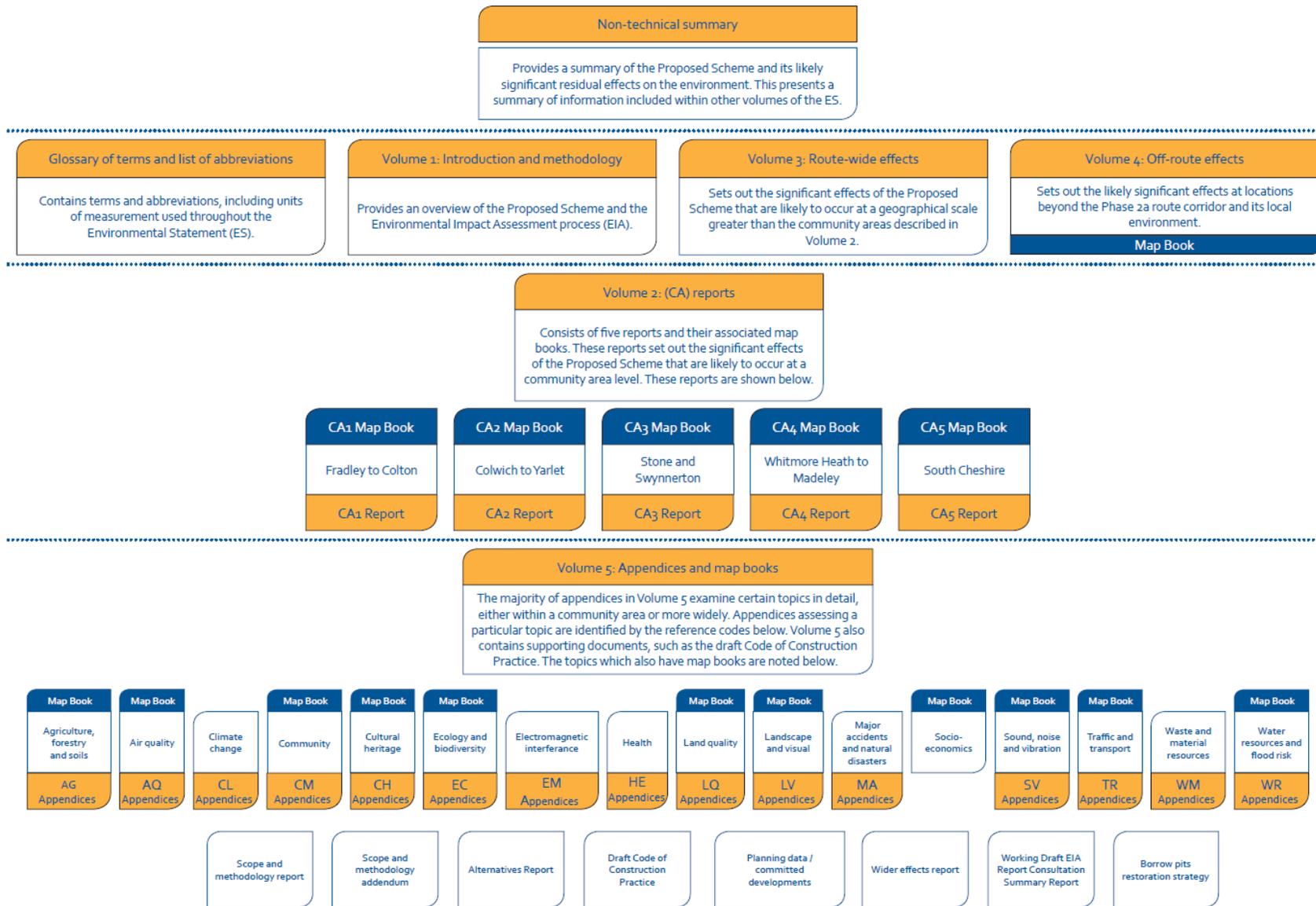
This contains supporting technical information and associated map books to be read in conjunction with the other volumes of the ES.

Background information and data (BID)

Certain reports and maps containing background information and data (BID) have been produced, which do not form part of the ES. These documents are available on the HS2 website. The BID reports and maps present relevant survey information, collated from published and unpublished sources, and other relevant background material.

Environmental Statement Volume 2: Community area 3, Stone and Swynnerton

Figure 1: Structure of the HS2 Phase 2a Environmental Statement



1 Introduction

1.1 Introduction to HS2

- 1.1.1 High Speed Two (HS2) is a new high speed railway proposed by the Government to connect major cities in Britain. Stations in London, Birmingham, Leeds, Manchester and East Midlands will be served by high speed trains running at speeds of up to 225mph (360kph). Trains will also run beyond the HS2 network to serve destinations including South Yorkshire, Liverpool, Glasgow, Edinburgh, Newcastle and York.
- 1.1.2 HS2 will be built in phases. Phase One comprises the first section of the HS2 rail network of approximately 143 miles (230km) between London, Birmingham and the West Midlands and is planned to become operational in 2026. It was the subject of an Environmental Statement (ES) deposited with the High Speed Rail (London – West Midlands) Bill in 2013 and subsequent ESs were deposited with Additional Provisions to that Bill in 2014 and 2015. The High Speed Rail (London – West Midlands) Bill received Royal Assent in February 2017 and initial works on Phase One have commenced.
- 1.1.3 Phase Two of HS2 will 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 Two will be constructed in two phases:
- Phase 2a (the Proposed Scheme): the western section of Phase Two between the West Midlands and Crewe, comprising approximately 36 miles (58km) of HS2 main line (including the section which would connect with and form the first part of Phase 2b) and two spurs (approximately 4 miles (6km)) south of Crewe that will allow trains to transfer between the HS2 main line and the existing WCML. Construction of the Proposed Scheme will commence in 2020, ahead of the rest of Phase Two, with operation planned to start in 2027, six years earlier than originally planned bringing more of the benefits of HS2 to the North sooner; and
 - Phase 2b: comprising the remainder of Phase Two, between Crewe (where it would connect with the Proposed Scheme) and Manchester and between the West Midlands and Leeds. Phase 2b will be the subject of a separate hybrid Bill with construction expected to commence in 2023 and operation planned to start by 2033.
- 1.1.5 The Proposed Scheme will connect with Phase One at Fradley, to the north-east of Lichfield, and to the WCML south of Crewe, providing onward services beyond the HS2 network and between the north-west of England and Scotland.
- 1.1.6 The Proposed Scheme has been the subject of an environmental impact assessment (EIA). During the development of the Phase 2a proposals, a working draft EIA Report was consulted on to help inform the design and assessment of the Proposed Scheme.

- 1.1.7 The findings of the assessment of the Proposed Scheme are reported in an Environmental Statement (the ES), of which this Volume 2 report forms a part. The ES has been deposited alongside a hybrid Bill for Phase 2a, in accordance with the requirements of Parliamentary Standing Order 27A (SO27A)^{1, 2}.
- 1.1.8 For the purposes of environmental assessment and community engagement, the Proposed Scheme has been divided into five community areas. These are shown in Figure 2.

¹ Standing Order 27A of the Standing Orders of the House of Commons relating to private business (environmental assessment) - 2015, House of Commons.

² Standing Orders of the House of Lords - Private Business – 2015, House of Lords.

1.2 Purpose of this report

- 1.2.1 This report presents the likely significant effects of the construction and operation of the Proposed Scheme on the environment within the Stone and Swynnerton area. The report also describes the means to avoid, prevent or reduce the likely significant effects of the Proposed Scheme on the environment within the area, along with any proposed monitoring measures.

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 studied;
- 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);
 - 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 existing and future environmental baseline within the community area;
- a description of the impacts and likely significant environmental effects arising during construction and operation of the Proposed Scheme, including cumulative effects; and

- a description of proposed mitigation and any monitoring measures that have been identified.

- 1.3.3 Environmental effects have been assessed in accordance with the methodology set out in Volume 1 (Section 8), the EIA Scope and Methodology Report (SMR) (Volume 5: Appendix CT-001-001) and the EIA SMR Addendum (Volume 5: Appendix CT-001-002). The purpose of the SMR Addendum is to set out where the assessment methodology presented within the SMR has been amended or developed, for example, as a result of changes in legislation or industry best practice guidance or where methodologies have undergone refinement in the course of preparation of the ES.
- 1.3.4 The Proposed Scheme in the Stone and Swynnerton area is shown in Volume 2: CA₃ Map Book on the Map Series CT-05 (construction) and CT-06 (operation), and should be read in conjunction with this report. There is some flexibility during detailed design to alter the horizontal and vertical alignments and other details within the limits shown on the plans and sections submitted to Parliament and as set out in the Bill. This flexibility is included within the scope of the environmental assessment. Further explanation is provided in Volume 1, Section 1.
- 1.3.5 In addition to the environmental topics covered in Sections 4 to 15 of this report, electromagnetic interference is addressed in Volume 1 and climate change, major accidents and natural disasters, and waste and material resources are addressed in Volume 3 on a route-wide basis. An assessment of potential environmental effects beyond the Phase 2a route corridor and its associated local environment has also been undertaken and this 'off-route' assessment is reported in Volume 4.
- 1.3.6 Supporting technical information, including technical appendices and map books, relating to the assessment in this Volume 2 report is provided in Volume 5 of the ES.
- 1.3.7 In addition to the technical appendices and map books in Volume 5, certain reports and maps containing background information and data (BID) have been produced, which do not form part of the ES. These documents are available on the HS2 Ltd website. The BID reports and maps present survey information, collated from published and unpublished sources, and other background analysis, and are referenced at various places within the ES.

2 Overview of the area and description of the Proposed Scheme

2.1 Overview of the area

General

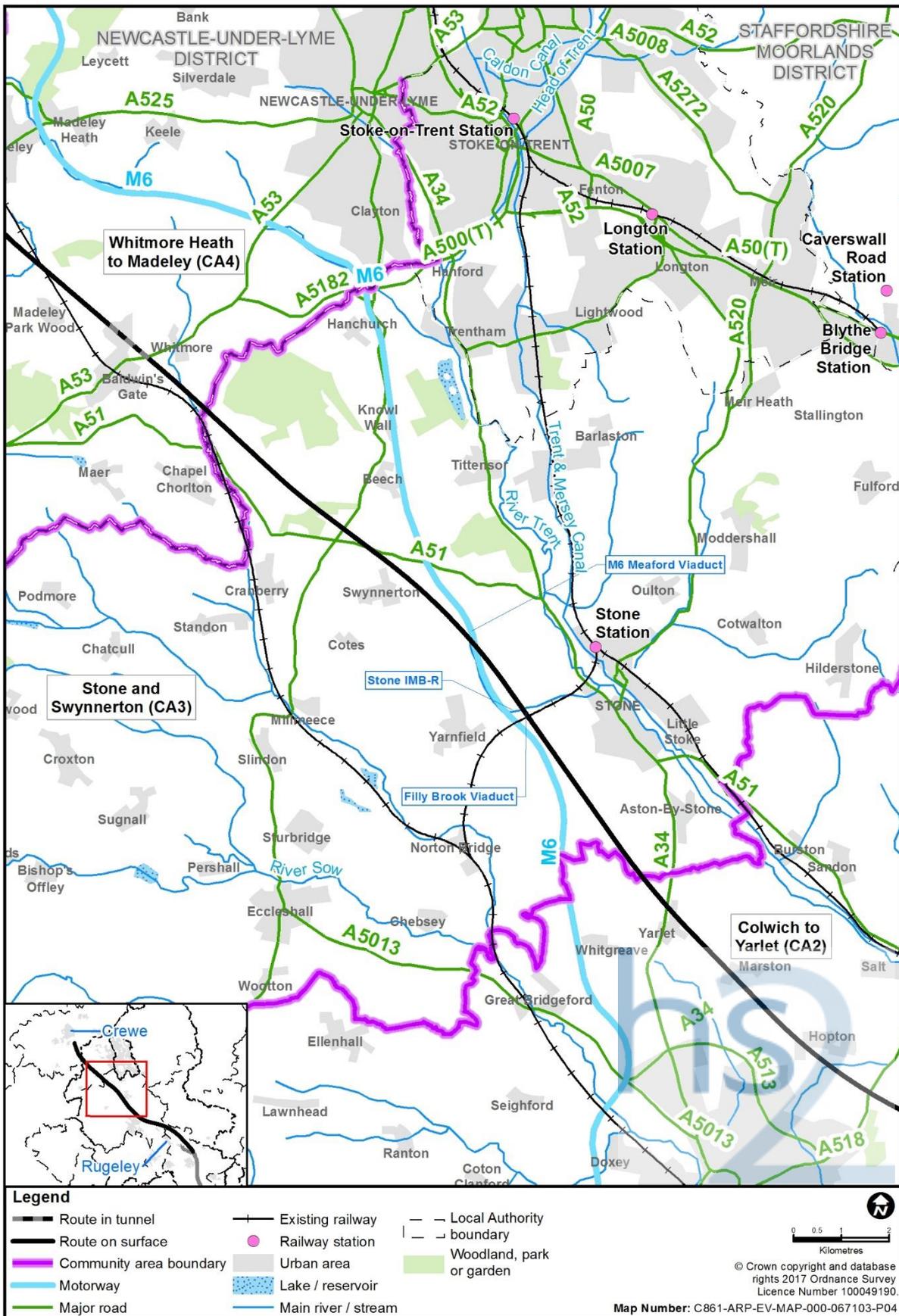
- 2.1.1 The Stone and Swynnerton area covers an approximately 13.5 km section of the Proposed Scheme, passing through the areas of Stone Rural parish council and Swynnerton parish council, with some works in the Stone Town council and Chebsey parish council areas, within the Stafford Borough Council (SBC) and Staffordshire County Council (SCC) areas.
- 2.1.2 The boundary between Marston parish and Stone Rural parish forms the southern boundary of this section. The boundary between Swynnerton parish and Whitmore parish forms the northern boundary of this section.
- 2.1.3 As shown in Figure 3 the Colwich to Yarlet community area (CA2) lies to the south and Whitmore Heath to Madeley community area (CA4) lies to the north.

Settlement, land use and topography

- 2.1.4 The 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 residential areas mainly relate to Stone and Walton and within the wider rural area there are a number of villages and hamlets, including Yarnfield, Cold Norton, Norton Bridge and Swynnerton.
- 2.1.5 At the southern end of this area, the route will pass approximately 1.6km to the west of the village of Aston-by-Stone and approximately 600m north-east of the village of Stableford at the northern end. Land use in the area is split between large blocks of arable and pasture, with dairy farms west of Walton, Swynnerton and at The Rowe.
- 2.1.6 Topography in the south of the Stone and Swynnerton area is characterised by a series of rounded summits with elevations of between 140m and 160m above Ordnance Datum (AOD). Topography around Swynnerton consists of a series of ridges, the highest of which is Knowl Wall (200m AOD). Slopes are generally shallow to moderate, falling to between 130m and 140m AOD. Small pockets of land between Yarnfield and Stone along the Filly Brook, extending north in line with the M6, and land to the east of Stableford extending north are classified as Flood Zone 3 (meaning there is 1 in 100 or greater annual probability of flooding).

Environmental Statement Volume 2: Community area 3, Stone and Swynnerton

Figure 3: Area context map



Key transport infrastructure

- 2.1.7 The M6 passes through the area, with junction 15 located at the northern boundary and the route of the Proposed Scheme crossing the M6 to the west of Stone. The A34 Stafford Road/The Fillybrooks passes through the area in a north-south alignment, connecting Trentham in the north with Aston-by-Stone in the south. Other main transport routes include the A51 Stone Road connecting Stone to Stableford (via Swynnerton) and the A519 Newcastle Road, which connects Eccleshall with Newcastle-under-Lyme.
- 2.1.8 The Proposed Scheme will cross the Norton Bridge to Stone Railway to the east of the M6 (between the B5026 Eccleshall Road and Yarnfield Lane). The West Coast Main Line (WCML) passes through the northern extent of the Stone and Swynnerton area, running in a south to north direction on the western side of the route.
- 2.1.9 The route will cross several public rights of way (PRoW) including local access roads, bridleways and public footpaths, which provide important links between scattered dwellings and surrounding villages. In the Stone and Walton area, the Trent and Mersey Canal towpath linking Barlaston to the north and Stafford to the south-west, provides an off-road cycle route. There are advisory cycle routes passing through Swynnerton, including Stab Lane and Cotes Lane.

Socio-economic profile

- 2.1.10 Within the SBC area there are a range 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 the second largest (11%), followed by retail and construction (10% each)³.
- 2.1.11 According to the Annual Population Survey (2016)⁴, the employment rate⁵ within the SBC area was 77% (63,000 people) and unemployment in the SBC area was 3%, which was lower than the West Midlands and England.
- 2.1.12 According to the Annual Population Survey (2015)⁶, 41% of SBC's residents aged 16-64 were qualified to National Vocational Qualification Level 4 and above, while 5% of residents had no qualifications.

Notable community facilities

- 2.1.13 The main concentration of community facilities in this area is in Stone. Yarnfield and Swynnerton are villages that are located closer to the Proposed Scheme, and include a limited number of local services. The M6 is a defining feature, providing a major transport corridor through the area.
- 2.1.14 Stone encompasses the adjoining settlement of Walton alongside the River Trent, approximately 5km south of Trentham, which is part of the wider Stoke-on-Trent settlement area. Stone includes a range of community facilities including: Trentside Clinic; Stone Youth and Community Centre; Walton Community Centre and Stone Air

³ Office for National Statistics; UK Business: Activity, Size and Location 2014. Available online at <https://www.nomisweb.co.uk>

⁴ Annual Population Survey, (2016), NOMIS. Available online at <https://www.nomisweb.co.uk>

⁵ The proportion of working age (16-64 year olds) residents that is in employment.

⁶ Annual Population Survey, (2015), NOMIS. Available online at <https://www.nomisweb.co.uk>

Cadets hut; Stone library; Stone police station; seven churches; and 10 schools (St Michael's Church of England First School; Christ Church, Church of England First School; Christ Church, Church of England Middle School; St Dominic's Roman Catholic Primary School; Manor Hill First School; Pirehill First School; Walton Priory Middle School; Oulton Church of England First School; Alleyne's High School and St Dominic's Priory School).

2.1.15 Yarnfield is a village located approximately 2.5km south-west of Stone. It includes several community facilities, including Springfield First School and Saint Barnabas Church.

2.1.16 Swynnerton is a small village linked to the Swynnerton Hall estate. The village includes a post office and village shop, St Mary's Church and Our Lady of the Assumption Roman Catholic Church.

Recreation, leisure and open space

2.1.17 The Stone and Swynnerton area is predominantly rural, with open space, woodland and farmland. The Proposed Scheme will cross several PRoW, including the Staffordshire Cakes and Ale Trail, Two Saints Way, and the Trent and Hanchurch Hills Circular Walk. Swynnerton Old Park is located to the north-east of the Proposed Scheme, and includes a wide range of walking and cycling routes, which also link to Hatton Common. There are a number of indoor recreational facilities in Stone including a soft play centre, a trampoline park, and a number of public houses.

Policy and planning context

Planning framework

2.1.18 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.

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

- Staffordshire and Stoke-on-Trent Joint Waste Core Strategy 2010 - 2026 (Adopted 2013)⁷;
- The Minerals Local Plan for Staffordshire 2015 to 2030 (Adopted 2017)⁸;
- The Plan for Stafford Borough 2011 - 2031 Part 1 (Adopted 2014)⁹;

⁷Staffordshire and Stoke-on-Trent Joint Waste Core Strategy 2010 - 2026 (Adopted 2013). Available online at: [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](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)

⁸The Minerals Local Plan for Staffordshire 2015 to 2030 (Adopted 2017). Available online at: <https://www.staffordshire.gov.uk/environment/planning/policy/thedevelopmentplan/mineralslocalplan/mineralsLocalPlan.aspx>

⁹The Plan for Stafford Borough 2011 - 2031 Part 1 (Adopted 2014). Available online at: <http://www.staffordbc.gov.uk/live/Documents/Planning%20Policy/Plan%20for%20Stafford%20Borough/PFSB-Adoption.pdf>

- The Plan for Stafford Borough 2011-2031 Part 2 (Adopted 2017)¹⁰; and
- Eccleshall Neighbourhood Plan 2011-2031 for the parish (Adopted 2016)¹¹.

2.1.20 Emerging policies are not considered as part of the assessment.

2.1.21 There are a number of key planning designations in the area. These include conservation areas, listed buildings, important archaeological assets listed on the National Heritage List for England (NHLE), ancient woodland and mineral safeguarding areas (MSA).

Committed development

2.1.22 Committed developments are defined as developments with planning permission and sites allocated for development or safeguarded for minerals in adopted development plans, on or close to the land required for the Proposed Scheme. Allocations and MSA in the submission drafts of the Minerals Local Plan for Staffordshire (2015) and the Plan for Stafford Borough: Part 2 (2015) have also been included as committed developments. These are listed in Volume 5: Appendix CT-004-000, Planning data and are shown in Volume 5 Planning Data/Committed Development Map Book: Maps CT-13-109b to CT-13-113a-L1.

2.1.23 Where it is likely that committed developments will have been completed by 2020, these have been identified as 'future baseline' schemes and have been taken into account for the purpose of assessing the likely significant environmental effects of the Proposed Scheme, for example, as new receptors as appropriate. Where these developments have a particular relevance to an assessment topic, this is noted in Volume 5: Appendix CT-004-000.

2.1.24 Where there are committed developments that are considered likely to be constructed between 2020 and 2027, i.e. at the same time as the Proposed Scheme, they are considered to be receptors for the operation of HS2, but also potentially to give rise to cumulative impacts with the Proposed Scheme during construction. These 'potential cumulative' developments are noted in Volume 5: Appendix CT-004-000.

2.1.25 There are no potential cumulative developments identified that are relevant to the topic assessments in the Stone and Swynnerton area.

2.1.26 Where a committed development lies wholly or partly within the land required for the Proposed Scheme, consideration has been given as to whether it will be commenced or completed in its proposed form. These developments are noted in Volume 5: Appendix CT-004-000.

2.1.27 Planning applications yet to be determined and sites that are proposed allocations in development plans that have yet to be adopted, on or close to the Proposed Scheme, are termed 'proposed developments'. These are listed in Volume 5: Appendix CT-004-000, but are not included in the assessment.

¹⁰The Plan for Stafford Borough 2011-2031 Part 2 (Adopted 2017). Available online at:

<http://www.staffordbc.gov.uk/live/Documents/Planning%20Policy/Plan%20for%20Stafford%20Borough/PFSB-Part-2-Adoption.pdf>

¹¹Eccleshall Neighbourhood Plan 2011-2031 for the parish (Adopted 2016). Available online at:

<http://www.staffordbc.gov.uk/live/Documents/Planning%20Policy/Neighbourhood%20Planning/Eccleshall---Neighbourhood-Plan-for-Referendum-2011---2031.pdf>

Changes to the design since the working draft EIA Report

2.1.28 Since the working draft EIA Report was published a number of changes have been introduced to the Proposed Scheme. The key changes include (all dimensions below are approximate):

- relocation of the permanent infrastructure maintenance facility from the South Cheshire area (CA5) to the Stone and Swynnerton area, in the form of the Stone Infrastructure Maintenance Base – Rail (IMB-R). The Stone IMB-R will be located on the site of the Stone railhead within the Stone and Swynnerton area. The railhead will be used to manage railway systems construction of the Proposed Scheme and will then be converted for use as the Stone IMB-R on completion of construction. This will be situated on land between the route of the Proposed Scheme and the M6, between the areas of Stone and Yarnfield. Permanent access to the IMB-R will be provided via a new works access slip road from the M6 (southbound) (see Volume 2: Map CT-06-222, C7 to Volume 2: Map CT-06-223, C7);
- realignment of Yarnfield Lane, crossing over the M6 on a replacement bridge, 50m north of the existing overbridge, avoiding the requirement to close Yarnfield Lane for the full construction period. This realignment will be required to accommodate the Stone IMB-R and will pass underneath the permanent maintenance facilities via the Yarnfield Lane IMB-R underbridge, and underneath the route of the Proposed Scheme via the Yarnfield Lane underbridge, rejoining the existing alignment of Yarnfield Lane on the northern side of the Proposed Scheme (see Volume 2: Map CT-06-223, H4 to Volume 2: Map CT-06-223-L1, I4);
- an increase in the length of Filly Brook viaduct, from 190m as reported in the working draft EIA Report, to 449m. This will accommodate the railway systems requirements and reception tracks for the Stone IMB-R (see Volume 2: Map CT-06-222, D5 to B5);
- change in location of Stone Rural Bridleway 0.1135 accommodation overbridge, with the new location 100m north of the existing bridleway alignment. The Stone Rural Bridleway 0.1135 accommodation overbridge will cross the Proposed Scheme at a lower height above track level than proposed in the working draft EIA Report, removing the need to construct large embankments for the realigned Stone Rural Bridleway 0.1135 on both sides of the route of the Proposed Scheme (see Volume 2: Map CT-06-221, H5 to H6);
- provision of a new section of bridleway to replace a connection lost as a result of the closure of Tittensor Road. A diverted Tittensor Road will be provided to maintain connectivity. Swynnerton New Bridleway will run from the closed Tittensor Road on the eastern side of the route of the Proposed Scheme, follow a maintenance access road for 200m before crossing the route via the Swynnerton New Bridleway accommodation underbridge. The bridleway will then turn north-west for 220m to rejoin the existing Tittensor Road alignment on the western side of the route, which will be retained to provide maintenance access (see Volume 2: Map CT-06-225, F4 to F7);

- provision of a new section of bridleway to direct users of Swynnerton Bridleway 54 onto Stab Lane from the diverted Tittensor Road and along a separate bridleway alongside the A51 Stone Road. Swynnerton New Bridleway 2 will provide a connection from 100m south of the Tittensor Road overbridge for 300m in a south-east to north-west direction to rejoin Stab Lane (see Volume 2: Map CT-06-225, D6 to C7);
- closure of Stab Lane to the west of the route of the Proposed Scheme. Access and connectivity between Swynnerton and the A51 Stone Road will be maintained via the diverted Tittensor Road (see Volume 2: Map CT-06-225, C6);
- change in the location of temporary worker accommodation for 240 workers from the Stone railhead main compound (as reported in the working draft EIA Report) to the Yarnfield North embankment satellite compound. This will provide accommodation and welfare facilities for the construction workforce for up to four years and three months (see Volume 2: Map CT-05-223, H5 to G5);
- introduction of two additional satellite compounds for railway systems works. The Stone connection satellite compound will be located on the northern side of the route of the Proposed Scheme, 50m south-east of the Norton Bridge to Stone Railway (see Volume 2: Map CT-05-222, D5). The Stableford auto-transformer station satellite compound will be located on the northern side of the route, opposite Shelton under Harley Farm (see Volume 2: Map CT-05-228, C5);
- a viaduct launching yard will be located to the east of the M6, south of the M6 Meaford viaduct satellite compound to facilitate construction of the M6 Meaford viaduct (see Volume 2: Map CT-05-223, D7 to B6);
- a concrete batching plant will be located within the Stone railhead main compound (see Volume 2: Map CT-05-223, F7); and
- transfer nodes for the storage, loading and unloading of bulk earthworks materials will be located at the Yarnfield North embankment satellite compound and Swynnerton North cutting main compound.

2.1.29 The location and configuration of construction compounds, stockpiles and site haul routes have been considered as part of the design development. In addition, mitigation such as noise barriers and landscape earthworks, green bridges, compensatory planting and replacement ponds and wetlands have been included throughout the Stone and Swynnerton area to reduce effects on receptors.

2.2 Description of the Proposed Scheme

General

2.2.1 The following section describes the main features of the Proposed Scheme in the Stone and Swynnerton area, including the proposed environmental mitigation measures that have been identified. Further information on typical permanent features is provided in Volume 1, Section 5. Similarly, a general description of the

approach to mitigation is provided in Volume 1, Section 9. Some of the ecological mitigation described in this section has been provided on a precautionary basis. This is set out in Section 8, Ecology and biodiversity.

- 2.2.2 Land required for operation of the Proposed Scheme is described in this section and is shown in the Volume 2: CA3 Map Book, Map Series CT-06. Land also required for construction is described in Section 2.3 and shown in the Volume 2: CA3 Map Book, Map Series CT-05.

Overview

- 2.2.3 The route of the Proposed Scheme, referred to in this section of the report as the HS2 main line, will extend from the boundary with the Colwich to Yarlet area (CA2), south-east of Aston-by-Stone, continuing northwards to the south of Stone, passing Swynnerton to the south-west and ending adjacent to Swynnerton Old Park in the north, bordering the Whitmore Heath to Madeley area (CA4), south-east of Whitmore.
- 2.2.4 The Stone IMB-R will be located on land between the HS2 main line and the M6 west of Stone, on both sides of the Norton Bridge to Stone Railway. There will be a connection between the Stone IMB-R and the Norton Bridge to Stone Railway.
- 2.2.5 In the Stone and Swynnerton area the route will run in a general south-east to north-west orientation towards the boundary with the Whitmore Heath to Madeley area (CA4). In general, features are described along the route of the Proposed Scheme from south-east to north-west and to the southern and northern sides of the route as they cross the Proposed Scheme, as shown on Map Series CT-06 in the Volume 2: CA3 Map Book.
- 2.2.6 The description of the Proposed Scheme within the Stone and Swynnerton area has three main components:
- HS2 main line: the route of the Proposed Scheme, continuing from the northern boundary of the Colwich to Yarlet area to Shelton under Harley, where it will enter the Whitmore Heath to Madeley area;
 - Norton Bridge to Stone sidings and Stone IMB-R reception tracks: to provide access to and from the HS2 main line and the existing Norton Bridge to Stone Railway to the Stone IMB-R; and
 - Stone IMB-R: this will provide permanent infrastructure maintenance facilities for the Proposed Scheme.
- 2.2.7 These components and the key features associated with them are set out in the following sections. Where key features are associated with more than one component of the Proposed Scheme, they are described within the section they are first associated with. Where reference is made to the Proposed Scheme, this includes the three components described above collectively.
- 2.2.8 This section of route is illustrated on maps CT-06-219b to CT-06-228a in the Volume 2: CA3 Map Book.
- 2.2.9 All dimensions below are approximate.

HS2 main line

2.2.10 In the Stone and Swynnerton area, the HS2 main line will be carried on the following features:

- viaduct for a total length of 623m (Filly Brook and M6 Meaford viaducts);
- cutting for a total length of 7.5km (Yarlet Central, Yarlet North, Meaford, Swynnerton South, Swynnerton North, Hatton South and Hatton North cuttings); and
- embankment for a total length of 5.4km (Yarlet, Yarnfield South, Yarnfield North, Meaford South, Meaford North, Swynnerton, Hatton and Stableford South embankments).

2.2.11 Embankments and cuttings have been labelled according to their predominant physical characteristics. It is important to note that a number of embankments and cuttings vary as to their depth of cutting or height of embankment, as a result of the topography through which the railway passes. Moreover, there are some sections of cutting over which the railway passes at grade or above ground and some sections of embankment which are at grade or below ground level. In the Stone and Swynnerton area, this applies to the following embankments and cuttings:

- Hatton embankment has some sections where the railway passes up to 1m below existing ground level; and
- Hatton North cutting has some sections where the railway passes up to 8m above existing ground level.

2.2.12 The HS2 main line is described in seven separate sections below.

Yarlet to Stone Rural Bridleway 0.1135 accommodation overbridge

2.2.13 The HS2 main line will continue from the northern boundary of the Colwich to Yarlet area (CA2), 1km north-west of Yarlet, heading in a north-west direction to the Stone Rural Bridleway 0.1135 accommodation overbridge. This section of the route will be within Yarlet Central cutting, continuing on Yarlet embankment and Yarlet North cutting.

2.2.14 This section of route is illustrated on maps CT-06-219b, CT-06-220b, CT-06-220b-R1 and CT-06-221 in the Volume 2: CA3 Map Book.

2.2.15 Key features of this 1.8km section will include:

- Yarlet Central cutting, 770m in length, up to 17m in depth and 106m in width (see Volume 2: Map CT-06-220b, I5 to E6);
- diversion of a 900mm diameter National Grid high-pressure gas pipeline, for 330m to cross under the HS2 main line 30m south-east of its existing alignment (see Volume 2: Map CT-06-220b, H4 to H7);
- an area of grassland habitat creation, to the south of the HS2 main line, to surround an existing pond, 150m to the south-west of Yarlet Central cutting (see Volume 2: Map CT-06-220b, H7);

- an ecological mitigation pond, to provide replacement habitat for reptiles and amphibians, within an area of grassland habitat creation, to the north of the HS2 main line, 50m to the north-east of Yarlet Central cutting (see Volume 2: Map CT-06-220b, H5);
- realignment of Stone Rural Footpath 28, 125m north-west of its existing alignment, to cross over the HS2 main line on the Stone Rural Footpath 28 accommodation overbridge, increasing the length of journey by 240m. The Stone Rural Footpath 28 accommodation overbridge will cross the route at existing ground level, which will be 11m in height above track level (see Volume 2: Map CT-06-220b, H4 to H6);
- areas of woodland habitat creation, to the south and north of the HS2 main line, adjacent to the Stone Rural Footpath 28 accommodation overbridge, extending for 175m to the north-west along the northern side of the route and 250m along the southern side of the route. There will also be an area of woodland habitat creation to the north-east of Yarlet Central cutting, extending for 300m to the east of the route, to provide ecological connectivity between habitats (see Volume 2: Map CT-06-220b, H6 to G5 and F4 to E5);
- Yarlet embankment, 940m in length and up to 15m in height, with landscape earthworks and landscape mitigation planting on both sides of the embankment. The embankment will have slopes graded out to integrate the Proposed Scheme into the surrounding landscape. The gradient of these earthworks on the northern side of the route will be suitable for a return to agricultural use (see Volume 2: Map CT-06-220b, E5 to A5);
- areas of woodland habitat creation along the southern side of the Yarlet embankment, to provide replacement habitat (see Volume 2: Map CT-06-220b, E6 to A6);
- an area of woodland habitat creation, 650m to the north-east of Yarlet embankment, to provide ecological connectivity between habitats (see Volume 2: Map CT-06-220b-R1, D7 to C9);
- Pirehill culvert, 900m north-west of Stone Rural Footpath 28 accommodation overbridge, for diversion of an unnamed watercourse (a tributary of the River Trent). The watercourse will be diverted for 550m, 300m south-east of its existing alignment, running parallel with the HS2 main line and to cross under the route to drain into a replacement ecological mitigation pond. This diversion will also incorporate a 30m realignment of an unnamed watercourse, joining the diverted unnamed watercourse immediately to the west of Pirehill culvert (see Volume 2: Map CT-06-220b, C5 to C6);
- six ecological mitigation ponds, to provide replacement habitat for reptiles and amphibians, within an area of woodland habitat creation, to the north of the HS2 main line, 60m north-east of Yarlet embankment (see Volume 2: Map CT-06-220b, C2 to C5);
- a balancing pond for railway drainage, within an area of grassland habitat creation, to the south of the HS2 main line, 250m to the south of Stone Rural

Bridleway 0.1135 accommodation overbridge. Access will be provided from a maintenance access track connecting to Stone Rural Bridleway 0.1135 (see Volume 2: Map CT-06-221, I6);

- realignment of Stone Rural Bridleway 0.1135, 100m north-west of its existing alignment, increasing the length of journey by 130m, to cross over the HS2 main line on Stone Rural Bridleway 0.1135 accommodation overbridge, 1.2m in height above existing ground level and 10m above track level (see Volume 2: Map CT-06-221, H5 to H6); and
- Yarlet North cutting, 94m in length, 13m in depth and 73m in width in this section (see Volume 2: Map CT-06-221, H5 and H6).

2.2.16 This section of the route of the Proposed Scheme will include two emergency access points located 175m north-west of the Stone Rural Footpath 28 accommodation overbridge on either side of the HS2 main line. There will also be maintenance access routes and hedgerow planting throughout this section. There will also be minor utilities works within this section, which may include works to low voltage overhead or underground lines, gas pipes, sewers and telecommunication cables.

2.2.17 Construction of this section will be managed from the Yarlet embankment satellite compound and the Yarlet North cutting satellite compound, which are described in Section 2.3, and shown on Maps CT-05-221 and CT-05-222 in the Volume 2: CA3 Map Book.

Stone Rural Bridleway 0.1135 accommodation overbridge to the B5026 Eccleshall Road overbridge

2.2.18 The HS2 main line will continue from the Stone Rural Bridleway 0.1135 accommodation overbridge, running adjacent to the M6 in the Yarlet North cutting, to the B5026 Eccleshall Road overbridge. Provision of railway access to the Stone IMB-R is described under the Norton Bridge to Stone sidings and Stone IMB-R reception tracks section.

2.2.19 This section of route is illustrated on maps CT-06-221, CT-06-222, CT-06-222-L1 and CT-06-222-R1 in the Volume 2: CA3 Map Book.

2.2.20 Key features of this 1.6km section will include:

- continuation of Yarlet North cutting, 1.6km in length, 13m in depth and 111m in width in this section (see Volume 2: Map CT-06-221, H6 to Volume 2: Map CT-06-222, F5);
- an area of grassland habitat creation, to the south of the HS2 main line, extending 350m north-west of the Stone Rural Bridleway 0.1135 accommodation overbridge (see Volume 2: Map CT-06-221, H6 to F6);
- realignment of Stone Rural Footpath 32, crossing the HS2 main line 500m south-east of its existing alignment, increasing the length of journey by 520m around Walton House Farm to the north of the HS2 main line. The realigned Stone Rural Footpath 32 will cross over the HS2 main line on the Stone Rural Footpath 32 accommodation overbridge at existing ground level, 12m above track level. The realigned footpath will continue south and then west to

connect to the existing Stone Rural Footpath 32 alignment on the eastern side of the M6 (see Volume 2: Map CT-06-221, E8 to B4);

- an area of woodland habitat creation, on the southern side of the HS2 main line, adjacent to the Stone Rural Footpath 32 accommodation overbridge, to provide replacement habitat (see Volume 2: Map CT-06-221, E6 to D6);
- an area of grassland habitat creation, to the south of the HS2 main line, surrounding an existing pond, adjacent to the Stone Rural Footpath 32 accommodation overbridge (see Volume 2: Map CT-06-221, D8 to C6);
- an area of grassland habitat creation, on the northern side of the HS2 main line, surrounding two existing ponds 100m to the north-east of Yarlet North cutting (see Volume 2: Map CT-06-221, E4);
- the Walton Heath package substation¹², 4m by 4m, on the southern side of the HS2 main line, 150m to the north-west of the Stone Rural Footpath 32 accommodation overbridge (see Volume 2: Map CT-06-221, D6);
- an area of landscape mitigation planting, along the northern side of the HS2 main line, from south-east of the Walton Farm House, extending along Yarlet north cutting for 980m (see Volume 2: Map CT-06-221, A5 to E5 to Volume 2: Map CT-06-222 H5);
- nine ecological mitigation ponds and associated grassland habitat creation, to provide replacement habitat for reptiles and amphibians, on the southern side of the HS2 main line, 350m to the west of Stone Rural Footpath 32 accommodation overbridge (see Volume 2: Map CT-06-221, D8 to C6);
- an area of grassland habitat creation, on the northern side of the HS2 main line, surrounding three existing ponds, 100m to the south of Walton Heath Farm (see Volume 2: Map CT-06-221, C4 to C5);
- realignment of the B5026 Eccleshall Road over a distance of 900m, 25m north-west of its current alignment, with no overall increase in journey length, to cross over the HS2 main line on the B5026 Eccleshall Road overbridge. The overbridge will be 2.4m above existing ground level and 10m above track level, connecting into its existing alignment east of the M6 (see Volume 2: Map CT-06-222, H1 to G7 to Volume 2: Map CT-06-222-R1, H9 to H10); and
- an area of landscape mitigation planting will extend along the southern side of the realigned B5026 Eccleshall Road for 600m, to provide visual screening for residential properties to the east of the Proposed Scheme (see Volume 2: Map CT-06-222, H1 to G7 to Volume 2: Map CT-06-222-R1, H9 to H10).

2.2.21 This section of the route of the Proposed Scheme will include three maintenance access points allowing vehicle access to the route. There will also be maintenance access routes and hedgerow planting throughout this section. There will also be minor

¹² Provides non-traction power to the Proposed Scheme

utilities works within this section, which may include works to low voltage overhead or underground lines, gas pipes, sewers and telecommunication cables.

- 2.2.22 Construction of this section will be managed from the Yarlet North cutting satellite compound, which is described in Section 2.3, and shown on Map CT-05-222 in the Volume 2: CA3 Map Book.

B5026 Eccleshall Road overbridge to Yarnfield Lane underbridge

- 2.2.23 The HS2 main line will continue from the B5026 Eccleshall Road overbridge in Yarlet North cutting, passing onto Yarnfield South embankment and crossing the Norton Bridge to Stone Railway and Filly Brook via the Filly Brook viaduct. The HS2 main line will continue from the Filly Brook viaduct onto Yarnfield North embankment, passing over Yarnfield Lane via the Yarnfield Lane underbridge.
- 2.2.24 This section of route is illustrated on maps CT-06-222, CT-06-222-L1, CT-06-222-R1, CT-06-223 and CT-06-223-L1 in the Volume 2: CA3 Map Book.

- 2.2.25 Key features of this 1.4km section will include:

- a section of Yarlet North cutting, 366m in length, up to 8m in depth and 65m in width (see Volume 2: Map CT-06-222, G5 to F5);
- two ecological mitigation ponds, to provide replacement habitat for reptiles and amphibians, within an area of grassland habitat creation, on the northern side of the HS2 main line, 100m to the north-east of the B5026 Eccleshall Road overbridge (see Volume 2: Map CT-06-222, H4 to G4);
- an area of landscape mitigation planting, along the northern side of the HS2 main line, extending 300m north-west of the realigned B5026 Eccleshall Road to provide visual screening for Micklow House Farm (see Volume 2: Map CT-06-222, G5 to F5);
- areas of grassland habitat creation, 750m in length, between the M6 and Proposed Scheme and extending from the B5026 Eccleshall Road and the Norton Bridge to Stone Railway (see Volume 2: Map CT-06-222, G6 to D7);
- Yarnfield South embankment, 225m in length and up to 5m in height, with woodland habitat creation on the southern side of the HS2 main line, to provide replacement habitat, and landscape earthworks and landscape mitigation planting on the northern side of the HS2 main line to integrate the Proposed Scheme into the surrounding landscape (see Volume 2: Map CT-06-222, F5 to D5);
- two balancing ponds for railway drainage and drainage from the Stone IMB-R within areas of landscape mitigation planting and grassland habitat creation on the northern side of the HS2 main line, 50m south of the Norton Bridge to Stone Railway. Access will be provided from an access road connecting to the B5026 Eccleshall Road (see Volume 2: Map CT-06-222, E5 to D5);
- Filly Brook viaduct, 449m in length and up to 15m in height (see Volume 2: Map CT-06-222, D5 to B5);

- an area of grassland habitat creation, on the northern side of the HS2 main line, adjacent to the Filly Brook viaduct and to the north of the Norton Bridge to Stone Railway (see Volume 2: Map CT-06-222, D4 to C5);
- replacement floodplain storage areas on the southern side of the HS2 main line, adjacent to the Norton Bridge to Stone Railway. Following excavation the area will be re-graded back to tie into existing ground level (see Volume 2: Map CT-06-222, C6 to C7);
- realignment of Filly Brook for 1.3km, starting adjacent to the western side of the M6, 200m north of Yarnfield Lane. The realignment of Filly Brook will remain on the western side of the M6 for 600m in a south-eastern direction crossing underneath the Yarnfield Lane realignment via a new culvert, and the M6 via an existing culvert. The watercourse realignment will then cross underneath Filly Brook viaduct, 200m north-east of the Norton Bridge to Stone Railway, rejoining its existing alignment on the northern side of the HS2 main line (see Volume 2: Map CT-06-223-L1, G1 to Volume 2: Map CT-06-223, C5 to C8);
- an area of woodland habitat creation and enhancement to provide replacement woodland habitat, on the northern side of the HS2 main line, immediately north of the Filly Brook viaduct and extending to Yarnfield Lane (see Volume 2: Map CT-06-222, C5 to A5);
- a section of Yarnfield North embankment, 348m in length and 12m in height in this section, with landscape earthworks and landscape mitigation planting on the northern side to integrate the Proposed Scheme into the surrounding landscape (see Volume 2: Map CT-06-222, B5 to A5);
- a balancing pond for railway drainage, on the northern side of the HS2 main line 50m north of Filly Brook viaduct. Access will be provided from an access road connecting to Yarnfield Lane to the north (see Volume 2: Map CT-06-222, B4);
- a balancing pond for highway drainage, with grassland habitat creation, on the northern side of the HS2 main line, 50m south of Yarnfield Lane. Access will be provided from an access road connecting to Yarnfield Lane to the north (see Volume 2: Map CT-06-223, H6);
- realignment of Yarnfield Lane over a distance of 1.2km, 25m north-west of its current alignment with no change in journey length. The realigned Yarnfield Lane will cross under the HS2 main line via the Yarnfield Lane underbridge. The realignment will continue under the Stone IMB-R via the Yarnfield Lane IMB-R underbridge, and over the M6 via the Yarnfield Lane M6 overbridge replacement. The Yarnfield Lane M6 overbridge replacement will be 9m in height above existing ground level. To the south-west of the M6, there will be landscape earthworks and landscape mitigation planting on both sides of the realigned Yarnfield Lane (see Volume 2: Map CT-06-223, H4, and Volume 2: Map CT-06-223-L1, I3 to H1);

- a maintenance and emergency access to the northbound lanes of the M6 from the realigned Yarnfield Lane with landscape mitigation planting on both sides (see Volume 2: Map CT-06-223-L1, H2 to H1); and
- a highway pumping station for drainage of the realigned Yarnfield Lane, on the south of Yarnfield Lane underbridge (see Volume 2: Map CT-06-223, H7).

2.2.26 This section of the route of the Proposed Scheme will include three maintenance access points allowing vehicle access to the route. There will also be maintenance access routes and hedgerow planting throughout this section. There will also be minor utilities works within this section, which may include works to low voltage overhead or underground lines, gas pipes, sewers and telecommunication cables.

2.2.27 Construction of this section will be managed from the Yarlet North cutting satellite compound and Yarnfield North embankment satellite compound, which are described in Section 2.3, and shown on Maps CT-05-222 and CT-05-223 in the Volume 2: CA3 Map Book.

Yarnfield Lane underbridge to Meaford North embankment

2.2.28 The HS2 main line will continue on the Yarnfield North embankment and then enter Meaford cutting. The route will then pass along Meaford South embankment, crossing over the M6 via the M6 Meaford viaduct and continuing in a north-west direction on Meaford North embankment.

2.2.29 This section of route is illustrated on maps CT-06-223, CT-06-223-L1, CT-06-224 and CT-06-224-R1 in the Volume 2: CA3 Map Book.

2.2.30 Key features of this 2.2km section will include:

- continuation of Yarnfield North embankment, 413m in length and up to 10m in height in this section, with landscape earthworks and woodland habitat creation on the northern side of the HS2 main line to provide replacement habitat and ecological connectivity. The area of woodland habitat creation will extend 250m to the north-east of the HS2 main line, parallel to the realigned Yarnfield Lane (see Volume 2: Map CT-06-223, H5 to G6);
- a landscape, noise and flood mitigation bund, with woodland habitat creation, 430m in length and 3m in height, to the west of the M6 and north of the realigned Yarnfield Lane. The bund will provide noise and visual screening for properties to the west of the Proposed Scheme and flood attenuation for the Stone IMB-R and Norton Bridge to Stone Railway (see Volume 2: Map CT-06-223, F10 to F9 and Volume 2: Map CT-06-223-L1, H2 to F1);
- a replacement floodplain storage area on the west side of the M6, 100m north of the realigned Yarnfield Lane. Following excavation the area will be re-graded back to tie into existing ground level (see Volume 2: Map CT-06-223-L1, H2 to G1);
- an area of wetland habitat creation on the west of the M6, extending 870m north from the realigned Yarnfield Lane, to provide replacement habitat (see Volume 2: Map CT-06-223, H10 to D9);

- Yarnfield Lane auto-transformer station, 46m by 24m in area, on the southern side of the HS2 main line within the area of the Stone IMB-R, 50m north-west of the Yarnfield Lane underbridge. Access will be provided via a maintenance access road from the Stone IMB-R (see Volume 2: Map CT-06-223, H7);
- fourteen ecological mitigation ponds, to provide replacement habitat for reptiles and amphibians, with areas of grassland habitat creation, on the northern side of the HS2 main line, to the north of the realigned Yarnfield Lane (see Volume 2: Map CT-06-223, H5 to F4);
- realignment of Stone Rural Footpath 33 by 800m to the north-west of its existing alignment, running adjacent to the northern side of the HS2 main line, and crossing under the M6 Meaford viaduct, increasing journey length by 710m (see Volume 2: Map CT-06-223, G7 to D8);
- Meaford cutting, 380m in length, up to 2m in depth and 54m in width (see Volume 2: Map CT-06-223, F7 to D7);
- an area of woodland habitat creation, on the northern side of the HS2 main line, 500m north of the realigned Yarnfield Lane, to provide replacement woodland habitat and ecological connectivity between fragmented habitats. There will also be two areas of grassland habitat creation, providing replacement terrestrial habitat for reptiles and amphibians around existing ponds (see Volume 2: Map CT-06-223, F6 to D5);
- extension of the existing M6 underpass 150m south-west of the HS2 main line by 3.5m as a consequence of the widening of the M6 central reserve by 13m for the M6 Meaford viaduct piers. Access under the M6 for the realigned Stone Rural Footpath 33 will be maintained via the extended underpass (see Volume 2: Map CT-06-223, D8);
- four areas of landscape mitigation planting, on the southern side of the HS2 main line, between the M6 and Yarnfield, including three sections adjacent to Swynnerton Bridleway 39 (see Volume 2: Map CT-06-223-L1, G5 to D1);
- Meaford South embankment, 343m in length and up to 9m in height, with landscape earthworks and landscape mitigation planting on the northern side of the HS2 main line to integrate the Proposed Scheme into the surrounding landscape (see Volume 2: Map CT-06-223, D7 to B7);
- an area of grassland habitat creation adjacent to the Meaford South embankment to provide new habitat and ecological connectivity between fragmented existing habitats (see Volume 2: Map CT-06-223, D6 to C6);
- the M6 Meaford viaduct, 174m in length and up to 16m in height (see Volume 2: Map CT-06-223, B7 to A7);
- realignment of southbound lanes of the M6 for 1.1km and widening of the central reservation to accommodate the M6 Meaford viaduct piers (see Volume 2: Map CT-06-224, G4 to Volume 2: Map CT-06-223, B7);

- five ecological mitigation ponds, to provide replacement habitat for reptiles and amphibians, within an area of grassland habitat creation, on the southern side of the HS2 main line, 100m south-west of the M6 Meaford viaduct (see Volume 2: Map CT-06-224, J7 to H7);
- realignment of an unnamed watercourse, for 200m, 50m east of its existing alignment and passing underneath the M6 Meaford viaduct (see Volume 2: Map CT-06-224, I5 to I6);
- Meaford North embankment, 928m in length and up to 18m in height. The embankment will have landscaping earthworks and landscape mitigation planting to integrate the Proposed Scheme into the surrounding landscape. There will also be areas of woodland habitat creation on the northern side of the HS2 main line (see Volume 2: Map CT-06-224, I6 to E5);
- a balancing pond for railway drainage, within an area of grassland habitat creation, between the northern side of the HS2 main line and the western side of the M6. Access will be provided from Swynnerton Footpath 27, 600m to the north (see Volume 2: Map CT-06-224, H5 to G5);
- diversion of two overhead power lines, one Western Power Distribution 33kV overhead line and one Scottish Power Energy Networks 132kV overhead line over a length of 1.2km. The power lines will be diverted underground, both on their existing alignments, for 500m, passing under the HS2 main line and the M6 in a north-east to south-west direction, 100m south of the Swynnerton Footpath 27 accommodation overbridge (see Volume 2: Map CT-06-224, F1 to F9 and Volume 2: Map CT-06-224-R1, F9 to);
- an ecological mitigation pond, to provide replacement habitat for reptiles and amphibians, on the northern side of the HS2 main line, adjacent to the M6 (see Volume 2: Map CT-06-224, F4 to E4);
- widening of Stone Rural Byway Open to All Traffic (BOAT) 34 to 3.5m wide and the provision of passing bays, for 675m from the A51 Bury Bank to join Swynnerton Footpath 27, to provide maintenance access for the Proposed Scheme (see Volume 2: Map CT-06-224, E1 to E3 and Volume 2: Map CT-06-224-R1, F6 to E10);
- realignment of Swynnerton Footpath 27, 75m south-east of its existing alignment, increasing the length of journey by 80m, to cross under the HS2 main line via the Swynnerton Footpath 27 accommodation underbridge. The underbridge will provide pedestrian and vehicular access for Blakelow Farm on both sides of the HS2 main line and access to properties within the Swynnerton Estate, including Grange Cottages and Swynnerton Grange (see Volume 2: Map CT-06-224, E6 to E4);
- diversion of Swynnerton Footpath 17 for 400m in length 400m south-east of its existing alignment, increasing the length of journey by 190m, joining Swynnerton Footpath 27 on the southern side of the HS2 main line (see Volume 2: Map CT-06-224, E4 to C6);

- an ecological mitigation pond, within an area of grassland habitat creation, to provide replacement habitat for reptiles and amphibians, on the southern side of the HS2 main line, 350m to the north-west of the Swynnerton Footpath 27 accommodation underbridge (see Volume 2: Map CT-06-224, E8); and
- an area of grassland habitat creation, on the northern side of the HS2 main line, 150m north-west of the Swynnerton Footpath 27 accommodation underbridge (see Volume 2: Map CT-06-224, D5).

2.2.31 This section of the route of the Proposed Scheme will include one emergency access point on the southern side of the HS2 main line, adjacent to the Meaford North embankment, and three maintenance access points allowing vehicle access to the route. There will also be maintenance access routes and hedgerow planting throughout this section. There will also be minor utilities works within this section, which may include works to low voltage overhead or underground lines, gas pipes, sewers and telecommunication cables.

2.2.32 Construction of this section will be managed from the Yarnfield North embankment satellite compound, Stone railhead main compound, the M6 Meaford viaduct satellite compound and the Meaford North embankment satellite compound, which are described in Section 2.3 and shown on Maps CT-05-223 and CT-05-224 in the Volume 2: CA3 Map Book.

Meaford North embankment to A519 Newcastle Road overbridge

2.2.33 From the Meaford North embankment, the HS2 main line will pass into the Swynnerton South cutting before continuing onto the Swynnerton embankment. It will continue into the Swynnerton North cutting until reaching the A519 Newcastle Road overbridge.

2.2.34 This section of route is illustrated on maps CT-06-224, CT-06-225, CT-06-226 and CT-06-226-R1 in the Volume 2: CA3 Map Book.

2.2.35 Key features of this 2.7km section will include:

- Swynnerton South cutting, 365m in length, up to 3m in depth and 36m in width (see Volume 2: Map CT-06-224, D5 to C5);
- two ecological mitigation ponds, to provide replacement habitat for reptiles and amphibians, within an area of grassland habitat creation, 200m south-west of the HS2 main line (see Volume 2: Map CT-06-224, C7 and C8);
- Swynnerton embankment, 1km in length and up to 7m in height, with landscape earthworks to integrate the Proposed Scheme into the surrounding landscape, with woodland and grassland habitat creation on the northern and southern sides of the HS2 main line. A noise fence barrier, 3m in height, will run along the southern side of the HS2 main line to provide acoustic screening for the residents of Swynnerton (see Volume 2: Map CT-06-224, C5 to A5 and Volume 2: Map CT-06-225, J5 to E5);
- an area of woodland habitat creation, 250m north-east of the HS2 main line, immediately adjacent to the M6 (see Volume 2: Map CT-06-224, B3);

- Swynnerton Estate South underbridge and associated planting, to provide vehicle access across the HS2 main line and to allow space for the passage of wildlife. Surface water drainage under the HS2 main line will be made via a watercourse crossing within the Swynnerton Estate South underbridge and under the M6 via an existing culvert. Planting adjacent to this underbridge will facilitate ecological connectivity across the route of the Proposed Scheme. Further detail regarding this underbridge is presented in Section 8, Ecology and biodiversity (see Volume 2: Map CT-06-224, B4 to B6);
- two balancing ponds for railway drainage, within areas of grassland habitat creation, on the northern side of the HS2 main line, one adjacent to the Swynnerton Estate South underbridge, and one adjacent to Sandyford Farm. Access will be provided from a track connecting to the existing Tittensor Road to the north-west (see Volume 2: Map CT-06-225, I4 and G4);
- four areas of woodland habitat creation and two ecological mitigation ponds within an area of grassland habitat creation, 500m to the west of the HS2 main line, immediately to the north of Hall Lane, to provide ecological connectivity between existing habitats (see Volume 2: Map CT-06-225, I9 to G8);
- Swynnerton New Bridleway, 800m in length and extending south-east from the existing Tittensor Road, on the northern side of the HS2 main line and running parallel to the route. The Swynnerton New Bridleway will pass under the HS2 main line via the Swynnerton New Bridleway accommodation underbridge. The new bridleway will then extend to the north-west for 200m to rejoin Tittensor Road on the southern side of the HS2 main line. The underbridge will also provide vehicle access to Sandyford Farm (see Volume 2: Map CT-06-225, F4 to F7);
- Swynnerton culvert, 180m north-west of Swynnerton New Bridleway accommodation underbridge, for the realignment of an unnamed watercourse under the HS2 main line (see Volume 2: Map CT-06-225, F5);
- a 450m section of Tittensor Road will be permanently closed to through traffic from Sandyford Farm on the northern side of the HS2 main line to Glebe House on the southern side of the HS2 main line, with sections of the closed road retained as maintenance access for the Proposed Scheme. On the southern side of the HS2 main line, Tittensor Road will be diverted for 800m in length and 375m north-west of its existing alignment, extending the journey length between Swynnerton and the A51 Stone Road by 390m. The diverted Tittensor Road will cross over the HS2 main line via Tittensor Road overbridge, 1m above existing ground level and 9m above track level (see Volume 2: Map CT-06-225, F9 to D4);
- a balancing pond for highway drainage within an area of grassland habitat creation 250m south-west of the HS2 main line, adjacent to the diverted Tittensor Road. Access will be provided from the section of Tittensor Road retained for maintenance access (see Volume 2: Map CT-06-225, E8);
- Swynnerton auto-transformer station, 58m by 25m, on the southern side of the HS2 main line, 200m west of Sandyford Farm. Access will be provided from

the southern section of the existing Tittensor Road retained for maintenance access (see Volume 2: Map CT-06-225, F5 to E5);

- diversion of a 600mm diameter National Grid high-pressure gas pipeline, for 140m in length, to cross the HS2 main line 25m north-west of its existing alignment (see Volume 2: Map CT-06-225, E5);
- diversion of a 600mm diameter National Grid high-pressure gas pipeline, for 170m in length, to cross the diverted Tittensor Road 30m south of its existing alignment (see Volume 2: Map CT-06-225, E6 to D7);
- four ecological mitigation ponds, to provide replacement habitat for reptiles and amphibians, with areas of grassland habitat creation, on the northern side of the HS2 main line, 100m east of Tittensor Road overbridge (see Volume 2: Map CT-06-225, E4 to D4);
- a section of Swynnerton North cutting, 1.3km in length, up to 18m in depth and 117m in width in this section, with landscape mitigation planting on the southern side of the HS2 main line and an area of woodland habitat creation to provide replacement habitat and ecological connectivity on the northern side of the HS2 main line (see Volume 2: Map CT-06-225, E5 to A6 and Volume 2: Map CT-06-226 J6 to F6);
- three ecological mitigation ponds, to provide replacement habitat for reptiles and amphibians, within areas of grassland habitat creation on the northern side of the HS2 main line, 250m north of Tittensor Road overbridge (see Volume 2: Map CT-06-225, C2 to C4);
- an ecological mitigation pond, to provide replacement habitat for reptiles and amphibians, on the southern side of the HS2 main line, 300m north-west of Tittensor Road overbridge (see Volume 2: Map CT-06-225, C6);
- diversion of the A51 Stone Road over a distance of 1.6km to join the A519 Newcastle Road via a new roundabout 400m north-east of its existing alignment, extending the journey length by 320m. A 900m section of the A51 Stone Road will be closed where it crosses the HS2 main line and on the southern side of the HS2 main line, to a point 250m east of the A519 Newcastle Road roundabout (see Volume 2: Map CT-06-225, D4 to A4 and Volume 2: Map CT-06-226, F4 to J5);
- Stab Lane will be closed on the southern side of the HS2 main line, immediately north of Whitehouse, 175m south of where it currently intersects the A51 Stone Road. Access and connectivity between Swynnerton and the A51 Stone Road will be maintained via the diverted Tittensor Road (see Volume 2: Map CT-06-225, C6);
- closure of a 74m section of Swynnerton Bridleway 54 on the northern side of the HS2 main line, with users directed alongside the diverted A51 Stone Road on a segregated route for 350m, connecting to the diverted Tittensor Road (see Volume 2: Map CT-06-226, B4 to D4);

- Swynnerton New Bridleway 2, which will extend for 300m along the southern side of the HS2 main line, connecting the diverted Tittensor Road with the retained section of Stab Lane (see Volume 2: Map CT-06-225, D6 to C7);
- Bottom Lane will be closed on the northern side of the HS2 main line, 275m to the north of where it currently intersects the A51 Stone Road. Users will be diverted along the A51 Stone Road, increasing the length of journey by 150m (see Volume 2: Map CT-06-226, H4);
- two areas of woodland habitat creation on the northern side of the HS2 main line to provide replacement habitat and ecological connectivity, one area 400m to the north-east of the HS2 main line and adjacent to Swynnerton Bridleway 54 and one area 550m to the north-east of the HS2 main line at the northern end of Bottom Lane, connecting with existing woodland on the western side of Swynnerton Bridleway 54 (see Volume 2: Map CT-06-226, H2 to G1 and F1 and Volume 2: Map CT-06-226-R1 I10 to G7);
- an area of grassland habitat creation, surrounding an existing pond 500m to the northern side of the HS2 main line, at the junction of Bottom Lane and the A519 Newcastle Road (see Volume 2: Map CT-06-226, F1 to F2);
- an area of woodland habitat creation on the southern side of the HS2 main line to provide replacement habitat and ecological connectivity, 300m to the south-east of the A519 Newcastle Road overbridge (see Volume 2: Map CT-06-226, H6);
- a balancing pond for highway drainage, within an area of grassland habitat creation, on the southern side of the HS2 main line, 100m to the south-east of the A519 Newcastle Road overbridge. Access will be provided from the A519 Newcastle Road (see Volume 2: Map CT-06-226, F6); and
- the A519 Newcastle Road will cross over the HS2 main line on its existing alignment via the A519 Newcastle Road overbridge, 3m in height above existing ground level and 10m in height above track level (see Volume 2: Map CT-06-226, F4 to F7).

2.2.36 This section of the route of the Proposed Scheme will include four maintenance access points allowing vehicle access to the route. There will also be maintenance access routes and hedgerow planting throughout this section. There will also be minor utilities works within this section, which may include works to low voltage overhead or underground lines, gas pipes, sewers and telecommunication cables.

2.2.37 Construction of this section will be managed from the Meaford North embankment satellite compound, the Swynnerton embankment satellite compound and the Swynnerton North cutting main compound, which are described in Section 2.3 and shown on Maps CT-05-224, CT-05-225 and CT-05-226 in the Volume 2: CA3 Map Book.

A519 Newcastle Road overbridge to Swynnerton Footpath 52 accommodation underbridge

- 2.2.38 The HS2 main line will continue in the Swynnerton North cutting from the A519 Newcastle Road overbridge, crossing under Swynnerton Heath Farm overbridge and continuing on Hatton embankment to the Swynnerton Footpath 52 accommodation underbridge. In this section, 170m of the route will be at existing ground level.
- 2.2.39 This section of route is illustrated on maps CT-06-226, and CT-06-227 in the Volume 2: CA3 Map Book.
- 2.2.40 Key features of this 1.6km long section will include:
- continuation of Swynnerton North cutting, 671m in length, 8m in depth and 63m in width in this section (see Volume 2: Map CT-06-226, C5 to F6);
 - an area of grassland habitat creation, on the northern side of the HS2 main line, extending for 400m north-west of the A519 Newcastle Road overbridge (see Volume 2: Map CT-06-226, F5 to D5);
 - an area of woodland habitat creation, on the southern side of the HS2 main line for 150m between the A519 Newcastle Road overbridge and the Swynnerton Heath Farm overbridge (see Volume 2: Map CT-06-226, F6 to E6);
 - Swynnerton Heath Farm overbridge, with a height of 5m above existing ground level and 9m above track level, to the north-west of Swynnerton Heath Farm, to provide vehicle access across the HS2 main line to the Swynnerton Estate (see Volume 2: Map CT-06-226, E5 to E6);
 - an area of grassland habitat creation, to provide replacement terrestrial habitat for great crested newt, around an existing pond to the west of the Swynnerton Heath Farm overbridge (see Volume 2: Map CT-06-226, E6 to E7);
 - a balancing pond for railway drainage, with an area of grassland habitat creation, located at Clifford's Wood on the southern side of the HS2 main line. Access will be provided from a track connecting to the realigned A519 Newcastle Road to the south-east (see Volume 2: Map CT-06-226, C6 to D7);
 - areas of woodland habitat creation, on the northern and southern sides of the HS2 main line to provide replacement habitat within Clifford's Wood (see Volume 2: Map CT-06-226, B5 to D5);
 - a section of Hatton embankment, 900m in length and up to 9m in height in this section (see Volume 2: Map CT-06-227, J5 to F6);
 - Swynnerton Estate Central underbridge to provide vehicular access to the Swynnerton Estate across the HS2 main line and surface water drainage under the route. Planting adjacent to this underbridge will facilitate ecological connectivity across the route of the Proposed Scheme. Further detail regarding this underbridge is presented in Section 8 Ecology and biodiversity (see Volume 2: Map CT-06-226, B1 to B2);

- areas of grassland and woodland habitat creation extending out 300m from the northern and southern sides of the HS2 main line around the Common Lane Cold War Bunkers, to the north-east and west of the Swynnerton Estate Central underbridge and providing replacement habitat and ecological connectivity between fragmented existing habitats (see Volume 2: Map CT-06-227, I8 to H3);
- Swynnerton Estate North green overbridge, with a height of 9m above existing ground and track levels, adjacent to the Common Lane Cold War Bunkers. The overbridge will provide vehicle access to the Swynnerton Estate across the HS2 main line. There will be landscape mitigation planting on both sides and planting across the overbridge to facilitate ecological connectivity across the route of the Proposed Scheme. Landscape earthworks will be provided on the southern side of the Swynnerton Estate North green overbridge. Further detail regarding this overbridge is presented in Section 8 Ecology and biodiversity (see Volume 2: Map CT-06-227, H5 to H6);
- an area of grassland habitat creation, 100m north-east of the HS2 main line, north of the Common Lane Cold War Bunkers, to provide replacement habitat and ecological connectivity between habitats (see Volume 2: Map CT-06-227, G4 to G5);
- a balancing pond for railway drainage, within an area of grassland habitat creation, on the southern side of the HS2 main line, 150m south of Swynnerton Footpath 52 accommodation underbridge. Access will be provided from a track connecting to Common Lane (Swynnerton) (see Volume 2: Map CT-06-227, G6 to F6);
- an area of grassland habitat creation, 200m south-west of the HS2 main line, surrounding an existing pond (see Volume 2: Map CT-06-227, G7 to G8);
- Plantation culvert, 120m south-east of Swynnerton Footpath 52 accommodation underbridge, for diversion of a 450m section of an unnamed watercourse under the HS2 main line (see Volume 2: Map CT-06-227, F6);
- an area of grassland habitat creation, 200m north-east of the HS2 main line, surrounding an existing pond (see Volume 2: Map CT-06-227, F4);
- realignment of Swynnerton Footpath 52, 20m south-east of its existing alignment and increasing the length of journey by 15m, crossing under the HS2 main line in the Swynnerton Footpath 52 accommodation underbridge. The underbridge will allow pedestrian and vehicle access to Hatton Farm across the HS2 main line and provide surface water drainage under the route (see Volume 2: Map CT-06-227, F6 to E5); and
- widening of the existing Common Lane (Swynnerton)/Swynnerton Footpath 52 to 3.5m and provision of passing bays along a 1.2km section, to the south-west of the HS2 main line between the A51 Stone Road and the Swynnerton Footpath 52 accommodation overbridge, to enable maintenance access to the Proposed Scheme (see Volume 2: Map CT-06-227, G10 to E5 and Volume 2: Map CT-06-227-L1, G1).

2.2.41 This section of the route of the Proposed Scheme will include two maintenance access points allowing vehicular access to the route. There will also be maintenance access routes and hedgerow planting throughout this section. There will also be minor utilities works within this section, which may include works to low voltage overhead or underground lines, gas pipes, sewers and telecommunication cables.

2.2.42 Construction of this section will be managed from the Swynnerton North cutting main compound and Hatton South cutting satellite compound, which are described in Section 2.3 and shown on Maps CT-05-226 and CT-05-227 in the Volume 2: CA3 Map Book.

Swynnerton Footpath 52 accommodation underbridge to Shelton under Harley

2.2.43 The HS2 main line will continue on Hatton embankment, passing into the Hatton South cutting, Hatton North cutting, and then onto Stableford South embankment. This section of the route will end at Shelton under Harley, at the boundary with the Whitmore Heath to Madeley area (CA4).

2.2.44 This section of route is illustrated on maps CT-06-227 to CT-06-228a in the Volume 2: CA3 Map Book.

2.2.45 Key features of this 2.3km section will include:

- continuation of Hatton embankment, for 80m in length and up to 8m in height in this section (see Volume 2: Map CT-06-227, F6 to E6);
- an area of woodland habitat creation, on the northern side of the HS2 main line, extending 700m north-west of the Swynnerton Footpath 52 accommodation underbridge (see Volume 2: Map CT-06-227, F5 to B5);
- Hatton South cutting, 1.3km in length, up to 10m in depth and 72m in width (see Volume 2: Map CT-06-227, E6 to A5 and Volume 2: Map CT-06-228, J6 to F6);
- realignment of Swynnerton Footpath 15, for 130m on both sides of the HS2 main line, to cross over the route on Swynnerton Footpath 15 green overbridge crossing the HS2 main line on its existing horizontal alignment, increasing the length of journey by 10m. The Swynnerton Footpath 15 green overbridge will be 3.5m in height above existing ground level and 10m above track level, it will also contain planting to facilitate ecological connectivity across the Proposed Scheme. Further detail regarding this overbridge is presented in Section 8 Ecology and biodiversity (see Volume 2: Map CT-06-227, C5 to C6);
- an area of woodland habitat creation, extending north-east from the HS2 main line, 200m north of the Swynnerton Footpath 15 green overbridge, incorporating an area of grassland habitat surrounding an existing pond (see Volume 2: Map CT-06-227, B5 to B4);
- Rowe Farm overbridge, 1.6m in height above existing ground level and 10m in height above track level, 580m north-west of Swynnerton Footpath 15 green overbridge. The overbridge will provide vehicle access to Rowe Farm across the HS2 main line (see Volume 2: Map CT-06-228a, H5 to H6);

- Dog Lane drop inlet culvert, 290m north-west of Rowe Farm overbridge, for surface water drainage under the HS2 main line (see Volume 2: Map CT-06-228a, F5);
- Hatton North cutting, 695m in length, up to 5m in depth and 48m in width, with landscape mitigation planting on both sides of the HS2 main line (see Volume 2: Map CT-06-228a, F5 to C5);
- realignment of Dog Lane over a distance of 950m, 125m north-west of its existing alignment, increasing the length of journey by 100m, to cross over the HS2 main line on the Dog Lane overbridge, 9m in height above existing ground level and 10m above track level. An area of woodland habitat creation at the south-eastern end of the realignment will provide visual screening for residents of properties at The Rowe and Yew Tree Park (see Volume 2: Map CT-06-228a, G3 to E9);
- a balancing pond for highway drainage, on the northern side of the HS2 main line, 150m north of Dog Lane overbridge. Access will be provided from Bent Lane (North) (see Volume 2: Map CT-06-228a, E5);
- diversion of Bent Lane to the northern side of the HS2 main line, over a distance of 750m, to create Bent Lane (North), which will run parallel to the HS2 main line, and pass south of Shelton under Harley, before continuing into the Whitmore Heath to Madeley area (CA4), with an increase in journey length of 55m (see Volume 2: Map CT-06-228a, E5 to A5);
- realignment of Bent Lane on the southern side of the HS2 main line, over a distance of 350m, to create Bent Lane (South), running parallel to the route of the Proposed Scheme and continuing for 350m into the Whitmore Heath to Madeley area (CA4) where Bent Lane (South) will be closed, with a reduction in journey length of 570m (see Volume 2: Map CT-06-228a, D7 to A6);
- Shelton culvert, 250m north-west of Dog Lane overbridge, for surface water drainage under the HS2 main line (see Volume 2: Map CT-06-228a, D5);
- a balancing pond for railway drainage, on the southern side of the HS2 main line, 350m west of Dog Lane overbridge. Access will be provided from Bent Lane (South) (see Volume 2: Map CT-06-228a, D8 to C7);
- Swynnerton Footpath 10 will be realigned around the balancing pond on the southern side of the HS2 main line over a distance of 100m, 25m west of its existing alignment, increasing journey length by up to 10m. Where Swynnerton Footpath 10 crosses the HS2 main line, it will be diverted 50m north-west of its existing alignment, to cross under the HS2 main line via Swynnerton Footpath 10 accommodation underbridge, increasing the length of journey by 65m. The Swynnerton Footpath 10 accommodation underbridge will provide pedestrian and vehicle access to Shelton under Harley Farm and incorporate the realignment of an unnamed watercourse under the HS2 main line (see Volume 2: Map CT-06-228a, D8 to C8 and B6 to B5);

- Stableford South embankment, 165m in length and up to 10m in height with landscape mitigation planting on the northern side of the HS2 main line to provide visual screening for residents of Shelton under Harley Farm (see Volume 2: Map CT-06-228a, C6 to B6);
- diversion of a Scottish Power Energy Networks 132kV overhead power line for 870m, of which 250m will be diverted underground to cross under the HS2 main line in a north-east to south-west direction, 100m to the south-east of the Swynnerton Footpath 10 underbridge (see Volume 2: Map CT-06-228a, C8 to B2);
- a replacement floodplain storage area on the southern side of the HS2 main line, 100m south-west of Swynnerton Footpath 10 accommodation underbridge. Following excavation the area will be re-graded back to tie into existing ground level (see Volume 2: Map CT-06-228a, B6);
- Stableford auto-transformer station, 58m by 25m, on the northern side of the HS2 main line, 40m south-east of Swynnerton Footpath 10 underbridge. Access will be provided from a track connecting to the diverted Bent Lane (North) (see Volume 2: Map CT-06-228a, B5); and
- a replacement floodplain storage area on the northern side of the Proposed Scheme, adjacent to the Swynnerton Footpath 10 accommodation underbridge. Following excavation, the area will be re-graded back to tie into existing ground level (see Volume 2: Map CT-06-228a, B4).

2.2.46 This section of the route of the Proposed Scheme will include three emergency access points, two adjacent to Rowe Farm overbridge and one to the south-west of the Swynnerton Footpath 10 underbridge, and one maintenance access point allowing vehicle access to the route. There will also be maintenance access routes and hedgerow planting throughout this section. There will also be minor utilities works within this section, which may include works to low voltage overhead or underground lines, gas pipes, sewers and telecommunication cables.

2.2.47 Construction of this section will be managed from the Hatton South cutting satellite compound, Hatton North cutting satellite compound and the Stableford auto-transformer station satellite compound, which are described in Section 2.3 and shown on maps CT-05-227, E5, and CT-05-228a, D5 to C4 and C5 in the Volume 2: CA3 Map Book.

Norton Bridge to Stone sidings and Stone IMB-R reception tracks

2.2.48 The Proposed Scheme will require the construction of new sidings adjacent to the south of the Norton Bridge to Stone Railway, on the northern side of the Proposed Scheme, to provide for access from the existing railway into the Stone IMB-R, as shown on Figure 4. The Proposed Scheme will require the construction of reception tracks to the southern end of the Stone IMB-R providing for access onto the HS2 main

line (once constructed) and the existing Norton Bridge to Stone Railway via the new sidings, both via the Stone headshunt¹³.

2.2.49 Key features of this section will include:

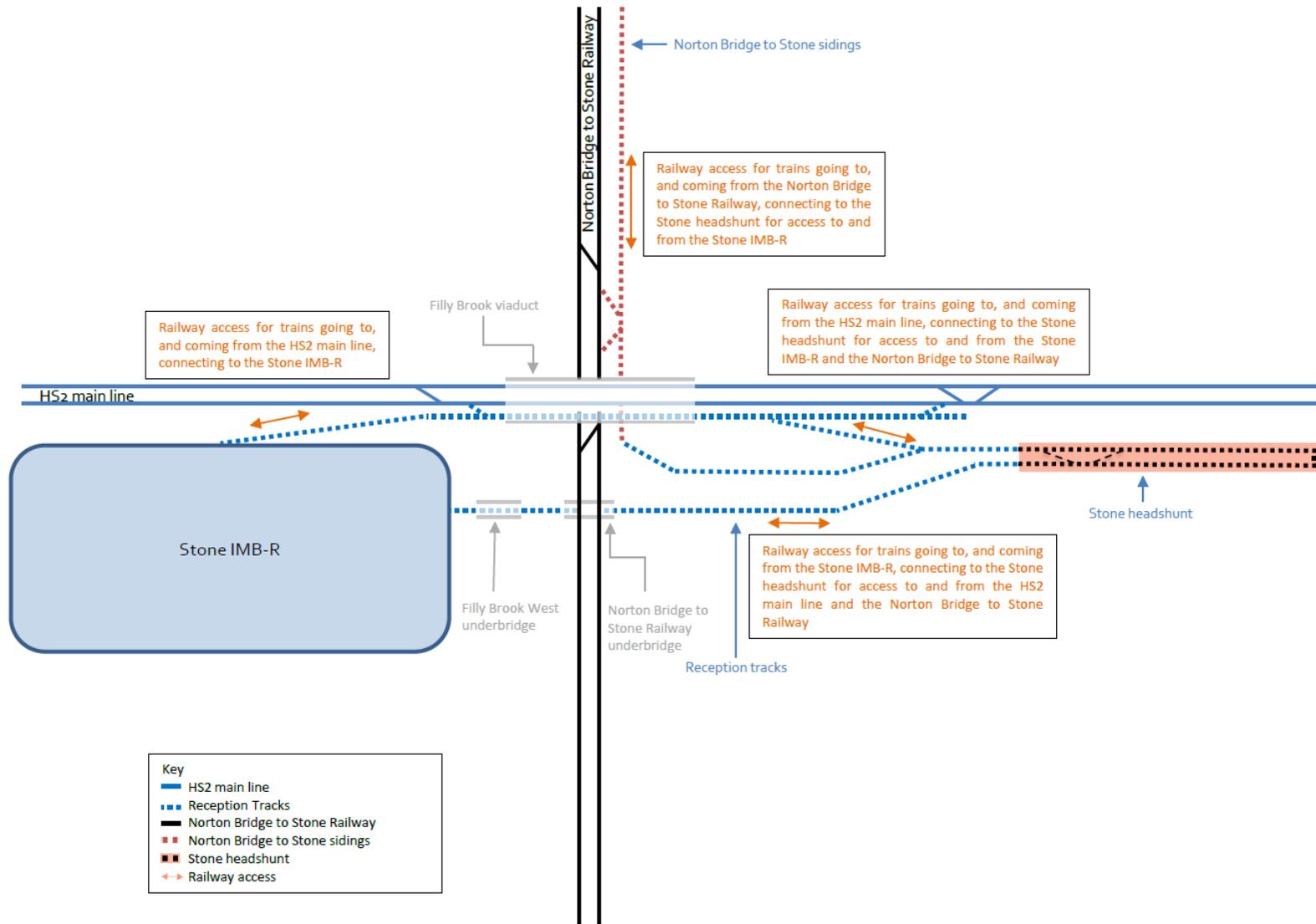
- reception tracks, 1.5km in length, which will diverge from the HS2 main line 500m to the north-west of the Stone Rural Footpath 32 accommodation overbridge and pass over the Norton Bridge to Stone Railway underbridge to the Stone IMB-R. Trains will use these reception tracks to enter the Stone IMB-R via the Stone headshunt (see Volume 2: Map CT-06-222, J6 to C6);
- the Stone headshunt, which will extend south-east for 600m, parallel to the HS2 main line. From the Stone headshunt, trains will be able to access either the Stone IMB-R, reception tracks, or the Norton Bridge to Stone sidings (see Volume 2: Map CT-06-221, C6 to B6 and Volume 2: Map CT-06-222, J6 to H6);
- Stone retaining wall 1, 169m in length and up to 5m in height, to retain a section of the reception tracks connecting to the Norton Bridge to Stone sidings adjacent to reception tracks entering the Stone IMB-R. Stone retaining wall 1 will be up to 6m below existing ground level (see Volume 2: Map CT-06-222, E7);
- Norton Bridge to Stone sidings will connect with the reception tracks under Filly Brook viaduct and extend north-east for 1km, along the southern side of the Norton Bridge to Stone Railway. These sidings will connect the HS2 main line and Stone IMB-R to the Norton Bridge to Stone Railway (see Volume 2: Map CT-06-222, D5 to D1 and Volume 2: Map CT-06-222 R1, E7 to D10);
- modifications to the existing Norton Bridge to Stone Railway over a length of 1.4km, adjacent to the Norton Bridge to Stone sidings (see Volume 2: Map CT-06-222, D7 to Volume 2: Map CT-06-222-R1, D5);
- Norton Bridge to Stone Railway underbridge above the Norton Bridge to Stone Railway, to allow railway access under the Stone IMB-R reception tracks (see Volume 2: Map CT-06-222, D7);
- Filly Brook West underbridge to allow passage of the realigned Filly Brook under the Stone IMB-R reception tracks (see Volume 2: Map CT-06-222, C7);
- a tributary of Filly Brook will be realigned for 470m in length, on the southern side of the Norton Bridge to Stone sidings, with an area of wetland habitat creation at its eastern extent (see Volume 2: Map CT-06-222, D2 to Volume 2: Map CT-06-222-R1, E8); and
- an area of landscape mitigation planting, 1km in length, along the southern side of the Norton Bridge to Stone sidings. A landscape bund 90m in length and 3m in height, will be located at the eastern extent of the Norton Bridge to Stone sidings. A noise fence barrier, 2m in height will run along the top of the landscape bund. The landscape mitigation planting, bund and barrier will

¹³ A headshunt is a length of track provided to release trains in the direction in which they originated, as well as allowing trains to change tracks and direction.

provide visual and acoustic screening for Micklow House Farm and residents of properties in Walton (see Volume 2: Map CT-06-222-R1, E6 to E7).

- 2.2.50 This section of the route will include maintenance access routes and hedgerow planting throughout this section. There will also be minor utilities works within this section, which may include works to low voltage overhead or underground lines, gas pipes, sewers and telecommunication cables.
- 2.2.51 Construction of this section will be managed from the Yarlet North cutting satellite compound, Yarnfield North embankment satellite compound, Stone connection satellite compound and Stone Railhead main compound, which are described in Section 2.3, and shown on Map CT-05-222, G5 to G4 and D5, and Map CT-05-223, G6 and J9 to C7.

Figure 4: Norton Bridge to Stone sidings and Stone IMB-R reception tracks



Stone IMB-R

- 2.2.52 The Stone IMB-R will occupy land between the HS2 main line and the M6, north of the Norton Bridge to Stone Railway. Reception tracks will connect the HS2 main line to the Stone IMB-R and the Norton Bridge to Stone Railway (described in the previous section). Site access to and from the Stone IMB-R will be provided via a new southbound slip road off the M6 and an upgraded maintenance and emergency access, as well as via the realigned Yarnfield Lane. The facility will operate as a base for maintenance activities to support the railway infrastructure for the Proposed Scheme.
- 2.2.53 The key features and works associated with the Stone IMB-R are shown on maps CT-06-222, CT-06-222-R1, CT-06-222-L1, CT-06-223 and CT-06-223-L1 and will include:
- the Stone IMB-R, a permanent maintenance facility covering 40ha of land, extending 1.6km along the HS2 main line from the Norton Bridge to Stone Railway. The facility will operate as a base for maintenance activities and will be 300m wide at its widest point (see Volume 2: Map CT-06-223, J9 to C7). It will comprise:
 - a secure storage area, 200m by 40m, and a two-storey workshop measuring 100m by 40m;
 - a single-storey covered storage and light maintenance workshop area of 0.4ha;
 - an external storage area with a concrete base measuring 270m by 75m, containing a small welfare unit 10m by 10m and storage unit 20m by 20m;
 - two sidings, one comprising 75m hard standing and one extending for 100m with train washing facilities and fuel storage;
 - car parking for up to 100 vehicles;
 - two two-storey units, 50m by 25m, with ground floor stores and workshops and first floor office and welfare facilities;
 - trackform storage areas, one 400m by 10m and one 275m by 10m, and one concrete store 125m by 10m in area; and
 - stabling sidings to allow the handling and storage of rail infrastructure replacement materials and maintenance trains;
 - Stone retaining wall 2, 170m in length and up to 5m in height, of which 15m will be above existing ground level. Stone retaining wall 2 will retain a section of the Stone IMB-R, adjacent to the Filly Brook viaduct on the southern side of the HS2 main line (see Volume 2: Map CT-06-222, C6 to B6);
 - a balancing pond for railway drainage from the Stone IMB-R, within an area of grassland habitat creation, 100m south-east of the realigned Yarnfield Lane and adjacent to the M6, with an access track connecting to the Stone IMB-R to the north (see Volume 2: Map CT-06-223, I9);
 - a balancing pond for railway drainage from the Stone IMB-R, located between the M6 and the Stone IMB-R, 100m north-west of the realigned Yarnfield Lane.

Access will be provided from a track from the Stone IMB-R (see Volume 2: Map CT-06-223, H9); and

- a new southbound slip road off the M6 and an upgraded maintenance and emergency access for access to the Stone IMB-R (see Volume 2: Map CT-06-223, I10-F10).

2.2.54 This section of the route of the Proposed Scheme will include two maintenance access points allowing vehicle access to the route. There will also be maintenance access routes throughout this section. There will also be minor utilities works within this section, which may include works to low voltage overhead or underground lines, gas pipes, sewers and telecommunication cables.

2.2.55 Construction of this section will be managed from the Yarnfield North embankment satellite compound and Stone railhead main compound, which are described in Section 2.3 and as shown on Map CT-05-223, G6 and J9 to C10 in the Volume 2: CA3 Map Book.

Demolitions

2.2.56 Demolition of five residential properties, 18 commercial and business properties (including farm outbuildings) and three other structures will be required to construct the permanent features in the Stone and Swynnerton area. Demolitions will be managed from the same construction compounds as the permanent features with which they are associated. The identified demolitions are listed in Section 2.3 under the relevant construction compounds.

2.3 Construction of the Proposed Scheme

2.3.1 This section sets out the key construction activities that are envisaged to build the Proposed Scheme in the Stone and Swynnerton 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 will be commissioned;
- an indicative construction programme; and
- monitoring arrangements during the construction period.

2.3.2 The construction arrangements described in this section provide the basis for the assessment presented in this ES.

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

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

- 2.3.5 During the construction phase, public roads and PRow routes will remain open for public use wherever reasonably practicable. Where such routes cross the Proposed Scheme and require diversion, the alternative road or PRow crossing the Proposed Scheme will be constructed prior to any closure of existing roads or PRow, wherever reasonably practicable. Where they 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 will be provided where it is safe and reasonably practicable to do so.
- 2.3.6 Volume 1, Section 5 and Section 6 provide details of the typical construction techniques. For the purposes of the environmental assessment, standard construction techniques as provided in Volume 1, Section 6 have been assumed.

Code of Construction Practice

- 2.3.7 All contractors will be required to comply with a Code of Construction Practice (CoCP). In addition, Local Environmental Management Plans (LEMPs) will be produced for each local authority area. The CoCP and LEMPs will be the means of controlling the construction works associated with the Proposed Scheme, and set out monitoring requirements, with the objective of ensuring that the effects of the works on people and the natural environment are reduced insofar as reasonably practicable. The CoCP will contain general control measures and standards to be implemented throughout the construction process.
- 2.3.8 A draft CoCP has been prepared and is published as part of this ES, in Volume 5: Appendix CT-003-000. It will remain a draft document through the parliamentary process and will be finalised at Royal Assent. The CoCP will set out measures to be implemented by the nominated undertaker.

Overview of the construction process

- 2.3.9 Building and preparing the Proposed Scheme for operation will comprise the following general stages:
- advance works including: site investigations further to those already undertaken and preliminary mitigation works;
 - civil engineering works including: extraction of sand and gravel from borrow pits; establishment of construction compounds; site haul routes, 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.

2.3.10 General information about the construction process is set out in more detail in Volume 1, Section 6, and the following sections of the draft CoCP (see Volume 5: Appendix CT-003-000) including:

- the approach to environmental management during construction and the role of the CoCP (Section 2);
- working hours (Section 5);
- management of construction traffic (Section 14); and
- handling of construction materials (Section 15).

Advance works

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

- further detailed site investigations and surveys;
- further detailed environmental surveys;
- advance mitigation works including, where appropriate, contamination remediation, habitat creation and translocation, landscape planting and built heritage survey and investigation;
- advance site access works; and
- site establishment with temporary fence construction; along with soil stripping and vegetation removal.

Engineering works

Introduction

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

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

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

2.3.14 The construction of the Proposed Scheme will be divided into sections, each of which will be managed from compounds. The compounds will act as the main interface between the construction work sites and the public highway, as well as performing other functions as described below. Compounds will either be main compounds or

satellite compounds. Satellite compounds are generally smaller. Compounds will either be used for civil engineering works, for railway installation works, or for both.

- 2.3.15 One main civil engineering compound, the Swynnerton North cutting main compound, will be located in the Stone and Swynnerton area. This will manage eight civil engineering satellite compounds in the Stone and Swynnerton area.
- 2.3.16 Two of these civil engineering compounds will continue to be used as satellite compounds for railway systems works following the completion of civil engineering works. In addition, there will be three further railway systems compounds throughout the Stone and Swynnerton area, one of which is the Stone railhead main compound, which will support the railway systems works throughout the Proposed Scheme.
- 2.3.17 Figure 5 shows the management relationship for civil engineering works compounds and Figure 6 for the railway installation works. Details about the works associated with individual compounds are provided in subsequent sections of this report.
- 2.3.18 Figure 8 provides a programme of works, which will be managed from each construction compound. All dates and durations of activities set out in this section are indicative.

General overview of construction compounds

- 2.3.19 Main compounds will be used by core project management staff (i.e. engineering, planning and construction delivery) and commercial and administrative staff. These teams will directly manage some works and coordinate the works at the satellite compounds. In general, a main compound will 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.
- 2.3.20 In the Stone and Swynnerton area there will be accommodation at the Yarnfield North embankment satellite compound for the construction workforce. Details of the location and duration of worker accommodation are provided in the description of the compound.
- 2.3.21 Satellite compounds will be used as the base to manage specific works along a section of the route. Depending on the nature and extent of the works to be managed, these satellite compounds could include office accommodation for staff, local storage for plant and materials, car parking for staff and site operatives, and welfare facilities.
- 2.3.22 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 will generally be within and adjacent to compounds and areas of

construction activity. These areas are referred to as material stockpiles and those adjacent to compounds are shown on maps CT-05-219b to CT-05-228a in the Volume 2: CA3 Map Book.

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

Construction traffic routes, site haul routes and transfer nodes

- 2.3.24 The proposed Stone railhead will connect with the existing railway network for the delivery of large materials required for the construction of the railway systems and the movement of excavated materials. This will reduce the volume of construction vehicles using the public road network.
- 2.3.25 The construction compounds will provide the interface between the construction works and the public road or railway network. The likely road routes to access compounds in the Stone and Swynnerton area are described in the subsequent sections of this report.
- 2.3.26 It may be necessary to undertake minor works including a number of minor highways and junction improvements along public roads that will be used as construction traffic routes but are at a distance from the route of Proposed Scheme. These minor works are reported in Volume 4: Off-route effects. 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 will allow transfer of material between road vehicles and site vehicles during construction to balance traffic movements on the road network. These areas are referred to as transfer nodes and are shown on maps CT-05-219b to CT-05-228a in the Volume 2: CA3 Map Book.

Use of borrow pits

- 2.3.27 A borrow pit is an area where material, usually sand and gravel, is excavated for use in the construction of nearby infrastructure projects.
- 2.3.28 There are no borrow pits proposed in the Stone and Swynnerton area, however, material from borrow pits in neighbouring areas may be used for construction of earthworks within the Stone and Swynnerton area, if required. Excavated material may also be used to backfill or restore borrow pits. Insofar as reasonably practicable, this material will be transported via site haul routes.

Figure 5: Construction compounds showing key civil engineering works within the Stone and Swynnerton area

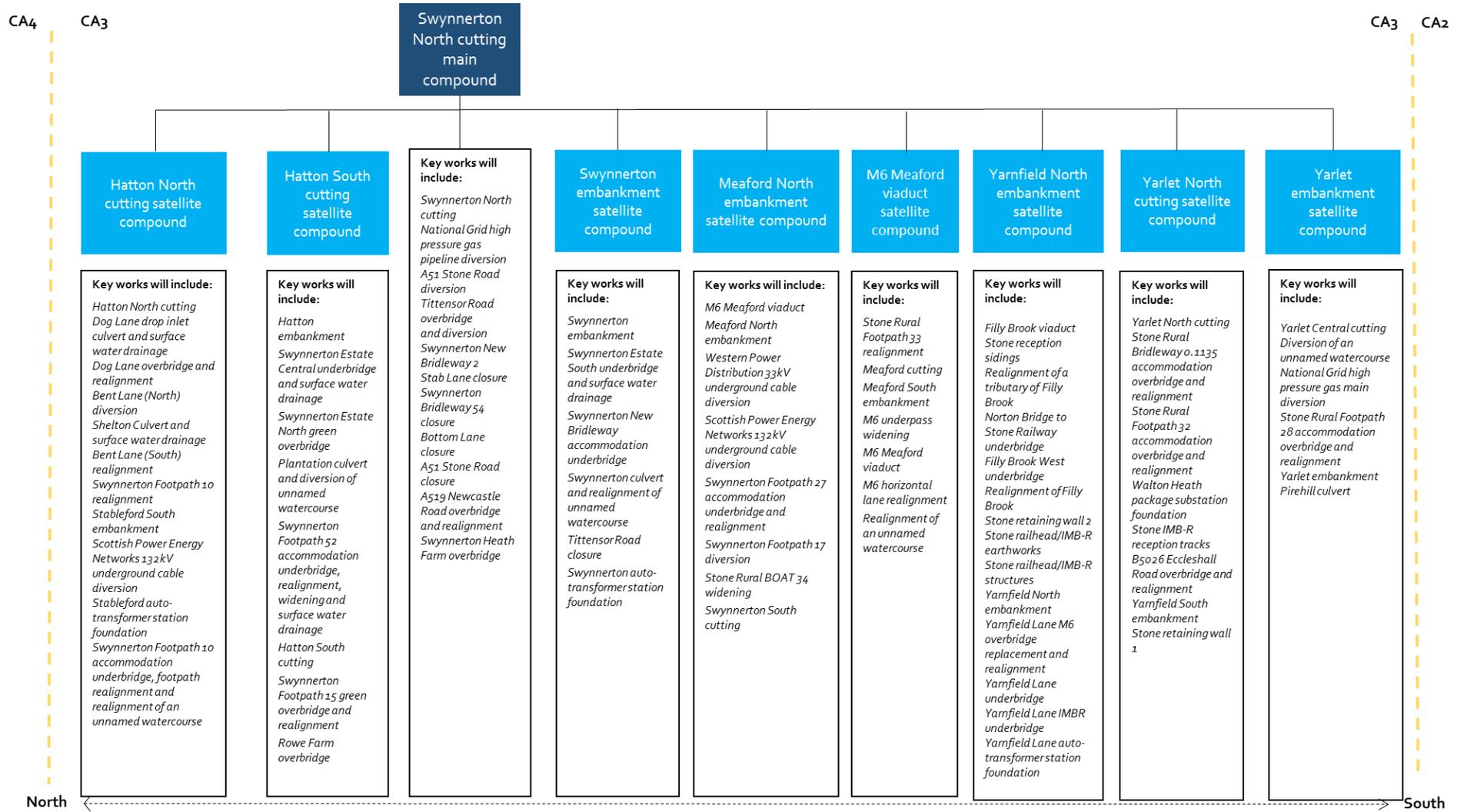
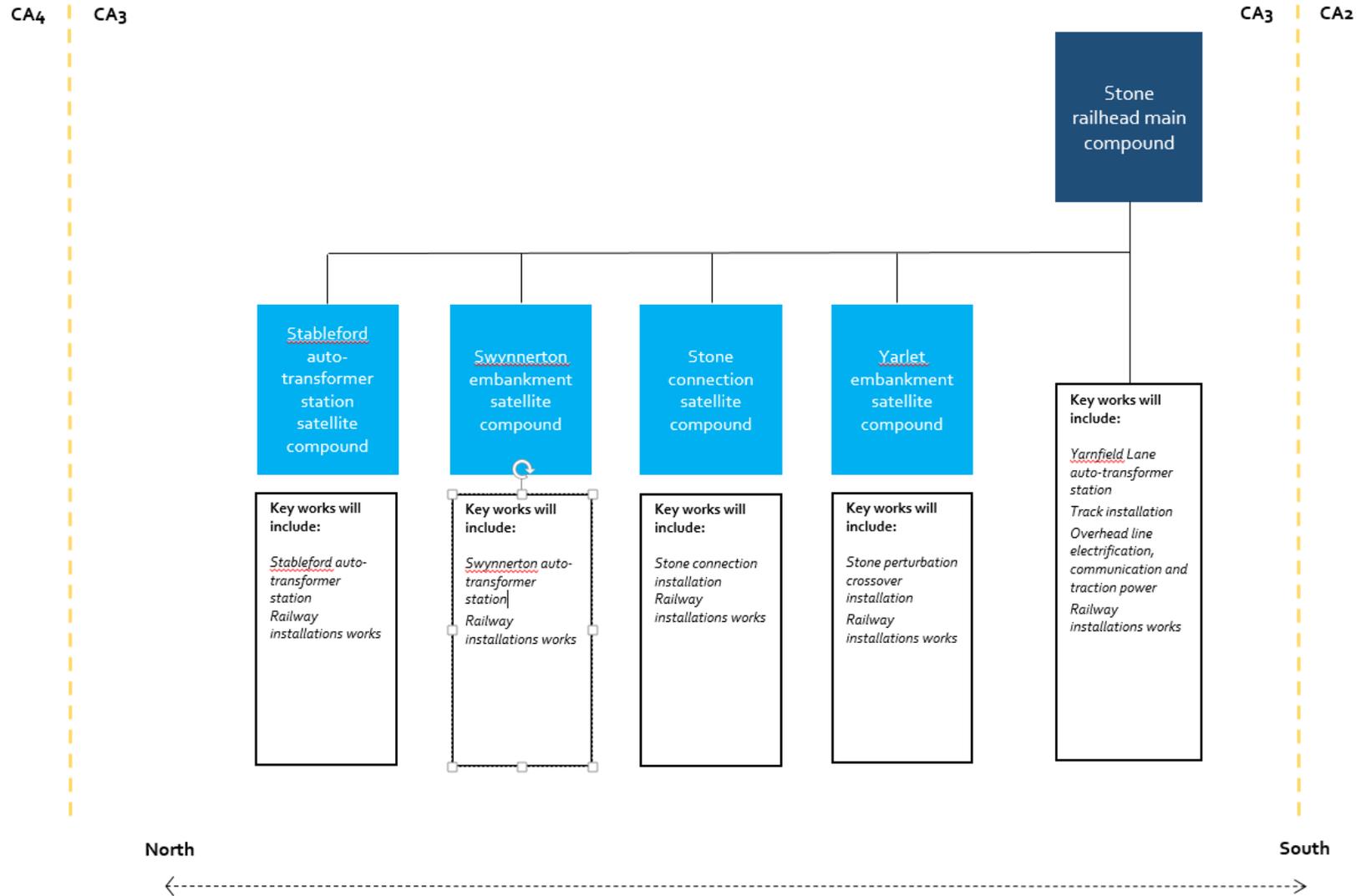


Figure 6: Construction compounds for railway installation works showing key works within the Stone and Swynnerton area



2.3.29 This section provides details of the works to be managed from the construction compounds in the Stone and Swynnerton area, including duration of works, number of workers and a summary of the works to be undertaken. All dates and durations of activities and number of workers are indicative.

Yarlet embankment satellite compound

2.3.30 This compound (see Map CT-05-221, I7 to H6) will provide for civil engineering works and railway installation works and will:

- be operational for a total of five years and six months, commencing during 2021. Civil engineering works will be managed from this compound for a period of three years and six months, followed by railway systems works for a period of two years;
- support 35 civil engineering workers per day (50 workers at peak times);
- support 10 railway installation workers per day (15 workers at peak times);
- be accessed via the Stone Rural Bridleway 0.1135 for site set up. Thereafter the compound will be accessed via site haul routes along the line of the route of the Proposed Scheme; and
- provide four temporary materials stockpiles on the northern and southern sides of the route of the Proposed Scheme (see Map CT-05-221, G5 to D7).

2.3.31 There will be no worker accommodation associated with this compound.

2.3.32 The works to be managed from this compound will not require demolition of any buildings.

2.3.33 The compound will be used to manage the construction of Stone Rural Footpath 28 accommodation overbridge, which will take one year and six months to complete. It will also be used to manage construction of the following earthworks:

- Yarlet Central cutting, which will take one year and six months to complete; and
- Yarlet embankment, which will take two years to complete.

2.3.34 Material for the Yarlet embankment will be received from Yarlet Central cutting, from cuttings elsewhere along the Proposed Scheme, and/or from borrow pits.

2.3.35 The works to be managed from this compound will require temporary diversion of the Stone Rural Footpath 28 for a period of one year and six months during construction. This will divert users for 450m, adjacent to the site haul route on the southern side of the route of the Proposed Scheme. On completion of construction, Stone Rural Footpath 28 will be permanently realigned 125m north-west of its existing alignment.

2.3.36 The compound will be used to manage the construction of Pirehill culvert for the diversion of an unnamed watercourse (a tributary of the River Trent). The watercourse will be diverted for 550m, 300m south-east of its existing alignment, which will take nine months to complete.

- 2.3.37 The works to be managed from this compound will require permanent diversion of a 900mm diameter National Grid high-pressure gas pipeline, 330m in length and 30m south-east of its existing alignment, which will take one year to complete.
- 2.3.38 Key railway systems installation works to be managed from this compound include the installation of crossover connections on the route of the Proposed Scheme, which will take one year and six months to complete.
- 2.3.39 Finalisation works will include site reinstatement, landscaping and planting.

Yarlet North cutting satellite compound

- 2.3.40 This compound (see Map CT-05-222, G4 to G5) will provide for civil engineering works and will:
- be operational for four years and three months, commencing during 2021;
 - support 95 civil engineering workers per day (135 workers at peak times);
 - be accessed initially via the B5026 Eccleshall Road for site set up and then via site haul routes along the line of the route of the Proposed Scheme; and
 - provide two temporary materials stockpiles on the northern and southern sides of the route of the Proposed Scheme (see Map CT-05-222, J7 to J6 and F5 to E5).
- 2.3.41 There will be no worker accommodation associated with this compound.
- 2.3.42 Demolition of buildings associated with two properties will be required as a result of the works to be managed from this compound, described in Table 1.

Table 1: Demolitions to be managed from the Yarlet North cutting satellite compound

Description	Location	Feature resulting in the demolition
Residential		
Two-storey residential cottage	Little Micklow Farm	Yarlet North cutting
Commercial		
Outbuilding	Walton House Farm	Yarlet North cutting
Other		
Solar panel area	Walton House Farm	Yarlet North cutting

- 2.3.43 The compound will be used to manage the construction of the following bridges:
- Stone Rural Bridleway 0.1135 accommodation overbridge, which will take one year and six months to complete;
 - Stone Rural Footpath 32 accommodation overbridge, which will take nine months to complete; and
 - B5026 Eccleshall Road overbridge, which will take one year and nine months to complete.

- 2.3.44 The compound will be used to manage construction of the following earthworks:
- Yarlet North cutting, which will take three years to complete; and
 - Yarnfield South embankment, which will take three years to complete.
- 2.3.45 Material for the Yarnfield South embankment will be received from Yarlet North cutting, from cuttings elsewhere along the Proposed Scheme, and/or from borrow pits.
- 2.3.46 This compound will be used for the establishment of the earthworks and foundation for the construction of the Norton Bridge to Stone sidings, which will take nine months to complete.
- 2.3.47 This compound will be used to manage the construction of foundations for the Stone headshunt for the Stone railhead (see Stone railhead main compound), which will take three years to complete.
- 2.3.48 The compound will also be used to manage the construction of Stone retaining wall 1, which will take one year and three months to complete.
- 2.3.49 The works to be managed from this compound will require permanent realignment of the B5026 Eccleshall Road over a distance of 900m, 25m north-west of its current alignment, which will take six months to complete. The B5026 Eccleshall Road will remain open during the construction of the B5026 Eccleshall Road overbridge, which will be constructed offline¹⁴. Temporary establishment of lane restrictions to the B5026 Eccleshall Road will be required for a period of three months to allow the formation of construction access to enable the construction of the realigned B5026 Eccleshall Road and overbridge. On completion of the construction, there will be tie-in works and traffic management, which will require a number of weekend closures to connect the existing road with the new alignment.
- 2.3.50 The works to be managed from this compound will require the following works to PRoW:
- temporary diversion of Stone Rural Bridleway 0.1135, for a period of one year and six months during construction. This will divert users for 350m, adjacent to the site haul route on the west side of the route of the Proposed Scheme. On completion of construction, Stone Rural Bridleway 0.1135 will be permanently realigned for 350m; and
 - permanent realignment of Stone Rural Footpath 32 over a length of 1.4km will be required as a result of the works to be managed from this compound. This realignment will cross the Proposed Scheme 500m south-east of its existing alignment, and will take nine months to complete.
- 2.3.51 The compound will be used to manage the construction of the Walton Heath package substation, which will take six months to complete.
- 2.3.52 Finalisation works will include site reinstatement, landscaping and planting.

¹⁴ Offline works are generally constructed along or nearby the existing routes which will remain open during construction.

Stone connection satellite compound

- 2.3.53 This compound (see Map CT-05-222, D5) will provide for the installation of the Norton Bridge to Stone sidings, connecting to the Stone railhead and IMB-R, and will:
- be operational for nine months, commencing during 2021;
 - support 45 railway installation workers per day (100 workers at peak times); and
 - be accessed via the B5026 Eccleshall Road to the south-east.
- 2.3.54 There will be no worker accommodation associated with this compound.
- 2.3.55 The works to be managed from this compound will not require demolition of any buildings.
- 2.3.56 Finalisation works will include site reinstatement, landscaping and planting.

Stone railhead main compound

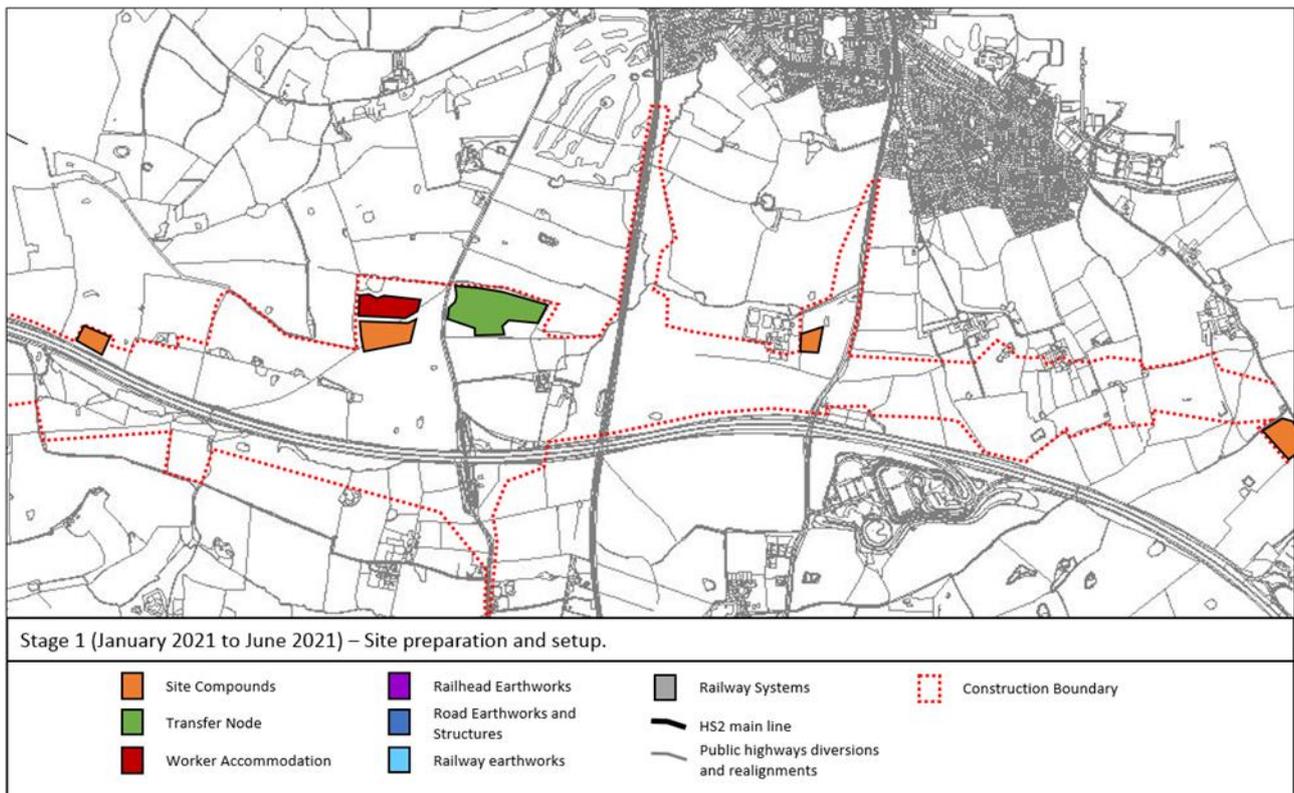
- 2.3.57 This compound (see Map CT-05-223, J9 to C7) will be used to manage the movement of excavated materials by rail and to manage railway systems installation works throughout the Proposed Scheme. The compound will occupy an area that includes the land required permanently for the Stone IMB-R. During construction of the Proposed Scheme this will be used temporarily as the Stone railhead main compound. Infrastructure required for the Stone IMB-R will be reused from the Stone railhead main compound where practicable.
- 2.3.58 The compound will:
- be operational for three years and three months, commencing during 2024;
 - support 225 railway installation workers per day (370 workers at peak times);
 - be accessed directly via the M6 southbound and temporary northbound slip roads which will be constructed as part of the Proposed Scheme;
 - provide one temporary materials stockpile area (see Map CT-05-223, F7 to D5);
 - be capable of receiving and dispatching trains to/from the existing railway network via purpose built sidings adjacent to the Norton Bridge to Stone Railway. Rail deliveries into the railhead will be undertaken during day and night-time hours and at weekends, though unloading will be undertaken during standard working hours, where reasonably practicable; and
 - provide rail systems support to rail installation works and satellite construction compounds throughout the Proposed Scheme.
- 2.3.59 Key civil engineering and railway installation works managed directly from this construction compound will include:
- transfer of excavated material from route-wide earthworks to point of use;
 - railway installation including track laying, overhead line equipment, communications equipment and traction power supply installation. The track

will be laid in both directions away from the Stone railhead, with access to the Proposed Scheme via northern and southern reception tracks;

- the installation of Yarnfield Lane auto-transformer station, commencing in 2024 and will take one year and three months to complete; and
- commissioning of the Stone IMB-R as the permanent facility for maintenance works for the Proposed Scheme.

2.3.60 The works within the Stone railhead/IMB-R will be carried out in stages as shown in Figure 7.

Figure 7: Construction phasing at the Stone railhead/IMB-R





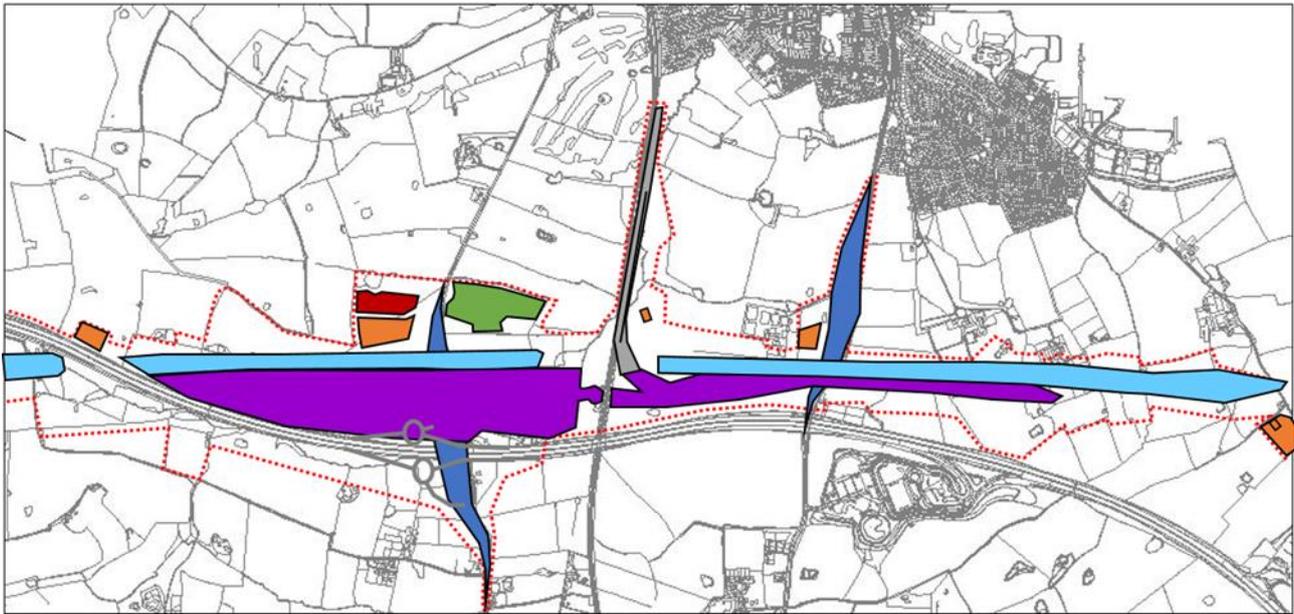
Stage 2 (July 2021 to March 2022) – Norton Bridge to Stone connections and sidings, utility diversions, M6 access and road diversions at Yarnfield Lane, B5026 Eccleshall Road.

- | | | | |
|----------------------|--------------------------------|---|-----------------------|
| Site Compounds | Railhead Earthworks | Railway Systems | Construction Boundary |
| Transfer Node | Road Earthworks and Structures | HS2 main line | |
| Worker Accommodation | Railway earthworks | Public highways diversions and realignments | |



Stage 3 (commencing October 2021) – Stone railhead earthworks and continuation of works commenced during Stage 2.

- | | | | |
|----------------------|--------------------------------|---|-----------------------|
| Site Compounds | Railhead Earthworks | Railway Systems | Construction Boundary |
| Transfer Node | Road Earthworks and Structures | HS2 main line | |
| Worker Accommodation | Railway earthworks | Public highways diversions and realignments | |



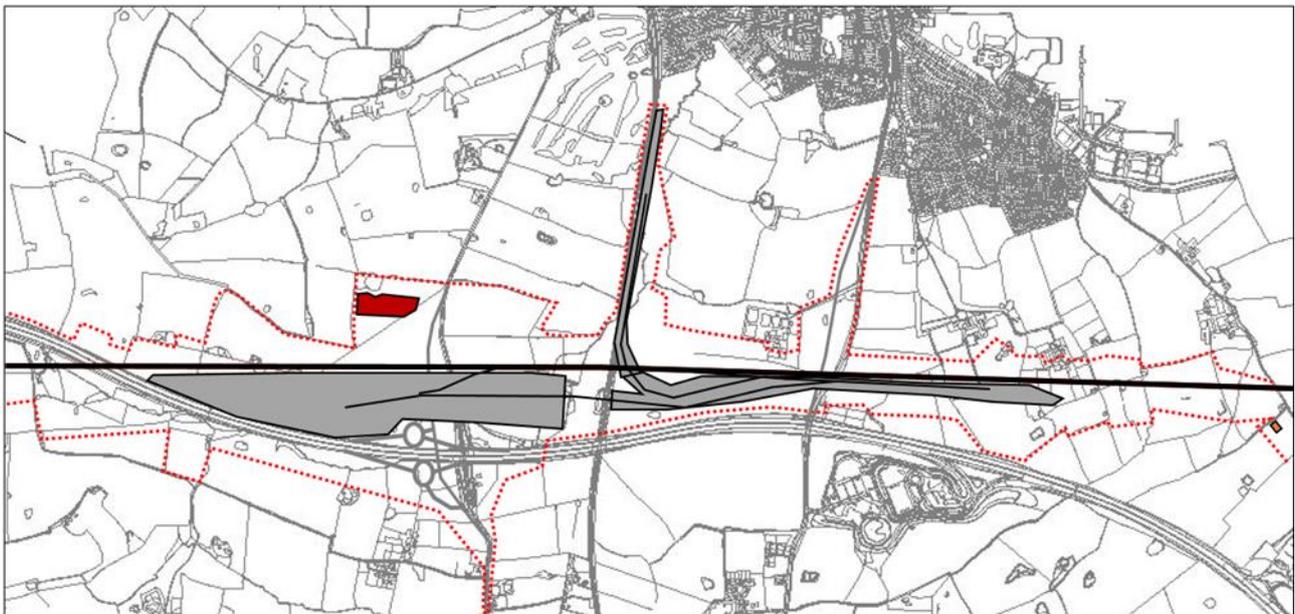
Stage 4 (2022-2024) – Commence route earthworks (continue railhead earthworks) with the operation of the Norton Bridge to Stone sidings.

- | | | | |
|----------------------|--------------------------------|---|-----------------------|
| Site Compounds | Railhead Earthworks | Railway Systems | Construction Boundary |
| Transfer Node | Road Earthworks and Structures | HS2 main line | |
| Worker Accommodation | Railway earthworks | Public highways diversions and realignments | |



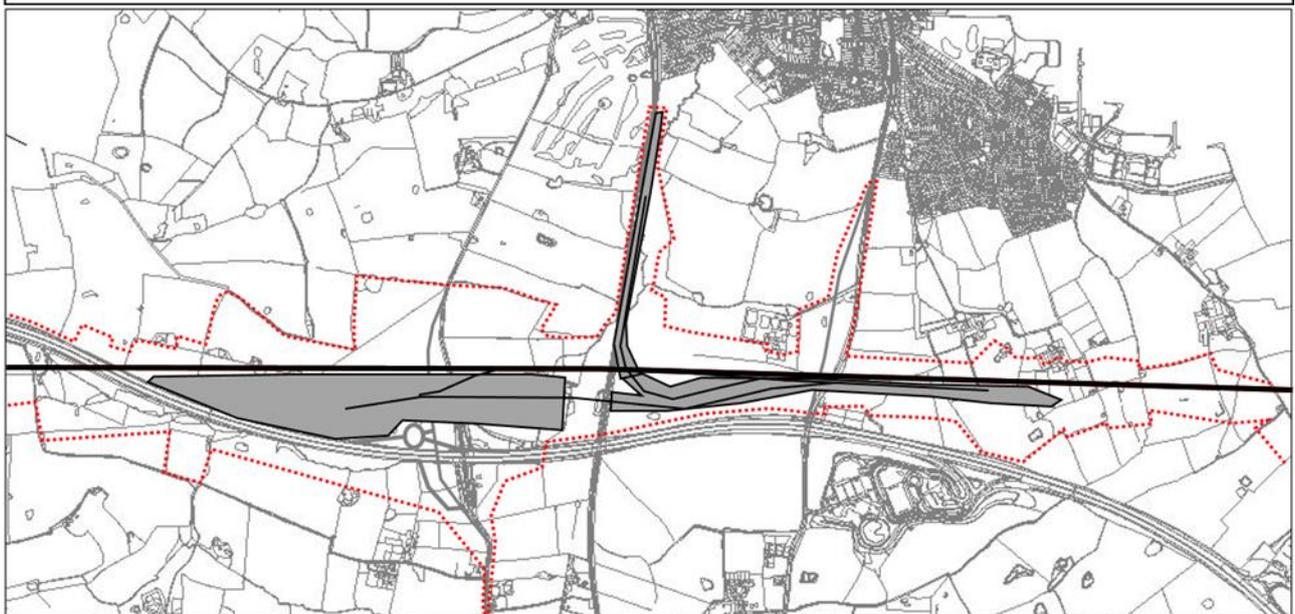
Stage 5 (July 2024 to December 2024) – Establishment of the Stone railhead.

- | | | | |
|----------------------|--------------------------------|---|-----------------------|
| Site Compounds | Railhead Earthworks | Railway Systems | Construction Boundary |
| Transfer Node | Road Earthworks and Structures | HS2 main line | |
| Worker Accommodation | Railway earthworks | Public highways diversions and realignments | |



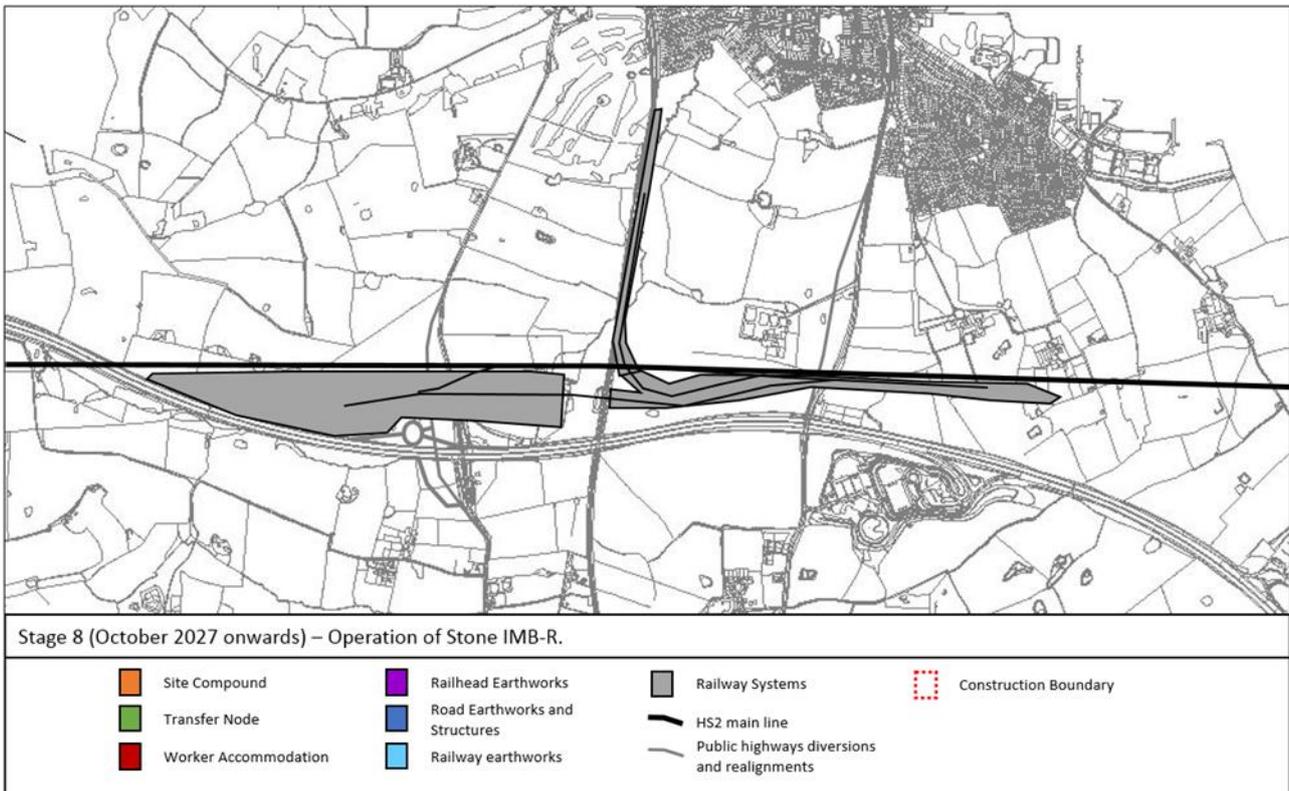
Stage 6 (January 2025 to June 2026) – Operation of Stone railhead for railway systems installation works

- | | | | |
|----------------------|--------------------------------|---|-----------------------|
| Site Compounds | Railhead Earthworks | Railway Systems | Construction Boundary |
| Transfer Node | Road Earthworks and Structures | HS2 main line | |
| Worker Accommodation | Railway earthworks | Public highways diversions and realignments | |



Stage 7 (July 2026 to September 2027) – Testing and commissioning of railway systems, followed by decommissioning of the Stone railhead, removal of the M6 northbound slip roads and establishment of the Stone IMB-R.

- | | | | |
|----------------------|--------------------------------|---|-----------------------|
| Site Compounds | Railhead Earthworks | Railway Systems | Construction Boundary |
| Transfer Node | Road Earthworks and Structures | HS2 main line | |
| Worker Accommodation | Railway earthworks | Public highways diversions and realignments | |



Yarnfield North embankment satellite compound

- 2.3.61 This compound (see Map CT-05-223, H6 to G6) will provide for civil engineering works and will:
- be operational for six years, commencing during 2021;
 - support 165 civil engineering workers per day (235 workers at peak times);
 - provide worker accommodation for up to 240 workers, with a three-storey modular accommodation block, parking and welfare facilities, which will be required for six years;
 - be accessed initially via Yarnfield Lane for site set up. During main construction the principal access to the compound for construction vehicles will be via the site haul routes. Yarnfield Lane will continue to be used for some construction traffic where the site haul routes are not reasonably practicable; and
 - provide a transfer node, accessed via the M6 and crossing Yarnfield Lane (Volume 2: Map CT-05-223, J5 to H5), for the storage and loading and unloading of bulk earthworks materials that will be moved to and from the site on public roads.
- 2.3.62 The works to be managed from this compound will require the demolition of buildings associated with two properties, as described in Table 2.

Environmental Statement Volume 2: Community area 3, Stone and Swynnerton

Table 2: Demolitions to be managed from the Yarnfield North embankment satellite compound

Description	Location	Feature resulting in the demolition
Residential		
Farmhouse	Pool House Farm	Yarnfield North embankment
Farmhouse	Brook House	Stone railhead/IMB-R
Commercial		
17 farm outbuildings	Pool House Farm	Yarnfield North embankment
1 outbuilding/office	Brook House	Stone railhead/IMB-R
Other		
Yarnfield Lane M6 overbridge	M6 crossing of Yarnfield Lane	Yarnfield Lane M6 overbridge replacement

2.3.63 The compound will be used to manage the construction of the following bridges and viaducts:

- Filly Brook viaduct, which will take three years to complete;
- Norton Bridge to Stone Railway underbridge, which will take one year and three months to complete;
- Filly Brook West underbridge, which will take one year and three months to complete;
- Yarnfield Lane M6 overbridge replacement, which will take two years to complete;
- Yarnfield Lane underbridge, which will take one year and six months to complete; and
- Yarnfield Lane IMB-R underbridge, which will take one year and three months to complete.

2.3.64 The compound will be used to manage construction of Yarnfield North embankment, which will take one year to complete. Material for the Yarnfield North embankment will be received from cuttings within the Stone and Swynnerton area, from cuttings elsewhere along the Proposed Scheme and/or from borrow pits.

2.3.65 The following civil engineering works will also be managed from this compound:

- establishment of the earthworks and foundation for the construction of Stone railhead/IMB-R, which will take two years and three months to complete;
- construction of Stone retaining wall 2, which will take one year and three months to complete; and
- establishment of the earthworks and foundation for the construction of the Stone IMB-R reception tracks and railhead structures (see Stone railhead main compound), which will take one year and six months to complete.

- 2.3.66 A temporary batching plant will be located within the compound, which will provide concrete supply to the construction works across the Proposed Scheme and will be operational for four years and three months.
- 2.3.67 The works to be managed from this compound will require the following works to public roads:
- Yarnfield Lane will be permanently realigned over a distance of 1.2km, 25m north-west of its current alignment, which will take one year to complete. Yarnfield Lane will remain open during the realignment, which will be constructed offline. Temporary lane restrictions on Yarnfield Lane for the construction of a temporary construction access roundabout to the north-east of the route of the Proposed Scheme will be required for a period of three months. On completion of construction, there will be tie-in works and traffic management requiring two weekend closures over a period of three months. There will also be minor temporary works to Yarnfield Lane near Stone Golf Club. These are described and assessed in Volume 4, Off-route effects; and
 - a permanent southbound access off the M6 will be required for access to the Stone railhead/IMB-R, connecting with the Yarnfield Lane realignment. The M6 will remain open during the construction of the permanent southbound access with temporary traffic management measures and overnight lane closures between junctions 15 and 16 of the M6 required. A temporary northbound access off the M6, connecting to Yarnfield Lane for access to the Stone railhead will also be required, which will take six months to complete.
- 2.3.68 The works to be managed from this compound will require temporary diversion of Stone Rural Footpath 33, for 650m north-west around the Yarnfield Lane realignment, for a period of three years. On completion of construction, the footpath will be reinstated on its existing alignment.
- 2.3.69 The works to be managed from this compound will require the following drainage works and watercourse diversions:
- realignment of Filly Brook watercourse for 1.3km, crossing the route of the Proposed Scheme under the Filly Brook viaduct;
 - realignment of a tributary of Filly Brook for 470m in length to the southern side of the Norton Bridge to Stone sidings; and
 - a temporary watercourse diversion of a tributary of Filly Brook, 660m in length underneath the Norton Bridge to Stone sidings via a culvert.
- 2.3.70 This compound will manage the construction of Yarnfield Lane auto-transformer station foundation and building, which will take nine months to complete. Access will be from within the Stone railhead/IMB-R via the M6 and Yarnfield Lane via a maintenance and emergency access road. During operation, this road will provide access to the auto-transformer station for intermittent maintenance.
- 2.3.71 Finalisation works will include site reinstatement, landscaping and planting.

M6 Meaford viaduct satellite compound

- 2.3.72 This compound (see Map CT-05-223, B6) will provide for civil engineering works and will:
- be operational for four years and three months, commencing during 2021;
 - support 15 civil engineering workers per day (25 workers at peak times);
 - be accessed initially via Yarnfield Lane for site set up and have a limited continued access. Main access will be via the site haul routes along the line of the route of the Proposed Scheme; and
 - support the Yarnfield North embankment viaduct launching yard.
- 2.3.73 There will be no worker accommodation associated with this compound.
- 2.3.74 The works to be managed from this compound will not require demolition of any buildings.
- 2.3.75 The compound will be used to manage the construction of the M6 Meaford viaduct, which will take two years and nine months to complete. These works will also be managed from the Meaford North embankment satellite compound.
- 2.3.76 The compound will be used to manage construction of the following earthworks:
- Meaford cutting, which will take one year and nine months to complete; and
 - Meaford South embankment, which will take three years to complete.
- 2.3.77 Material for the Meaford South embankment will be received from the Meaford cutting, from cuttings elsewhere along the Proposed Scheme, and/or from borrow pits
- 2.3.78 The works to be managed from this compound will require permanent localised realignment of the southbound lanes of the M6, which will take two years and six months to complete. These works will also be managed from the Meaford North embankment satellite compound. The M6 localised realignment works will be constructed using standard construction techniques to minimise disruption to motorway users.
- 2.3.79 To maintain safe operation of the motorway it will be necessary to undertake the works under traffic management. The construction of the motorway crossings in this area will be coordinated to reduce the overall duration of disruption to the motorway. The traffic management will operate for a period of one year and six months over this length of the M6, and will be likely to include temporary speed restrictions for safety, temporary use of the hard shoulder, and reduced lane widths. The temporary closures that have been included in the assessment of the Proposed Scheme include 10 overnight/weekend lane closures of the northbound and southbound carriageway for the construction of the M6 Meaford viaduct substructure, and four weekend carriageway closures for the construction of the M6 Meaford viaduct deck.
- 2.3.80 The works to be managed from this compound will require temporary diversion of Stone Rural Footpath 33 for a period of three years during construction. This will divert users for 250m, across the route of the Proposed Scheme towards the M6 at the northern extent of the Stone railhead/IMB-R. Stone Rural Footpath 33 will

permanently cross the route of the Proposed Scheme 800m north-west of its existing alignment to run adjacent to the M6, increasing journey length by 710m, this realignment will take nine months to complete. The footpath will re-join its existing alignment at the existing M6 underpass, which will require widening, which will take nine months to complete.

2.3.81 Realignment of an unnamed watercourse under the M6 Meaford viaduct will be required as a result of the works to be managed from this compound.

2.3.82 Finalisation works will include site reinstatement, landscaping and planting.

Meaford North embankment satellite compound

2.3.83 This compound (see Map CT-05-224, G7 to F6) will provide for civil engineering works and will:

- be operational for four years, commencing during 2021;
- support 40 civil engineering workers per day (65 workers at peak times);
- be accessed initially via the existing BOAT 34 and Swynnerton Footpath 27 for site set up and then via site haul routes along the line of the route of the Proposed Scheme; and
- provide five temporary materials stockpiles on the northern and southern sides of the route of the Proposed Scheme (see Map CT-05-224, H7 to C6 and G4 to F4).

2.3.84 There will be no worker accommodation associated with this compound.

2.3.85 The works to be managed from this compound will not require demolition of any buildings.

2.3.86 The compound will be used to manage the construction of the following bridges and viaducts:

- M6 Meaford viaduct, which will take two years and nine months to complete (this will also be managed from the M6 Meaford viaduct satellite compound); and
- Swynnerton Footpath 27 accommodation underbridge, which will take one year and six months to complete.

2.3.87 The compound will be used to manage construction of the following earthworks:

- Meaford North embankment, which will take three years to complete; and
- Swynnerton South cutting, which will take one year and three months to complete.

2.3.88 Material for the Meaford North embankment will be received from the Swynnerton South cutting. Insofar as reasonably practicable, any excess material from this cutting will be used as engineering material in neighbouring areas and locally within the Stone and Swynnerton area.

2.3.89 The works to be managed from this compound will require the following works to PRow:

- temporary diversion of Swynnerton Footpath 27 for a period of one year and six months during construction. This will divert users for 900m adjacent to the west of the route of the Proposed Scheme crossing the route on the existing alignment of Swynnerton Footpath 17. On completion of construction, Swynnerton Footpath 27 will be permanently realigned, 75m south-east of its existing alignment. Swynnerton Footpath 27 will also be widened along a 200m section, to provide maintenance access to the Proposed Scheme, which will take one year and six months to complete;
- temporary diversion of Swynnerton Footpath 17 for a period of one year and six months during construction. This will divert users for 625m, to the west of the route of the Proposed Scheme, to cross the route via the Swynnerton Footpath 27 accommodation overbridge. On completion of construction, Swynnerton Footpath 17 will be permanently diverted, 400m south-east of its existing alignment; and
- widening of Stone Rural BOAT 34, for 675m to provide maintenance access to the Proposed Scheme, which will take one year and six months to complete.

2.3.90 The works to be managed from this compound will require the following works to utilities:

- underground diversion of a Western Power Distribution 33kV cable, which will take one year to complete; and
- underground diversion of a Scottish Power Energy Networks 132kV cable, which will take one year to complete.

2.3.91 Finalisation works will include site reinstatement, landscaping and planting.

Swynnerton embankment satellite compound

2.3.92 This compound (see Map CT-05-225, E7) will provide for civil engineering works and railway installation works and will:

- be operational for four years and nine months, commencing during 2021. Civil engineering works will be managed from this compound for a period of four years, with railway installation works occurring over a period of one year;
- support 15 civil engineering workers per day (25 workers at peak times);
- support 25 railway installation workers per day (40 workers at peak times);
- be accessed initially via existing Tittensor Road for site set up and then via site haul routes along the line of the route of the Proposed Scheme; and
- provide four temporary materials stockpiles on the southern sides of the route of the Proposed Scheme (see Map CT-05-225, F7 to E6).

2.3.93 There will be no worker accommodation associated with this compound.

- 2.3.94 The works to be managed from this compound will not require demolition of any buildings.
- 2.3.95 The compound will be used to manage the construction of the following bridges and viaducts:
- Swynnerton Estate South underbridge, which will take one year and three months to complete; and
 - Swynnerton New Bridleway accommodation underbridge, which will take one year and three months to complete.
- 2.3.96 The compound will be used to manage construction of Swynnerton embankment, which will take two years and nine months to complete. Material for the Swynnerton embankment will be received from neighbouring areas and from locally within the Stone and Swynnerton area.
- 2.3.97 The works to be managed from this compound will require the following works to public roads:
- permanent closure of a 450m section of Tittensor Road to through traffic from Sandyford Farm on the northern side of the route to Glebe House on the southern side of the route, with sections of the closed road retained as accommodation access, bridleway and maintenance access for the Proposed Scheme. This work will take six months to complete; and
 - a temporary route for non-motorised users of Tittensor Road will be established for a period of three years during construction, crossing the route of the Proposed Scheme 400m south of Tittensor Road. On completion of construction, Swynnerton New Bridleway will cross the route of the Proposed Scheme via Swynnerton New Bridleway accommodation underbridge.
- 2.3.98 A temporary route for non-motorised users will be established for a period of 15 months during construction, crossing the route of the Proposed Scheme 50m north-west of its existing location. On completion of construction, access will be maintained via the Swynnerton Estate South underbridge that will cross the route of the Proposed Scheme at its existing location.
- 2.3.99 The compound will be used to manage the construction of Swynnerton culvert for the realignment of an unnamed watercourse, which will take nine months to complete.
- 2.3.100 Construction of the Swynnerton auto-transformer station will be managed from this compound. Civil engineering works to construct the foundations will take one year to complete and installation of the railway systems equipment will take a further one year and three months to complete. A new access road will be provided from Tittensor Road to the Swynnerton auto-transformer station. Initially this road will be used to access the satellite compound, site haul routes and for the construction of the auto-transformer station foundation. During operation, the road will provide access to the auto-transformer station for intermittent maintenance.
- 2.3.101 Finalisation works will include site reinstatement, landscaping and planting.

Swynnerton North cutting main compound

- 2.3.102 This compound (see Map CT-05-226, H4 to F2) will provide for civil engineering works and will:
- be operational for four years and three months, commencing during 2021;
 - support 250 civil engineering workers per day (350 workers at peak times);
 - provide one transfer node, accessed from the A519 Newcastle Road for the storage and loading and unloading of bulk earthworks materials, which will be moved to and from the site on public roads for a period of four years and three months;
 - be accessed initially via the A519 Newcastle Road and the A51 Stone Road for site set up and then via site haul routes along the line of the route of the Proposed Scheme;
 - provide five temporary materials stockpiles to the northern and southern sides of the route of the Proposed Scheme; and
 - provide main compound support to eight satellite compounds in the Stone and Swynnerton area, as illustrated in Figure 5 for the civil engineering works. The Swynnerton North cutting main compound will also support eight satellite compounds in the Whitmore Heath and Madeley area (CA4).
- 2.3.103 There will be no worker accommodation associated with this compound.
- 2.3.104 The works to be managed from this compound will not require demolition of any buildings.
- 2.3.105 The compound will be used to manage the construction of the following bridges:
- Tittensor Road overbridge, which will take one year and nine months to complete;
 - A519 Newcastle Road overbridge, which will take one year and six months to complete; and
 - Swynnerton Heath Farm overbridge, which will take one year and three months to complete.
- 2.3.106 The compound will be used to manage construction of Swynnerton North cutting, which will take three years and three months to complete.
- 2.3.107 Material from the Swynnerton North cutting will be used as engineering material in neighbouring areas and locally within the Stone and Swynnerton area.
- 2.3.108 The works to be managed from this compound will require the following works to public roads:
- permanent diversion of Tittensor Road for 800m crossing the route of the Proposed Scheme 375m north-west of existing via Tittensor Road overbridge. During construction, a temporary diversion will be required over a nine month period for the construction of tie-ins on the existing alignment over a length of

200m. Temporary diversions will also be required to enable tie-in connections between the existing and new road;

- permanent diversion of the A51 Stone Road, for 1.6km, to join the A519 Newcastle Road via a new roundabout junction, 400m north-west of its existing alignment, which will take nine months to complete. Following the completion of the A51 Stone Road diversion, a permanent closure of a 900m section of the A51 Stone Road will be required as a result of works to be managed from this compound;
- permanent closure of a 175m section of Stab Lane, with traffic diverted via the Tittensor Road diversion/A51 Stone Road diversion;
- permanent closure of a 275m section of Bottom Lane, with traffic diverted via the A51 Stone Road diversion; and
- temporary lane restrictions along the A519 Newcastle Road will be required to allow the formation of construction access over a period of three months. Following this, there will be a temporary diversion of the A519 Newcastle Road for a period of one year and six months during construction to allow construction of the A519 Newcastle Road overbridge. This will divert users for 350m, to cross the route of the Proposed Scheme 50m north-west of the existing road alignment. On completion of construction, the A519 Newcastle Road will cross the route of the Proposed Scheme via the A519 Newcastle Road overbridge.

2.3.109 The works to be managed from this compound will require the following works to PRoW:

- temporary diversion of Swynnerton Bridleway 54 for a period of one year and six months. This will divert users of the Swynnerton Bridleway 54 along the north-eastern side of the A51 Stone Road diversion for 500m. On completion of construction, Swynnerton Bridleway 54 will be permanently diverted alongside the diverted A51 Stone Road for 350m, connecting to the diverted Tittensor Road, reducing journey length by 85m; and
- provision of a temporary bridleway route for a period of one year during construction works to Stab Lane and Tittensor Road. On completion of construction, Swynnerton New Bridleway 2 will be established on the southern side of the route of the Proposed Scheme, for 300m in length, connecting the diverted Tittensor Road with Stab Lane, which will take three months to complete.

2.3.110 The works to be managed from this compound will require the following works to utilities:

- permanent diversion of a National Grid gas transmission 600mm diameter high pressure gas pipeline for a length of 140m, which will take nine months to complete; and

- permanent diversion of a National Grid gas transmission 600mm diameter high pressure gas pipeline for a length of 170m, which will take nine months to complete.

2.3.111 Finalisation works will include site reinstatement, landscaping and planting.

Hatton South cutting satellite compound

2.3.112 This compound (see Map CT-05-227, E5) will provide for civil engineering works and will:

- be operational for four years, commencing during 2021;
- support 30 civil engineering workers per day (45 workers at peak times);
- provide 11 temporary materials stockpiles on the northern and southern sides of the route of the Proposed Scheme (see Map CT-05-227, E5 to A6 and Map CT-05-228 J5 to G6); and
- be accessed initially via Dog Lane and Bent Lane for site set up then via site haul routes along the line of the route of the Proposed Scheme.

2.3.113 There will be no worker accommodation associated with this compound.

2.3.114 Demolition of one building and will be required as a result of the works to be managed from this compound, described in Table 3.

Table 3: Demolitions to be managed from the Hatton South cutting satellite compound

Description	Location	Feature resulting in the demolition
Other		
Reinforced concrete bunker	Common Lane Cold War bunker site	Hatton embankment

2.3.115 The compound will be used to manage the construction of the following bridges:

- Swynnerton Estate Central underbridge, which will take one year and three months to complete;
- Swynnerton Estate North green overbridge, which will take one year and three months to complete;
- Swynnerton Footpath 52 accommodation underbridge, which will take nine months to complete;
- Swynnerton Footpath 15 green overbridge, which will take nine months to complete; and
- Rowe Farm overbridge, which will take one year and three months to complete.

2.3.116 The compound will be used to manage construction of the following earthworks:

- Hatton embankment, which will take two years and three months to complete; and

- Hatton South cutting, which will take two years and nine months to complete.
- 2.3.117 Material for the Hatton embankment will be received from Hatton South cutting, from cuttings elsewhere along the Proposed Scheme, and/or from borrow pits.
- 2.3.118 The works to be managed from this compound will require the following works to PRoW:
- temporary diversion of Swynnerton Footpath 52 for a period of one year and six months during construction. This will divert users for 250m in length, 50m to the east of the existing footpath alignment. On completion of construction, Swynnerton Footpath 52 will be permanently realigned 20m south-east of its existing alignment, increasing the length of journey by 15m;
 - permanent widening of Swynnerton Footpath 52/Common Lane (Swynnerton), for a length of 1.2km, to provide maintenance access to the Proposed Scheme, which will take nine months to complete; and
 - temporary diversion of Swynnerton Footpath 15 for a period of three years during construction. This will divert users of Swynnerton Footpath 15 for 1.5km, crossing the route 550m south-east of its existing alignment. On completion of construction, Swynnerton Footpath 15 will be permanently realigned to cross the route at its existing location via Swynnerton Footpath 15 green overbridge.
- 2.3.119 The works to be managed from this compound will require the following drainage works and watercourse diversions:
- the realignment of an unnamed watercourse via Swynnerton Estate Central underbridge for 200m;
 - the construction of Plantation culvert for a 450m diversion of an unnamed watercourse crossing the route 150m north-west of existing, which will take nine months to complete; and
 - the realignment of an unnamed watercourse via Swynnerton Footpath 52 accommodation underbridge for 450m.
- 2.3.120 Finalisation works will include site reinstatement, landscaping and planting.

Hatton North cutting satellite compound

- 2.3.121 This compound (see Map CT-05-228a, D5 to C4) will provide for civil engineering works and will:
- be operational for four years, commencing during 2021;
 - support 15 civil engineering workers per day (25 workers at peak times);
 - provide six temporary materials stockpiles on the northern and southern sides of the route of the Proposed Scheme (see Map CT-05-228a, F5 to D5 and E6 to C6); and

- be accessed initially via Dog Lane and Bent Lane for site set up and limited ongoing access. Main access will be via site haul route along the line of the route of the Proposed Scheme.

2.3.122 There will be no worker accommodation associated with this compound.

2.3.123 Demolition of two properties and will be required as a result of the works to be managed from this compound, described in Table 4.

Table 4: Demolitions to be managed from the Hatton North cutting satellite compound

Description	Location	Feature resulting in the demolition
Residential		
Terraced cottage	Jacobyre, Shelton under Harley	Hatton North cutting and Bent Lane (North) diversion
Terraced cottage	Whisper Barn, Shelton under Harley	Hatton North cutting and Bent Lane (North) diversion

2.3.124 The compound will be used to manage the construction of the following bridges and viaducts:

- Dog Lane overbridge, which will take one year and nine months to complete; and
- Swynnerton Footpath 10 accommodation underbridge, which will take one year and three months to complete.

2.3.125 The compound will be used to manage construction of the following earthworks:

- Hatton North cutting, which will take two years and six months to complete; and
- Stableford South embankment, which will take two years to complete.

2.3.126 Material for the Stableford South embankment will be received from Hatton North cutting, from cuttings elsewhere along the Proposed Scheme, and/or from borrow pits.

2.3.127 The works to be managed from this compound will require the following works to public roads:

- temporary diversion of Dog Lane for a period of three months during construction. This will divert users of Dog Lane for 400m adjacent on the southern side of the existing Dog Lane. There will be temporary closures to enable tie-in connections between the existing and new road. On completion of construction, Dog Lane will be permanently realigned over a distance of 950m, 125m north-west of its existing alignment. There will also be temporary works at the junction of the A51 The Rowe and Bent Lane/Dog Lane. These are described and assessed in Volume 4, Off-route effects; and
- temporary diversion of Bent Lane for a period of three months during construction. This will divert users for 150m adjacent to the eastern side of the existing Bent Lane alignment on the southern side of the route of the

Proposed Scheme. On completion of construction, Bent Lane will be permanently diverted. There will be a permanent diversion of Bent Lane for 750m on the northern side of the route to create Bent Lane (North). Bent Lane will also be realigned on the southern side of the route for 350m to create Bent Lane (South).

- 2.3.128 The works to be managed from this compound will require temporary diversion of Swynnerton Footpath 10 for a period of one year and six months during construction. This will divert users for 200m on the northern side of the route, to the west of Shelton under Harley Farm. On completion of construction, Swynnerton Footpath 10 will be permanently realigned for over a distance of 150m, to cross the route of the Proposed Scheme 50m north-west of its existing alignment, increasing the length of journey by 65m.
- 2.3.129 The works to be managed from this compound will require the following drainage works and watercourse diversions:
- Dog Lane drop inlet culvert for surface water drainage, which will take nine months to complete;
 - Shelton culvert for surface water drainage, which will take nine months to complete; and
 - realignment of an unnamed watercourse (tributary of Meece Brook) via Swynnerton Footpath 10 accommodation underbridge, which will take one year and three months to complete.
- 2.3.130 The works to be managed from this compound will require permanent underground diversion of a Scottish Power Energy Networks 132kV overhead cable, which will take one year to complete.
- 2.3.131 The compound will manage the construction of the Stableford auto-transformer station foundation and building, which will take one year to complete. A new access road will be provided from Bent Lane (North) to the Stableford auto-transformer station. Initially the access road will be used to access the satellite compound, site haul routes and for the construction of the auto-transformer station base slab. During operation, the road will provide access to the auto-transformer station for intermittent maintenance.
- 2.3.132 Finalisation works will include site reinstatement, landscaping and planting.
- Stableford auto-transformer station satellite compound*
- 2.3.133 This compound (see Map CT-05-228a, C5) will provide for the installation of the railway systems equipment at Stableford auto-transformer station and will:
- be operational for one year and three months, commencing during 2024;
 - support 30 railway installation workers per day (40 workers at peak times); and
 - be accessed via Bent Lane (North).
- 2.3.134 There will be no worker accommodation associated with this compound.

- 2.3.135 The works to be managed from this compound will not require demolition of any buildings.
- 2.3.136 Finalisation works will include site reinstatement, landscaping and planting.

Construction waste and material resources

- 2.3.137 Excavated material generated across the Proposed Scheme will be reused as engineering fill material or in the environmental mitigation earthworks of the Proposed Scheme, where reasonably practicable
- 2.3.138 Forecasts of the amount of construction, demolition and excavation waste that will be produced during construction of the Proposed Scheme are reported in Volume 3, Route-wide effects.
- 2.3.139 Local excess or shortfall of excavated material within the Stone and Swynnerton area will be managed through the mitigation earthworks design approach adopted for the Proposed Scheme, as well as the use of borrow pits in other community areas, with the aim of contributing to an overall balance of excavated material on a route-wide basis and help reduce the amount of material transported on public highways. The overall balance of excavated material is presented in Volume 3, Section 14.

Commissioning of the railway

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

Construction programme

- 2.3.141 A construction programme illustrating indicative periods for each of the core construction activities described above is provided in Figure 8.

Monitoring during construction

- 2.3.142 The appointed contractor will be required to undertake the necessary monitoring for each environmental topic to comply with the requirements of the CoCP, the relevant LEMP and any additional consent requirements. Any actions that may be necessary for compliance will be reported to the nominated undertaker and remedial action identified.
- 2.3.143 The CoCP will set out the approach to inspection and monitoring to assess the effectiveness of measures to prevent or reduce environmental effects during construction. Relevant local authorities and consenting authorities, such as the Environment Agency, will be consulted on the monitoring procedures to be implemented prior to construction commencement, as appropriate.

Stone and Swynnerton	2020 Quarters				2021 Quarters				2022 Quarters				2023 Quarters				2024 Quarters				2025 Quarters				2026 Quarters				2027 Quarters							
Construction Activity	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
Hatton South cutting satellite compound																																				
Site preparation and set-up																																				
Demolitions																																				
Utilities																																				
Swynnerton Footpath 52 accommodation underbridge, realignment and widening																																				
Swynnerton Footpath 15 green overbridge and realignment																																				
Swynnerton Estate Central underbridge																																				
Swynnerton Estate North green overbridge																																				
Hatton embankment																																				
Hatton South cutting																																				
Rowe Farm overbridge																																				
Plantation culvert																																				
Site reinstatement																																				
Hatton North cutting satellite compound																																				
Site preparation and set-up																																				
Demolitions																																				
Utilities																																				
Dog Lane Drop inlet culvert																																				
Shelton culvert																																				
Bent Lane (North) diversion																																				
Swynnerton Footpath 10 underbridge and realignment																																				
Stableford South embankment																																				
Bent Lane (South) realignment																																				
Hatton North cutting																																				
Dog Lane overbridge and realignment																																				
Stableford mid-point auto-transformer station foundation																																				
Site reinstatement																																				
Stableford auto-transformer station satellite compound																																				
Site preparation and set-up																																				
Stableford auto-transformer station installation																																				
Site reinstatement																																				

Construction works
 Compound duration

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 may change when Phase Two, as a whole, is operational.

HS2 services

- 2.4.2 It is anticipated that there will be up to six trains per hour in each direction upon opening in 2027, increasing to up to 12 trains per hour each way passing through the Stone and Swynnerton area from 2033 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 will run on the HS2 main line at speeds of up to 225mph (360kph). The trains will be either single zoom trains or two zoom trains coupled together (i.e. 400m), depending on demand and time of day.

Maintenance

- 2.4.4 Volume 1, Section 4 describes the maintenance regime for the Proposed Scheme.
- 2.4.5 Asset performance and condition monitoring will be undertaken using asset condition monitoring and unattended measurement systems fitted to the HS2 passenger rolling stock. Intrusive inspections will be carried out during the maintenance period. The maintenance approach will be a combination of risk based, preventative and reactive maintenance.
- 2.4.6 The Stone IMB-R will operate 24 hours a day, seven days a week once the Proposed Scheme is operational. The planning, management and preparation for maintenance activities will usually be carried out at the Stone IMB-R itself during the daytime. The majority of the maintenance works will be carried out along the Proposed Scheme during the night-time. For normal maintenance operations, maintenance vehicles will be loaded during the day. Once the passenger service draws to a close, maintenance vehicles will leave the IMB-R and travel to the area where maintenance is required. These maintenance vehicles will then return to the Stone IMB-R prior to passenger service resuming. Volume 1, Section 4 provides further information about the maintenance activities carried out at or from the Stone IMB-R.
- 2.4.7 Up to 100 staff will work at the Stone IMB-R in three, eight hour shifts during each 24 hour period. The maximum number of staff on site is likely to be during the night shift at the start and end of the maintenance periods when 30 to 50 people may be at the Stone IMB-R at any time, though peaks of activity and shift handovers may increase these numbers. Staff access to the Stone IMB-R will be from the M6 (southbound) and Yarnfield Lane.
- 2.4.8 Supplies will be delivered to the Stone IMB-R via road or rail. The majority of heavy materials will arrive by rail, with access via the M6 and Yarnfield Lane only used for

light equipment and spare parts or if rail transport is not appropriate. HGV access to the Stone IMB-R will be from the M6 via southbound slip roads.

- 2.4.9 Lighting will be required for all external working areas of the Stone IMB-R, including general circulation areas and walkways, with enhanced lighting to loading areas. The height of lighting installations will be kept as low as possible to facilitate maintenance and to reduce light pollution. Automatic lighting control systems complete with photocells and time clocks will be used to operate all external lighting. The external lighting at the Stone IMB-R will satisfy the environmental guidance for a 'dark sky' lighting installation. The luminaires and their support systems will also be installed to reduce the visual impact of the lighting installation. LED or low energy lamps will be used for lighting in the external areas to reduce energy consumption.

Operational waste and material resources

- 2.4.10 The assessment of the likely significant environmental effects associated with the disposal of operational waste has been undertaken for the Proposed Scheme as a whole in Volume 3, Section 15.
- 2.4.11 Forecasts of the amount of waste arising from track maintenance and ancillary infrastructure and the associated likely significant environmental effects are provided in Volume 5: Appendix WM-001-000.

Monitoring during operation

- 2.4.12 The nominated undertaker will be responsible for monitoring during operation of the Proposed Scheme. General monitoring measures during operation are set out in Volume 1, Section 9. Monitoring requirements and proposed monitoring measures relevant to the Stone and Swynnerton area are presented in Sections 4 to 15 of this report.

2.5 Route section alternatives

Introduction

- 2.5.1 Since November 2015, as part of the design development process, a series of potentially feasible amendments to the Proposed Scheme have been identified and reviewed within workshops attended by engineering, construction, planning and environmental specialists. During the workshops, a comparison was conducted of each design option, which included consideration of:
- engineering requirements: the degree of design complexity of the alternatives and the impact this would have on construction durations and construction and operational costs;
 - cost: whether the alternatives would be more cost effective or incur additional costs; and
 - potential environmental impact: whether the alternatives would have more or less environmental impact (e.g. sound, noise and vibration and landscape and visual).
- 2.5.2 The comparison also considered, as appropriate, feedback provided through stakeholder engagement and responses to the consultation between September and

November 2016 on the working draft EIA Report and the Design Refinement Consultation.

- 2.5.3 The following sections detail the reasonable local alternatives studied and the main reasons for selecting the option to be taken forward into the Proposed Scheme. The environmental impacts of the option selected (the Proposed Scheme) are then presented, followed by the environmental impacts of the alternative options compared to those of the Proposed Scheme. Other considerations are also noted including engineering requirements and cost. In some cases a preliminary appraisal of options has been undertaken, whereby options have been considered in terms of whether they are reasonable against environmental, technical and design criteria, and should, therefore, be progressed for further consideration.
- 2.5.4 In considering the environmental impacts, all EIA topics have been taken into account, however, only those topics where there is a potential impact are reported. During the preparation of the EIA, alternatives were appraised against the baseline scheme, however in accordance with the new Environmental Impact Assessment (EIA) Directive (2014/52/EU) that was implemented by the Town and Country Planning (Environmental Impact Assessment) Regulations that came into force on 16 May 2017, the comparison is presented below against the Proposed Scheme.

Stone railhead and Stone railhead main compound

- 2.5.5 During the design development process since the announcement of the preferred route to Crewe in November 2015, further consideration has been given to the location of a temporary railhead facility and associated compound to serve the construction works for the Proposed Scheme. The railhead and associated compound will be required to accommodate rail systems construction works, as well as allow receipt and stabling of construction trains.
- 2.5.6 A preliminary options appraisal was undertaken of eight options, of which four options were not taken forward for further consideration as they were not considered to be reasonable alternatives:
- Option 1 included a railhead and associated compound located to the east of Yarnfield and west of the M6, positioned on the western side of the Norton Bridge to Stone Railway. The railhead would encroach on the residential areas of Yarnfield and Cold Norton, as well as requiring a significant amount of agricultural land. As such this option was not taken forward for further consideration;
 - Option 4 included a railhead and associated compound located in the Whitmore Heath to Madeley area (CA4), positioned between the proposed tunnels at Madeley and Whitmore, 1km south-east of Madeley. A railhead at this location would require the demolition of Hey House, a Grade II listed building, as well as the demolition of Madeley Cemetery. This option would also introduce construction risks, which would potentially lengthen the construction programme due to the positioning of the railhead between two tunnels. As such this option was not taken forward for further consideration;
 - Option 6 included a railhead and associated compound located to the west of Stone and east of the HS2 main line, positioned to the south of the Norton

Bridge to Stone Railway. The railhead would be located on land approved for up to 500 residential properties between the Norton Bridge to Stone Railway and the B5026 Eccleshall Road (reference 13/19002/OUT) and would also be close to residential properties in Stone and Walton. The railhead at this location would also require the demolition of Walton House Farm and associated outbuildings. As such this option was not taken forward for further consideration; and

- Option 7 included a railhead and associated compound located to the west of Stone and east of the HS2 main line, positioned north of the Norton Bridge to Stone Railway. The railhead would result in the loss of Stone Golf Club and would require sidings that would encroach on the residential areas of Stone. As such this option was not taken forward for further consideration.

2.5.7 In addition, the use of Kingsbury railhead, located in the Curdworth to Middleton area (CFA 20) in Phase One, positioned east of the M42 and north of the A409 Kingsbury Road, was considered. This option would require the construction of the Proposed Scheme from a railhead and associated compound approximately 20km south of the start of Phase 2a. A railhead at this location would be unfeasible for the construction of the Proposed Scheme within the project timescales. As such this option was also not taken forward for further consideration.

2.5.8 The following four options were taken forward to a more detailed appraisal where engineering and construction feasibility, cost and environmental impacts were considered. Consideration was given to a further option identified at Aldersey's Rough as a result of stakeholder feedback following the working draft EIA Report consultation and is reported below:

- Option 2: a railhead and associated compound would be located to the west of Stone, on land isolated between the M6 and the HS2 main line, north of the Norton Bridge to Stone Railway. This option would enable a direct southbound connection into the HS2 main line, requiring a headshunt adjacent to the HS2 main line to enable northbound access. Connections in both directions to the Norton Bridge to Stone Railway would be provided via 1km long railway sidings in a north-east direction towards Stone. Vehicular access to the railhead and associated compound within this option would be potentially gained via the M6 as well as the local road network;
- Option 3: a railhead and associated compound located to the south-west of Stone, on land isolated between the M6 and the HS2 main line, south of the Norton Bridge to Stone Railway. This option would provide connection to the Norton Bridge to Stone Railway in both directions on the southern side via 1km long railway sidings in a north-easterly direction towards Stone. This option would enable a direct northbound connection into the HS2 main line, requiring a headshunt adjacent to the HS2 main line to enable southbound access. Vehicular access to the railhead and associated compound within this option would be potentially gained via the M6, as well as the local road network;
- Option 5: a railhead and associated compound located in the South Cheshire area (CA5), south of Crewe in the west Basford area. This option would provide

a southbound connection into the HS2 main line via 2km long railway sidings and a connection into the WCML in both directions at Basford Hall. Vehicular access to the railhead and associated compound within this option would be gained via the local road network; and

- Option 8: a railhead and associated compound located to the west of Stone, on land isolated between the M6 and the HS2 main line, north and south of the Norton Bridge to Stone Railway. The railhead would provide connection to the Norton Bridge to Stone Railway in both directions on the southern side via 1km long railway sidings in a north-easterly direction towards Stone. This option would also enable direct connections into the HS2 main line in both directions, with vehicular access to the railhead and associated compound made via connections to the M6 as well as the local road network, namely Yarnfield Lane.

- 2.5.9 As a result of stakeholder feedback following the working draft EIA Report consultation, consideration was given to a further option named Aldersey's Rough, Madeley. Under this option a railhead and associated compound would be located in the Whitmore Heath to Madeley area (CA4), at a location adjacent to Aldersey's Rough, 1km south-east of Madeley, with connections to the HS2 mainline and WCML positioned between the proposed tunnels at Madeley and Whitmore. This option would require the re-commissioning and upgrade of 2.5km of the out of use Stoke to Market Drayton Railway (also known as the Silverdale line of the Stoke to Market Drayton Railway) to provide connections into the HS2 infrastructure via two separate reception tracks approximately 1km in length. Connections into the existing WCML would also be facilitated by two separate reception tracks approximately 1.2km in length, with road access to the compound potentially gained via the M6.
- 2.5.10 Option 8 was taken forward into the Proposed Scheme. Option 3 and Aldersey's Rough in comparison would present an increase in environmental impacts and construction complexities. During construction, Option 3 would generate a significant amount of excavated material due to the topography of the site and the excavation required, this would make Option 3 significantly more expensive to construct than Option 8 and would be environmentally worse in comparison. Option 3 would only be capable of connecting directly into the HS2 main line in one direction, restricting the effectiveness of the railhead during construction of the Proposed Scheme.
- 2.5.11 Aldersey's Rough would likely introduce significant landscape and visual impacts on local residential receptors as a result of the significant amount of land required for construction. Areas of ancient woodland would also be directly impacted and some of the rail connections would be located within the flood zone of River Lea increasing flood risk in the area. This option would be likely to require large quantities of earthworks and highlights key construction risks, with the potential to impact the project timescales due to the positioning of the railhead between two tunnels.
- 2.5.12 Option 2 was considered to be environmentally comparable to Option 8. However, due to a constrained layout, this option would only be capable of connecting directly into the HS2 main line in one direction, restricting the effectiveness of the railhead and associated compound. Option 5 was considered to provide greater environmental benefits when compared with Option 8, however, these benefits were not considered

sufficient to justify the significant lengthening of the construction programme due to the location of the railhead and realignment works to the existing road network.

- 2.5.13 The analysis of engineering, cost and potential environmental impacts associated with all five options is set out below, with the impacts of the option selected presented first.

Option 8

- 2.5.14 This option would impact on the landscape character of the area, particularly the setting of Darlaston Park, and would result in visual impacts during construction on the residential properties to the edge of Walton and Yarnfield. There would be an impact on agricultural land and holdings and the likely sterilisation of mineral associated with a mineral safeguarding area. This option would result in the loss of ecological habitats and there would be a potential impact on species.
- 2.5.15 This option would require the widening of the existing rail embankment, which is currently within the flood zone, and as such, compensatory storage areas would likely be required. Filly Brook, on the eastern side of the M6, would require works to culvert the watercourse along the railway sidings adjacent to the Norton Bridge to Stone Railway. There would also be an impact on heritage assets. This option would impact on a minor area of a committed development for up to 500 residential properties between the Norton Bridge to Stone Railway and the B5026 Eccleshall Road (reference 13/19002/OUT) due to the presence of the railway sidings adjacent to the Norton Bridge to Stone Railway. There would be an impact on a historic landfill, and therefore, this option presents a risk of contamination. At the time of the appraisal it was also considered that this option would require the temporary closure of Yarnfield Lane for up to three years during construction with traffic being diverted onto the B5026 Eccleshall Road, which has the potential to result in congestion and delays and impact on businesses that use Yarnfield Lane, such as Stone Golf Club and The Wayfarer. However, further development of the access arrangements to and from the railhead have been undertaken following the outcome of this appraisal which have mitigated these impacts. An offline realignment of Yarnfield Lane has been incorporated into the design, allowing it to remain open during both construction and operation of the Proposed Scheme. The findings of this appraisal are presented later in this section.
- 2.5.16 Option 8 does not introduce any technical or construction complexities, risk of safety hazards, or lengthening of the construction programme.

Option 2

- 2.5.17 In comparison to Option 8 (the Proposed Scheme), the impact on agricultural land and holdings would be reduced as would the loss of ecological habitats and the potential impact on species. With this option the committed residential development between the Norton Bridge to Stone Railway and the B5026 Eccleshall Road (reference 13/19002/OUT) would be avoided. The MSA would also be avoided.
- 2.5.18 With this option there would be an increase in construction traffic associated with the movement of materials off-site to construct the railhead. There would be an impact on two historic landfills, and therefore, the risk of contamination would be increased.

- 2.5.19 Due to a constricted layout, this option would only be capable of connecting directly into the HS2 main line in a southbound direction, restricting the effectiveness of the railhead and associated compound for the construction of the Proposed Scheme.

Option 3

- 2.5.20 In comparison to Option 8 (the Proposed Scheme), Option 3 presented an increase in the impact on agricultural land and holdings due to an increase in the number of commercial agricultural holdings affected. This option would reduce the loss of ecological habitats and potential impact on biodiversity and a reduction in surface water effects due to a lesser extent of Filly Brook and associated floodplain affected. There would be reduced transport impacts with this option as there would not be a requirement to potentially provide a temporary closure of Yarnfield Lane. During construction there would be a significant increase in excavated material removed from site due to the topography of the site and the excavation required. As with Option 8, Option 3 would potentially impact on a minor area of a committed development for up to 500 residential properties between the Norton Bridge to Stone Railway and the B5026 Eccleshall Road (reference 13/19002/OUT) during construction of the railway sidings adjacent to the Norton Bridge to Stone Railway. The MSA would also be avoided and there would be no impact on historic landfills.
- 2.5.21 Due to a constricted layout, this option would only be capable of connecting directly into the HS2 main line in a northbound direction, restricting the effectiveness of the railhead and associated compound for the construction of the Proposed Scheme. A significant increase in excavation work would be required to establish the railhead within the existing topography, as well as potential waste storage and reinstatement complexities. This option would also be substantially more expensive to construct than Option 8 due to the level of excavation required and the design of this option to work within the ground levels proposed.

Option 5

- 2.5.22 In comparison to Option 8 (the Proposed Scheme), Option 5 would reduce the impact on landscape character and visual impacts, due to the isolated urban nature of the location. There would still, however, be visual impacts on residential properties in proximity to the railhead. There would be a reduced impact on surface water, groundwater and ecological habitats and the potential impact on species would also be reduced. There would also be a reduced impact on agricultural land and holdings. There would be a reduction in construction traffic as the need to move material off-site would be minimised.
- 2.5.23 This option would require an extensive area of land at Basford West, which would impact on a committed development for general industry, storage and distribution and a separate application for residential development, offices and local amenity facilities (reference 14/0378N). This option would result in the need to demolish a number of residential properties. This option would result in the likely sterilisation of mineral associated with two MSAs. This option would result in the need for the closure of the newly built B5071 Jacks Mills Way, which has the potential to result in congestion and delays.

- 2.5.24 Due to the location at the northern extent of the Proposed Scheme, the railhead in this option would only be able to facilitate the construction of the Proposed Scheme in one direction, placing significant restrictions on the construction programme.

Aldersey's Rough, Madeley

- 2.5.25 In comparison to Option 8 (the Proposed Scheme), this option would require an extensive area of land currently not required or directly impacted by the Proposed Scheme. This option would give rise to visual effects, with likely impacts on a number of residential receptors in the local area and recreational receptors using two PRow. The railhead and associated road and rail connections within this option would be likely to give rise to an increase in the landscape character effects on the local landscape character within Hey Sprink Ancient Redlands and Woodland LCA. This is in an area, located away from the route of the Proposed Scheme, which is currently not affected.
- 2.5.26 This option would see increased effects on biodiversity in the area with the likely partial loss of Hey Sprink Ancient Woodland adjacent to the proposed railhead compound location at its westernmost extent during the construction of the connections into the HS2 main line. This option would also impact directly on other wooded areas, including Aldersey's Rough, that are considered likely to be deemed of ancient woodland status due to the fragmented nature of the wooded areas in proximity to Hey Sprink. Re-commissioning and upgrading of the existing Stoke to Market Drayton Railway would be likely to be required and would be likely to have an impact on ecology in the area. Connection sidings to the west of the route and north of the Stoke to Market Drayton Railway would be located within the floodplain of the River Lea resulting in increased flood risk of the surrounding area and residential properties along Manor Road. Vehicular access to the M6 would require considerable upgrade works to the M6, as well as having likely impacts on the local road network due to connections to the railhead facility.
- 2.5.27 This option would have associated key construction risks, with the potential to impact the project timescales due to the positioning of the railhead between two tunnels in the Whitmore Heath to Madeley area (CA4). To enable this option to be viable large amounts of earthworks and the reinstatement of the out of use Stoke to Market Drayton Railway would be required. This would restrict connections to the WCML to one direction. Alternative options to provide connections in both directions would be likely to require significant earthworks. The out of use Stoke to Market Drayton Railway would further limit the connections into the WCML and the HS2 main line requiring substantial upgrade works to enable the provision of two track widths.

Location of the permanent maintenance facility

- 2.5.28 During the design development process since the announcement of the preferred route to Crewe in November 2015, further consideration has been given to the location and operating requirements of a permanent maintenance facility for the Proposed Scheme to optimise the maintenance regime. The working draft EIA Report included reference to a permanent maintenance facility that would be provided in the South Cheshire area (CA5), which would operate as a base for maintenance activities to support the railway infrastructure. Since the publication of the working draft EIA

Report and the design refinement consultation, further work has been undertaken to consider the location of the permanent maintenance facility.

2.5.29 The following two options were assessed on the basis of engineering and construction feasibility, cost and environmental impacts:

- Stone: a permanent maintenance facility located near Stone, sharing the same footprint and core infrastructure as the proposed Stone railhead. The maintenance facility, in the form of an IMB-R, would be situated on land between the HS2 main line and the M6, between the Norton Bridge to Stone Railway and the M6 Meaford viaduct, with sidings connecting into the Norton Bridge to Stone Railway; and
- Basford, Crewe (the scheme as assessed in the working draft EIA Report): a permanent maintenance facility located at Crewe. The maintenance facility would be situated in the west Basford area, with access spurs from the WCML via the proposed Basford Hall sidings and connection to the HS2 main line east of Hough.

2.5.30 The option near Stone was taken forward into the Proposed Scheme. Basford, in comparison to Stone, would be significantly more expensive to construct requiring the development of a second rail connected facility, the requirement for maintenance loops at Pipe Ridware and realignment works to the existing road network.

2.5.31 The analysis of engineering, cost and potential environmental impacts associated with both options are set out below, with the impacts of the option selected presented first.

Stone

2.5.32 This option would share the same footprint and the core infrastructure as the Stone railhead, and as a result would not introduce any additional significant environmental effects during construction. During operation, this option would introduce landscape and visual effects to nearby residential receptors including areas of Stone, Walton and Yarnfield. This option would also permanently affect commercial agricultural land holdings as well as impacting on a minor area of a committed development for up to 500 residential properties between the Norton Bridge to Stone Railway and the B5026 Eccleshall Road (reference 13/19002/OUT) due to the presence of the railway sidings adjacent to the Norton Bridge to Stone Railway.

2.5.33 This option would strategically position the permanent maintenance facility in the middle section of the Phase 2a Proposed Scheme enabling access to the HS2 main line in both directions. For the final Phase Two scheme (with the route from Crewe extended to Manchester and Golborne), this location would be ideally positioned between the northern ends of the route and the maintenance facilities proposed for Phase One. The positioning of a permanent maintenance facility in this location would enable maintenance activities to be undertaken along the Proposed Scheme efficiently due to its location in the middle section, making efficient use of the maintenance period when the railway is not operating.

2.5.34 A permanent maintenance facility, sharing the same footprint as the Stone railhead, would remove the cost of restoring the Stone railhead and enable the ongoing use of

infrastructure including buildings, utilities connections, rail sidings, connections to the conventional railway and M6 and environmental mitigation. Sharing of these elements would avoid the cost and environmental impact of providing these facilities separately and reduce the overall area of land required by the Proposed Scheme.

- 2.5.35 Maintenance loops located at Pipe Ridware, in the Fradley to Colton area (CA1), would also no longer be required with this option, enabling the height of the route of the Proposed Scheme in that area to be lowered, reducing visual impacts on local residential properties and impacts on the setting of listed buildings. Lowering the alignment in this area would also reduce costs and reduce the area of land required to operate and maintain the Proposed Scheme (Volume 2: Community area 1, Fradley to Colton).
- 2.5.36 The option near Stone does not introduce any additional technical or construction complexities, risk of safety hazards, or lengthening of the construction programme.

Basford, Crewe

- 2.5.37 In comparison to Stone (the Proposed Scheme), the Basford option would require extensive works to the local road network to maintain accessibility, which would have the potential to result in congestion and delays. Required works would include the replacement of the existing A500 Shavington Road viaduct and Weston Lane overbridge, the permanent closure of the B5071 Jack Mills Way, and an extension of the proposed Newcastle Road overbridge.
- 2.5.38 The land required for the implementation of a permanent maintenance facility at this location would also impact on an approved planning application at Basford West for general industry, storage and distribution and a separate application for residential development, offices and local amenity facilities (reference 14/0378N).
- 2.5.39 Due to the location at the northern extent of the Proposed Scheme, a permanent maintenance facility at this location would only be able to maintain the Phase 2a Proposed Scheme in one direction, resulting in increased travel times during periods of maintenance with decreased efficiency in comparison to a permanent maintenance facility situated in the middle section of the route. For the final Phase Two scheme (with the route from Crewe extended to Manchester and Golborne), this location would be approximately 30km north of the optimum position between the northern ends of the route and the maintenance facilities proposed for Phase One, lengthening travel times during periods of maintenance to the southern end of the Phase 2a scheme, and necessitating maintenance loops at Pipe Ridware.
- 2.5.40 The Basford option would be significantly more expensive to construct than the Stone option as a result of having two rail connected facilities, one temporary and one permanent, as well as the need for maintenance loops at Pipe Ridware.

Stone railhead and IMB-R access arrangements

- 2.5.41 Following consultation on the working draft EIA Report and the further analysis of traffic surveys and modelling, further consideration has been given to the access arrangements to serve the temporary railhead and the IMB-R at Stone in order to minimise the disruption to the local road network, including Yarnfield Lane. The responses received to the working draft EIA consultation demonstrated the

importance of Yarnfield Lane as a primary transport link between Yarnfield and Stone. It was also identified that the link between Yarnfield and Stone is important due to the facilities and community services shared between those communities. Options to address the temporary closure of Yarnfield Lane and to provide access to the Stone railhead and IMB-R via the M6 to reduce traffic impacts on local roads have been considered.

2.5.42 A preliminary options appraisal was undertaken of six options, and the following four options were not taken forward for further consideration as they were not considered to be reasonable alternatives:

- Option 1: This option involved the permanent closure of Yarnfield Lane with site access to the Stone railhead and IMB-R via the closed section of Yarnfield Lane. A diversion would be put in place for users of Yarnfield Lane adjacent to the western side of the M6, connecting into the B5026 Eccleshall Road. The access arrangements in this option were deemed unfeasible from a traffic perspective, as access to the Stone railhead and IMB-R would be required from the local road network, which would result in significant traffic and community impacts as well as the permanent closure of Yarnfield Lane during construction. As such this option was not taken forward for further consideration;
- Option 1B: This option involved access arrangements to the Stone railhead and IMB-R via Yarnfield Lane. A temporary closure of a section of Yarnfield Lane for approximately one year and six months between the M6 and the HS2 main line would be required, with users diverted via the existing road network during the realignment works. Yarnfield Lane would be reinstated via a new vertical alignment underneath the HS2 main line to connect back in with the existing Yarnfield Lane on the eastern side of the Proposed Scheme. The access arrangements in this option were also deemed unfeasible from a traffic perspective due to the temporary closure of Yarnfield Lane as well as access to the Stone railhead and IMB-R gained via the local road network, resulting in significant traffic and community impacts. As such this option was not taken forward for further consideration;
- Option 3: This option consisted of access arrangements to the Stone railhead and IMB-R via the M6. A temporary closure of a section of Yarnfield Lane for approximately one year and six months between the M6 and the HS2 main line would be required, with users diverted via the existing road network. Access from the M6 would be provided via a permanent southbound junction off the M6, as well as a temporary northbound junction off the M6 during the construction phase. This option included slip roads that were not compliant with relevant highway standards for both the permanent and temporary accesses off the M6, and would also require the closure of Yarnfield Lane for long periods due to the online vertical realignment, temporarily severing the communities of Yarnfield and Stone, as well as putting significant pressures on the local road network. As such this option was not taken forward for further consideration; and

- Option 4: This option included access arrangements to the Stone railhead and IMB-R via a southbound connection off the M6. A temporary closure of a section of Yarnfield Lane for approximately one year and six months between the M6 and the HS2 main line would be required with users diverted via the existing road network. Access from the M6 southbound would tie in with the existing Yarnfield Lane. This option also included slip roads that were not compliant with relevant highway standards for the permanent southbound access off the M6, and would also require the closure of Yarnfield Lane for long periods due to the online realignment of the lane underneath the HS2 main line, temporarily severing the communities of Yarnfield and Stone, as well as putting significant pressures on the local road network. As such this option was not taken forward for further consideration.

2.5.43 The following two options were taken forward to a more detailed appraisal where engineering and construction feasibility, cost and environmental impacts were considered:

- Option 2: New northbound and southbound accesses off the M6 located to the north of the existing Norton Bridge to Stone Railway. The northbound slip roads would only be used during the construction period with access restricted for vehicles to the Stone railhead and IMB-R as well as retaining the existing emergency access, connecting up with Yarnfield Lane. The southbound slip road would be permanent and would be used during construction and as access for the railhead and IMB-R during operation. Access from the M6 via the southbound slip roads would include security control features within the railhead and IMB-R, as well as security controls located at the northbound access point, prior to accessing Yarnfield Lane, restricting access to unauthorised vehicles. Yarnfield Lane would be realigned, crossing over the M6 on a new bridge. The southbound slip road would run under the realigned Yarnfield Lane. The existing Yarnfield Lane would remain open during construction and would only be closed for a short period of time to allow connections to the new realigned Yarnfield Lane. Following construction and connection of the realigned Yarnfield Lane, the disconnected section of road would be removed; and
- Option 5: This option is a further development of the option presented in the working draft EIA Report with consideration given to the duration of the temporary closure of Yarnfield Land and access from the M6. In this option new northbound and southbound accesses off the M6, located to the north of the existing Norton Bridge to Stone Railway, would be required. The northbound slip road would be used during the construction period for construction traffic and would be retained permanently to provide emergency access. The southbound slip road would be permanent and used by construction traffic during construction and would then provide access to the railhead and IMB-R. Both northbound and southbound slip roads would include security control features, restricting access to unauthorised vehicles. Yarnfield Lane would remain on its current alignment over the M6, before being realigned underneath the HS2 main line requiring a temporary closure of this section during construction for approximately one year and six months (as

opposed to up to three years stated in the working draft EIA Report). Both the northbound and southbound slip roads would be located on the northern side of Yarnfield Lane.

- 2.5.44 Option 2 was taken forward into the Proposed Scheme as, on balance, it presented the most favourable environmental outcome with significant improvements in comparison to Option 5 through retaining the use of Yarnfield Lane for public access throughout construction and operation of the Proposed Scheme and mitigating severance of communities. Option 5, in comparison, would present significant reductions in cost and construction programme timescales, however, it would present an increase in environmental impacts. Most notably these included community and traffic impacts as a result of temporary road closures across Yarnfield Lane for approximately one year and six months, which would cause congestion on the local road network.
- 2.5.45 The analysis of engineering, cost and potential environmental impacts associated with both options is set out below, with the impacts of the option selected presented first.

Option 2

- 2.5.46 This option would maintain Yarnfield Lane as a primary transport link between Yarnfield and Stone via an offline realignment of Yarnfield Lane. As such this would maintain access to facilities and community services shared between those communities.
- 2.5.47 During construction there would be amenity impacts on local residential properties with the realigned Yarnfield Lane causing significant visual effects on Whitemoor Farm, properties on Moss Lane and on the outskirts of Yarnfield, as well as a negative impact on the rural landscape character of the area west of the M6. Construction air quality impacts would also be experienced at Whitemoor Farm. However, the realignment of Yarnfield Lane would reduce the visual, air quality and noise impacts at Whitemoor Farm during the operational phase due to the location north of its existing alignment. This option would include the loss of ecological habitats potentially supporting protected species, as well as encroaching on Filly Brook on the western side of the M6. This option would also temporarily require agricultural land for the M6 northbound connections.
- 2.5.48 Option 2 has construction complexities associated with the realignment of Yarnfield Lane over the M6, with the new alignment adjacent to the existing crossing with limited working area.

Option 5

- 2.5.49 In comparison to Option 2 (the Proposed Scheme), Option 5 would temporarily remove an important transport link between Yarnfield and Stone, and as such, access to shared facilities and services. The closure of Yarnfield Lane would result in the need to divert traffic, resulting in congestion and delays. This option would increase the amount of land required, largely due to the temporary northbound slip road alignment, resulting in increased impacts on agricultural land and ecological habitats, as well as having a greater impact on Filly Brook, crossing the watercourse and requiring temporary culverting of this watercourse. A reduction in the visual effects would be evident during the construction phase on Whitemoor Farm, residential

properties along Moss Lane and properties along the outskirts of Yarnfield due to the retention of the existing Yarnfield Lane over the M6. There would be an increased impact on the rural landscape character due to the increased land required during construction of the northbound temporary slip roads west of the M6. The temporary closure of Yarnfield Lane during the construction phase would also result in reduced amenity effects at residential properties that line this section of the lane due to a temporary reduction in traffic emissions, dust and noise.

- 2.5.50 Option 5 does not introduce any technical or construction complexities or risk of safety hazards, and presents a reduction to the construction programme when compared to Option 2. Option 5 would also present significant cost savings in comparison to Option 2 as there would be no need to realign Yarnfield Lane and the existing structure over the M6 would be retained.

Bent Lane (North) diversion

- 2.5.51 During the design development process since (issue with demolitions the announcement of the preferred route to Crewe in November 2015, further consideration has been given to the diversion of Bent Lane, located to the south-west of Swynnerton Old Park. The sensitivities at this location, particularly the proximity to Swynnerton Old Park, maintaining access to Whitmore village, and reducing the impact on the community of Shelton under Harley have been key considerations in the development of these alternatives.

- 2.5.52 The following two options were taken forward to a detailed appraisal where engineering and construction feasibility, cost and environmental impacts were considered:

- Option 1 (route announced in November 2015): Bent Lane (North) diversion would continue from Dog Lane on the northern side of the HS2 main line in a westerly direction for approximately 400m before passing approximately 150m north of Shelton under Harley. The diversion would then continue in a south-westerly direction into the Whitmore Heath to Madeley area for approximately 450m before reconnecting into the existing Bent Lane; and
- Option 2: Bent Lane (North) diversion would continue from Dog Lane on the northern side of the HS2 main line in a westerly direction for approximately 500m before passing adjacent to and to the south of Shelton under Harley. This option would then continue on the existing Bent Lane alignment for approximately 250m into the Whitmore Heath to Madeley area, remaining north of the Proposed Scheme.

- 2.5.53 Option 2 was taken forward into the Proposed Scheme as, on balance, it presented the most favourable environmental outcome. Option 1, in comparison, would present an increase in environmental impacts, most notably an increase in landscape and visual effects, as well as agricultural, biodiversity and community impacts in the Shelton under Harley area.

- 2.5.54 The analysis of engineering, cost and potential environmental impacts associated with both options is set out below, with the impacts of the option selected presented first.

Option 2

- 2.5.55 This option would require demolition of properties in Shelton under Harley as a result of the construction of Bent Lane diversion. This option would generate impacts on the agricultural holding at Shelton under Harley due to loss of land both during construction and operation. Construction works within this option would likely impact directly and indirectly on protected species within Swynnerton Old Park. This option is also located within a groundwater source protection zone (SPZ) 1 of Severn Trent Water's public abstraction boreholes and construction would likely impact on groundwater quality in the area.
- 2.5.56 Option 2 does not introduce any technical or construction complexities, risk of safety hazards, or lengthening of the construction programme.

Option 1

- 2.5.57 In comparison to Option 2 (the Proposed Scheme), Option 1 would require an increase in the number of demolitions in Shelton under Harley as a result of the construction of Bent Lane diversion. A greater amount of land would also be required, thereby resulting in a greater loss of habitats including direct loss and fragmentation of hedgerows. This option would be closer to the sensitive habitats of Swynnerton Old Park, and therefore, may cause disturbance to the flora and fauna of these habitats through both construction and operation. This option would result in increased permanent impacts on the open rural landscape character of the park, including the historic context, and would increase visual amenity impacts on residential properties in Shelton under Harley and Swynnerton Old Park. The diversion of Bent Lane within this option would significantly increase severance of Shelton under Harley Farm from its agricultural land holding, as well as an increase in the impact on non-motorised users of Bent Lane. Option 2 is also within SPZ 1 of the Severn Trent Water's public abstraction boreholes, albeit further away having less of an impact in comparison to Option 2 on groundwater quality in the area.
- 2.5.58 Option 1 does not introduce any technical or construction complexities, risk of safety hazards, or lengthening of the construction programme.

3 Stakeholder engagement and consultation

3.1 Introduction

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

3.1.2 Since the route announcement in November 2015, HS2 Ltd has carried out a programme of stakeholder engagement and formal consultation with a broad range of stakeholders.

3.1.3 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.

3.2 Key stages of Phase 2a engagement and consultation

Summary of engagement

3.2.1 A summary of engagement undertaken or underway since the route announcement in November 2015 is provided in Table 5.

Table 5: Mechanisms and timeline of stakeholder engagement and consultation since the route announcement in November 2015

Date	Engagement and consultation activity and mechanisms	Stakeholders engaged/consulted
November 2015	Local authority briefings.	Local authority officers along the line of route.
November 2015 - February 2016	Consultation on schemes to assist property owners from 30 November 2015 to 25 February 2016.	National consultation with information published on the HS2 website. Direct engagement with communities and their representatives through public events and documents being made available at a range of community locations along the route.
December 2015 - September 2016	Direct engagement to develop the Proposed Scheme, the Environmental Impact Assessment (EIA) and Equality Impact Assessment (EQIA).	Local authorities, parish councils and technical and specialist stakeholders.
January 2016 - ongoing	Site visits and meetings to observe and discuss possible impacts and understand people’s concerns.	Residents, landowners, businesses, community interest groups and other directly affected stakeholders and their representatives along the route.
March 2016 - May 2016	Consultations on the draft EIA and EQIA Scope and Methodology Reports (SMR) from 8 March to 13 May 2016.	National consultation with information published on the HS2 website. Technical and specialist stakeholders, local authorities and parish councils on the line of route directly invited to participate.
September - November 2016	Consultations on the Working Draft EIA Report; Working Draft EQIA Report; and Design Refinements from 13 September to 7 November 2016.	National consultation with information published on the HS2 website. Direct engagement with communities and their representatives through public events and documents being made available at a range of community locations along the route.

Date	Engagement and consultation activity and mechanisms	Stakeholders engaged/consulted
November 2016 - ongoing	Ongoing discussions, meetings and site visits in response to issues raised during consultation and through broader stakeholder engagement.	Residents, landowners, businesses, community interest groups and other directly affected stakeholders and their representatives along the route

Property consultation

- 3.2.2 Property consultation focused on those individuals and landowners potentially directly affected by the Proposed Scheme. Consultation took place between 30 November 2015 and 25 February 2016. Its purpose was to inform the Government’s decision on whether to implement the same compensation and assistance schemes as for Phase One, taking into consideration the views of those individuals and organisations who expressed their opinions on the proposals.
- 3.2.3 Within the Stone and Swynnerton area, a property consultation event was held at Yarnfield Village Hall on 16 January 2016. An analysis of consultation responses was carried out, and reported on 26 May 2016 in the Government’s report entitled “HS2 Phase Two: West Midlands to Crewe Property Consultation 2015”¹⁵ and the Government’s response was issued in the “Decision Document HS2 Phase Two: West Midlands to Crewe Property Consultation 2015”¹⁶.

EIA SMR consultation

- 3.2.4 The draft EIA Scope and Methodology Report (SMR) was formally consulted on from 8 March to 13 May 2016 and was issued to statutory bodies, non-government organisations and local authorities. It was also available on the Government’s website, allowing comment by local interest groups and the public. Twenty-six responses to the draft EIA SMR were received, as a result of which changes were made to the EIA SMR, which was published in September 2016. The changes between the draft EIA SMR and the publication of the EIA SMR were set out in the EIA SMR Consultation Report, also published in September 2016.
- 3.2.5 The assessment set out in this ES follows the scope and methodology in the EIA SMR and SMR Addendum (Volume 5: Appendix CT-001-001 and Appendix CT-001-002).

Working draft EIA Report consultation

- 3.2.6 The working draft EIA Report was formally consulted upon between 13 September and 7 November 2016. Parallel consultations on the working draft EQIA and Design Refinements were also undertaken during this period. As part of the process of consultation, stakeholders were invited to comment on the Proposed Scheme and the working draft EIA and EQIA reports that informed it as well as the key design refinements to the Proposed Scheme, which were being considered at the time.

¹⁵ UK Government: HS2 Phase 2a: 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>

¹⁶ UK Government: HS2 Phase 2a: HS2 Phase Two West Midlands to Crewe property consultation 2015: government decision. Available online at: <https://www.gov.uk/government/publications/hs2-phase-two-west-midlands-to-crewe-property-consultation-2015-government-decision>

- 3.2.7 Four hundred and seventy-five responses to the working draft EIA Report consultation were received in total.
- 3.2.8 These responses were analysed and the following themes and issues relevant to the Stone and Swynnerton area included:
- impacts on the communities of Yarnfield and Swynnerton, including potential isolation impacts;
 - impacts of the Stone railhead and Stone IMB-R, specifically the potential for dust, light, sound, noise, visual, ecological and traffic and transport impacts;
 - impacts on strategic allocations and proposed housing developments at Stone, Yarnfield, Eccleshall and Walton;
 - use of Yarnfield Lane and the local road network by construction traffic, including road safety concerns;
 - impacts on the M6; and
 - ecological impacts.
- 3.2.9 These consultations and wider feedback from ongoing stakeholder engagement have been considered as part of the ongoing design of the Proposed Scheme, including the assessment and identification of mitigation opportunities for the Stone and Swynnerton area.
- 3.2.10 A Working Draft EIA Report Consultation Summary Report¹⁷ has been published alongside this ES summarising how the responses to the working draft EIA Report have been taken into consideration in the design and assessment of the Proposed Scheme. A separate consultation summary report has been prepared for the working draft EQIA Report¹⁸.
- 3.2.11 Section 2 of this report describes the key changes made to the design in the Stone and Swynnerton area since the working draft EIA Report.

3.3 Engagement and consultation with stakeholder groups

Technical and specialist groups

- 3.3.1 Engagement has been undertaken with technical and specialist organisations to provide appropriate specialist input to inform the design and assessment of the Proposed Scheme. This includes engagement with statutory bodies, local councils and utility companies operating within the Stone and Swynnerton area.
- 3.3.2 Direct engagement with county and borough councils within the Stone and Swynnerton area took place in order to collate local baseline information, identify and understand issues and concerns, and provide a mechanism for ongoing dialogue and discussion on the assessment and design development.

¹⁷ Volume 5: Appendix CT-008-000, Working Draft Environmental Impact Assessment Report: Consultation Summary Report.

¹⁸ Working Draft Equality Impact Assessment Report: Consultation Summary Report. Available online at: www.gov.uk/hs2

- 3.3.3 Engagement has focused on the technical areas that inform the assessment, including, landscape and visual, sound, noise and vibration and traffic and transport, amongst others topics. It has also informed the design of the Proposed Scheme, as summarised in Table 6.
- 3.3.4 Briefings were offered to specialist and technical stakeholders along the route of the Proposed Scheme during the period of consultation on the working draft EIA Report to provide information on the evolving design and assessment of the Proposed Scheme in their respective areas.
- 3.3.5 Table 6 includes engagement undertaken with technical and specialist groups and how this has informed the design and assessment of the Proposed Scheme in the Stone and Swynnerton area.

Table 6: Engagement to date with technical and specialist groups

Stakeholder	Area of focus for design and assessment	How this has informed the design and assessment of the Proposed Scheme
Statutory		
Department for Environment, Food and Rural Affairs (Defra)	Agricultural and land quality issues	Identifying local agricultural and land quality issues, including sites of particular interest such as foot and mouth burial sites.
Canal & River Trust	The landscape and visual assessment methodology with specific reference to the selection and location of representative viewpoints for the assessment and for photomontages.	Informing the selection of draft representative viewpoint and photomontage locations, with particular focus on intersections of the Proposed Scheme with Canal & River Trust estate and assets. Understanding the potential impact of the Proposed Scheme on landscape character and key recreational visual receptors at important sites in the Canal & River Trust's estate.
Environment Agency	Water and flood risk issues	Providing information on water and flood risk issues along the line of route.
Food and Environment Research Agency (FERA)	Land contamination issues	Identification of local land quality issues.
Forestry Commission	Ecology and landscape related issues	Informing understanding of methodological approach and detailed local conditions and factors to be taken into consideration in the assessment.
Highways England	Traffic and transport assessment	Informing the assessment of road network capacity and identification of proposed future works.
Historic England	Nationally designated heritage assets and the heritage assessment methodology	Informing the methodology for assessing setting and impacts on historic landscape at national and regional level. Identification and assessment methodology of designated and non-designated heritage assets.
Natural England	Ecology and landscape and visual related issues Agricultural land quality and land restoration issues	Providing further information regarding potential ancient woodland sites. Understanding of methodological approach and detailed local conditions and factors to be taken into consideration in the assessment.
Local authorities		

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Stakeholder	Area of focus for design and assessment	How this has informed the design and assessment of the Proposed Scheme
Staffordshire County Council	Cultural heritage	Identifying heritage assets to protect these assets and their settings.
	Water and flood risk issues	Understanding local infrastructure and conditions, including flood risks.
	Ecology and biodiversity assessment	Understanding sensitive ecological sites and appropriate mitigations and compensation for habitat loss associated with the Proposed Scheme.
	Traffic and transport in relation to the construction of the Proposed Scheme	Understanding the local road network, its current use and levels of traffic and congestion to inform construction traffic routes.
	Landscape and visual effects of the Proposed Scheme	Identifying representative viewpoint and photomontages locations.
	Potential health effects of the Proposed Scheme on local communities	Understanding local demographic and determinants of health and wellbeing.
	Equalities assessment	Identifying vulnerable groups within the community area.
	Air quality assessment	Understanding local conditions and factors to inform scheme design and EIA.
Stafford Borough Council	Sound noise and vibration assessment	Understanding local conditions and factors to inform scheme design and EIA.
	Equalities assessment	Identifying vulnerable groups within the community area.
	Land quality assessment	Identifying key sites within the local area to be included in the land quality assessment.
Utilities		
National Grid	Utilities, gas and electricity networks	Informing route-wide considerations around utilities network and factors to be considered in the design and assessment of the Proposed Scheme.
Severn Trent Water	Potential connections and proximity of the Proposed Scheme to Severn Trent Water assets.	Understanding of local utilities and factors to consider in the design, construction and operation of the Proposed Scheme, in particular the Hatton ground water abstraction site and Source Protection Zone.
Other specialist stakeholders		
Central Association of Agricultural Valuers (CAAV)	Potential impacts of the Proposed Scheme on agricultural businesses.	Understanding the concerns of the agricultural industry in relation to the Proposed Scheme.
Country Land and Business Association (CLA)	Potential impacts of the Proposed Scheme on agricultural businesses	Understanding the concerns of the agricultural industry in relation to the Proposed Scheme.
National Farmers Union (NFU)	Potential impact of the Proposed Scheme on farmers and agricultural businesses	Understanding the concerns of farmers affected by the Proposed Scheme.

Stakeholder	Area of focus for design and assessment	How this has informed the design and assessment of the Proposed Scheme
Royal Society for the Protection of Birds (RSPB)	Ecology and biodiversity issues	Informing the ecology survey programme, and strategic mitigation opportunities.
Staffordshire Wildlife Trust	Local and regional ecology and biodiversity issues	Understanding of local wildlife assets and informing potential off site and strategic mitigation.
Woodland Trust	The route and associated effects to local woodland habitats	Informing understanding of local woodland habitats and how to mitigate and offset impacts to these.

3.3.6 Further information about topic-specific engagement with technical and specialist groups is provided in Sections 4 to 15, where relevant.

Communities

3.3.7 Community stakeholders in the area include a range of local interest groups, local facility and service providers and schools as well as members of the public, in the Stone and Swynnerton area. The purpose of this engagement has been to give affected communities the opportunity to raise issues during the development of the design and assessment of the Proposed Scheme.

3.3.8 As part of the formal consultation on the working draft EIA Report, members of local communities and other interested parties were notified, provided with information and invited to engage on issues pertinent to the working draft EIA Report and the development of the Proposed Scheme design. Details of local consultation events were provided on the HS2 Ltd website, via social media, on posters at local venues, through regional advertising and direct mail-out to properties within 1km of the Proposed Scheme.

3.3.9 In the Stone and Swynnerton area a consultation event on the working draft EIA Report, working draft EQIA Report and on key design refinements was held at Yarnfield Park on 12 October 2016.

3.3.10 HS2 Ltd staff and consultants, including engineers, environmental and property specialists, attended the event, for members of the public to speak to.

3.3.11 An overview of how these responses have been taken into consideration in the ES is contained in the Working Draft EIA Report Consultation Summary Report.

3.3.12 Engagement has also been undertaken with members of the community via the local parish councils and residents, as outlined in Table 7. Engagement with parish councils and residents has been used to understand local community concerns and issues in relation to the Proposed Scheme.

3.3.13 Table 7 sets out meetings undertaken with community stakeholders in the Stone and Swynnerton area.

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Table 7: Meetings held with communities and community stakeholders

Stakeholder	Area of focus	How this has informed the design and assessment of the Proposed Scheme
Swynnerton Parish Council	To provide and update on the Proposed Scheme and discuss the working draft EIA, EQIA and Design Refinement consultation documents and understand the local conditions and factors to inform scheme design and EIA.	Understanding local conditions and factors to inform scheme design and EIA.
Eccleshall Parish Council		
Chebsey Parish Council		
Whitgreave Parish Council		
Stone Town Council		
Stone Rural Parish Council		
Stone Dominoes Football Club - Wellbeing Park	To understand the functionality of the football ground and discuss any potential interfaces with the Proposed Scheme.	Details of the football grounds use and visitor numbers has informed the traffic and transport assessment.

Directly affected individuals, landowners and businesses

- 3.3.14 Engagement was undertaken with land owners, farmers and growers whose operations, land and/or property will be directly affected by the Proposed Scheme whether permanently or temporarily. This included individual property and land owners, commercial and educational entities, and farmers and growers, including through the land and property consultation and ongoing dialogue.
- 3.3.15 Fourteen visits were undertaken to farmers and growers in this area during the assessment and design development. Engagement was also carried out with key representatives of the farmers and growers industry.
- 3.3.16 Key areas of focus for the engagement with landowners and their representatives were: the refinement of locations of balancing ponds, access roads and environmental mitigation; the design of access and accommodation bridges; and maintaining operational access to land and businesses.

4 Agriculture, forestry and soils

4.1 Introduction

- 4.1.1 This section provides a description of the current baseline for agriculture, forestry and soils and the likely impacts and significant effects of the construction and operation of the Proposed Scheme within the Stone and Swynnerton area. Consideration is given to the extent and quality of the soil and land resources underpinning the primary land use activities of farming and forestry, and the physical and operational characteristics of enterprises engaged in these activities. Consideration is also given to diversification associated with the primary land uses, and to related land-based enterprises, notably equestrian activities.
- 4.1.2 Engagement with farmers and landowners has been undertaken. The purpose of the engagement has been to obtain baseline information on the scale and nature of the farm and forestry operations and related farm-based uses, and to provide farmers and landowners with the opportunity to raise issues and discuss mitigation in relation to the Proposed Scheme. Engagement undertaken with farmers and landowners will be documented in a farm pack for each farm holding¹⁹.
- 4.1.3 Details of published and publicly available information used in the assessment, and the results of surveys undertaken within this area, are contained in Volume 5: Appendix AG-001-003 and shown on Map Series AG-01 (Agricultural Holdings), AG-02 (Soil Associations) and AG-04 (Agricultural Land Classification) (Volume 5: Agriculture, forestry and soils Map Book).
- 4.1.4 Maps showing the location of the key environmental features (Map Series CT-10) and the key construction (Map Series CT-05) and key operational (Map Series CT-06) features of the Proposed Scheme can be found in the Volume 2: CA3 Map Book.

4.2 Scope, assumptions and limitations

- 4.2.1 The assessment scope, key assumptions and limitations for the agriculture, forestry and soils assessment are set out in Volume 1 (Section 8), the Phase 2a Scope and Methodology Report (SMR)²⁰, and the SMR Addendum²¹.
- 4.2.2 The study area for the agriculture, forestry and soils assessment covers all land required for the construction and operation of the Proposed Scheme. The resources and receptors that are assessed within this area are agricultural land, forestry land and soils, together with farm and rural holdings. The assessments of the impacts on agricultural land quality and forestry land are made with reference to the prevalence of best and most versatile (BMV) land and forestry land in the general locality, taken as a 4km corridor centred on the route of the Proposed Scheme.
- 4.2.3 The quality of agricultural land in England and Wales is assessed according to the Agricultural Land Classification (ALC)²² system, which classifies agricultural land into

¹⁹ Part 3 of the HS2 Phase 2a Guide for Farmers and Growers, Available online at: www.gov.uk/hs2

²⁰ Volume 5: Appendix CT-001-001, Environmental Impact Assessment Scope and Methodology Report.

²¹ Volume 5: Appendix CT-001-002, Environmental Impact Assessment Scope and Methodology Report Addendum.

²² 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.

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 BMV agricultural quality (Grades 1, 2 and 3a) is affected by the Proposed Scheme.

- 4.2.4 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.
- 4.2.5 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; Section 11, Landscape and visual; and Section 15, Water resources and flood risk. The function of soil as a carbon store is described in Volume 3: Route-wide effects (Section 4).
- 4.2.6 The main issue for farm holdings is disruption by the Proposed Scheme of the physical structure of agricultural holdings and the operations taking place upon them, during both construction and operational phases.
- 4.2.7 Common assumptions that have been used in assessing the effects of the Proposed Scheme are set out in Volume 1 (Section 8). These assumptions include the restoration of agricultural land that is required temporarily for construction to agricultural use, and the handing back of land used temporarily to the original landowner. It is also assumed that capital items demolished will not be replaced as replacement assets are not included in the Proposed Scheme and will ultimately be at the discretion of the landowner. In the majority of cases, the details of land use have been obtained from face-to-face interviews; where this has not been possible, holding data has been obtained from publicly available sources.

4.3 Environmental baseline

Existing baseline

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

Soil and land resources

Geology and soil parent materials

- 4.3.2 A full description of the geological characteristics of the Stone and Swynnerton area is provided in Section 10, Land quality and Section 15, Water resources and flood risk, and shown on Map WR-02-203 (Volume 5: Water resources and flood risk Map Book). The bedrock geology mapped by the British Geological Survey (BGS)²³ is that of the Mercia Mudstone Group, comprising mudstones and subordinate siltstone, with halite-bearing units. The Stafford Halite Member, in which halite-stone is more

²³ British Geological Survey (2017). Geology of Britain viewer. Available online at <http://mapapps.bgs.ac.uk/geologyofbritain/home.html>

prevalent, is part of the Mercia Mudstone Group and is found in the southernmost part of the study area.

- 4.3.3 Further north, around Swynnerton, the bedrock comprises the Chester Formation (part of the Sherwood Sandstone Group) and the Tarporley Siltstone Formation (part of the Mercia Mudstone Group), with faulting and folding resulting in a repeated sequence of the Tarporley Siltstone and Helsby Sandstone Formations (the latter part of the Sherwood Sandstone Group).
- 4.3.4 In the northern part of the study area, the bedrock comprises the Wildmoor Sandstone Member, which is part of the Sherwood Sandstone Group.
- 4.3.5 There are no superficial deposits recorded over large parts of the study area. There are deposits of Glacial Till on higher land north of Yarlet, at Aston-by-Stone, north of Swynnerton and west of Beech. These comprise unsorted material ranging in size from clay to boulders (hence, it is also commonly referred to as Boulder Clay).
- 4.3.6 Superficial Glacial Head Deposits are also mapped in a small area north of Swynnerton and predominantly include poorly sorted sand and gravel. Glaciofluvial Sheet Deposits are mapped to the south of Swynnerton.
- 4.3.7 Alluvium associated with the Filly Brook overlies the mudstone between Stone and Yarnfield, extending northwards alongside the M6, and is also found along minor watercourses between Yarnfield and Swynnerton. Further north, alluvium is mapped in association with the Meece Brook from Lower Hatton to Whitmore in the Whitmore Heath to Madeley area (CA4). Alluvial deposits typically include consolidated silty clay, but may also contain sand, Peat and gravel. Peat is also mapped to the east of Yarnfield.
- 4.3.8 North of Stableford, two narrow valleys are cut into the Wildmoor Sandstone. The valley bottoms are overlain by superficial alluvium whilst Quaternary alluvial fan deposits are mapped on the valley sides, typically on the steepest slopes.

Topography and drainage

- 4.3.9 In the south of the Stone and Swynnerton area, the topography is characterised by a series of rounded hill tops with elevations of between 140m and 160m above Ordnance Datum (AOD). The land falls from these heights in irregular, convexo-concave, shallow to moderate slopes. The moderate slopes generally have a north-easterly aspect and drain into the River Trent in the east, at approximately 85m AOD. To the east of Yarnfield, the Filly Brook runs northward in a shallow valley at an altitude of around 95m AOD.
- 4.3.10 From the south-east of Swynnerton the topography becomes characterised by a series of ridges at generally around 185m AOD. The highest is at Knowl Wall with an altitude of over 200m AOD. Slopes are generally shallow to moderate, falling to altitudes of 130m to 140m AOD. At Swynnerton Old Park, there is a general, though irregular, shallow slope downward and westward, draining the land to the Meece Brook.
- 4.3.11 Small pockets of lower-lying land in this area are at risk of flooding by rivers. Land between Yarnfield and Stone along the Filly Brook (extending northwards in line with the M6) and land to the east of Stableford along the Meece Brook is classified as Flood

Zone 3, in which there is a 1 in 100 or greater annual probability of flooding. With increased distance from the watercourses the areas mapped as Flood Zone 2 are less susceptible to flooding, defined as having between a 1 in 100 and 1 in 1,000 annual probability of flooding by rivers. Further details are provided in Section 15, Water resources and flood risk.

Description and distribution of soil types

- 4.3.12 The characteristics of the soils are described by the Soil Survey of England and Wales²⁴ and shown on the National Soil Map²⁵. The soils are grouped into associations of a range of soil types. They are described in more detail in Volume 5: Appendix AG-001-003 and their distribution is shown on Map AG-02-103 (Volume 5: Agriculture, forestry and soils Map Book).
- 4.3.13 There are three groups of soil associations in this study area. The presence of each group has been confirmed by detailed soil survey data obtained from published survey records and surveys undertaken for the purpose of this assessment. The first group comprises clay loam, silty clay loam or clay topsoils, overlying clay or silty clay subsoils of the Worcester and Whimple 3 associations. These soils occur on steep to moderate slopes respectively, and although slowly permeable, are typically imperfectly drained and Wetness Class²⁶ (WC) III.
- 4.3.14 The second group comprises clay loam or sandy clay loam topsoils over clay loam or clay subsoils and include the Wigton Moor, Enborne and Clifton associations. These profiles are imperfectly (WC III) to poorly (WC IV) drained. The presence of both soil types is confirmed by available survey data in the south, west and north of the study area. Profiles include clay loam topsoil and upper subsoil horizons over poorly drained clay or silty clay lower horizons.
- 4.3.15 Coarse loamy and sandy profiles of the Wick 1, Delamere and Bridgnorth associations comprise the third group. These soil profiles are well drained (WC I-II) and affected by droughtiness. The presence of this soil type around Swynnerton is confirmed by detailed soil surveys undertaken in 2016.

Soil and land use interactions

Agricultural land quality

- 4.3.16 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.
- 4.3.17 The main soil properties that affect the cropping potential and management requirements of land are texture, structure, depth, stoniness and chemical fertility.

²⁴ 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.

²⁵ Cranfield University (2001), *The National Soil Map of England and Wales 1:250,000 scale*. Cranfield University: National Soil Resources Institute.

²⁶ 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 WC I which is well drained to WC VI which is very poorly drained.

- 4.3.18 Climate within this study 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 droughtiness²⁷ limitations of the land.
- 4.3.19 The local agro-climatic data have been interpolated from the Meteorological Office's standard 5km grid point dataset²⁸ for three points within the area and are set out in Volume 5: Appendix AG-001-003. The data show climate in the area to be cool and moist. The number of Field Capacity Days (FCDs), when the soil moisture deficit²⁹ is zero, ranges from 184 to 192 days per annum. This is higher than average for lowland England (150 days) and generally constrains agricultural cultivations and soil handling for relatively long periods over winter. Soil moisture deficits (which provide an indication of the liability of soils to droughtiness in summer) are moderate to moderately small.
- 4.3.20 Site factors include gradient and microrelief, and these are potentially limiting to agricultural land quality within this study area particularly in its southern and northernmost parts where gradients limit land to Subgrade 3b.
- 4.3.21 Flood risk represents a potential limitation to agricultural land quality around the Filly Brook between Yarnfield and Stone, and north of Stableford. Land in Flood Zone 3 is at risk of annual flooding, which will be reflected in a moderate to severe limitation to agricultural land quality. Further details are provided in Section 15, Water resources and flood risk.
- 4.3.22 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. For soil wetness, each soil is allocated a Wetness Class based on soil structure, evidence of waterlogging and the number of FCDs. The topsoil texture then determines its ALC grade. Soil droughtiness is determined by the soil textures and thickness of each soil horizon present, together with the crop moisture deficits.
- 4.3.23 The first and second groups of soil associations identified (Worcester, Whimple 3, Wigton Moor, Enborne and Clifton), comprising imperfectly drained profiles of WC III with medium loamy topsoils, are limited by wetness and workability to Subgrade 3a, whilst the poorly drained profiles with heavier loamy topsoils are limited to Subgrade 3b. Survey data has confirmed these limitations at Walton, to the south of Yarnfield and east of Swynnerton Park.
- 4.3.24 The third group, which includes the well-drained, coarse loamy and sandy soils of the Wick 1, Delamere and Bridgnorth associations are mostly affected by soil droughtiness, the severity of which is determined by factors such as topsoil texture, specific stone content and depth to the sandstone bedrock. The exception is the Delamere association, which includes very acidic and coarse-textured soils that are typically under woodland or heath and are of very poor quality when in agricultural use.

²⁷ 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.

²⁸ Meteorological Office (1989), *Gridpoint Meteorological data for Agricultural Land Classification of England and Wales and other Climatological Investigations*.

²⁹ The moisture deficit is a crop-related meteorological variable which represents the balance between rainfall and potential evapotranspiration calculated over a critical portion of the growing season.

- 4.3.25 Survey data from the area to the west of Aston-by-Stone shows soils in the Wick 1 association with common medium-sized stones in the topsoil equating to a limitation to Subgrade 3a. Wick 1 soils in the area to the north-east of Swynnerton have little to no limitation to agricultural use and are of Grade 1.
- 4.3.26 As crop moisture deficits are moderate to moderately-small, the droughtiness limitation for the majority of these soils is mostly only slight. This has also been confirmed by surveys at Swynnerton, which show most of the land as Grade 2. Occasional profiles with sand subsoil layers are limited by droughtiness to Subgrade 3a.
- 4.3.27 As set out in the SMR, the sensitivity of BMV land in the study area is determined relative to the abundance of such land in the area, set as a 4km corridor centred on the route of the Proposed Scheme. Department for the Environment, Food and Rural Affairs (Defra) mapping³⁰ shows that there is a high likelihood of encountering BMV agricultural land in the locality, which makes such land a resource of low sensitivity in this study area.
- 4.3.28 The distribution of agricultural land quality in the study area is described in more detail in Volume 5: AG-001-002 and shown on Map AG-04-109b to Map AG-04-113a (Volume 5: Agriculture, forestry and soils Map Book).

Other soil interactions

- 4.3.29 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 England³¹ and the Government's White Paper, *The Natural Choice: securing the value of nature*³² and include:
- the storage, filtration and transformation of water, carbon and nitrogen in the biosphere;
 - the support of ecological habitats, biodiversity and gene pools;
 - support for the landscape;
 - the protection of cultural heritage;
 - the provision of raw materials; and
 - the provision of a platform for human activities, such as construction and recreation.
- 4.3.30 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.

³⁰ Defra (2005), *Likelihood of Best and Most Versatile Agricultural Land*.

³¹ Defra (2009), *Soil Strategy for England*.

³² HM Government (2011), *The Natural Choice: securing the value of nature*.

- 4.3.31 The low-lying land between Yarnfield and Stone along the Filly Brook and along the Meece Brook at Stableford is prone to occasional flooding, as set out in Section 15, Water resources and flood risk. The soils in this area function as water stores for flood attenuation, as well as providing a habitat for ecology and biodiversity.

Land use

Land use description

- 4.3.32 Land use in the Stone and Swynnerton area is predominantly agricultural with large blocks of arable and pasture and a few smaller holdings located close to Stone; there are large dairy farms west of Walton, east and north of Swynnerton and at Stableford. The fields are mainly regular in shape and medium to large in scale, reflecting the large size of the farm holdings. There is also a large equestrian livery enterprise near Walton.
- 4.3.33 There are large stands of woodland in the north of the area, the largest of which is in Swynnerton Old Park and Maer Hills, with others including Clifford's Wood and Hatton Common. Closer to Swynnerton, woodland blocks include Birchwood, Cash's Pit, Stabhill Plantation, Closepit Plantation and Lodge Covert. Swynnerton Old Park Ancient Woodland Inventory (AWI) site covers approximately 289ha, and Natural England has confirmed that two woodlands at Birchwood (0.6ha) and Clifford's Wood (16.9ha) will be added to the AWI. There are no woodlands of note in the south of the Stone and Swynnerton area. A full description of woodland in the Stone and Swynnerton area is set out in Section 8, Ecology and biodiversity.
- 4.3.34 The proportion of woodland as a land use in the general locality, taken as a 4km corridor centred on the route of the Proposed Scheme, is relatively high at 14.3% compared to the national average (which is 10%), as such woodland as a land use is a resource of low sensitivity in this study area.
- 4.3.35 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.
- 4.3.36 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 from 2015 is the main agri-environment scheme in England. The CSS incorporates elements of Environmental Stewardship, the English Woodlands Grant scheme and Catchment Sensitive Farming grants.
- 4.3.37 Most Environmental Stewardship agreements, which were extensive and covered approximately 70% of agricultural land in England, have now ended although existing agreements will run their course. The CSS is more focussed than Environmental Stewardship, with applications for funding being competitive and the area covered by the scheme expected to be less than that covered under Environmental Stewardship. Holdings that have land entered into an agri-environment scheme are identified in Table 8.

Number, type and size of holdings

- 4.3.38 Table 8 sets out the main farm holdings within this area. There is a mixture of owner-occupation and tenancies, which range from small holdings to the Swynnerton Estate with over 2,000ha around Swynnerton (of which approximately half is tenanted). Excluding the Swynnerton Estate, the average farm size is approximately 100ha. The boundaries of the holdings are shown on Maps AG-01-109b to AG-01-113a (Volume 5: Agriculture, forestry and soils Map Book) along with the location of the main farm buildings. Field drainage is common throughout the south of the study area, but considerably less so in the naturally well-drained soils to the north of Swynnerton.
- 4.3.39 Table 8 also sets out the sensitivity of individual holdings to change. This is determined by the extent to which they have the capacity to absorb or adapt to impacts, which in turn is determined primarily by their nature and scale. In general terms, larger holdings have a greater capacity to change enterprise mix and scale, can better absorb impacts and are less sensitive. Units that rely on the use of buildings (such as intensive livestock and dairy farms, and horticultural units) are less able to accommodate change and have a higher sensitivity. Non-commercial land uses and units, such as pony paddocks associated with residential properties, have a low sensitivity. The holding reference provides a unique identifier and relates to Maps AG-01-109b to AG-01-113a (Volume 5: Agriculture, forestry and soils Map Book) and Volume 5: Appendix AG-001-003.

Table 8: Summary characteristics of holdings

Holding reference/name	Holding type	Holding size (ha)	Diversification	Agri-environment scheme	Sensitivity to change
CA3/1 New House Farm	Dairy	50	None	None	High
CA3/2* Aston Hill Farm	Grassland	29	Not known	ELS	Medium
CA3/3 Aston Pool Farm	Dairy and arable	300	Diversified activities include buildings let for commercial and residential uses; fishery lake let, on-farm shoot; waste storage and disposal	ELS	High
CA3/4 Pirehill Cottage Farm	Beef cattle and sheep	40	Residential lets	None	Medium
CA3/5 North Pirehill Farm	Arable and beef cattle	225	Residential lets and telecommunications mast	None	Medium
CA3/6 Walton House Farm	Equestrian and arable	27	DIY livery yard, 0.4ha solar farm, wind turbine, residential lets and commercial barn let	ELS	Medium
CA3/7	Dairy	67	None	ELS	High

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Holding reference/name	Holding type	Holding size (ha)	Diversification	Agri-environment scheme	Sensitivity to change
Walton Heath Farm					
CA3/8* Little Micklow Farm	Grassland	1	Not known	None	Low
CA3/9* Land at Walton	Grassland	14	Not known	None	Medium
CA3/10* Land north of Eccleshall Road	Arable	17	Not known	None	Medium
CA3/11 Micklow House Farm	Beef cattle, arable, sheep	332	Feed mill	None	Medium
CA3/12 Pool House Farm	Beef cattle	14	Barns let for commercial uses, agricultural and civil contracting	None	Medium
CA3/13* The Paddock Home Farm	Arable and grassland	9	No data available	None	Medium
CA3/14* Land south of Yarnfield Lane M6 overbridge replacement	Grassland	1	Not known	None	Low
CA3/15* Land south of Yarnfield Lane	Grassland	<2	Not known	None	Low
CA3/16 Darlaston Grange Farm	Arable	95	None	ELS	Medium
CA3/17* Whitemoor Farm	Grassland with equestrian	14	Not known	None	Medium
CA3/18* The Ashtons Farm	Arable	5	Not known	ELS	Medium
CA3/19* Darlastonwood Farm	Arable and grassland	95	Not known	None	Medium
CA3/20 Swynnerton Estate (land farmed by the estate as opposed to let)	Arable, beef cattle and dairy heifer rearing	925 (in-hand)	Forestry land let to Forestry Commission and extensive estate operations including property lets, commercial storage and shoot	HLS and ELS	Medium

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Holding reference/name	Holding type	Holding size (ha)	Diversification	Agri-environment scheme	Sensitivity to change
CA3/21* Grange Farm (Swynnerton Estate tenanted farm)	Arable and grassland	91	Not known	HLS and ELS	Medium
CA3/22 Sandyford Farm (Swynnerton Estate tenanted farm)	Dairy and arable	146	None	ELS	High
CA3/23 Hatton Farm (Swynnerton Estate tenanted farm)	Arable and beef cattle	121	Logging business	None	Medium
CA3/24 Rowe Farm (Swynnerton Estate tenanted farm)	Dairy and beef cattle	198	Waste collection and spreading to land	None	High
CA3/25* Land at Stableford	Grassland	5	Not known	None	Low
CA3/26 Shelton under Harley Farm (Swynnerton Estate tenanted farm)	Dairy	167	None	ELS	High

* No Farm Impact Assessment interview conducted; data estimated.

Future baseline

Construction (2020)

- 4.3.40 Volume 5: Appendix CT-004-000 provides details of the developments in the Stone and Swynnerton area that are assumed to have been implemented by 2020.
- 4.3.41 No committed developments have been identified in this study area that will materially alter the baseline conditions in 2020 for agriculture, forestry and soils.

Operation (2027)

- 4.3.42 Volume 5: Appendix CT-004-000 provides details of the developments in the Stone and Swynnerton area that are assumed to have been implemented by 2027.
- 4.3.43 No committed developments have been identified in this study area that will materially alter the baseline conditions in 2027 for agriculture, forestry and soils.

4.4 Effects arising during construction

Avoidance and mitigation measures

- 4.4.1 During the development of the design, the following measures have been incorporated to avoid or mitigate adverse impacts on agriculture, forestry or soils:
- agricultural crossing incorporated into Stone Rural Footpath 28 accommodation overbridge to access severed land at New House Farm (CA3/1) and Aston Pool Farm (CA3/3);
 - revision of the Stone Rural Bridleway 0.1135 accommodation overbridge alignment to reduce the area of agricultural land required at North Pirehill Farm (CA3/5);
 - agricultural crossing incorporated into Stone Rural Footpath 32 accommodation overbridge to access severed land at Walton House Farm (CA3/6);
 - agricultural and forestry access incorporated into a number of crossings on the Swynnerton Estate (CA3/20), including:
 - Swynnerton Footpath 27 accommodation underbridge;
 - Swynnerton Estate South underbridge;
 - Swynnerton Heath Farm overbridge;
 - Swynnerton Estate Central underbridge; and
 - Swynnerton Estate North underbridge.
 - agricultural crossing incorporated into Swynnerton Bridleway 24 accommodation underbridge to access severed land at Sandyford Farm (CA3/22);
 - agricultural crossing incorporated into Swynnerton Footpath 52 accommodation underbridge to access severed land at Hatton Farm (CA3/23);
 - agricultural access to severed land available for Rowe Farm (CA3/24) via Rowe Farm overbridge;
 - revision of the Bent Lane and Dog Lane realignments to reduce the area of agricultural land required at Shelton under Harley Farm (CA3/23); and
 - agricultural crossing incorporated into Swynnerton Footpath 10 accommodation underbridge to access severed land.
- 4.4.2 Other design refinements to reduce the impact of the construction of the Proposed Scheme on agriculture, forestry and soil resources have included:
- rationalisation of balancing ponds to seek to locate them in least sensitive agricultural locations;
 - locally slackened or steepened slopes to improve agricultural land use;

- rationalisation of road realignments to reduce the area of agricultural land required;
- incorporation of agricultural tracks to gain access to severed land; and
- rationalisation and relocation of mitigation planting to reduce the area of agricultural land required and reduce impacts on holdings.

4.4.3 In addition, 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 will be stripped and stored. This will enable agricultural land that is required temporarily for construction to be returned to agricultural use. It will also enable soils to be returned to other uses, such as to support landscape planting and biodiversity, and to a suitable condition whereby they will be able to fulfil the identified function.

4.4.4 Compliance with the Code of Construction Practice (CoCP) will avoid or reduce environmental impacts during construction. Those measures that are particularly relevant to agriculture, forestry and soils are set out in the draft CoCP³³ and relate to:

- the reinstatement of agricultural land that is used temporarily during construction to agriculture, where this is the agreed end use (Section 6);
- the provision of a method statement for stripping, handling, storing and replacing agricultural and woodland soils to reduce risks associated with soil degradation on areas of land to be returned to agriculture and woodland following construction, based on detailed soil survey work to be undertaken prior to construction. This will include any remediation measures necessary following the completion of works (Section 6);
- a requirement for contractors to monitor and manage flood risk and other extreme weather events, insofar as reasonably practicable, that may affect agriculture, forestry and soil resources during construction (Sections 5 and 16);
- arrangements for the maintenance of farm and field accesses affected by construction (Section 6);
- the protection and maintenance of existing land drainage and livestock water supply systems, where reasonably practicable (Sections 6 and 16);
- the protection of agricultural land adjacent to the construction site, including the provision and maintenance of appropriate stock-proof fencing (Sections 5, 6, 9 and 12);
- the adoption of measures to control the deposition of dust on adjacent agricultural crops (Section 7);
- the control of invasive and non-native species; and the prevention of the spread of weeds generally from the construction site to adjacent agricultural land (Section 9);

³³ Volume 5: Appendix CT-003-000, Draft Code of Construction Practice.

- the adoption of measures to prevent, insofar as reasonably practicable, the spread of soil-borne, tree, crop and animal diseases from the construction area (Sections 6 and 9); and
- liaison and advisory arrangements with affected landowners, occupiers and agents, as appropriate (Sections 5 and 6).

4.4.5 Upon completion of construction, soils replaced for agricultural, forestry or landscape uses will be monitored to identify any unsatisfactory growing conditions during the five-year aftercare period.

4.4.6 Where agricultural uses are to be resumed on land disturbed during the construction of the Proposed Scheme, the design objective is to avoid any reduction in long term capability, which would downgrade the quality of the disturbed land, through the adoption of good practice techniques in handling, storing and reinstating soils on that land. Some land with heavier textured soils (such as the Worcester and Whimple 3 soils, but also including the Wigton Moor, Enborne and Clifton associations) may also require particularly careful management, such as the timing of cultivation and livestock grazing, during the aftercare period to ensure this outcome.

Assessment of impacts and effects

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

4.4.8 Land used to construct the Proposed Scheme will 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);
- used for drainage or replacement floodplain storage areas, which may also retain some agricultural use; or
- used for ecological and/or landscape mitigation.

Temporary effects during construction

Impacts on agricultural land

4.4.9 During the construction phase, the total area of agricultural land used within the Stone and Swynnerton area will be approximately 423ha as shown in Table 9. Of this total, it is anticipated that approximately 152ha will be restored and available for agricultural use following construction.

Table 9: Agricultural land required for the construction of the Proposed Scheme

Agricultural land quality	Area required (ha)	Percentage of agricultural land	Area to be restored (ha)
Grade 1	7.6	2	4.9
Grade 2	147.2	35	58.8
Subgrade 3a	221.2	52	65.6
BMV subtotal	376	89	129.2
Subgrade 3b	46.5	11	22.6
Grade 4	0	0	0
Grade 5	0	0	0
Total agricultural land	422.5	100	151.8

4.4.10 The disturbance during construction to approximately 376ha of BMV land is assessed as an impact of high magnitude, comprising 89% of the agricultural land requirement. BMV land is assessed as a receptor of low sensitivity because of its relative abundance in this area. The effect of the Proposed Scheme on BMV land during the construction phase is, therefore, assessed as moderate adverse, which is significant.

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

Nature of the soil to be disturbed

4.4.12 The sensitivity of the soils disturbed by construction activity reflects their textural characteristics, in the light of local rainfall conditions, as set out in the SMR. In areas of heaviest rainfall, and during the wettest times of the year, soils with high clay and silt fractions are most susceptible to the effects of handling during construction and the re-instatement of land; whereas loamy soils in areas of lowest rainfall and during the driest times of the year are the least susceptible.

4.4.13 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 Soils³⁴. These principles will be followed throughout the construction period.

4.4.14 The fine loamy and clayey, seasonally waterlogged Wigton Moor, Enborne and Clifton associations, and the clayey Worcester and Whimple 3 associations, are least able to remain structurally stable if moved in wet conditions or by inappropriate equipment.

³⁴ Defra (2009), *Construction Code of Practice for the Sustainable Use of Soils on Construction Sites*.

They are susceptible to compaction and smearing, which could affect successful reinstatement. Implementation of the measures set out in the draft CoCP will ensure the magnitude of impact on soil will be low and the significance of the effect will be negligible and not significant.

- 4.4.15 The disturbance of peat soils has implications for carbon emissions and biodiversity. The Proposed Scheme seeks to reduce disturbance of any deep peat soils insofar as reasonably practicable. Where disturbance cannot be avoided, the peat soils will be handled with particular care to avoid compaction when wet and wind erosion when the soils are dry. When reinstated, opportunities will be taken to use peat soils to create habitats, enhance biodiversity and build carbon reserves.

Impacts on holdings

- 4.4.16 Land may be required for the Proposed Scheme from holdings temporarily, during the construction period, or permanently. In most cases, the temporary and permanent land requirement will occur simultaneously at the start of the construction period and it is the combined effect of both that will have the most impact on the holding. During the construction period, some agricultural land will be restored and the impact on individual holdings will reduce.
- 4.4.17 The effects of the Proposed Scheme on individual agricultural and related interests during the construction period are summarised in Table 10. This table shows the total area of land required from a particular holding in absolute terms and as a percentage of the total area farmed. It also shows the area of land that could be returned to the holding following the construction period. The degree of impact is based on the proportion of the holding required rather than the absolute area of land.
- 4.4.18 The effects of severance during construction are judged on the ease and availability of access to severed land. With the implementation of the measures set out in the draft CoCP, these will generally be the same during and post construction. The disruptive effects, principally of construction noise and dust, are assessed according to their effects on land uses and enterprises. Impacts on residential properties on farm holdings are assessed, as required, in Section 5, Air quality; Section 6, Community; and Section 13, Sound, noise and vibration. Full details of the nature and significance of effects are set out in Volume 5: Appendix AG-001-003.
- 4.4.19 New House Farm (CA3/1) comprises land in both the Colwich to Yarlet area (CA2) and the Stone and Swynnerton area. Shelton under Harley Farm (CA3/26) comprises land in both the Stone and Swynnerton area and the Whitmore Heath to Madeley area (CA4). In both cases, the assessment of impacts and effects is reported in this document as the main farm buildings are in this area.

Table 10: Summary of effects on holdings during construction

Holding reference/ name/ sensitivity	Total area required from holding	Construction severance	Disruptive effects	Scale of construction effect	Area to be restored
CA3/1 New House Farm High sensitivity	12.7ha (25%) High	Low	Low	Major adverse due to the proportion of the farm required during construction	7.0ha
CA3/2	0.1ha (<1%)	Negligible	Negligible	Negligible	0.1ha

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Holding reference/ name/ sensitivity	Total area required from holding	Construction severance	Disruptive effects	Scale of construction effect	Area to be restored
Aston Hill Farm Medium sensitivity	Negligible				
CA3/3 Aston Pool Farm High sensitivity	8.9ha (3%) Negligible	Low	Low	Minor adverse	4.2ha
CA3/4 Pirehill Cottage Farm Medium sensitivity	8.0ha (20%) High	Negligible	Negligible	Major/moderate adverse due to the proportion of the farm required during construction	2.7ha
CA3/5 North Pirehill Farm Medium sensitivity	27.8ha (12%) Medium	Low	Medium	Moderate adverse due to the proportion of the farm required and disruption during construction	11.8ha
CA3/6 Walton House Farm Medium sensitivity	11.6ha (43%) High	Low	Medium	Major/moderate adverse due to the proportion of the farm required during construction	2.6ha
CA3/7 Walton Heath Farm High sensitivity	19.0ha (28%) High	High	Negligible	Major adverse due to the proportion of the farm required and severance	4.1ha
CA3/8 Little Micklow Farm Low sensitivity	0.4ha (40%) High	Negligible	High	Moderate adverse due to the proportion of the holding farm required and disruption	0.4ha
CA3/9 Land at Walton Medium sensitivity	2.9ha (21%) High	Negligible	Negligible	Major/moderate adverse due to the proportion of the farm required during construction	0ha
CA3/10 Land north of Eccleshall Road Medium sensitivity	0.2ha (1%) Negligible	Negligible	Negligible	Negligible	0.2ha
CA3/11 Micklow House Farm Medium sensitivity	34.3ha (10%) Medium	Negligible	Medium	Moderate adverse due to the proportion of the farm required and disruption during construction	7.9ha
CA3/12 Pool House Farm Medium sensitivity	13.6ha (100%) High	Negligible	High	Major/moderate adverse due to the proportion of the farm required, disruption and cessation of all	0ha

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Holding reference/ name/ sensitivity	Total area required from holding	Construction severance	Disruptive effects	Scale of construction effect	Area to be restored
				agricultural enterprises	
CA3/13 The Paddock Home Farm Medium sensitivity	1.0ha (12%) Medium	Negligible	Negligible	Moderate adverse due to the proportion of the farm required	0.5ha
CA3/14 Land south of Yarnfield Lane M6 overbridge replacement Low sensitivity	0.8ha (81%) High	Negligible	Negligible	Moderate adverse due to the proportion of the holding required	0ha
CA3/15 Land south of Yarnfield Lane Low sensitivity	1.6ha (100%) High	Negligible	High	Moderate adverse due to the proportion of the holding required	0ha
CA3/16 Darlaston Grange Farm Medium sensitivity	36.9ha (39%) High	Negligible	Negligible	Major/moderate adverse due to the proportion of the farm required	11.0ha
CA3/17 Whitemoor Farm Medium sensitivity	6.2ha (44%) High	Negligible	Medium	Major/moderate adverse due to the proportion of the farm required	0.2ha
CA3/18 The Ashtons Farm Medium sensitivity	1.4ha (29%) High	Negligible	Negligible	Major/moderate adverse due to the proportion of the farm required	0.6ha
CA3/19 Darlastonwood Farm Medium sensitivity	30.0ha (32%) High	Negligible	Negligible	Major/moderate adverse due to the proportion of the farm required	9.7ha
CA3/20 Swynnerton Estate Medium sensitivity	145.1ha (16% of land farmed in-hand) Medium	Low	Medium	Moderate adverse due to the proportion of the farm required and disruption during construction	43.5ha
CA3/21 Grange Farm Medium sensitivity	2.3ha (3%) Negligible	Negligible	Negligible	Negligible	2.3ha
CA3/22 Sandyford Farm High sensitivity	31.9ha (22%) High	Low	Medium	Major adverse due to the proportion of the farm required	11.9ha
CA3/23 Hatton Farm	18.9ha (16%) Medium	Low	Low	Moderate adverse due to the	10.6ha

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Holding reference/ name/ sensitivity	Total area required from holding	Construction severance	Disruptive effects	Scale of construction effect	Area to be restored
Medium sensitivity				proportion of the farm required	
CA3/24 Rowe Farm High sensitivity	15.8ha (8%) Low	Low	Medium	Major/moderate adverse due to disruption during construction	10.9ha
CA3/25 Land at Stableford Medium sensitivity	1.3ha (26%) High	Negligible	Negligible	Major/moderate adverse due to the proportion of land required	0.3ha
CA3/26 Shelton under Harley Farm High sensitivity	36.1ha (22%) High	Low	Medium	Major adverse due to the proportion of the farm required and disruption during construction	22.4ha

- 4.4.20 Overall, 26 holdings in the Stone and Swynnerton area will be affected during construction, of which 22 will experience moderate, major/moderate or major adverse effects, which are significant.
- 4.4.21 Two commercial agricultural businesses and three small holdings will cease to operate as a result of the construction of the Proposed Scheme. Walton Heath Farm (CA3/7) is a dairy farm and, given that approximately 28% of the holding will be required for the full duration of the construction and commissioning period (seven years) and land will be severed with no access available, the dairy enterprise is likely to cease. All the land at Pool House Farm (CA3/12) and the farmstead will be required for the construction of the Proposed Scheme. The small holdings referred to as Little Micklow Farm (CA3/8), Land south of Yarnfield Lane overbridge (CA3/14) and Land south of Yarnfield Lane (CA3/15) will also cease, as dwellings and/or all, or the majority, of the land and buildings associated with the holdings will be required.
- 4.4.22 Significant effects will also arise on large, commercial dairy farms that rely on the ready availability and access between the milking parlour and grazing land. In this area, the significantly affected dairy farms will be: New House Farm (CA3/1); Sandyford Farm (CA3/22); Rowe Farm (CA3/24); and Shelton under Harley Farm (CA3/26).
- 4.4.23 Other holdings that will be significantly affected by the area of land required are: Pirehill Cottage Farm (CA3/4); North Pirehill Farm (CA3/5); Walton House Farm (CA3/6); Land at Walton (CA3/9); Micklow House Farm (CA3/11); The Paddock Home Farm (CA3/13); Darlaston Grange (CA3/16); Darlastonwood Farm (CA3/19); Swynnerton Estate (CA3/20); and Hatton Farm (CA3/23).
- 4.4.24 The other holdings that will be significantly affected are small but the area of land required represents a high proportion of the holding, including Land south of Yarnfield Lane M6 overbridge replacement (CA3/14), Whitemoor Farm (CA3/17), The Ashtons Farm (CA3/18) and Land at Stableford (CA3/25).

Permanent effects of construction

Impacts on agricultural land

- 4.4.25 Following construction and restoration, the area of agricultural land that will remain permanently required will be approximately 271ha, as shown in Table 11.

Table 11: Agricultural land required permanently

Agricultural land quality	Total area required (ha)	Percentage of agricultural land
Grade 1	2.7	1
Grade 2	88.5	33
Subgrade 3a	155.6	57
BMV subtotal	246.8	91
Subgrade 3b	24.0	9
Grade 4	0	0
Grade 5	0	0
Total agricultural land	270.8	100

- 4.4.26 Of this total requirement, approximately 43.9ha (16%) will comprise newly planted woodlands for visual screening and habitat creation to mitigate environmental effects arising from the Proposed Scheme, as set out in Section 8, Ecology and biodiversity and Section 11, Landscape and visual.
- 4.4.27 A total area of approximately 2.5ha of agricultural land shown on CT-06-222, CT-06-223-L1 and CT-06-228a (Volume 2: CA3 Map Book) will be engineered to provide replacement floodplain storage, and could be subject to marginal downgrading in agricultural land quality. This agricultural assessment assumes that this land will return to agricultural use.
- 4.4.28 The permanent requirement for approximately 247ha of BMV land within the Stone and Swynnerton area is assessed as an impact of high magnitude, comprising 91% of the overall agricultural land requirement. BMV land is assessed as a receptor of low sensitivity because of its relative abundance in this area. The permanent effect on BMV land is, therefore, assessed as moderate adverse, which is significant.

Impacts on forestry land

- 4.4.29 The total area of woodland required as a result of the Proposed Scheme in the Stone and Swynnerton area will be approximately 18.1ha, as set out in Section 8, Ecology and biodiversity, out of a total permanent land requirement (including non-agricultural land) of approximately 310ha (6%). Approximately half of the woodland required as a result of the Proposed Scheme in this area is forestry land that is commercially managed, mostly by the Swynnerton Estate and including Clifford's Wood.
- 4.4.30 The permanent requirement for woodland is assessed as an impact of low magnitude in land use terms and, as the extent of woodland in the area is proportionally greater

than the average national woodland cover (10%), the effect on forestry land is not considered to be significant in quantitative terms or in terms of the agriculture, forestry and soils assessment. The qualitative assessment of loss of native woodland is addressed in Section 8, Ecology and biodiversity.

Impacts on holdings

4.4.31 The permanent effects from the construction of the Proposed Scheme on individual agricultural and related interests are summarised in Table 12. The land required column refers to the area of land required to operate the Proposed Scheme in absolute terms and as a percentage of the overall area farmed. The scale of effect is based on the likely proportion of land required from the holding. The 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 loss of or damage to farm capital, such as property, buildings and structures, and the consequential effects on land uses and enterprises. Full details of the nature and scale of effects are set out in Volume 5: Appendix AG-001-003.

Table 12: Summary of permanent effects on holdings from construction

Holding reference/name/sensitivity	Land required from holding	Severance	Infrastructure	Scale of effect
CA3/1 New House Farm High sensitivity	5.7ha (11%) Medium	Low	Negligible	Major/moderate adverse due to the proportion of the farm required
CA3/2 Aston Hill Farm Medium sensitivity	0ha (0%) Negligible	Negligible	Negligible	Negligible
CA3/3 Aston Pool Farm High sensitivity	4.7ha (2%) Negligible	Low	Negligible	Minor adverse
CA3/4 Pirehill Cottage Farm Medium sensitivity	5.3ha (13%) Medium	Negligible	Negligible	Moderate adverse due to the proportion of the holding required
CA3/5 North Pirehill Farm Medium sensitivity	16.0ha (7%) Low	Low	Negligible	Minor adverse
CA3/6 Walton House Farm Medium sensitivity	9.0ha (33%) High	Low	High	Major/moderate adverse due to the proportion of the holding required and demolition
CA3/7 Walton Heath Farm High sensitivity	14.9ha (22%) High	Medium	High	Major adverse due to the proportion of the holding required and cessation of dairy business
CA3/8 Little Micklow Farm	<0.1ha (3%) Negligible	Negligible	High	Moderate adverse due to property demolition

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Holding reference/name/sensitivity	Land required from holding	Severance	Infrastructure	Scale of effect
Low sensitivity				
CA3/9 Land at Walton Medium sensitivity	2.9ha (20%) High	Negligible	Negligible	Major/moderate adverse due to the proportion of the holding required
CA3/10 Land north of Eccleshall Road Medium sensitivity	0ha (0%) Negligible	Negligible	Negligible	Negligible
CA3/11 Micklow House Farm Medium sensitivity	26.4ha (8%) Low	Negligible	Negligible	Minor adverse
CA3/12 Pool House Farm Medium sensitivity	13.6ha (100%) High	Negligible	High	Major/moderate adverse due to the proportion of the holding required and demolition
CA3/13 The Paddock Home Farm Medium sensitivity	0.5ha (6%) Low	Negligible	Negligible	Minor adverse
CA3/14 Land south of Yarnfield Lane M6 overbridge replacement Low sensitivity	0.8ha (81%) High	Negligible	Negligible	Moderate adverse due to the proportion of the holding required
CA3/15 Land south of Yarnfield Lane Low sensitivity	1.6ha (100%) High	Negligible	High	Moderate adverse due to the proportion of the holding required and demolition ³⁵
CA3/16 Darlaston Grange Farm Medium sensitivity	25.9ha (27%) High	Negligible	Negligible	Major/moderate adverse due to the proportion of the holding required
CA3/17 Whitemoor Farm Medium sensitivity	6.0ha (43%) High	Negligible	Negligible	Major/moderate adverse due to the proportion of the holding required
CA3/18 The Ashtons Farm Medium sensitivity	0.8ha (17%) Medium	Negligible	Negligible	Moderate adverse due to the proportion of the holding required
CA3/19 Darlastonwood Farm Medium sensitivity	20.3ha (21%) High	Negligible	Negligible	Major/moderate adverse due to the proportion of the holding required

³⁵ Brook House residential property and outbuildings fall within the holding of Land south of Yarnfield Lane. These will be demolished as a result of the Proposed Scheme.

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Holding reference/name/sensitivity	Land required from holding	Severance	Infrastructure	Scale of effect
CA3/20 Swynnerton Estate Medium sensitivity	101.6ha (11%) Medium	Low	High	Major/moderate adverse due to the proportion of the holding required and demolition
CA3/21 Grange Farm Medium sensitivity	0ha (0%) Negligible	Negligible	Negligible	Negligible
CA3/22 Sandyford Farm High sensitivity	20.0ha (14%) Medium	Low	Negligible	Major/moderate adverse due to the proportion of the holding required
CA3/23 Hatton Farm Medium sensitivity	8.3ha (7%) Low	Low	Negligible	Minor adverse
CA3/24 Rowe Farm High sensitivity	4.9ha (3%) Negligible	Low	Low	Moderate adverse due to severance and impact on cow tracks
CA3/25 Land at Stableford Medium sensitivity	1.0ha (20%) High	Negligible	Negligible	Major/moderate adverse due to the proportion of the holding required
CA3/26 Shelton under Harley Farm High sensitivity	13.7ha (8%) Low	Low	Negligible	Moderate adverse due to the proportion of the holding required and severance

4.4.32 Overall, the construction of the Proposed Scheme will permanently affect 23 holdings in the Stone and Swynnerton area, with 18 holdings experiencing moderate, major/moderate or major adverse permanent effects, which will be significant.

4.4.33 Many of the permanent effects are similar to those reported for the temporary, construction phase. Walton Heath Farm (CA3/7) is unlikely to remain in dairy production and the residual land is likely to be managed with alternative agricultural crops/livestock. Little Micklow Farm (CA3/8), Pool House Farm (CA3/12), Land south of Yarnfield Lane overbridge (CA3/14) and Land south of Yarnfield Lane (CA3/15) will no longer operate as agricultural holdings.

4.4.34 Permanent significant effects will remain for the four dairy farms: New House Farm (CA3/1), Sandyford Farm (CA3/22), Rowe Farm (CA3/24) and Shelton under Harley Farm (CA3/26). The other larger, commercial holdings that will remain permanently affected by the area of land required are Pirehill Cottage Farm (CA3/4), Walton House Farm (CA3/6), Land at Walton (CA3/9), Darlaston Grange (CA3/16), Darlastonwood Farm (CA3/19) and Swynnerton Estate (CA3/20). The remaining significant effects will arise mainly from high land requirements from the smaller holdings including Whitemoor Farm (CA3/17), The Ashtons Farm (CA3/16) and Land at Stableford (CA3/25).

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

Other mitigation measures

- 4.4.36 Soils and their associated seed banks from the ancient woodlands at Birchwood and Clifford's Wood will be stored separately and utilised in species translocation, as discussed in Section 8, Ecology and biodiversity.
- 4.4.37 Other mitigation will incorporate climate change adaptation and resilience measures, insofar as reasonably practicable. For example, restored soils in areas that could be prone to drought with climate change could potentially be replaced at greater depths than at present to make them resilient to drought.
- 4.4.38 A farm pack is being provided to all farmers and landowners that sets out baseline conditions on the farm and the assurances and obligations that HS2 Ltd will accept upon entering the land. This will include advice and appropriate assistance where there is a need for the landowner to relocate or provide replacement agricultural buildings displaced by the Proposed Scheme.

Summary of likely residual significant effects

- 4.4.39 During construction, the total area of agricultural land required will be approximately 422ha, of which approximately 376ha is BMV land. This is assessed as a moderate adverse effect, which is significant.
- 4.4.40 Twenty-six holdings will be affected temporarily, of which 22 will experience temporary moderate, major/moderate or major adverse effects, which are significant.
- 4.4.41 Once the construction process is complete and land required temporarily has been restored, the permanent requirement for agricultural land will be approximately 271ha of which approximately 247ha is BMV land. This is assessed as a moderate adverse residual effect, which is significant.
- 4.4.42 Eighteen holdings have been identified that will experience moderate, moderate/major or major permanent effects, which is significant. Of these, 14 are likely to remain as agricultural or rural businesses and the use of compensation payments to purchase replacement land or farm buildings could reduce the effects. Four holdings will cease: Little Micklow Farm (CA3/8), Pool House Farm (CA3/12), Land south of Yarnfield Lane overbridge (CA3/14) and Land south of Yarnfield Lane (CA3/15).

Cumulative effects

- 4.4.43 There are no known cumulative effects arising from the construction of the Proposed Scheme as a consequence of other development projects affecting agriculture, forestry or soil in the study area.

4.5 Effects arising from operation

Avoidance and mitigation measures

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

Assessment of impacts and effects

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

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

- 4.5.3 Operational airborne sound at the following sensitive livestock receptors have been included in the assessment and the results are presented in Volume 5: Appendix SV-002-003:

- Walton House Farm (CA3/6);
- Walton Heath Farm (CA3/7);
- Micklow House Farm (CA3/11);
- Swynnerton Heath Farm (CA3/20);
- Sandyford Farm (CA3/22); and
- Shelton under Harley Farm (CA3/26).

- 4.5.4 The predicted sound levels have been considered against the criteria defined in the SMR Addendum. Taking into consideration the noise mitigation included within the Proposed Scheme, as shown on Map Series SV-02 (Volume 5: Sound, noise and vibration Map Book), no likely significant effects from noise on livestock are identified.

- 4.5.5 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.

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

Other mitigation measures

- 4.5.7 No other mitigation measures have been identified.

Summary of likely residual significant effects

- 4.5.8 No residual significant effects on agriculture, forestry and soils have been identified as a result of the operation of the Proposed Scheme.

Cumulative effects

- 4.5.9 There are no known cumulative effects arising from the operation of the Proposed Scheme as a consequence of other development projects affecting agriculture, forestry or soil in the Stone and Swynnerton area.

Monitoring

- 4.5.10 Volume 1, Section 9 sets out the general approach to environmental monitoring during operation of the Proposed Scheme.
- 4.5.11 On the basis of there being no significant residual operational effects, there are no area-specific requirements for monitoring agriculture, forestry and soil effects during the operation of the Proposed Scheme in the Stone and Swynnerton area.

5 Air quality

5.1 Introduction

- 5.1.1 This section of the report provides an assessment of the impacts and likely significant effects on air quality arising from the construction and operation of the Proposed Scheme within the Stone and Swynnerton area. Oxides of nitrogen (NO_x) including nitrogen dioxide (NO₂), fine particulate matter (PM₁₀, PM_{2.5})³⁶ and dust have been considered in the assessment. Emissions of all or some of these air pollutants are likely to arise from construction activities, demolition, site preparation works and the use of haul routes. Emissions will also arise from road traffic during construction and operation of the Proposed Scheme.
- 5.1.2 Engagement with Stafford Borough Council (SBC) and Staffordshire County Council (SCC) has been undertaken. The purpose of this engagement has been to obtain relevant baseline information, which includes monitoring data in this area. Detailed reports on the air quality data and assessments for this area, are contained within Volume 5: Appendix AQ-001-003.
- 5.1.3 Maps showing the location of the key environmental features (Map Series CT-10) and the key construction (Map Series CT-05) and key operational (Map Series CT-06) features of the Proposed Scheme can be found in the Volume 2: CA3 Map Book. Air quality mapping is presented in the Volume 5: Air quality Map Book, Map AQ-01-103.
- 5.1.4 In addition, the traffic data used for the air quality assessment is set out in Background Information and Data (BID)³⁷, (see BID-AQ-002-000: Traffic data used for the air quality assessment).

5.2 Scope, assumptions and limitations

- 5.2.1 The scope, assumptions and limitations for the air quality assessment are set out in Volume 1 (Section 8), the Scope and Methodology Report (SMR)³⁸, the SMR Addendum³⁹ and Volume 5: Appendix AQ-001-003.
- 5.2.2 The study areas for the air quality assessment have been determined on the basis of where impacts on local air quality may occur⁴⁰:
- from construction and/or mineral extraction activities (borrow pits);

³⁶ PM_{2.5} 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.

³⁷ HS2 Ltd (2017), High Speed Two (HS2) Phase 2a (West Midlands - Crewe), Background Information and Data, Available online at: www.gov.uk/hs2

³⁸ Volume 5: Appendix CT-001-001, Environmental Impact Assessment Scope and Methodology Report.

³⁹ Volume 5: Appendix CT-001-002, Environmental Impact Assessment Scope and Methodology Report Addendum.

⁴⁰ The assessment of construction dust emissions has been undertaken where sensitive receptors are located up to a distance of 350m from dust generating activities. The assessment of mineral dust emissions has been undertaken for sensitive receptors located within a distance of 250m from a borrow pit site. The assessment of traffic emissions has been undertaken where sensitive receptors are located up to a distance of 200m from roads screened in for further assessment.

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

5.2.3 The assessment has incorporated HS2 Ltd's policies on vehicle emissions⁴¹. These include the use of Euro VI heavy goods vehicles (HGVs), Euro 4 petrol and Euro 6 diesel cars and light goods vehicles (LGVs) during construction of the Proposed Scheme.

5.2.4 The assessment of construction traffic emissions has used traffic data based on an estimate of the average daily flows at the peak year during the construction period (2020-2026). The assessment assumes vehicle emission rates and background pollutant concentrations from year 2020. This is because both pollutant emissions from vehicle exhausts and background pollutant concentrations are anticipated to reduce year by year as a result of vehicle emission controls, and so the year 2020 represents the worst case for the construction assessment.

5.3 Environmental baseline

Existing baseline

Background air quality

5.3.1 The main sources of air pollution in the Stone and Swynnerton area are emissions from road vehicles and agricultural activities. The main roads within the area are: the M6; the A34 Stafford Road/The Fillybrooks; the A51 Stone Road; and the A519 Newcastle Road.

5.3.2 There are five industrial installations (regulated by the Environment Agency) with permits for emissions to air within the area, namely: Biffa Waste Services Ltd, Meece Landfill Site; Biffa Waste Services Ltd, Westgate, Cold Meece; Amey LG Limited; Meece Highways Depot; Infinis (Re-Gen) Ltd, Westgate, Cold Meece; and Carrs Billington Agriculture (Operations) Limited, Cold Meece. Details of their location are presented in Volume 5: Appendix AQ-001-003. The contribution of all industrial processes and other emission sources to local air quality is included within the background concentrations.

5.3.3 Estimates of background air quality have been obtained from Defra⁴² for the baseline year of 2016. The data is estimated for 1km grid squares for NO_x, NO₂, PM₁₀ and PM_{2.5}. Background concentrations are within the air quality standards as defined in the SMR and the SMR Addendum, for all pollutants within the Stone and Swynnerton area.

⁴¹ HS2 Phase 2a Information Paper E14: Air Quality

⁴² Department for Environment, Food and Rural Affairs (Defra) (2013) Defra Background Pollutant Concentration Maps; Available online at: <http://uk-air.defra.gov.uk/data/laqm-background-maps?year=2013>

Local monitoring data

- 5.3.4 There are currently 15 diffusion tube sites located within the Stone and Swynnerton area for monitoring NO₂ concentrations. These are located along junction 15 of the M6, the A34 Stone Road, the A34 The Fillybrooks, the A500 Queensway, the A519 Newcastle Road, the B5038 Whitmore Road, and Old Road in Stone. Measured concentrations at these sites in 2015⁴³ were within the air quality standard. Details of their location and data measurements are presented in Map AQ-01-103 and Volume 5: Appendix AQ-001-003.

Air quality management areas

- 5.3.5 There are no air quality management areas within the Stone and Swynnerton area.

Receptors

- 5.3.6 Several locations have been identified in the area as sensitive receptors, which are considered to be susceptible to changes in air quality due to their proximity to dust-generating activities or traffic routes during construction or operation of the Proposed Scheme. Details of their location are presented in Map AQ-01-103 and Volume 5: Appendix AQ-001-003.
- 5.3.7 Most of the receptors located close to the route of the Proposed Scheme are residential. Other receptors include Meir Primary Care Centre, Pirehill First School and Springfields First School.
- 5.3.8 There are no statutory designated ecological sites identified close to the Proposed Scheme. Non-statutory sensitive ecological sites, identified close to the Proposed Scheme, include the ancient woodlands of Birchwood and Clifford's Wood and the Local Wildlife Sites of Highlow Meadows, Closepit Plantation and Hatton Common. Further details of the ecological receptors are set out in Section 8, Ecology and biodiversity.

Future baseline

- 5.3.9 Volume 5: Appendix CT-004-000 provides details of the developments in the Stone and Swynnerton area that are assumed to be implemented by 2020. The potential cumulative impact from committed developments on air quality in conjunction with the effects from the construction and operation of the Proposed Scheme have been considered as part of this assessment. This has been achieved by including changes in traffic predicted as a result of the committed developments within the traffic data used for the air quality assessments for construction and operation. The future air quality baselines are defined as the 'without the Proposed Scheme' scenarios at each stage.

Construction (2020)

- 5.3.10 Future background pollutant concentrations have been sourced from the Defra background maps for the first year of construction in 2020⁴⁴, which predict NO₂,

⁴³ At the time of assessment, measurements for 2015 were the latest published annual monitoring data.

⁴⁴ Department for Environment, Food and Rural Affairs (Defra) (2013) Defra Background Pollutant Concentration Maps 2020; Available online at: <http://uk-air.defra.gov.uk/data/laqm-background-maps?year=2013>

PM₁₀ and PM_{2.5} levels in 2020 to be lower than in the 2016 baseline and within the relevant air quality standards.

- 5.3.11 Committed developments that have been included as future receptors in the assessment of air quality impacts during construction of the Proposed Scheme are identified in Volume 5: AQ-001-003. No additional committed developments have been identified in this area that will materially alter the baseline conditions in 2020 for air quality.

Operation (2027)

- 5.3.12 Future background pollutant concentrations have been sourced from the Defra background maps for 2027⁴⁵, which predict NO₂, PM₁₀ and PM_{2.5} levels in 2027 to be lower than in the 2016 baseline and within the relevant air quality standards.
- 5.3.13 Committed developments that have been included as future receptors in the assessment of air quality impacts during operation of the Proposed Scheme are identified in Volume 5: AQ-001-003. No additional committed developments have been identified in this area that will materially alter the baseline conditions in 2027 for air quality.

5.4 Effects arising during construction

Avoidance and mitigation measures

- 5.4.1 Emissions to the atmosphere will be controlled and managed during construction through the route-wide implementation of the Code of Construction Practice (CoCP). The draft CoCP⁴⁶ includes a range of mitigation measures that are accepted by the Institute of Air Quality Management (IAQM) 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 assessment has assumed that the general measures detailed in Section 7 of the draft CoCP will be implemented. These include:
- contractors being required to manage dust, air pollution, odour and exhaust emissions during construction works;
 - inspection and visual monitoring, undertaken in consultation with the local authorities, to assess the effectiveness of the measures taken to control dust and air pollutant emissions;
 - cleaning (including watering) of vehicle routes and designated vehicle waiting areas to suppress dust;
 - the use of water spray systems on demolition sites to dampen down fugitive dust;

⁴⁵ Department for Environment, Food and Rural Affairs (Defra) (2013) Defra Background Pollutant Concentration Maps 2027; Available online at: <http://uk-air.defra.gov.uk/data/iaqm-background-maps?year=2013>

⁴⁶ Volume 5: Appendix CT-003-000, Draft Code of Construction Practice.

- keeping soil stockpiles away from sensitive receptors where reasonably practicable, also taking into account the prevailing wind direction relative to sensitive receptors;
- the use of enclosures to contain dust emitted from construction activities; and
- soil spreading, seeding and planting of completed earthworks as soon as reasonably practicable following completion of earthworks.

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

5.4.4 The use of borrow pits is intended to reduce the need for longer distance transport and import of materials, therefore, reducing the volume and impact of road traffic on local roads and communities.

Assessment of impacts and effects

Temporary effects

5.4.5 Impacts from construction of the Proposed Scheme could arise from dust-generating activities and emissions from construction traffic, as well as emissions from diesel trains associated with the Stone railhead. As such, the assessment of construction impacts has been undertaken for dust and exposure to NO₂, PM₁₀ and PM_{2.5} concentrations.

Construction dust effects

5.4.6 Construction activities, such as demolition of existing buildings, earthworks, construction of new structures and trackout⁴⁷, have been assessed for their risk of having an effect on dust soiling, human health⁴⁸ and ecological sites. There are residential and ecological receptors located within 350m of these activities in the Stone and Swynnerton area.

5.4.7 It has been identified that there would be a negligible to medium risk of dust effects and a negligible risk of human health effects from demolition activities. For earthworks, there would be a low to medium risk of dust effects and a low risk of human health effects. For construction, there would be a negligible to medium risk of dust effects and a negligible to low risk of human health effects. For trackout, there would be a medium risk of dust effects and a low risk of human health effects.

5.4.8 No demolition activities would affect any ecological receptors. There would be a negligible to low risk of ecological effects from other dust generating activities.

5.4.9 With the application of the mitigation measures contained in the draft CoCP, no significant effects are anticipated from these risks associated with the dust generating activities. The basis for this conclusion can be found in Volume 5: Appendix AQ-001-

⁴⁷ 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.

⁴⁸ Human health effects relate mainly to short-term exposure to particles of size between 2.5µm to 10µm, measured as PM₁₀.

003, where the scale of dust emissions and the sensitivity of the area and receptors are fully described.

Construction traffic effects

- 5.4.10 Construction activity could also have the potential to affect local air quality through the additional traffic generated on local roads as a result of construction vehicles and through changes to traffic patterns arising from temporary road diversions and realignments.
- 5.4.11 The assessment of construction traffic emissions has been undertaken for a 'without the Proposed Scheme' scenario and a 'with the Proposed Scheme' scenario. The traffic data for each scenario includes the additional traffic from future committed developments.
- 5.4.12 Construction traffic data in the study area has been screened to identify roads that required further assessment and to confirm the likely effect of the change in emissions from vehicles using those roads in the construction period. These were primarily the main roads within the Stone and Swynnerton area, including the M6, the A50 Uttoxeter Road, the A500 Queensway, the A5182 Trentham Road, the A519 Newcastle Road and Yarnfield Lane.
- 5.4.13 No significant effects are predicted at any sensitive receptor during construction of the Proposed Scheme. Concentrations of NO₂, PM₁₀ and PM_{2.5} are within the relevant air quality standards both with and without the Proposed Scheme.
- 5.4.14 No significant effects are anticipated at any of the ecological receptors in the area.

Rail emissions at the Stone Railhead

- 5.4.15 The impact from diesel trains associated with the Stone railhead has been assessed and is considered to be negligible. Therefore, no significant effects would be anticipated from the operation of diesel trains at this location (see Volume 5: Appendix AQ-001-003).

Permanent effects

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

Other mitigation measures

- 5.4.17 No other mitigation measures in relation to air quality are considered necessary during construction of the Proposed Scheme in this area.

Summary of likely residual significant effects

- 5.4.18 No significant residual effects are anticipated for air quality in this area during construction of the Proposed Scheme.

Cumulative effects

- 5.4.19 The data used for the air quality assessment takes account of predicted changes in traffic as a result of committed developments in the Stone and Swynnerton area. It is assumed that dust emissions from construction of other developments in the area

would be controlled by appropriate measures as set out within their respective environmental management controls, and therefore, no cumulative effects for air quality would be anticipated.

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 and relate to changes in the volume, composition and distribution of road traffic and changes in road alignment. There will be no direct atmospheric emissions from the operation of the Proposed Scheme trains that will cause an impact on air quality, and therefore, no assessment is required. Indirect emissions from sources such as rail and brake wear have been assumed to be negligible.
- 5.5.3 The assessment of operational traffic emissions has been undertaken for two scenarios in the operation year 2027: a 'without the Proposed Scheme' scenario and a 'with the Proposed Scheme' scenario. The traffic data for each scenario includes the additional traffic from future committed developments.
- 5.5.4 Traffic data in the Stone and Swynnerton area has been screened to identify roads that required further assessment and to confirm the likely effect of the change in emissions from vehicles using those roads in 2027. These were the proposed re-aligned or diverted roads within the Stone and Swynnerton area and some roads with changes in annual average daily traffic (AADT) or daily HGV flows, including the B5026 Eccleshall Road, Yarnfield Lane, Tittensor Road, the A51 Stone Road, the A519 Newcastle Road, Dog Lane and Bent Lane.
- 5.5.5 No significant effects are predicted at any sensitive receptors in the operation year. Concentrations of NO₂, PM₁₀ and PM_{2.5} are predicted to be within the relevant air quality standards both with and without the Proposed Scheme.
- 5.5.6 No significant effects are anticipated at any of the ecological receptors in the area.

Other mitigation measures

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

Summary of likely residual significant effects

- 5.5.8 No significant residual effects are anticipated for air quality in this area during operation of the Proposed Scheme.

Cumulative effects

- 5.5.9 The data used for the air quality assessment takes account of predicted changes in traffic as a result of committed developments in the area, and therefore, their impacts have been included within the assessment.

Monitoring

- 5.5.10 Volume 1, Section 9 sets out the general approach to environmental monitoring during operation of the Proposed Scheme.
- 5.5.11 On the basis of there being no significant residual operational effects, there are no area-specific requirements for monitoring air quality effects during the operation of the Proposed Scheme in the Stone and Swynnerton area.

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 Stone and Swynnerton area.
- 6.1.2 Further details of the community assessments undertaken within the Stone and Swynnerton area are contained in Volume 5: Appendix CM-001-003.
- 6.1.3 Community assessment maps are provided in the Map Series CM-01 in Volume 5: Community Map Book. Maps showing the location of the key environmental features (Map Series CT-10) and the key construction (Map Series CT-05) and key operational (Map Series CT-06) features of the Proposed Scheme can be found in the Volume 2: CA3 Map Book.

6.2 Scope, assumptions and limitations

- 6.2.1 The assessment scope, key assumptions and limitations for the community assessment are set out in Volume 1 (Section 8) and the Scope and Methodology Report (SMR)⁴⁹ and the SMR Addendum⁵⁰.
- 6.2.2 The study area includes the areas of land required both temporarily and permanently for the Proposed Scheme. It also includes a wider corridor within which receptors or resources could be affected by a combination of significant residual effects drawing from the findings of other technical disciplines: noise, vibration, air quality, traffic (in relation to heavy goods vehicles (HGVs⁵¹)) and visual intrusion. 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. Overall, the study area is taken as the area of land that encompasses the likely significant effects of the Proposed Scheme.
- 6.2.3 Worker accommodation will be located at the Yarnfield North embankment satellite compound. Construction worker impacts on community resources are considered at a route-wide level in Volume 3: Route-wide effects.

6.3 Environmental baseline

Existing baseline

- 6.3.1 The Stone and Swynnerton area covers approximately 13.5km of the Proposed Scheme in Staffordshire. It extends from approximately 1km north-west of Yarlet to Shelton under Harley at the northern extent of the area. It passes near the settlements of Cold Norton, Stone and Walton, Yarnfield, and Swynnerton.

⁴⁹ Volume 5: Appendix CT-001-001, Environmental Impact Assessment Scope and Methodology Report.

⁵⁰ Volume 5: Appendix CT-001-002, Environmental Impact Assessment Scope and Methodology Report Addendum.

⁵¹ HGV effects are increases in HGV construction traffic flows identified as significant by the Traffic and Transport topic. They contribute to in-combination effects on sensitive community resources which are located adjacent to a designated construction traffic route which experiences a significant increase in HGV traffic flows or a site haul route which experiences a significant number of HGV movements.

- 6.3.2 The area is predominantly rural, made up of small settlements with limited community facilities. In general, the majority of community facilities, such as GP surgeries, schools and community meeting places, are located within the larger settlement of Stone. There are also some smaller services within the village centres of Yarnfield and Swynnerton.
- 6.3.3 Outside of the main settlements the area is characterised by small clusters of dwellings and individual dwellings within rural areas.

Settlements

- 6.3.4 Stone and Walton are joined settlements located north and south of the River Trent, with approximately 7,500 residential properties in total. The settlements include a wide variety of community and recreational resources, and act as the key settlement for the smaller villages and rural properties that are located around it.
- 6.3.5 Between Stone and the M6, north of Yarlet, there are numerous small clusters of residential properties, often linked to the running of farms.
- 6.3.6 Swynnerton is located to the west of the M6, approximately 5km north-west of Stone and 3km north of Yarnfield. Swynnerton includes approximately 210 residential properties, two places of worship, a public house and a convenience store.
- 6.3.7 North of Swynnerton, there are numerous small clusters of residential properties. Notably, this includes Hatton Manor and Shelton under Harley. Hatton Manor is a small hamlet of approximately 30 residential properties located approximately 2.5km north-west of Swynnerton and 2km south-west of Stableford. Shelton under Harley is a small hamlet of approximately five residential properties linked to Shelton under Harley Farm. It is located approximately 1.7km south of Whitmore and 800m north of Stableford.

Recreational facilities

- 6.3.8 Stone Golf Club provides a nine hole golf course, open to both members and visitors. It is located to the west of Stone, between the A34 The Fillybrooks, Yarnfield Lane and the Norton Bridge to Stone Railway. The course markets itself as having panoramic views of the area from all nine holes.

Open space and public rights of way

- 6.3.9 Staffordshire Cakes and Ale Trail (including Swynnerton Bridleway 54) is a 161km long distance walking route across Staffordshire. The circular route begins and ends in Burton-upon-Trent. It passes along the Trent and Mersey Canal and through Alrewas, Lichfield, Cannock Chase, Eccleshall, Barlaston, Stone, and Uttoxeter.
- 6.3.10 Stones Circle Challenge (including Swynnerton Bridleway 54) is a 53km circular route around Stone, which starts at Yarnfield and passes through the villages of Swynnerton, Beech, Tittensor, Barlaston, Moddershall, Fulford, Milwich, Hartley Green, Salt, Hopton, Whitgreave and Norton Bridge.
- 6.3.11 Hanchurch Hills Circular Walk (including Swynnerton Bridleway 54 and Swynnerton Footpath 52) is a walk that offers three levels: green, which is approximately 5.6km; red, which is approximately 3.2km; and blue, which is approximately 11.3km. The

circular walk passes through Swynnerton Old Park, and the villages of Hanchurch, Lower Hatton and Swynnerton.

Future baseline

Construction (2020)

- 6.3.12 Volume 5: Appendix CT-004-000⁵² provides details of the developments in the Stone and Swynnerton area that are assumed to have been implemented by 2020.
- 6.3.13 The following committed developments have been identified in this area that will materially alter the baseline conditions in 2020 for community resources are set out in Table 13.

Table 13: Committed developments relevant to community

Map book Reference ⁵³	Planning reference	Description
CA3/15	14/20854/OUT	Up to 92 dwellings and associated development including access, open space, landscaping, balancing pond and earthworks.
CA3/17	13/19002/OUT	Residential development including new access, open space, landscaping and associated infrastructure.
CA3/18	Policy Stone 2, West and South of Stone – Housing	Allocation for 500 new dwellings, with 40% affordable housing.

- 6.3.14 These committed developments form part of the future baseline for the assessment of community effects during construction of the Proposed Scheme.

Operation (2027)

- 6.3.15 Volume 5: Appendix CT-004-000 provides details of the developments in the Stone and Swynnerton area that are assumed to have been implemented by 2027.
- 6.3.16 No additional committed developments have been identified in this area that will materially alter the baseline conditions in 2027 for community resources.

6.4 Effects arising during construction

Avoidance and mitigation measures

- 6.4.1 The following measures have been incorporated into the Proposed Scheme design as part of the design development process to avoid or minimise, insofar as reasonably practicable, the environmental impacts during construction:
- the realignment of Stone Rural Bridleway 0.1135 has been designed to limit impacts on residential properties at North Pirehill Farm;
 - Yarnfield Lane realignment will be constructed offline, maintaining access between nearby communities throughout the construction and operation of the Proposed Scheme;

⁵² Volume 5: Appendix CT-004-000, Planning data.

⁵³ Volume 5 Map Book: Maps CT-13-109b to CT-13-113a-L1

- land required for localised widening of the M6 has been designed to limit isolation impacts on the Blakelow residential property;
- planting and landscape earthworks at the Meaford South embankment will limit visual impacts on isolated residential properties west of the M6;
- planting and landscape earthworks along the Norton Bridge to Stone sidings to limit visual impacts on existing and proposed residential properties to the south of Walton;
- mitigation planting over the existing section of Yarnfield Lane to the west of the M6, between White Moor Farm and the Yarnfield Lane realignment, will screen views of the new section of road;
- planting and landscape earthworks at the Swynnerton embankment will limit visual impacts on Sandyford Farm;
- land required for the construction of the Tittensor Road diversion and the associated earthworks have been designed to limit the area of land required from the gardens of The Laurels in Swynnerton;
- a new bridleway has been added along the diverted A51 Stone Road and the diverted Tittensor Road to maintain connectivity of the Staffordshire Cakes and Ale Trail, Hanchurch Hills Circular Walk and the Stone Circles Challenge;
- Swynnerton Footpath 15 overbridge has been added to maintain pedestrian access to Hatton Common from the north;
- mitigation planting at the southern extent of the Dog Lane realignment will screen views from The Rowe and Yew Tree Park residential properties;
- the route of Bent Lane via the Bent Lane (North) diversion has been designed to limit the number of residential properties that will be demolished in Shelton under Harley; and
- planting at the Hatton North cutting and Stableford South embankment will limit visual impacts on residential properties in Shelton under Harley.

6.4.2 The draft Code of Construction Practice⁵⁴ (CoCP) includes a range of provisions that will help mitigate community effects associated with construction within this area, including:

- implementation of a community engagement framework to provide appropriate information and resolve community issues (Section 5);
- sensitive layout of construction sites to reduce nuisance as far as possible (Section 5);
- maintenance of public rights of way (PRoW) during construction where reasonably practicable (Section 14);

⁵⁴ Volume 5: Appendix CT-003-000, Draft Code of Construction Practice.

- monitoring and management of flood risk and other extreme weather events, where reasonably practicable, which may affect community resources during construction (Section 16); and
- specific measures in relation to air quality and noise and the avoidance of HGVs operating adjacent to school during drop off and pick up periods (Section 7, 13 and 14).

Assessment of impacts and effects

Temporary effects

Residential properties

- 6.4.3 It is necessary to carry out minor utility works or minor highways works associated with the construction of the Proposed Scheme within land which falls within the boundaries of residential properties. The scale of impact will be small, and the duration short (up to three months), resulting in minor adverse effects, which are not significant. A full description of the affected properties is included within Volume 5: Appendix CM-001-003.
- 6.4.4 Eight residential properties on Pirehill Lane, south-west of Stone, will be in proximity to the construction of the Proposed Scheme. The works will include the construction of Yarlet embankment, Yarnfield South cutting and Stone Rural Bridleway 0.1135 accommodation overbridge. These works will result in significant noise effects during the daytime on the eight residential properties due to increases in traffic along Pirehill Lane. The same properties will experience significant adverse visual effects due to views of construction activities, including construction equipment and earthworks required for the route of the Proposed Scheme, movement of construction vehicles and material stockpiles. The noise and visual effects will result in an in-combination effect on the amenity of residents at the eight properties for up to four years and one month. This will result in a major adverse effect, which is significant.
- 6.4.5 The widening of the Stone Rural Byway Open to All Traffic (BOAT) 34 will temporarily require a small area of the garden at High View House, located south of the A51 Bury Bank, for up to one year and six months. The temporary loss of this small area of land will not impact on the ability of the residents to use their property and access will be maintained to the property throughout construction. This will result in a minor adverse effect, which is not significant.
- 6.4.6 Swynnerton embankment and Swynnerton North cutting require realignments, diversions and closures at the A51 Stone Road, Tittensor Road and Stab Lane, north of Swynnerton. These road works will require small areas from access roads and/or gardens of six residential properties to the north of Swynnerton, these are: Sandyford Farm, Glebe House, Queenswood Lodge, The Old School House, The Laurels and Long Compton Farm. Land at each of the properties will be required for up to nine months. The temporary loss of these small areas of land will not impact on the ability of the residents to use their properties and access will be maintained to the properties throughout the construction works. This will result in a minor adverse effect, which is not significant.

- 6.4.7 The widening of Swynnerton Footpath 52 will temporarily require small areas of gardens from two residential properties on Common Lane (Swynnerton): The Hattons and 1 Cottage, Hatton Hill, at Hatton Manor. Land at the properties will be required for up to nine months. The temporary loss of these small areas of land will not impact on the ability of the residents to use their properties and access will be maintained to the properties throughout the construction works. This will result in a minor adverse effect, which is not significant.
- 6.4.8 Two residential properties will be permanently lost in Shelton under Harley (reported under permanent effects). The three remaining residential properties in Shelton under Harley will be in proximity to the construction of the Proposed Scheme. The works will include: the construction of the Hatton North cutting, Stableford South embankment and the Bent Lane (North) diversion; demolition works; and utility connections. The properties will also be adjacent to Hatton North cutting satellite compound, Stableford auto-transformer station satellite compound and temporary material stockpiles. All three of the properties will experience significant adverse visual effects due to views of works to construct the above elements including associated earthworks, construction equipment, movement of construction vehicles and stockpiles. The use of Bent Lane as a construction traffic route and the presence of the site haul route alongside the route of the Proposed Scheme will result in a significant increase in HGVs passing the properties. The combination of visual and HGV effects will result in an in-combination effect on the amenity of residents at these three properties for up to four years and two months in total. Although there are fewer than five properties in this group, these comprise the whole remaining settlement. Therefore, this will result in a major adverse effect, which is significant.

Community facilities

- 6.4.9 No temporary effects on community facilities are anticipated in this area.

Recreational facilities

- 6.4.10 No temporary effects on recreational facilities are anticipated in this area.

Open space and public rights of way

- 6.4.11 In Swynnerton, Swynnerton Bridleway 54 and Stab Lane form part of three promoted PRoW routes: Hanchurch Hills Circular Walk, Staffordshire Cakes and Ales Trail and the Stone Circles Challenge. These promoted routes will be crossed by Swynnerton North cutting and the A51 Stone Road diversion. These PRoW will be accessible throughout the construction period. This will result in a negligible adverse effect, which is not significant.
- 6.4.12 In Hatton Manor, the Hanchurch Hills Circular Walk (Swynnerton Footpath 52 and Common Lane (Swynnerton)) will be located within land required for the widening of the Swynnerton Footpath 52 and Common Lane (Swynnerton) over 1.2km, for approximately nine months. In addition, a section of the Hanchurch Hills Circular Walk (Swynnerton Footpath 52) will be within the land required for the construction of Hatton embankment. The Hanchurch Hills Circular Walk in Hatton Manor will be accessible throughout the construction period. This will result in a negligible adverse effect, which is not significant.

Permanent effects

Residential properties

- 6.4.13 The construction of the Yarnfield North embankment, Yarlet North cutting and the Stone railhead/Stone IMB-R will require the demolition of three residential properties: Little Micklow, Pool House Farmhouse and Brook House located in the rural area south of Stone. The residential properties will be permanently lost.
- 6.4.14 The works to enable the construction of Hatton North cutting and the diversion of Bent Lane to create Bent Lane (North) will require the demolition of two residential properties: Whisper Barn and Jacobyre, in Shelton under Harley. The residential properties will be permanently lost. The loss of Whisper Barn and Jacobyre represents a high proportion of this small community of only five residential properties. Therefore, the loss from the housing stock in this hamlet will result in a moderate adverse effect, which is significant at the community level.

Community facilities

- 6.4.15 No permanent effects on community facilities are anticipated in this area.

Recreational facilities

- 6.4.16 No permanent effects on recreational facilities are anticipated in this area.

Open space and public rights of way

- 6.4.17 In Swynnerton, the Hanchurch Hills Circular Walk, Staffordshire Cakes and Ales Trail and Stone Circles Challenge (Swynnerton Bridleway 54 and Stab Lane) will be crossed by the Swynnerton North cutting. Permanent diversions will be provided, as well as the Swynnerton New Bridleway 2, which will ensure users of the Hanchurch Hills Circular Walk, Staffordshire Cakes and Ales Trail and Stone Circles Challenge can still access the Swynnerton viewpoint as part of their recreational walks. A permanent diversion will be provided to ensure the footpath is accessible permanently. This will result in a negligible effect, which is not significant.
- 6.4.18 In Hatton Manor, the Hanchurch Hills Circular Walk (Swynnerton Footpath 52) will be crossed by the Hatton embankment. This is considered to be a negligible adverse effect, which is not significant.

Other mitigation measures

- 6.4.19 No other mitigation measures are proposed.

Summary of likely residual significant effects

- 6.4.20 The construction of the Proposed Scheme will result in significant permanent effects on residents of Shelton under Harley due to the demolition of two residential properties.
- 6.4.21 The construction of the Proposed Scheme will also result in significant temporary in-combination effects on the following resources:
- eight residential properties on Pirehill Lane due to the combination of noise and visual effects; and

- residential properties in Shelton under Harley due to the combination of visual and HGV effects.

Cumulative effects

- 6.4.22 Community wide effects occur where a number of individual impacts on resources come together within a location and have a wider impact on the community, such that they change the experience of a considerable proportion of people within that community.
- 6.4.23 At Shelton under Harley the residential demolitions, temporary land required for the construction of the Proposed Scheme and in-combination effects mean that the whole community will be affected in some way during the construction of the Proposed Scheme, and this will, therefore, result in a community wide effect at Shelton under Harley.

6.5 Effects arising from operation

Avoidance and mitigation measures

- 6.5.1 The following measures have been incorporated into the Proposed Scheme design as part of the design development process to avoid or minimise, insofar as reasonably practicable, environmental impacts during operation:
- mitigation planting on the southern side of the Norton Bridge to Stone sidings will screen the additional lines from existing and proposed residential properties in Walton;
 - planting and a landscape noise bund (with a noise fence barrier on top of the bund) to the south of the Norton Bridge to Stone sidings will limit visual and noise impacts on existing and proposed residential properties south of Stone;
 - a noise fence barrier along the Yarnfield South embankment and Filly Brook viaduct will limit noise impacts on Micklow House Farm and proposed residential properties in Walton; and
 - a noise fence barrier along the Swynnerton embankment will limit noise impacts in Swynnerton.

Assessment of impacts and effects

Residential properties

- 6.5.2 During operation, all three remaining residential properties in Shelton under Harley will be in proximity to the Proposed Scheme. The operation of the Proposed Scheme will result in significant increases in noise level during the daytime and night-time due to the running of the trains along the route. All of the properties will experience significant adverse visual effects due to views of the Proposed Scheme including the new roads, Stableford auto-transformer station, new overhead low voltage power lines and overhead line equipment. The combination of significant noise and visual effects will have a permanent effect on the amenity of residents at these three residential properties. This will result in a major adverse effect, which is significant.

Community facilities

- 6.5.3 No operational effects on community facilities are anticipated in the Stone and Swynnerton area.

Recreational facilities

- 6.5.4 No operational effects on recreational facilities are anticipated in the Stone and Swynnerton area.

Open space and public rights of way

- 6.5.5 No operational effects on open space or public rights of way are anticipated in the Stone and Swynnerton area.

Other mitigation measures

- 6.5.6 No other mitigation measures are proposed.

Summary of likely residual significant effects

- 6.5.7 The operation of the Proposed Scheme will result in permanent effects on residents of Shelton under Harley due to the combination of noise and visual effects.

Cumulative effects

- 6.5.8 Community wide effects occur where a number of individual impacts on resources come together within a location and have a wider impact on the community, such that they change the experience of a significant proportion of people within that community.
- 6.5.9 At Shelton under Harley in-combination effects mean that the whole community will be affected in some way during the operation of the Proposed Scheme, and will, therefore, result in a community wide effect at Shelton under Harley.

Monitoring

- 6.5.10 Volume 1, Section 9 sets out the general approach to environmental monitoring during operation of the Proposed Scheme.
- 6.5.11 There are no area-specific community monitoring requirements during operation of the Proposed Scheme. Any area-specific operational monitoring requirements in relation to air quality effects, noise and vibration effects, traffic effects and visual effects that have contributed to the in-combination assessments, are described in the relevant topic chapters.

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 the likely impacts and significant effects resulting from the construction and operation of the Proposed Scheme within the Stone and Swynnerton area. Consideration is given to the extent and value (significance) of heritage assets including archaeological and palaeoenvironmental remains, historic buildings, the built environment and historic landscape.
- 7.1.2 Engagement has been undertaken with Historic England and Staffordshire County Council (SCC). The purpose of this engagement has been to understand the nature of heritage assets within the area, to obtain relevant baseline information and to inform the design development and assessment of the Proposed Scheme.
- 7.1.3 Throughout this section, heritage assets within the study area are identified with a unique reference code (for example STS001). Further detail on these heritage assets can be found in the gazetteer in Volume 5: Appendix CH-002-003. Detailed reports on cultural heritage baseline, historic landscape character and surveys undertaken within the Stone and Swynnerton area are contained in the Volume 5 Appendices. These are:
- Appendix CH-001-003 – Cultural heritage baseline report;
 - Appendix CH-002-003 – Gazetteer of heritage assets; and
 - Appendix CH-003-003 – Cultural heritage impact assessment table.
- 7.1.4 In addition there are two route-wide cultural heritage appendices:
- Appendix CH-005-000 – Historic landscape character report; and
 - Appendix CH-006-000 – Geoarchaeological desk study report.
- 7.1.5 Maps showing the location of all designated and non-designated heritage assets can be found in Volume 5: Cultural heritage Map Book.
- 7.1.6 Maps showing the location of the key environmental features (Map Series CT-10) and the key construction (Map Series CT-05) and key operational (Map Series CT-06) features of the Proposed Scheme can be found in the Volume 2: CA3 Map Book.
- 7.1.7 In addition, survey reports for the Stone and Swynnerton area, incorporating geophysical survey and remote sensing studies, are available in Background Information and Data (BID)⁵⁵, (see BID-CH-004-003: Cultural heritage survey reports).

⁵⁵ HS2 Ltd (2017), High Speed Two (HS2) Phase 2a (West Midlands - Crewe), Background Information and Data, Available online at: www.gov.uk/hs2

7.2 Scope, assumptions and limitations

- 7.2.1 The scope, key assumptions and limitations for the cultural heritage assessment are set out in full in Volume 1 (Section 8), the Scope and Methodology Report (SMR)⁵⁶, and the SMR Addendum⁵⁷.
- 7.2.2 The assessment focuses on the extent to which the Proposed Scheme will affect designated and non-designated heritage assets. Impacts on assets as a result of the Proposed Scheme will occur largely through the physical removal and alteration of heritage assets and changes to their setting.
- 7.2.3 The study area within which a detailed assessment of all assets, designated and non-designated, has been carried out is defined as the land required for the Proposed Scheme plus 500m. This is referred to in the remainder of this assessment as the 500m study area.
- 7.2.4 The setting of all designated heritage assets within the zone of theoretical visibility (ZTV) up to 2km from the land required for the Proposed Scheme has been considered. This is referred to in the remainder of this report as the 2km study area.
- 7.2.5 Impacts on the setting of heritage assets within the ZTV beyond 2km have been considered where professional judgement indicates that a significant effect may occur. No such impacts have been identified within the Stone and Swynnerton area.
- 7.2.6 The cultural heritage methodology includes the consideration of the intra-project effects of a number of topic assessments, for example, landscape and visual, ecology and biodiversity, and water resources and flood risk. Consequently, these interactions have been included in the assessment of impacts and effects.
- 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 live in or visit the area. Where measurements identified in the sound noise and vibration studies⁵⁸ indicate a significant effect, this has triggered an assessment of the contribution that tranquillity makes to the significance of the heritage asset.
- 7.2.8 The baseline studies informing this assessment have been drawn from a wide and comprehensive range of information sources. These have been supported by a programme of non-intrusive survey, including extensive geophysical survey.
- 7.2.9 Heritage assets within the land required to construct the Proposed Scheme are assumed to require complete removal and the assessment has been undertaken on that basis. With respect to overhead line diversions/realignments in particular, it is likely that the majority of the heritage assets can in fact be retained, as the land is only required to allow for raising or lowering of pylons and/or re-stringing of cables, or to provide an access route to the works.

⁵⁶ Volume 5: Appendix CT-001-001, Environmental Impact Assessment Scope and Methodology Report.

⁵⁷ Volume 5: Appendix CT-001-002, Environmental Impact Assessment Scope and Methodology Report Addendum.

⁵⁸ Volume 5: Appendix SV-002-003, CA3 Stone and Swynnerton. Sound, noise and vibration report, Tables 15 and 16.

- 7.2.10 Common features of the historic landscape such as marl pits, field boundaries and former areas of ridge and furrow are not individually considered and have not been included in the baseline, and impacts on them are not assessed individually. However, they are considered to contribute to the historic landscape character of the area and are considered within the overall assessment of impacts on historic landscape.
- 7.2.11 In undertaking the assessment, the following limitations were identified:
- although the LiDAR⁵⁹ data examined covers the majority of the 500m study area, there were some areas for which data was unavailable⁶⁰; and
 - not all areas within the 2km study area were available for field survey (due to limited land access or site conditions) such as site reconnaissance visits and geophysical survey⁶¹.
- 7.2.12 Limitations in the LiDAR data were not considered to be of a scale or significance that would have any impact on the robustness of the assessment.
- 7.2.13 Where survey data are limited, a precautionary baseline has been built up according to the guidance reported in the SMR and the SMR Addendum.

7.3 Environmental baseline

Existing baseline

- 7.3.1 Documentary baseline data was collated from a variety of sources in compiling this assessment, as set out in Volume 5: Appendix CH-001-003, including:
- Staffordshire Historic Environment Record (HER)⁶²;
 - Staffordshire Record Office collections;
 - material held at the William Salt Library, Stafford;
 - historic Ordnance Survey mapping; and
 - other published sources (full references are provided in Volume 5: Appendix CH-001-003).
- 7.3.2 In addition to collating this baseline data, the following surveys were undertaken, as set out in BID-CH-004-003: Cultural heritage survey reports:
- non-intrusive geophysical surveys;
 - targeted fieldwalking surveys;
 - detailed and systematic transcription of remote sensing data including LiDAR and aerial photographs;

⁵⁹ Light detection and ranging (LiDAR) is a high resolution remote sensing technique to capture 3D data.

⁶⁰ For details see the Remote Sensing Survey Report, in the Background Information and Data document, BID-CH-004-003.

⁶¹ For details see the Geophysical Survey Report, in the Background Information and Data document, BID-CH-004--003.

⁶² Staffordshire Historic Environment Record. Available online at: <https://www.staffordshire.gov.uk/environment/eLand/planners-developers/HistoricEnvironment/Historic-Environment-Record/HistoricEnvironmentRecord.aspx>

- walkover and site reconnaissance of sites and buildings of potential heritage significance; and
- setting assessments of all accessible designated heritage sites within 2km of the land required for the Proposed Scheme.

Designated assets

7.3.3 Swynnerton Conservation Area (STSo42) is located partially within the land required for the Proposed Scheme (see Volume 5: Cultural heritage Map Book: Map CH-02-205).

7.3.4 The following designated heritage assets are located partially or wholly within the 2km study area (see Volume 5: Cultural heritage Map Book: Maps CH-02-204b to CH-02-206a):

- three scheduled monuments: Bury Bank multivallate⁶³ hillfort (STSo35); Saxon's Lowe, Tittensor Common (STSo36); and a bowl barrow⁶⁴ in Swynnerton Park (STSo43);
- two Grade I listed buildings within Swynnerton Conservation Area (STSo42): Swynnerton Hall and the Church of St Mary;
- ten Grade II* listed buildings: four in a group centred on the Church of St Michael, Stone including the church itself, the Crompton Tomb and Jervis Mausoleum in the graveyard, and The Priory 8 Lichfield Street (STSo19); The Crown Hotel, 38 High Street (part of a group of buildings at Stone town centre, (STSo18); Meaford Hall (STSo34); The Nursery House, Meaford (STSo34); Walton House and attached walls, Walton (STSo12); Chapel of Our Lady of the Assumption, Swynnerton (STSo42); and Hatton Water Pumping Station and Chimney, Hatton (STSo51);
- ninety Grade II listed buildings including large groups at: Aston by Stone (STSo02); the Trent and Mersey Canal (STSo03 and STSo17); Stone (STSo18, STSo19 and STSo21); and Swynnerton (STSo42);
- individual Grade II listed buildings lying outside settlements including:
 - Swynnerton Heath Farm (STSo49), an early 19th century brick farmhouse with an L-shape plan, situated at the junction of the A51 Stone Road and the A519 Newcastle Road;
 - Blakelow Farm (STSo30), a group of historic brick farm buildings laid out around a regular U-plan courtyard, with additional detached elements; and
 - a former Water Tower (STSo47), built in approximately 1890, situated on Stab Lane on a ridge with views to the north-east, 800m north of Swynnerton Village.
- Trentham Gardens, Grade II* registered garden (STSo61); and

⁶³ Double banked defended enclosure.

⁶⁴ A prehistoric burial mound.

- five further conservation areas: the Trent and Mersey Canal (STSo69, STSo03 and STSo17); Stone (STSo18); Moddershall Valley (STSo67); Meaford (STSo34); and Trentham Gardens (within the study area co-extensive with the Trentham Gardens, Grade II* registered garden (STSo61)).

Non-designated assets

- 7.3.5 All non-designated heritage assets within the 500m study area are listed in the gazetteer in Volume 5: Appendix CH-002-003 and identified on Maps CH-01-209b to CH-01-213a (Volume 5: Cultural heritage Map Book).
- 7.3.6 The following non-designated assets of moderate value lie wholly or partially within the land required for the Proposed Scheme:
- undated but possibly late prehistoric or Romano-British settlement site, south of Dog Lane, Stableford (STSo64); and
 - undated but possibly late prehistoric or Romano-British settlement site north of Dog Lane, Stableford (STSo65).
- 7.3.7 The following non-designated assets of low value lie wholly or partially within the land required for the Proposed Scheme:
- undated enclosure at Peasley Bank (STSo01);
 - the site of a possible beacon or look out at Pirehill (STSo04);
 - peat extraction site at Walton Heath (STSo08);
 - extensive medieval/post-medieval agricultural landscape, west of Walton and Darlaston (STSo13);
 - Darlaston Pool, which lies to the south of Yarnfield Lane immediately north-east of the M6, is depicted on late 19th and early 20th century Ordnance Survey maps and confirmed in a 2016 walkover survey (STSo16);
 - earthwork remains of former trackways, west of Darlaston Park, formerly connecting Swynnerton Grange and Darlaston Wood Farm to Yarnfield Lane (STSo27);
 - surviving ridge and furrow, set within pasture surrounding Swynnerton Grange (STSo37);
 - boundaries, trackways and possible fishponds (former and surviving) in Swynnerton Park (STSo40);
 - milepost near Cash's Pit, north of Swynnerton village (STSo48);
 - Second World War military site at Hatton comprising a complex of four bunkers surrounded by bunds and linked by trackways (referred to as Common Lane Cold War Bunkers) (STSo53);
 - earthwork remains of a series of former field boundaries at Hatton (STSo55);

- a 185m long north-west to south-east aligned feature, west of Nursery Common (STSo58);
- areas of former field boundaries south-west (STSo62) and north-east (STSo63) of Shelton under Harley Farm; and
- Swynnerton Outer Park – the eastern portion of the park, now divided into agricultural fields (STSo74).

7.3.8 There are a number of non-designated heritage assets within the 500m study area, the setting of which may be affected by the Proposed Scheme, as follows:

- Swynnerton Park pleasure grounds and inner park to the south of Swynnerton Hall, incorporating elements of a late 18th century designed landscape (STSo73);
- North Pirehill Farm, west of Pirehill Lane to the south of Walton, a courtyard farm of historic brick buildings, in existence by the late 18th century (STSo05);
- Walton House Farm, to the south-west of Walton, a courtyard farm of historic brick buildings, in existence by the mid-19th century (STSo06);
- an isolated outfarm, north-east of Walton Heath Farm, in existence by the late 19th century (STSo07);
- site of an isolated farmstead with a dispersed cluster plan, north-east of Walton Heath Farm in existence by the 1830s (STSo09);
- late 19th century milestone at Walton Heath (STSo11);
- Clement House/Walton Heath Farm, to the south-west of Walton, a courtyard farm of historic brick buildings, in existence by the early 19th century (STSo14);
- Micklow House Farm, west of Walton, a courtyard farm of historic brick buildings, in existence by the late 18th century (STSo15);
- Darlaston Grange Farm, to the north of Yarnfield Lane to the west of Stone, a courtyard farm of historic brick buildings, in existence by the late 18th century (STSo25);
- remains of a post-medieval landscape park at Darlaston Hall (STSo26);
- former Stone infectious diseases hospital on Moss Lane to the east of Yarnfield, later converted to sanatorium and now private residences (STSo28);
- Blakelow Farm, on the west side of the M6 to the east of Swynnerton, an isolated farmstead laid out around a regular u-plan courtyard, thought to date back to at least the 17th century (STSo30);
- Swynnerton Grange Farm, to the south-east of Swynnerton, a E-plan courtyard farm of historic brick buildings, in existence by the early 19th century (STSo32);

- Upper Rowe Farm, on the east side of the A51 Stone Road and West Coast Main Line to the east of Stableford, a linear layout of historic brick buildings in existence by the late 19th century (STSo60); and
- Shelton under Harley Farm, to the north-east of Stableford, a historic 18th or 19th century farmstead of historic brick buildings on a site mentioned in the Domesday Book (STSo75).

Historic landscape

7.3.9

Analysis has been undertaken of the historic landscape character within and around the land required for the Proposed Scheme. This was based on the outputs of the SCC Historic Landscape Characterisation (HLC), geological and geographical data sources, site visits and professional judgment. For the purpose of assessment, the Proposed Scheme has been divided into a number of Historic Landscape Character Areas (HLCAs) (see Volume 5: Appendix CH-005-000). Within the Stone and Swynnerton area these are as follows:

- HLCA 11 Stone, Walton and environs: this HLCA comprises the modern town of Stone, the nucleus of which is a medieval settlement focused on the Augustinian Priory of St Mary and St Wulfad. In the 18th century Stone occupied a key location on the road and canal network and buildings of this date remain a conspicuous feature of the urban core. Extensive modern development within and around the town, which has affected the legibility of the historic urban landscape, means that the heritage value of this HLCA is considered to be moderate;
- HLCA 12 Meece Brook to River Trent: this HLCA comprises parts of the modern civil parishes of Chebsey, Stone Rural and Whitgreave. Finds of prehistoric date at Cold Norton and Norton Bridge give an indication of the potential time depth within the area. The principal landscape types are 19th century or earlier piecemeal enclosures with some elements of later re-organisation. The M6 runs north-south through the area and has led to significant recent landscape change meaning that the heritage value of this HLCA is considered to be low; and
- HLCA 13 Swynnerton and Tittensor: this HLCA comprises the majority of the modern civil parish of Swynnerton with part of the adjacent parishes of Stone, Barlaston, Standon, Chapel Chorlton and Hill Chorlton. The predominant landscape types are 19th century or earlier enclosures with relatively small areas of later re-organisation. Within the area there are historic village settlements at Swynnerton, Tittensor and Yarnfield. The widespread survival of early enclosure and patches of ancient woodland is offset to some degree by the M6, meaning that the heritage value of this HLCA is considered to be moderate.

Cultural heritage overview

7.3.10

This overview of the cultural heritage baseline is drawn from the more detailed analysis set out in the Cultural heritage baseline report (Volume 5: Appendix CH-001-003). This also contains references and a timeline setting out the chronological limits

of the periods referred to below. This overview refers to heritage assets within the 500m study area, unless specified otherwise.

- 7.3.11 Within the Stone and Swynnerton area the solid geology is partially overlain by superficial deposits formed during the Quaternary period (last 2.5 million years) as a consequence of the repeated advance and retreat of ice sheets. Superficial deposits are patchy across the study area, largely occurring north of the Proposed Scheme associated with the Trent Valley. The study area is close to the margins of the last major ice sheet to have affected mainland Britain, which expanded during the late Devensian period (approximately 30,000 to 15,000 years ago) to cover the area, largely removing evidence for earlier ice sheets and drainage systems. Present evidence suggests the margins of the ice sheet reached a line from Lichfield to Wolverhampton, although the precise limits of the ice sheet are still a matter for debate. It is possible, therefore, that isolated remnants of earlier glacial and fluvial sediments may be preserved beneath deposits of more recent date, although the majority of the deposits will date to the Devensian and Holocene period.
- 7.3.12 Deposits of Holocene alluvium are present where former and extant river and minor tributaries cut across the study area. The most significant deposits of alluvium are associated with the course of the River Trent that runs north-west to south-east through the area. Alluvium deposited along the course of minor tributaries of the River Trent occurs to the immediate south and north of Stone, as well as associated with the course of Filly Brook, running west from Stone, and Park Brook, running west along the northern edge of Trentham Park. Peat deposits, representing waterlogged, partly decayed plant material, occur in two distinct areas. The first area of Peat is located on fluvioglacial sands and gravels and terrace deposits on the western bank of the River Trent, approximately 1km west of Burston. The deposit is associated with an extant lake and may represent deposits infilling a formerly more extensive lake. The second area of Peat is located to the immediate west of Yarnfield associated with the course of Filly Brook, and appears most likely to reflect Peat forming within the floodplain of the brook.
- 7.3.13 The only evidence of early prehistoric activity in the Stone and Swynnerton area comprises a few stray finds of Mesolithic and Neolithic date including six Neolithic (or early Bronze Age) stone axes found in the vicinity of Cold Norton Farm (STSo77).
- 7.3.14 Evidence from the Bronze Age is more extensive with two barrows within the scheduled hillfort at Bury Bank (STSo35), a scheduled barrow within the grounds of Swynnerton Park (STSo43), and a potential barrow at Sandyford (STSo44). Placename evidence has been taken to indicate that barrows were previously present in the vicinity of Micklow Farm (STSo15) and Blakelow Farm (STSo30).
- 7.3.15 One of the barrows at Bury Bank (STSo35) was investigated in the 19th century with no conclusive result⁶⁵. The barrow at Bury Bank farmhouse, known as Round Low Barrow, was excavated by the landowner as an obstruction to ploughing⁶⁶. A possible cist or pyre arrangement containing human skull fragments was uncovered (no earthwork remains now survive). A considerable number of metal detected finds have

⁶⁵ Victoria County History (1908): A History of Staffordshire Volume 1, p342 strongly suggests the presence of a central burial but the material recovered does not seem to have included any pottery or metalwork, which would have allowed the features to be dated.

⁶⁶ Staffordshire HER reference MST589.

been made in the vicinity of the Swynnerton Park barrow (STSo43) suggesting continued activity in the vicinity of the monument in and after the Roman period.

- 7.3.16 The small multivallate hillfort at Bury Bank (STSo35) is the most substantial Iron Age monument in the study area. The defences were investigated in the 19th century. However, the date of construction and interior arrangements are unknown beyond the presence of two earlier barrows in the southern part of the fort. Geophysical survey undertaken in 2016 in the vicinity of Dog Lane, Stableford identified two sites (STSo64 and STSo65) where enclosures of possible late prehistoric date with associated pit groups seem to be present.
- 7.3.17 The Romano-British period is equally bereft of evidence reflecting the picture more widely in the county where Romano-British sites are a rarity. A possible example of a temporary military camp has been suggested at Aston-by-Stone, outside the study area, just over 600m from the route of the Proposed Scheme. The site was initially identified from aerial photographs and subsequently subject to geophysical survey. Chance finds of Roman material have been made in the area since the 19th century. The largest collection of finds was made during metal detecting at Swynnerton in the vicinity of the scheduled barrow (STSo43), which resulted in the discovery of around 100 artefacts of Roman, Saxon and medieval date including four brooches, a strap end and two coins of Roman date.
- 7.3.18 The Domesday survey suggests that the pattern of land occupation was well established by the second half of the 11th century with settlements at Aston, Walton, Stoke by Stone, Swynnerton, Hatton and Shelton under Harley although archaeological evidence for these settlements is entirely lacking. The place name Walton has been interpreted as indicating the presence of a community of Britons in the post-Roman period⁶⁷.
- 7.3.19 The organisation of Staffordshire into the administrative units known as Hundreds may have occurred as early as the 10th or 11th century. Pirehill Hundred occupied the north-western part of the county and it is assumed that the eponymous meeting centre of the Hundred was located at Pirehill, south-west of Stone (STSo04). The potential presence of archaeological remains in this location is uncertain although hundredal centres in Staffordshire seem to coincide with earlier prehistoric activity⁶⁸.
- 7.3.20 The evidence base for activity after AD1100 is much stronger than for earlier periods. Evidence of settlement contraction and movement can be seen at Cold Norton and Swynnerton Grange (STSo31), probably reflecting the population decline noted generally as a feature of the period after AD1350. The current principal settlement developed out of the market town which grew up next to the Augustinian Priory at Stone. The market was granted a charter in AD1251. By the 14th century, the settlement of the de Swynnertons, at Swynnerton village (STSo42) provided an additional focus where the Chapel of the Blessed Virgin in the church of St Mary was a local site of pilgrimage. Emparking⁶⁹ was a significant feature of the medieval landscape in Staffordshire with over 100 being identified in the county having an

⁶⁷ Palliser, D.M.(1976) *The Staffordshire Landscape*, London, Hodder and Stoughton p45 and Duignan, W.H. (1902) *Notes on Staffordshire Placenames*, London, OUP p159-160

⁶⁸ See Palliser, D.M. (1976) p51

⁶⁹ The process of enclosing an area for the creation of a park. The creation of a game proof boundary or park 'pale' was a key feature. The process might also include the clearance of any existing settlements from within the pale.

average size of between 400 and 500 acres (approximately 1.6km² – 2km²). Swynnerton Old Park, a short distance outside of the study area, probably reflects the location if not the exact form of one such park.

- 7.3.21 By the beginning of the 16th century, substantial landholdings in the study area were held by religious houses, principally the Priory of Stone. The transfer of these landholdings to secular owners as a result of the religious reforms of the mid-16th century may have indirectly led to a process of enclosure and consolidation, which continued into the 19th century. It is probable that the process of enclosure started earliest in the vicinity of Swynnerton, for which there is no record of Parliamentary enclosure. By contrast, Stone and immediate surrounding areas have a fairly full record of Parliamentary enclosure suggesting that the process took place later here. Enclosure in the late 18th and 19th centuries led to the creation of a series of isolated farmsteads located within the newly enclosed land. A number of farmsteads of this type survive in vicinity of Stone, including: North Pirehill Farm (STS005); Walton Heath Farm (STS014); Walton House Farm (STS006); an outfarm north-east of Walton Heath Farm (STS007); Micklow House Farm (STS015); Darlaston Grange Farm (STS025); Blakelow Farm (STS030); and Swynnerton Grange Farm (STS032).
- 7.3.22 Swynnerton Hall (within Swynnerton Conservation Area, STS042) was constructed on its present site between 1725 and 1729 to replace an earlier residence destroyed in the mid-17th century. The park within which it is set demonstrates the general transition from deer parks to ornamental parks in the Georgian period. Lancelot 'Capability' Brown developed a scheme for the immediate environs of the house although it is not clear how much of the scheme was adopted (if any)⁷⁰. Swynnerton Hall remains in the ownership of the Fitzherbert family, who built the chapel of Our Lady of the Assumption in 1869 (also part of STS042). The village of Swynnerton in its present form is essentially an estate village of 18th or 19th century date.
- 7.3.23 In the 18th century Stone thrived as a coaching and carriage centre following the turnpiking of the Chester Road in 1729. James Brindley's Trent and Mersey Canal opened in 1777 and the headquarters of the Canal Company and some of its workshops and manufacturing facilities (STS017) were located in Stone, consolidating the prosperity of the town and leaving a legacy of fine industrial and residential buildings. The 19th century saw the arrival of the railways and a consequent downturn in the viability of the canal. Nonetheless, Stone continued to prosper and expand as demonstrated by the Victorian industrial and residential suburb between the canal and the A519 Newcastle Road.
- 7.3.24 The 20th century saw a major change to the area with expansion of Stone and the nearby villages well beyond their historic core areas. In 1940, an ordnance factory was established at Swynnerton, which brought tens of thousands of workers to the site on a daily basis. Although the factory closed in the late 1940s, the area remains in military use and other defence installations were constructed north of Swynnerton at Hatton Roughs. The Stafford bypass section of the M6 was completed in 1962 and by 1965 the motorway extended as far north as Lancaster.

⁷⁰ Mowl T and Barre D (2009) p182-183

Future baseline

Construction (2020)

- 7.3.25 Volume 5: Appendix CT-004-000⁷¹ provides details of the developments in the Stone and Swynnerton area that are assumed to have been implemented by 2020.
- 7.3.26 No committed developments have been identified in this area that will materially alter the baseline conditions in 2020 for heritage assets.

Operation (2027)

- 7.3.27 Volume 5: Appendix CT-004-000 provides details of the developments in the Stone and Swynnerton area that are assumed to have been implemented by 2027.
- 7.3.28 No committed developments have been identified in this area that will materially alter the baseline conditions in 2027 for heritage assets.

7.4 Effects arising during construction

Avoidance and mitigation measures

- 7.4.1 The design of the Proposed Scheme avoids physical impacts on any scheduled monuments, registered parks or gardens, registered battlefields or listed buildings within the Stone and Swynnerton area.
- 7.4.2 Section 8 of the draft Code of Construction Practice⁷² (CoCP) sets out the measures that will be adopted, insofar as reasonably practicable, to control effects on heritage assets. These include:
- management measures that will be implemented for heritage assets that are to be retained within the land required for the Proposed Scheme;
 - route-wide principles, standards and techniques for works affecting heritage assets; and
 - a programme of historic environment investigation and recording (including archaeology and historic buildings) to be undertaken prior to or during construction works affecting the heritage assets.

Assessment of impacts and effects

- 7.4.3 Impacts on all heritage assets described above have been assessed⁷³. However, only those leading to significant effects are described in the construction assessment set out below.

Temporary effects

- 7.4.4 The construction works, comprising excavations and earthworks and including temporary works such as construction compounds, storage areas, and diversion of existing roads and services, have the potential to affect heritage assets during the

⁷¹ Volume 5: Appendix CT-004-000, Planning data.

⁷² Volume 5: Appendix CT-003-000, Draft Code of Construction Practice.

⁷³ These are set out in detail in the Impact Assessment Table, Volume 5: Appendix CH-003-003, Cultural heritage impact assessment table.

construction period. Impacts will occur to assets both within the land required for the Proposed Scheme and assets in the wider study area due to the visibility of plant, cranes and equipment.

- 7.4.5 The following significant effects are expected to occur as a result of temporary impacts on designated or non-designated heritage assets due to changes to their settings.
- 7.4.6 Swynnerton Heath Farmhouse (STSo49), an asset of moderate value, will experience a temporary change in its setting. The farmhouse forms part of a working farm with large modern farm buildings to the north and main roads to the east and south. The farmhouse will be affected by construction activity associated with Swynnerton North cutting, approximately 230m to the north, the A519 Newcastle Road overbridge, immediately to the north-east of the farmhouse, and the presence of a temporary material stockpile, immediately opposite the farmhouse. During construction, there will be an increase in traffic movements as the result of construction traffic along the adjacent roads. This will constitute a medium adverse impact and a moderate adverse significant effect. Construction activity will take place over three years and three months.
- 7.4.7 Blakelow Farm (STSo30), an asset of low value, will experience a temporary change in its setting. The farm's significance is supported by its relationship with the surrounding farmland with which it has a strong historic and functional connection. While this has already been substantially affected by the presence of the M6, immediately to the north, the construction activity associated with the construction of the Meaford North embankment, approximately 90m to the south, will further affect these historic relationships. This will constitute a high adverse impact and a moderate adverse significant effect. Construction activity will take place over approximately three years.
- 7.4.8 In addition, there will be a change in the heritage significance of the historic landscape at HCLA 13 Swynnerton and Tittensor. The construction of the Meaford North embankment, Swynnerton South cutting, Swynnerton North cutting, the diversions of Tittensor Road and the A51 Stone Road, and the presence of construction compounds will result in a temporary impact on the HLCA, considered to be of moderate value. This HLCA retains substantial elements of a traditional rural landscape including historic settlements, 19th century and earlier enclosures, aristocratic estate parkland and historic routeways. Although the historic elements have seen some loss of significance as a result of 20th century changes, construction will alter the legibility of the former parkland at Swynnerton, impact upon Swynnerton Conservation Area and introduce changes to historic routeways. This will constitute a medium adverse impact and a moderate adverse significant effect.

Permanent effects

- 7.4.9 Permanent significant effects can occur either as a result of physical impacts on heritage assets within the land required for the Proposed Scheme, or through changes to the setting of heritage assets through the presence of the Proposed Scheme.
- 7.4.10 The following significant effects are expected to occur as a result of permanent physical impacts on heritage assets within the land required for the Proposed Scheme.

- 7.4.11 Darlaston Pool (STSo16), an asset of low value, will be removed by the construction of the Stone railhead and associated compound. This will constitute a high adverse impact and a moderate adverse significant effect.
- 7.4.12 Swynnerton Conservation Area (STSo42), an asset of high value, will be directly affected by the earthworks required for the diversion of Tittensor Road within the northern part of the Conservation Area, affecting key outward views from the village. This will constitute a low adverse impact and a moderate adverse significant effect.
- 7.4.13 The milepost near Cash's Pit (STSo48), north of Swynnerton village, an asset of low value, will be removed during construction of the Swynnerton North cutting. This will constitute a high adverse impact and a moderate adverse significant effect.
- 7.4.14 The Cold War bunker complex at Hatton (STSo53), an asset of low value, will be directly affected by construction of the Proposed Scheme. Construction of the Hatton embankment will result in the demolition of one bunker and the severance of the remaining bunkers from each other. This will constitute a high adverse impact and a moderate adverse significant effect.
- 7.4.15 Sections of former field boundaries to the south and west of Shelton under Harley Farm (STSo62), an asset of low value, will be removed by the construction of Hatton North cutting and Stableford auto-transformer station, and the Bent Lane (North) diversion. This will constitute a high adverse impact and a moderate adverse significant effect.
- 7.4.16 The following significant effects will occur as a result of the permanent impacts on designated or non-designated heritage assets as a result of changes to their settings.
- 7.4.17 Blakelow Farm (STSo30), an asset of low value, will be subject to a permanent change in its setting. The farm's significance is supported by its relationship with the surrounding farmland with which it has a strong historic and functional connection, albeit this has been substantially modified by the construction of the M6 immediately to the north-east. The farm will be affected as a result of the construction of the Meaford North embankment, approximately 90m to the south, which will permanently isolate the farm complex between the embankment to the south-west and the M6 to the north-east, largely severing the building's visual links with the surrounding farmland. This will constitute a high adverse impact and a moderate adverse significant effect.
- 7.4.18 The former Water Tower (STSo47), an asset of moderate value, will be subject to a permanent change in its setting. The water tower is a significant historic feature in views looking westwards towards Swynnerton, particularly for those travelling towards the village along Tittensor Road. The diversion of Tittensor Road, approximately 80m from the water tower, combined with the presence of the Swynnerton embankment, approximately 370m to the north, will considerably alter this rural view. This will constitute a medium adverse impact and a moderate adverse significant effect.
- 7.4.19 Swynnerton Heath Farmhouse (STSo49), an asset of moderate value, will be subject to a change in its setting. The farmhouse's significance lies substantially in its historic relationship to the surrounding farmland and other elements of the historic landscape including the network of country lanes. The Swynnerton North cutting and the A519

Newcastle Road overbridge will be located on rising ground, approximately 230m to the north, and will be visible from the rear of the farmhouse, permanently changing these historic relationships. This will constitute a medium adverse impact and a moderate adverse significant effect.

- 7.4.20 In addition there will be a change in the heritage significance of the historic landscape at HLCA 13 Swynnerton and Tittensor. The construction of the Meaford North embankment, Swynnerton North cutting, Swynnerton South cutting, and the diversions of Tittensor Road and the A51 Stone Road will result in a permanent impact on this HLCA, considered to be of moderate value. The HLCA retains substantial elements of a traditional rural landscape including historic settlements, 19th century and earlier enclosures, aristocratic estate parkland and historic routeways. Although the historic elements have seen some loss of significance as a result of 20th century changes, construction will permanently alter the legibility of the former parkland at Swynnerton, impact upon Swynnerton Conservation Area and introduce changes to historic routeways. This will constitute a medium adverse impact and a moderate adverse significant effect.

Other mitigation measures

- 7.4.21 Refinements to the mitigation measures incorporated into the design of the Proposed Scheme or included in the draft CoCP will be considered during detailed 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 impacts on below ground heritage assets can be reduced through the design of earthworks.
- 7.4.22 Milestones and/or mileposts that have to be removed during construction will be, wherever it is reasonably practicable to do so, returned to their original location before operation commences.

Summary of likely residual significant effects

- 7.4.23 The temporary effects of construction activity on the setting of heritage assets have been considered. However, they are largely reversible in nature and will be restricted to the duration of the construction works.
- 7.4.24 As no mitigation beyond that described above has been identified the residual effects are the same as those reported in the permanent and cumulative effects sections.

Cumulative effects

- 7.4.25 No cumulative effects on heritage assets during construction have been identified in the Stone and Swynnerton 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, which will reduce the impacts and effects on heritage assets as shown on the Map Series CT-o6 within the Volume 2: CA3 Map Book:

- noise fence barriers on the Swynnerton embankment and along the south side of the Swynnerton North cutting, which will reduce noise effects on the setting of Swynnerton Conservation Area (STSo42) and Swynnerton Outer Park (STSo74); and
- landscape planting, which will increasingly reduce impacts on the settings of the assets within the 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 will be no physical impacts on buried archaeological remains or other heritage assets arising from the operation of the Proposed Scheme. Impacts on heritage assets due to changes in their settings 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 will 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 scheme and its operation, this is reported in the assessment of operation.

7.5.3 Significant effects will occur as a result of permanent changes to the setting of the following assets arising from the impacts of railway operation.

7.5.4 Blakelow Farm (STSo30), an asset of low value, will be subject to a permanent change in its setting as a result of the operation of the Proposed Scheme. The noise and movement of passing trains to the west will be in contrast to the historical significance of the farm, with its historic landscape context of fields and the traditional rural economy. In combination with the permanent effects of the Proposed Scheme the effect will remain as moderate adverse significant.

7.5.5 The former Water Tower (STSo47), an asset of moderate value, will be subject to a permanent change in its setting as a result of the operation of the Proposed Scheme. The movement of passing trains in the valley over which it looks will be in marked contrast to the rural landscape that makes up the building's current setting, and will, therefore, affect its historic significance in the landscape. In combination with the permanent effects of the Proposed Scheme the effect will remain as moderate adverse significant.

7.5.6 No significant effects on HLCAs will result from the operation of the Proposed Scheme in the Stone and Swynnerton area.

Other mitigation measures

7.5.7 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. Potential opportunities for further mitigation, such as planting and noise fencing, have not been identified at this stage, but will be considered as part of the detailed design process.

Summary of likely residual significant effects

- 7.5.8 As no mitigation beyond that described has been identified, the residual effects are the same as those reported in the assessment of impacts and effects and cumulative effects section.

Cumulative effects

- 7.5.9 No cumulative effects on heritage assets during operation have been identified in the Stone and Swynnerton area.

Monitoring

- 7.5.10 Volume 1, Section 9 sets out the general approach to environmental monitoring during operation of the Proposed Scheme.
- 7.5.11 There are no area-specific heritage monitoring requirements during operation of the Proposed Scheme. It is assumed that all heritage assets within the land required for the Proposed Scheme will be removed during construction unless expressly excluded as a result of the mitigation process.

8 Ecology and biodiversity

8.1 Introduction

- 8.1.1 This section of the report describes the ecological baseline and identifies likely impacts and significant ecological effects that will arise from the construction and operation of the Proposed Scheme in the Stone and Swynnerton area. This includes effects upon sites recognised or designated on the basis of their importance for nature conservation.
- 8.1.2 Engagement has been undertaken with national organisations and regional and local stakeholders including: Natural England; Environment Agency; Forestry Commission; Staffordshire Wildlife Trust; Royal Society for the Protection of Birds (RSPB); Woodland Trust; and Staffordshire County Council (SCC). The purpose of this engagement has been to obtain relevant baseline information and inform the design development and assessment of the Proposed Scheme.
- 8.1.3 Volume 5 contains supporting information to the ecological assessment reported in this section, including:
- ecological baseline data - designated sites (see Volume 5: Appendix EC-001-000); and
 - an ecology register of local level effects, which are not reported individually in Volume 2 (see Volume 5: Appendix EC-016-003).
- 8.1.4 Map Series EC-01 showing statutory and non-statutory designated sites of relevance to the assessment in the Stone and Swynnerton area is provided in the Volume 5: Ecology Map Book.
- 8.1.5 Maps showing the location of the key environmental features (Map Series CT-10) and the key construction (Map Series CT-05) and key operational (Map Series CT-06) features of the Proposed Scheme can be found in the Volume 2: CA3 Map Book.
- 8.1.6 In addition, ecological baseline data relating to habitats and species recorded in the Stone and Swynnerton area is set out in Background Information and Data (BID)⁷⁴ (see BID-EC-002-000 to BID-EC-014-000) and accompanying Map Series EC-02 to EC-12 (see BID Ecology Map Books).

8.2 Scope, assumptions and limitations

- 8.2.1 The scope, assumptions and limitations for the ecological assessment are set out in Volume 1 (Section 8), the Scope and Methodology Report (SMR⁷⁵) and the SMR Addendum⁷⁶.
- 8.2.2 Limitations associated with particular surveys are reported in Background Information and Data: BID-EC-002-000 to BID-EC-014-000.

⁷⁴ HS2 Ltd (2017), High Speed Two (HS2) Phase 2a (West Midlands - Crewe), Background Information and Data, Available online at: www.gov.uk/hs2

⁷⁵ Volume 5: Appendix CT-001-001, Environmental Impact Assessment Scope and Methodology Report.

⁷⁶ Volume 5: Appendix CT-001-002, Environmental Impact Assessment Scope and Methodology Addendum.

- 8.2.3 A route-wide Water Framework Directive (WFD) compliance assessment has been undertaken in conjunction with the environmental assessment (Section 15, Water resources and flood risk). Details of the assessment are presented in Volume 5: Appendix WR-001-000.
- 8.2.4 Access was obtained to the majority of land where general habitat survey (Phase 1 habitat survey) was proposed. However, access could not be gained in time for seasonally constrained surveys at a few locations that have potential to support key ecological features. This includes access to Clifford's Wood and the parcels of land directly adjacent to it. Further details are provided in Background Information and Data: BID-EC-002-000 to BID-EC-014-000.
- 8.2.5 Where data are limited, such as due to the absence of field surveys, a precautionary baseline has been built up according to the guidance reported in the SMR and the SMR Addendum. This constitutes a 'reasonable worst case' basis for the subsequent assessment and development of mitigation. Background Information and Data: BID-EC-002-000 to BID-EC-014-000 identifies these survey locations. Where the assessment has been based upon limited data, the ecological receptor is described as 'of up to' a specific value.
- 8.2.6 The precautionary approach to the assessment that has been adopted identifies the likely significant ecological effects of the Proposed Scheme. Unless otherwise stated, the description of effects assumes that land within the Bill limits will be subject to habitat loss resulting from development of the Proposed Scheme, with the land required for construction purposes only being reinstated following completion of construction. With respect to overhead line diversions/realignments in particular, it is likely that the majority of the habitats within the land required for the Proposed Scheme can in fact be retained, and land is only required to allow for raising or lowering of pylons and/or re-stringing of cables, or to provide an access route to the works.

8.3 Environmental baseline

Existing baseline

- 8.3.1 This section describes the ecological baseline relevant to the assessment: the designated sites, habitats and species recorded in this area. Further details are provided in the reports presented in Volume 5: Appendix EC-001-000 and Background Information and Data: BID-EC-002-000 to BID-EC-015-000, and maps presented in Volume 5: Map Series EC-01 and BID Ecology Map Books: Map Series EC-02 to EC-12. Statutory and non-statutory designated sites are shown on Volume 5: Map EC-01-309b to EC-01-313a.
- 8.3.2 Land required for and adjacent to the Proposed Scheme in the Stone and Swynnerton area consists mainly of agricultural land, hedgerows, broadleaved and mixed plantation woodland, villages and farmsteads. The topography is undulating with areas of higher ground at Swynnerton, Swynnerton Old Park and Pire Hill down to lower level agricultural land associated with Filly Brook towards the south of the Stone and Swynnerton area.

Designated sites

- 8.3.3 There are no statutory designated sites of international importance within 2km of the Proposed Scheme in the Stone and Swynnerton area.
- 8.3.4 There are no statutory designated sites of national importance within 500m of the Proposed Scheme in the Stone and Swynnerton area.
- 8.3.5 There is one nationally important Site of Special Scientific Interest (SSSI) of potential relevance to the assessment in the Stone and Swynnerton area. The land required for the Proposed Scheme is located within the Natural England Impact Risk Zone⁷⁷ for King's and Hargreaves Woods SSSI.
- 8.3.6 King's and Hargreaves Woods SSSI, covering an area of approximately 57.6ha, is designated for two ancient woodland sites with mature timber and dead wood that support an 'outstanding' assemblage of ground beetles, including nationally uncommon species. The site is also important for its moths and breeding bird assemblage. The SSSI is located south of Stoke-on-Trent approximately 1.8km north-east of the land required for the Proposed Scheme.
- 8.3.7 There is one Local Nature Reserve (LNR) relevant to the assessment in the Stone and Swynnerton area, which is of county value. Stone Meadows LNR, covering an area of approximately 14.4ha, comprises of three separate meadows next to the River Trent that support botanically rich floodplain meadow grasslands. The LNR is located within Stone adjacent to the A34 Stafford Road/The Fillybrooks, approximately 100m to the north of the land required for the Proposed Scheme.
- 8.3.8 There are 11 Local Wildlife Sites (LWS) of potential relevance to the assessment in the Stone and Swynnerton area, each of which is of county value. They are:
- Pirehill (north of) LWS, covering an area of approximately 2.3ha, is designated for its large fishing pool, associated osier bed⁷⁸ and wet woodland. The LWS is located to the west of the A34 Stafford Road/The Fillybrooks at Aston-by-Stone, directly adjacent to the land required for the Proposed Scheme;
 - Micklow Wood LWS, covering an area of approximately 1.5ha, is designated for its mixed deciduous woodland with a moderate diversity of plant species. The LWS is located to the west of Stone and east of the M6, approximately 190m north of the land required for the Proposed Scheme;
 - Filly Brook (west of Stone) LWS, covering an area of approximately 2ha, is designated for its mosaic of habitats including scattered trees, semi-improved lowland grassland, marshy grassland, running water and species-rich hedgerows. The LWS is located on the western edge of Stone, within the land required for the Proposed Scheme;
 - Pool House Wood LWS, covering an area of approximately 3.3ha, comprises two separate blocks of damp deciduous woodland. The LWS is located to the

⁷⁷ The Impact Risk Zones are a GIS tool developed by Natural England to make a rapid initial assessment of the potential risks to SSSIs posed by development proposals and indicate the types of development proposal which could potentially have adverse impacts.

⁷⁸ Osier beds are areas where willow was historically planted and coppiced to produce withies suitable for use in construction or to make functional items such as baskets and fencing.

east of the M6 and west of Stone, within the land required for the Proposed Scheme;

- Highlow Meadows LWS, covering an area of approximately 5.9ha, is designated for the range of habitats it supports including semi-improved grassland, species-rich marshy grassland and broadleaved woodland. The LWS is located to the west of the M6 and east of Swynnerton Grange, partially within the land required for the Proposed Scheme;
- Darlaston Wood LWS, covering an area of approximately 14ha, is designated for its ancient replanted woodland. This comprises an even-aged, mature mixed plantation on ground with a wide range of soil conditions. Throughout the wood are banks and hollows leading to a mosaic of dry and wet ground encouraging a diverse ground flora. The LWS is located east of the M6, to the north of Darlaston Park, approximately 180m north-east of the land required for the Proposed Scheme;
- Lodge Covert LWS, covering an area of approximately 2.9ha, is designated for its linear planted broadleaved woodland, dominated by sycamore and wych elm. The LWS is located east of the M6, south east of Sandyford, partially within the land required for the Proposed Scheme;
- Closepit Plantation LWS, covering an area of approximately 1.6ha, is designated for its habitats including deciduous woodland, which is dominated by sycamore, and three eutrophic pools. The LWS is located off the A51 Stone Road at Long Compton. The LWS is directly adjacent to the land required for the Proposed Scheme on three sides and partially within the land required for the Proposed Scheme on its fourth side;
- Clifford's Wood LWS, covering an area of approximately 16.9ha, is designated for its mosaic of semi-natural broadleaved woodland dominated by pedunculate oak and beech with lime, sycamore and areas of mixed plantation including larch and scots pine. The LWS is located to the north of the A51 Stone Road and west of the A519 Newcastle Road, partially within the land required for the Proposed Scheme;
- Hatton Common LWS, covering an area of approximately 7.6ha, is designated for its woodland comprising semi-natural woodland and conifer plantation with a ground flora with heathland characteristics. The LWS is located to the east of the A51 Stone Road at The Rowe, directly adjacent to the land required for the Proposed Scheme; and
- Swynnerton Old Park LWS, covering an area of approximately 370ha, is designated for its woodland, part of which is a plantation on ancient woodland site (PAWS), with extensive mixed conifer plantation and ground flora with heathland characteristics, especially along more open areas such as rides and glades. The LWS is located to the west of the M6 and south-west of Hanchurch, directly adjacent to the land required for the Proposed Scheme.

8.3.9 There are two Biodiversity Alert Sites (BAS) of potential relevance to the assessment in the Stone and Swynnerton area, both of which are of district/borough value. They are:

- Beatty Hall BAS, covering an area of approximately 0.5ha, designated for its broadleaved woodland, dominated by hazel, surrounding three small pools. The BAS is located to the north-east of Yarnfield, approximately 50m north of the land required for the Proposed Scheme; and
- Lower Hatton BAS, covering an area of approximately 1.8ha, designated for its woodland and grassland including mainly immature mixed broadleaved/conifer plantation, with a small area of semi-natural woodland, an area of semi-improved neutral grassland and a small pond with diverse marginal vegetation. This BAS is located to the south of the A51 Stone Road, east of Lower Hatton, approximately 220m east of the land required for the Proposed Scheme.

8.3.10 There is one Ancient Woodland Inventory (AWI) site of potential relevance to the assessment in the Stone and Swynnerton area, which is of county value. Swynnerton Old Park AWI site, covering an area of approximately 289ha, comprises PAWS within the Swynnerton Old Park LWS. The AWI site is located to the west of the M6 and south-west of Hanchurch, directly adjacent to the land required for the Proposed Scheme.

8.3.11 On the basis of the heritage review undertaken by HS2 Ltd, Natural England has confirmed that two woodlands of potential relevance to the assessment in the Stone and Swynnerton area will be added to the AWI. These are:

- Birchwood, covering an area of approximately 0.6ha, located adjacent to the M6, to the south of Blakelow, within the land required for the Proposed Scheme. It is of up to county value; and
- Clifford's Wood, covering an area of approximately 16.9ha (the same area as designated as a LWS), located to the north of the A51 Stone Road, west of the A519 Newcastle Road, partially within the land required for the Proposed Scheme. The ancient component of the woodland forms approximately 40% of a larger and well-connected wooded area of Clifford's Wood, which totals an area of approximately 42ha. It is of county value.

Habitats

8.3.12 The following habitat types that occur in the Stone and Swynnerton area are relevant to the assessment.

Woodland

8.3.13 Swynnerton Old Park LWS includes an area of approximately 289ha of woodland listed on the AWI as PAWS. Swynnerton Old Park includes defined areas of named woodland such as Nursery Common and Harley Thorns. The woodland comprises mixed semi-natural deciduous wood dominated by oak, with large areas of conifer dominated by larch and scots pine. The broadleaved areas are likely to qualify as lowland mixed deciduous woodland, a habitat of principal importance as listed under

Section 41 of the Natural Environment and Rural Communities (NERC) Act (2006)⁷⁹ and a conservation priority of the Staffordshire Biodiversity Action Plan⁸⁰ (local BAP). The ground flora in these woodlands is indicative of acid conditions and is dominated by bracken. The woodland is located to the west of the M6 and south-west of Hanchurch, directly adjacent to the land required for the Proposed Scheme. The woodland habitat is of county value.

8.3.14 The two woodlands to be added to the AWI are lowland mixed deciduous woodland, a habitat of principal importance and a conservation priority of the local BAP. These are:

- Birchwood, covering an area of approximately 0.6ha of deciduous woodland, adjacent to the west of the M6 and the northern edge of the Highlow Meadows LWS. The woodland is dominated by beech and sycamore and is located within the land required for the Proposed Scheme. Despite its small size, it is due to be added to the AWI, and therefore, is considered to be of up to county value; and
- approximately 40% (16.9ha and the same area as designated as LWS) of Clifford's Wood comprising a mosaic of semi-natural broadleaved woodland dominated by pedunculate oak and beech with lime, sycamore and areas of mixed plantation including larch and scots pine. The species composition within the broadleaved components is characteristic of the National Vegetation Classification (NVC⁸¹) W10a *Quercus robur-Pteridium aquilinum-Rubus fruticosus* woodland. The ground flora is dominated by bluebell. The ancient area forms part of a larger, well connected woodland. The habitat within the ancient area of the woodland is of county value and is partially within the land required for the Proposed Scheme.

8.3.15 There are 14 other woodlands that qualify or are likely to qualify as lowland mixed deciduous woodland, a habitat of principal importance. These are:

- Pirehill (north of) LWS includes approximately 1.3ha of woodland comprising of osier beds and wet woodland. The woodland is located to the west of the A34 Stafford Road/The Fillybrooks at Aston-by-Stone, directly adjacent to the land required for the Proposed Scheme. The woodland habitat is of up to county value;
- Pool House Wood LWS, covering an area of approximately 3.3ha, comprising of two separate areas of wet broadleaved woodland dominated by alder and willow with areas of sycamore and ash. The species composition is characteristic of NVC W6d *Alnus glutinosa-Urtica dioica* woodland *Sambucus nigra* sub-community. Pool House Wood is located to the east of the M6 and west of Stone, located within the land required for the Proposed Scheme. The woodland habitat is of county value;
- Fox Covert, covering an area of approximately 3.6ha, comprising of semi-natural deciduous woodland, dominated by oak with sycamore, beech and ash.

⁷⁹ Natural Environment and Rural Communities Act 2006, Chapter 16. Her Majesty's Stationery Office, London.

⁸⁰ Staffordshire Biodiversity Partnership. *Staffordshire Biodiversity Action Plan*. Available online at: <http://www.sbap.org.uk/>

⁸¹ NVC is a detailed survey and classification system that is used to compare plant communities within a range of defined community types.

The woodland is partially within the area designated as Highlow Meadows LWS. Fox Covert is located to the west of the M6 and east of Swynnerton Grange, partially within the land required for the Proposed Scheme. The woodland habitat is of up to county value;

- Lodge Covert, covering an area of approximately 7.5ha, on either side of the M6 and comprising of mixed deciduous woodland. The non-LWS section of woodland on the southern side of the M6 (approximately 4.6ha) supports species characteristic of NVC W10c *Quercus robur-Pteridium aquilinum-Rubus fruticosus* woodland *Hedera helix* sub-community. The un-surveyed area on the northern side of the M6 (approximately 2.9ha) is designated as LWS and is considered likely to have a similar species composition as the southern section. Lodge Covert is partially within the land required for the Proposed Scheme. The woodland provides good connectivity through the landscape. The woodland habitat is of up to county value;
- Closepit Plantation LWS, covering an area of approximately 1.6ha, comprising of sycamore dominated deciduous woodland. Closepit Plantation LWS is located off the A51 Stone Road at Long Compton and is directly adjacent on three sides to the land required for the Proposed Scheme with approximately 0.01ha (<1%) of the woodland within the land required for the Proposed Scheme on the fourth side. The woodland habitat is of up to county value;
- Clifford's Wood, in addition to the area that has been assessed as ancient woodland and is designated as LWS, comprises of approximately 25ha of non-ancient woodland (approximately 42ha in total with the LWS/ ancient sections) with the same NVC W10a habitat community as that described within the ancient woodland description above. Clifford's Wood is located to the north-east of Lower Hatton partially within the land required for the Proposed Scheme. Given its supporting value, the woodland habitat within the non-ancient areas of Clifford's Wood is of county value;
- Hatton Common LWS, covering an area of approximately 7.6ha, comprising mixed semi-natural deciduous woodlands, dominated by oak, with areas of conifer plantation dominated by larch and scots pine in places. The ground flora is indicative of acid conditions and is dominated by bracken species. Hatton Common LWS is located to the east of the A51 Stone Road at The Rowe, directly adjacent to the land required for the Proposed Scheme. The woodland habitat is of county value;
- The Shrubs, covering an area of approximately 11ha, comprising mixed semi-natural woodland with areas of conifer plantation. The woodland is to the east of Swynnerton, directly adjacent to the land required for the Proposed Scheme. The Shrubs forms a belt of woodland through the landscape and the broadleaved components are habitats of principal importance, as such the woodland is of district/borough value;
- The Stretters, covering an area of approximately 12ha, comprising mixed semi-natural woodland with areas of larch plantation and a ground flora dominated by bluebell. The woodland is located to the west of the M6 and north of the

A51 Stone Road near Swynnerton, directly adjacent to the land required for the Proposed Scheme. As a large area of woodland with semi-natural areas that are likely to be classified as habitats of principal importance, the woodland is of district/borough value;

- a cluster of three small mixed deciduous and conifer plantations are located in proximity to Clifford's Wood, within the land required for the Proposed Scheme, and have a similar species composition to this site. The majority of these woodlands also support a ground flora dominated by bluebell. The broadleaved components of these woodlands are habitats of principal importance. An additional four small woodlands of a similar composition are adjacent to the land required for the Proposed Scheme in this location. This cluster of woodlands is of district/borough value;
- Stabhill Plantation, covering an area of approximately 1.3ha, comprising semi-natural deciduous woodland, formed of two wooded areas either side of an unnamed road. The woodland is dominated by oak with sycamore, beech and ash characteristic of NVC W10c *Quercus robur-Pteridium aquilinum-Rubus fruticosus* woodland *Hedera helix* sub-community. Stabhill Plantation is located off the junction of Stab Lane and the A51 Stone Road and falls almost entirely within the land required for the Proposed Scheme. Due to its small size this woodland is of local/parish value; and
- Cash's Pit, covering an area of approximately 1.5ha, comprising of semi-natural deciduous woodland, dominated by oak with sycamore, beech and ash and characteristic of NVC W8e *Fraxinus excelsior-Acer campestre-Mercurialis perennis* woodland *Geranium robertianum* sub-community. Cash's Pit is located to the north of the A51 Stone Road and west of Bottom Lane, within the land required for the Proposed Scheme. Due to its size this woodland is of local/parish value.

8.3.16 In addition to those described above, the Stone and Swynnerton area has a series of small woodlands comprising areas of young mixed deciduous woodland with conifer components. This includes nine unnamed woods and Black Plantation. Five of these woodlands are within the land required for the Proposed Scheme, and five are immediately adjacent to the land required for the Proposed Scheme. These small woodlands are each of up to local/parish value.

Parkland

8.3.17 Swynnerton Park is a 93ha area of parkland located to the south and east of Swynnerton, to the south-west of Lodge Covert. Scattered trees within areas of improved pasture grassland include pedunculate oak, ash, lime, sycamore and horse chestnut. Many of the trees are mature specimens with at least one veteran oak. This parkland is located to the south-west of and directly adjacent to the land required for the Proposed Scheme. Parkland is a habitat of principal importance and this area of parkland is of district/borough value.

Grassland

- 8.3.18 There is approximately 7.3ha of grassland located adjacent to the M6 and partially covered by Highlow Meadows LWS. The designation for the LWS states the presence of an area of species-rich purple moor grass and rush pasture, a habitat of principal importance. However, whilst the area surveyed has a marshy characteristic and high proportion of rushes of *Juncus* spp., particularly within the southern portion, the species identified during NVC survey are more characteristic of NVC MG4 *Alopecurus pratensis-Sanguisorba officinalis* grassland. This grassland is representative of lowland meadow habitat of principal importance. This area of lowland meadow is located within the land required for the Proposed Scheme and is of county value.
- 8.3.19 There is approximately 5.6ha of neutral semi-improved grassland located to the east of Pool House Wood LWS within the floodplain of Filly Brook, with areas of scattered willow scrub and tall ruderals. The dominant grass is Yorkshire-fog reflecting the wet nature of the grassland. In the absence of detailed surveys, it is assumed on a precautionary basis to meet the criteria of lowland meadows, a habitat of principal importance. This grassland is adjacent to the land required for the Proposed Scheme and is of up to district/borough value.
- 8.3.20 There is approximately 7.2ha of species-rich semi-improved neutral grassland directly adjacent to the M6 and north-east of Yarnfield. In the absence of detailed surveys, it is assumed on a precautionary basis to meet the criteria of lowland meadows, a habitat of principal importance. This grassland is located partially within the land required for the Proposed Scheme and is of up to district/borough value.
- 8.3.21 Two areas of marshy grassland, covering an area of approximately 3.5ha, have been identified alongside an unnamed stream to the north of Yarnfield. In the absence of detailed surveys, it is assumed on a precautionary basis to meet the criteria of floodplain grazing marsh, a habitat of principal importance. The larger of these two areas of marshy grassland is located directly adjacent to the land required for the Proposed Scheme, the smaller area is approximately 80m from the land required for the Proposed Scheme. This grassland is of up to district/borough value.

Hedgerows

- 8.3.22 There is approximately 45.7km of hedgerow within the land required for the Proposed Scheme in the Stone and Swynnerton area. Hedgerow with at least 80% cover of native woody species is a habitat of principal importance. Hedgerows within the land required for the Proposed Scheme comprise approximately:
- 20km of native species-poor; and
 - 25.7km of native species-rich; of which, 3.4km are also classified as 'Important' according to the 'Wildlife and Landscape' criteria described in The Hedgerows Regulations 1997⁸².
- 8.3.23 Of the 45.7km of hedgerow, a total of 14.4km have not been subject to survey. To accord with Phase 1 habitat descriptions un-surveyed hedgerows are mapped as native species-rich on Map Series EC-02 (see BID Ecology Map Book), and they are

⁸² The Hedgerows Regulations 1997, (No. 1160). Her Majesty's Stationery Office, London.

included as native species-rich in the list above. This is highly precautionary, and based on ratios from the surveyed hedgerows in this area, it is likely that part of the un-surveyed hedgerow network will be species-poor.

- 8.3.24 As part of the precautionary assessment, it is assumed that further important hedgerows will be found within land that was not surveyed, but which will be required for the Proposed Scheme. The hedgerows within the area also function as wildlife corridors. The hedgerow network as a whole is of district/borough value.

Watercourses

- 8.3.25 Filly Brook, a tributary of the River Trent, and several smaller watercourses including further tributaries of the River Trent and Meece Brook as well as drainage ditches will be crossed by the route of the Proposed Scheme. Filly Brook may qualify as a habitat of principal importance and a local BAP habitat. This watercourse and associated habitats are intrinsically important and provide corridors for wildlife dispersal, and they are of up to county value. The smaller watercourses are of up to district/borough value.

Water bodies

- 8.3.26 There are 78 ponds located within, or partially within, the land required for the Proposed Scheme, and a further 109 ponds within 250m of the land required for the Proposed Scheme. On a precautionary basis it is assumed that all ponds are habitats of principal importance or local BAP habitats and are of district/borough value unless surveys have shown that they are of local/parish value only.

Ancient and veteran trees

- 8.3.27 Ancient and veteran⁸³ trees with potential relevance to the assessment in the Stone and Swynnerton area have been considered.
- 8.3.28 In addition to the veteran trees within parkland habitat near Lodge Covert, on the basis of the surveys undertaken there are a further four trees within the land required for the Proposed Scheme that are considered to be of sufficient age and/or support features to indicate they are of veteran status. Each of the trees is considered to be of up to district/borough value. These are:
- a pedunculate oak to the west of the large pool, south of Sandyford Farm;
 - a pedunculate oak next to Common Lane (Swynnerton), north of Hatton;
 - an ash tree at the edge of an unnamed track, south of Walton Heath; and
 - an ash tree off Common Lane (Swynnerton), west of Clifford's Wood.

Protected and notable species

- 8.3.29 A summary of the likely value of protected and/or notable species of relevance to the assessment is provided in Table 14.

⁸³ An ancient tree is one that has passed maturity and is old, or aged, in comparison with other trees of the same species. Veteran trees are younger than ancient trees, but have features found on ancient trees such as decay in the trunk, branches and/or roots. Ancient and veteran trees are included on the Ancient Tree Inventory.

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Table 14: Protected and notable species within the Stone and Swynnerton area

Resource/feature	Value	Receptor	Baseline and rationale for valuation
Bats	Up to regional	Population of noctule bats associated with habitats at Micklow Wood	<p>Field surveys recorded noctule bats roosting within an ash tree in Micklow Wood, approximately 350m from the land required for the Proposed Scheme. The roost was identified at the end of July 2016 and detailed emergence field surveys were not able to be undertaken to confirm the numbers of bat using the roost, therefore, on a precautionary basis the roost have been considered a maternity roost.</p> <p>Noctule bats are a species of principal importance⁸⁴, conservation priority of the local BAP and are considered to be 'rarer' bats in England⁸⁵. Maternity roosts of rarer bats have been considered of regional value.</p>
	County	Bat assemblage associated with habitats at Clifford's Wood	<p>Low levels of activity were recorded for common pipistrelle, soprano pipistrelle, Nathusius' pipistrelle, Myotis species, brown long-eared, noctule and Nyctalus/Eptesicus species bats, foraging and commuting in and around Clifford's Wood both within and outside of the land required for the Proposed Scheme.</p> <p>Evidence of roosting bats was also identified within two of Common Lane Cold War bunkers directly to the north of Clifford's Wood, approximately 25m from the land required for the Proposed Scheme. The species of bat was not able to be identified. It is considered likely that a number of bat roosts are present throughout Clifford's Wood, including the area within the land required for the Proposed Scheme.</p> <p>Due to the quality of the habitats present including, ancient woodland, edge habitats and ponds, Clifford's Wood is considered to represent an important resource for a range of bat species including common and soprano pipistrelle and brown long-eared as well as rarer bat species, notably noctule bats, Nathusius' pipistrelle, Myotis species, and Nyctalus/Eptesicus species.</p> <p>Soprano pipistrelle and brown long eared bats are both species of principal importance. Soprano pipistrelle and common pipistrelle are also conservation priorities of the local BAP. Nathusius' pipistrelle is considered to an uncommon, but widespread species.</p>
	County	Bat assemblage associated with habitats at Closepit Plantation and Stabhill Plantation	<p>Field surveys recorded evidence of roosting bats in five trees within Closepit Plantation, as well as hedgerow trees linked to this woodland and Stabhill Plantation. This includes a confirmed noctule bat roost with one bat present and four roosts supporting unidentified bat species. All but one of these roosts fall within the land required for the Proposed Scheme. The remaining roost is approximately 120m from the land required for the Proposed Scheme. In addition, two bat roosts supporting unidentified bat species were confirmed within two farm buildings to the east of Closepit Plantation, approximately 20m from the land required for the Proposed Scheme and another unidentified roost to the west of Stabhill Plantation,</p>

⁸⁴ Natural Environment and Rural Communities Act 2006. Available online at: <http://www.legislation.gov.uk/ukpga/2006/16/section/41>

⁸⁵ Wray, S. Wells, D. Long, E. & Mitchell-Jones, T. (2010), Valuing Bats in Ecological Impact Assessment, *In-Practice*, p23-25. Chartered Institute of Ecology and Environmental Management, Winchester.

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Resource/feature	Value	Receptor	Baseline and rationale for valuation
			approximately 20m from the land required for the Proposed Scheme.
	County	Bat assemblage associated with habitats present between Lodge Covert and Birchwood	<p>Field surveys recorded low levels of activity for common pipistrelle, soprano pipistrelle, Nathusius' pipistrelle, Myotis species, brown long-eared, noctule and Nyctalus/Eptesicus species bats. These species were recorded foraging along hedgerows and tree clusters between Lodge Covert and the smaller areas of woodland at Birchwood and Fox Covert both within and adjacent to the land required for the Proposed Scheme. The survey results suggest the hedgerow network between these wooded areas is an important foraging and commuting habitat for a range of species including rarer species such as Nyctalus species, Myotis species and Nathusius' pipistrelle.</p> <p>Eleven bats were recorded emerging from a roost within an oak tree at the edge of Birchwood, five of which were confirmed as common pipistrelle, the rest were unidentified. The roost falls within the land required for the Proposed Scheme. A roost of an unidentified species was found within a barn at Blakelow, to the south of Lodge Covert and directly adjacent to the land required for the Proposed Scheme.</p>
	County	Bat assemblage associated with habitats south of Swynnerton Old Park	<p>Populations of common pipistrelle, soprano pipistrelle, Myotis species, brown long-eared, noctule, serotine and Leisler's have been recorded foraging and commuting along woodland, hedgerow and arable field margin habitats between Swynnerton Old Park LWS and Hatton Common LWS both within and outside of the land required for the Proposed Scheme. Hatton Common LWS was the only location where Leisler's and serotine bats were recorded within the Stone and Swynnerton area.</p> <p>A brown long-eared bat roost was identified through the presence of droppings within a converted barn at Shelton under Harley to the south of Swynnerton Old Park LWS, within the land required for the Proposed Scheme. An unidentified bat was found roosting within a tree, approximately 300m from the land required for the Proposed Scheme, at Nursery Common, which forms part of the Swynnerton Old Park LWS. Given the large size of Swynnerton Old Park LWS and age of the ancient components of the woodland, there are likely to be a large number of tree roosts throughout the woodland. This will also be the case within the areas of Hatton Common LWS woodland.</p> <p>Serotine bats are considered uncommon and are largely restricted to the south of England⁸⁶. Leisler's are also considered to be an uncommon species.</p>
	County	Bat assemblage associated with habitats around Cash's Pit	Field surveys recorded low to moderate activity for common pipistrelle, soprano pipistrelle, Nathusius' pipistrelle, Myotis species, brown long-eared, noctule and Nyctalus/Eptesicus species bats, which were foraging and commuting along hedgerows, woodland and field margins within the land required for the Proposed Scheme between Cash's Pit and The Stretters woodland.

⁸⁶ Bat Conservation Trust (2014), *The State of the UK's bats: National Bat Monitoring Programme Population Trends 2014*. BCT, London.

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Resource/feature	Value	Receptor	Baseline and rationale for valuation
			Cash's Pit woodland, and the hedgerows and field margins directly adjacent, are within the land required for the Proposed Scheme and offer foraging and commuting opportunities for both common and rarer bat species.
	Up to county	Bat assemblage associated with habitat at Pool House Wood	<p>It is considered likely that bats are using the trees within the woodland as roosts. This potentially includes small numbers of rarer bat species.</p> <p>The landscape around Pool House Wood on the eastern side of the M6, comprises large arable fields that are divided by a network of well-established hedgerows, many of which support ponds and areas of semi-improved grassland, and offer foraging and commuting opportunities for bats.</p>
	Up to county	Bat assemblage associated with habitats near Pire Hill	<p>Field surveys recorded a roost containing a small number of droppings within an attic space of a building near Pire Hill, approximately 80m from the land required for the Proposed Scheme. The species of bat roosting was not able to be confirmed.</p> <p>The landscape in this area comprises large arable fields with gappy hedgerows or fence lines, scattered ponds and small isolated parcels of woodland, and offers limited value for foraging or commuting bats. The roost at Pire Hill sits within the centre of this urbanised landscape between the industrial estates at the edge of Stone and the M6 and is, therefore, unlikely to support large numbers of rarer species of bat.</p>
Amphibians	County	A meta-population (AMP _{3.1}) ⁸⁷ of great crested newt across a network of greater than 60 ponds between Yarnfield and Swynnerton	<p>A medium meta-population of great crested newt was recorded within five ponds during field surveys. These ponds sit within a wider network of more than 60 ponds located within and up to approximately 520m from the land required for the Proposed Scheme and are located close enough to allow for great crested newts to move between them. Within this network, significant barriers to dispersal, such as the M6, are overcome by the presence of large underpasses and culverts that may be used by great crested newt.</p> <p>Great crested newt is an Annex 2⁸⁸ species, a species of principal importance, and a conservation priority of the local BAP.</p>
	County	A meta-population (AMP _{3.2}) of great crested newt across 12 ponds around Clifford's Wood and Upper Hatton	<p>A medium meta-population of great crested newt recorded within three ponds during field surveys. These ponds sit within a larger network of 12 ponds, which are located within and up to approximately 850m from the land required for the Proposed Scheme. The pond network available to the meta-population spans ponds both within and either side of land required for the Proposed Scheme.</p>
	Up to county	A meta-population (AMP _{3.3}) of great crested newt across a network of four ponds south-west of the A519 Newcastle Road	<p>A small meta-population of great crested newt was recorded within one pond during field surveys. This pond sits within a network of four ponds, which are located within and up to approximately 500m from the land required for the Proposed Scheme. The pond network and assumed meta-population of great</p>

⁸⁷ A metapopulation is a group of spatially separated populations which interact. Each Amphibian Metapopulation (AMP) has been given an identifying number. Metapopulations are described in BID-EC-007-000, Ecological baseline data - amphibian and pond surveys.

⁸⁸ Annex 2 of the EU's Habitats Directive (1992) lists priority species whose conservation requires the designation of Special Areas of Conservation.

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Resource/feature	Value	Receptor	Baseline and rationale for valuation
		and west of the A51 Stone Road	crested newt they support spans ponds and terrestrial habitats to the south of the land required for the Proposed Scheme.
	Up to county	Populations of great crested newt within un-surveyed ponds within the Stone and Swynnerton area	Ponds that have not been surveyed are assumed to support breeding populations of great crested newt of medium size class.
	Local/parish	Populations of amphibian species including palmate newt, smooth newt, common toad and common frog within the Stone and Swynnerton area	These common amphibian species have been identified within ponds throughout the Stone and Swynnerton area during field surveys and are assumed to be present within the ponds that have not yet been surveyed. Woodland, rough grassland and hedgerow habitats are likely to be used by these species during their terrestrial phase for foraging, dispersal and shelter. Each of these species is common and widespread throughout the UK. Common toad is a species of principal importance.
Birds	Up to county	Barn owl population at Blakelow	A barn owl was recorded approximately 100m from the land required for the Proposed Scheme on the northern side of the M6 near Blakelow during field surveys. Suitable barn owl nest sites are present within trees and buildings within the Blakelow area. Suitable rough grassland foraging areas are located on either side of the M6 in this location, most notably at Highlow Meadows LWS to the south of Blakelow. Barn owl is a conservation priority of the local BAP.
	County	Barn owl population at Clifford's Wood and Common Lane (Swynnerton)	Desk study records indicate the presence of breeding barn owl within the land required for the Proposed Scheme between Clifford's Wood and Common Lane (Swynnerton). A nest box located off Common Lane (Swynnerton) near Upper Hatton, approximately 50m south of the land required for the Proposed Scheme, is regularly used by breeding barn owls. In addition, this area supports a series of buildings and mature trees that would provide suitable nesting opportunities for this species, as well as good quality foraging habitats within the less intensively grazed grassland and field margins.
	Up to county	Barn owl population at Yarnfield	Desk study records indicate the presence of barn owl west of the land required for the Proposed Scheme, south of Yarnfield, at a non-specified location off Yarnfield Lane and along the B5026 Eccleshall Road, however, breeding status was not confirmed. This area supports agricultural land with large arable fields with rough grassland margins, well established hedgerows, pockets of woodland, mature trees and agricultural buildings, which offer potential foraging and nesting opportunities for barn owl.
	Up to county	Barn owl population at Pire Hill	Desk study records indicate the presence of barn owl associated with land to the south of Pire Hill, potentially within land required for the Proposed Scheme, however, a detailed location was not available and breeding status was not confirmed. This area comprises agricultural land with large arable and pasture fields, a network of hedgerows and mature trees and agricultural buildings. These habitats provide foraging and potential nesting opportunities for barn owl.

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Resource/feature	Value	Receptor	Baseline and rationale for valuation
	District/borough	Population of ravens at Highlow Meadows	Two ravens were recorded at Highlow Meadows LWS within the land required for the Proposed Scheme during wintering field surveys.
	Local/parish	Kingfisher associated with a tributary of the Meece Brook	A kingfisher was observed flying along a tributary of Meece Brook to the north-east of Yarnfield, approximately 50m from land required for the Proposed Scheme. Suitable foraging and nesting habitats for kingfisher are present at locations on Meece Brook and its tributaries. Kingfisher are an Amber List species.
	Local/parish	Wintering bird assemblage at Highlow Meadows	A total of 40 species were recorded at Highlow Meadows LWS within the land required for the Proposed Scheme which includes 10 Red List species ⁸⁹ . These species are typical of this habitat and were present in low numbers. The recorded wintering bird assemblage included 10 species of principal importance and/or conservation priorities of the Local BAP.
	Local/parish	Wintering bird assemblage at Hatton Common	A total of 31 species were recorded at Hatton Common LWS adjacent to the land required for the Proposed Scheme which includes six Red List species. These species are typical of this habitat and were present in low numbers. The recorded wintering bird assemblage included four species of principal importance and/or conservation priorities of the Local BAP.
	Local/parish	Breeding bird assemblage at Highlow Meadows	A total of 34 species were recorded at Highlow Meadows LWS within the land required for the Proposed Scheme which includes five Red List species. These species are typical of this habitat and were present in low numbers. The recorded breeding bird assemblage included seven species of principal importance and/or conservation priorities of the Local BAP.
	Local/parish	Breeding bird assemblage at Swynnerton Heath	A total of 34 species were recorded at Swynnerton Heath within the land required for the Proposed Scheme, which includes five Red List species. These species are typical of this habitat and were present in low numbers. The recorded breeding bird assemblage included six species of principal importance and/or conservation priorities of the local BAP.
Otter	District/borough	A population of otter using the River Trent, Filly Brook and its tributaries	The desk study reported numerous records of otter using the River Trent and Filly Brook, which flows into the River Trent. This includes a record between Filly Brook and ponds located to the east of the M6. Filly Brook, its tributaries and nearby ponds, that are within or directly adjacent to the land required for the Proposed Scheme, provide suitable foraging, breeding and dispersal opportunities for otter.

⁸⁹ Bird of Conservation Concern 4: the Red List for Birds. British Trust for Ornithology (BTO). Available online at <https://www.bto.org/science/monitoring/psob>

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Resource/feature	Value	Receptor	Baseline and rationale for valuation
			Otter is an Annex 2 species, and is also a species of principal importance and a conservation priority of the local BAP.
	District/borough	A population of otter using Meece Brook and its tributaries	Desk study records have confirmed the presence of otter in numerous locations on Meece Brook, downstream of the land required for the Proposed Scheme. Desk study records confirm the presence of signal crayfish on Meece Brook, which offers a valuable foraging resource for otter. The Meece Brook provides suitable foraging, dispersal, and potentially breeding opportunities for otter.
Terrestrial invertebrates	District/borough	White-letter hairstreak butterfly near to Pool House Wood and Micklow	<p>Desk study records of the white-letter hairstreak were identified from two locations within the land required for the Proposed Scheme, off the B5026 Eccleshall Road, near Micklow and to the west of Pool House Wood, off Yarnfield Lane.</p> <p>This species relies on elm as its food plant, therefore, it is closely associated with hedgerow and woodland habitats that support elm. Such suitable habitats are present throughout the land required for the Proposed Scheme in the Stone and Swynnerton area.</p> <p>White-letter hairstreak butterfly is a species of principal importance.</p>
	Up to local/parish	Terrestrial invertebrate assemblage at Clifford's Wood	Given the presence of high quality habitats including large mature trees and associated dead wood at Clifford's Wood LWS, the possibility of notable or protected species being present cannot be excluded.
	Up to local/parish	Terrestrial invertebrate assemblage at Highlow Meadows LWS	Highlow Meadows LWS supports a range of suitable habitats including scrub fringe, a rich flower resource, and wetland elements, which are considered to be of value to the local invertebrate assemblage.
	Local/parish	Terrestrial invertebrate assemblage at Hatton Common LWS	Forty-five terrestrial invertebrate species were recorded during field surveys of the woodland at Hatton Common LWS adjacent to the land required for the Proposed Scheme, of which one fly species (<i>Clusiodes gentilis</i>) of local importance was identified. Given the presence of suitable habitat, the possibility of notable or protected species being present cannot be excluded.
Badger	Local/parish	At least six social groups in undisclosed locations in the Stone and Swynnerton area	A common and widespread species recorded during field surveys in the Stone and Swynnerton area. Six main setts have been identified within or adjacent to the land required for the Proposed Scheme.
Polecat	Local/parish	Potential populations using suitable habitats present in the Stone and Swynnerton area	<p>There is a single desk study record of polecat along the east of the M6 within the land required for the Proposed Scheme. Polecat is relatively widely distributed in Staffordshire.</p> <p>Suitable habitat is present within the network of farmland with hedgerows and small woodlands throughout the Stone and Swynnerton area.</p> <p>Polecat is a species of principal importance.</p>
Harvest mouse	Up to local/parish	Potential populations using suitable habitats present in the Stone and Swynnerton area	Although no confirmed evidence of this species has been found during field surveys, it is possible that populations of harvest mouse are present in hedgerows, arable land, areas of taller grassland and woodland edge habitats throughout this area.

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Resource/feature	Value	Receptor	Baseline and rationale for valuation
			Harvest mouse is a species of principal importance.
European hedgehog	Local/parish	Potential populations using suitable habitats present in the Stone and Swynnerton area	<p>There is a single desk study record of hedgehog at Stableford within the land required for the Proposed Scheme.</p> <p>This species is widely distributed throughout the UK and is likely to be present in suitable habitats throughout this area including woodland, hedgerows, grassland, scrub and gardens.</p> <p>European hedgehog is a species of principal importance.</p>
Brown hare	Local/parish	Potential populations using suitable habitats present in the Stone and Swynnerton area	<p>There are two desk study records of brown hare within 250m of the land required for the Proposed Scheme, at Hanchurch to the south of Swynnerton Old Park and at Hatton Common.</p> <p>Brown hare is a species of principal importance and a conservation priority of the local BAP.</p>
Reptiles	Up to local/parish	Potential small populations of common reptiles in the Stone and Swynnerton area	<p>No reptiles were found during field surveys. Suitable habitat that was not surveyed was generally constrained to field margins, edges of woodland and scrub habitat or isolated small patches of overgrown grassland. These habitats are within a generally intensively farmed landscape, offering limited opportunities for reptiles. It is, therefore, likely that any reptiles located within the land required for the Proposed Scheme are present in low numbers.</p> <p>Grass snake, slow-worm and common lizard are all species of principal importance. Grass snake is also a conservation priority of the local BAP.</p>
Plants	Local parish	Notable plant species throughout Stone and Swynnerton area	<p>Field surveys have identified two species, wood-sorrel and ragged robin, listed as near threatened on the Staffordshire Rare Plant Register, and one species, corn spurrey, listed as vulnerable. All are within the land required for the Proposed Scheme.</p> <p>Desk study records identified the following notable species within or directly adjacent to the land required for the Proposed Scheme: bluebell, which were recorded in woodlands, are widely distributed, and listed as very common on the Staffordshire Flora Checklist 2017⁹⁰; and loose silky-bent, which were recorded to the south of Clifford's Wood, is listed as a near threatened species on the Staffordshire Rare Plant Register.</p>
Water vole	Negligible	Potential populations using watercourse in the Stone and Swynnerton area	<p>Although no direct evidence of water voles has been found during field surveys, there are desk study records of this species occurring in a location on the River Trent north of Aston-by-Stone, approximately 2km from the section of Filly Brook that is within the land required for the Proposed Scheme. However, habitats along the brook appear to be of poor suitability for this species, therefore, this species is considered unlikely to be present within the land required for the Proposed Scheme.</p>

⁹⁰ A Checklist of the Flora of Staffordshire Revised 2017. Available at: <http://bsbi.org/staffordshire>

Resource/feature	Value	Receptor	Baseline and rationale for valuation
Hazel dormouse	Negligible	Potential populations using suitable woody habitats in the Stone and Swynnerton area	No evidence has been found for the presence of hazel dormouse during field surveys of the larger areas of woodland within the Stone and Swynnerton area such as Clifford's Wood, Hatton Common and Lodge Covert. No records of dormouse within this area were obtained during the desk study records search, however, there is a record for within a woodland in proximity to the Whitmore Heath to Madeley area (CA4), to the north. However, given the poor connectivity to woodlands within the area to the north it is unlikely that any populations are present within the land required for the Proposed Scheme.
White-clawed crayfish	Negligible	Potential populations using watercourse in the Stone and Swynnerton area	There is an historic desk study record of white-clawed crayfish on Meece Brook approximately 13km downstream of the section that crosses the land required for the Proposed Scheme. Due to the declining status of the white-clawed crayfish within Staffordshire, and increasing prevalence of signal crayfish, it is considered that native white-clawed crayfish are absent from the area.

Future baseline

Construction (2020)

- 8.3.30 Volume 5: Appendix CT-004-000 provides details of the developments in the Stone and Swynnerton area that are assumed to have been implemented by 2020.
- 8.3.31 The committed developments that materially affect the baseline conditions for ecology in this area and form part of the future baseline assessment of the effects during construction are listed in Table 15.

Table 15 Committed developments relevant to ecology and biodiversity

Map book reference ⁹¹	Planning reference	Description
CA3/17	13/19002/OUT	Residential development including new access, open space, landscaping and associated infrastructure.

- 8.3.32 The boundary of this committed development includes Filly Brook LWS, and sections of semi-improved neutral grassland and marshy grassland along the Filly Brook that fall within the land required for the Proposed Scheme. The development proposals retain and enhance these habitats, therefore, while the assessment of the value of Filly Brook LWS is unlikely to change, on a precautionary basis it is assumed that its associated grassland habitats could increase in value by the time of construction to up to county value.

Operation (2027)

- 8.3.33 Volume 5: Appendix CT-004-000 provides details of the developments in the Stone and Swynnerton area that are assumed to have been implemented by 2027.

⁹¹ Volume 5 Map Book: Maps CT-13-109b to CT-13-113a-L1.

8.3.34 No committed developments have been identified in this area that will materially alter the baseline conditions in 2027 for ecological receptors.

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-o6 along the route of the Proposed Scheme, which will be largely a mixture of woodland/scrub and grassland), and will contribute towards limiting effects on habitat and species:

- provision of Filly Brook viaduct over Filly Brook will avoid direct effects on this watercourse and allow free passage for wildlife beneath it. The realigned section of the Filly Brook, as it passes through the Stone railhead/Stone Infrastructure Maintenance Base-Rail (IMB-R) has been designed to allow it to be a naturalised open channel, rather than culverted. This will reduce the extent of habitat loss and thereby reduce the fragmentation and barrier effects, allowing free passage of wildlife along the Filly Brook corridor; and
- refinement of the location of a balancing pond to avoid the loss of woodland at Clifford's Wood.

8.4.2 The assessment assumes implementation of the measures set out within the draft Code of Construction Practice⁹² (CoCP), which includes sensitive construction practices and the preparation of habitat management plans.

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

- manage impacts from construction, including the timing of works, on designated sites, protected and notable species and other features of ecological importance such as ancient woodlands and watercourses;
- reduce habitat loss by keeping the working area to the reasonable minimum;
- reinstatement of areas of temporary habitat loss;
- restoration and replacement planting;
- implementing management measures for potential ecological impacts to control dust, water quality and flow, noise and vibration, and lighting;
- provision of a watching brief, where relevant;
- relocation or translocation of species, soil and/or plant material, as appropriate;
- consultation with Natural England, the Environment Agency, local wildlife trusts and relevant planning authorities prior to and during construction; and

⁹² Volume 5: Appendix CT-003-000, Code of Construction Practice.

- compliance with all wildlife licensing requirements, including those for protected and invasive species and designated sites.

Assessment of impacts and effects

- 8.4.4 Effects arising during construction that are significant at the district/borough level or above are described below. Effects on ecological features of significance at the local/parish level are listed in Volume 5: Appendix: EC-016-003.

Designated sites

- 8.4.5 The King's and Hargreaves SSSI will not be directly affected by the construction of the Proposed Scheme. The SSSI is designated for its mature woodland and associated dead wood invertebrate assemblage. The closest point of the land required for the Proposed Scheme is approximately 1.7km away, on the far side of Swynnerton Old Park and the M6. Given this distance, no indirect effects of the Proposed Scheme on the designating features of this SSSI are anticipated.
- 8.4.6 Construction of the Swynnerton North cutting and Hatton embankment will result in the permanent loss of approximately 1.3ha (8%) of ancient woodland within Clifford's Wood LWS. The ancient woodland and LWS components of Clifford's Wood cover the same area. As an irreplaceable and highly valued resource, the extent of ancient woodland is important to the integrity of the site. The loss of this habitat will fragment the woodland and result in a permanent adverse effect on the structure and function of the site that is significant at county level.
- 8.4.7 The construction of the Stone railhead and associated infrastructure will result in the permanent loss of approximately 3.3ha (100%) of NVC W6d *Alnus glutinosa-Urtica dioica* woodland *Sambucus nigra* sub-community at Pool House Wood LWS. The woodland is the reason for the LWS designation and its loss will result in a permanent adverse effect on the structure and function of the site that is significant at county level.
- 8.4.8 Highlow Meadows LWS falls within the land required for the Proposed Scheme, however, this is largely due to the land required for grassland and wetland habitat creation, the majority of the habitats in this area will not be lost. Construction of the Meaford North embankment for the M6 Meaford viaduct will result in the permanent loss of approximately 1.2ha (20%) of NVC MG4 *Alopecurus pratensis-Sanguisorba officinalis* grassland at the northern end of Highlow Meadows LWS. The grassland is part of the reason for the LWS designation. This loss will result in a permanent adverse effect on the structure and function of the site that is significant at county level.
- 8.4.9 Construction of the Norton Bridge to Stone sidings and the associated landscape bund, will result in the permanent loss of approximately 1.4ha (70%) of semi-improved grassland along the northern half of Filly Brook (west of Stone) LWS. The grassland forms part of the reason for the LWS designation. This loss will result in a permanent adverse effect on the structure and function of the site that is significant at county level.
- 8.4.10 Construction of Swynnerton North cutting, the A51 Stone Road diversion and Tittensor Road diversion will be adjacent to Closepit Plantation LWS on three sides,

and approximately 0.1ha (3%) of the LWS falls within the land required for the Proposed Scheme to allow construction of a drainage ditch along Swynnerton North cutting. The Proposed Scheme will isolate the woodland and limit dispersal routes for the flora and fauna that form the broadleaved woodland community for which the site is designated, potentially leading to the long term degradation of the site. The fragmentation effect of the Proposed Scheme on the LWS will result in a permanent adverse effect that is significant at district/borough level.

- 8.4.11 Works required to a drainage channel associated with an existing culvert under the M6 will result in the permanent loss of approximately 0.1ha (4%) of woodland at Lodge Covert LWS. Given the small area of woodland lost the effect on the designating feature of the LWS is considered lower than the county level at which the site is valued. It is considered that the maintenance works associated with the drainage channel will result in a permanent adverse effect on the structure and function of the site that is significant at district/borough level.
- 8.4.12 Hatton South cutting will cross between the large area of ancient woodland forming Swynnerton Old Park LWS and the wooded area that forms Hatton Common LWS. While both LWS are directly adjacent to land required for construction of Hatton South cutting, this land is only required for woodland habitat creation in the case of Swynnerton Old Park, and for woodland habitat creation and temporary material stockpiles at Hatton Common. There will be no loss of woodland from Swynnerton Old Park or Hatton Common. These two sites are currently connected via a hedgerow network and the fragmentation of this network and ecological corridors between the LWSs will affect the biodiversity value of the sites, particularly the smaller Hatton Common. Although the potential fragmentation effect on Swynnerton Old Park is not considered to be significant, due to its smaller size and its likely dependence on this connectivity, the permanent adverse effect of fragmentation on Hatton Common LWS is significant at county level.
- 8.4.13 Construction of the Meaford North embankment leading to the M6 Meaford viaduct will result in the permanent loss of approximately 0.6ha (100%) of ancient woodland at Birchwood, which is to be added to the AWI. The loss of ancient woodland will result in a permanent adverse effect on this habitat that is significant at up to county level.

Habitats

Grassland

- 8.4.14 Construction of the M6 Meaford viaduct and Meaford North embankment will result in the permanent loss of approximately 1.2ha of MG4 *Alopecurus pratensis-Sanguisorba officinalis* lowland meadow with a marshy grassland character within Highlow Meadows LWS. The loss of this habitat of principal importance will result in a permanent adverse effect that is significant at county level.
- 8.4.15 Construction of drainage channels associated with a balancing pond for the Stone railhead/Stone IMB-R will result in the permanent loss of approximately 1ha of lowland meadow within the floodplain of Filly Brook, to the east of Pool House Wood LWS. The loss of this grassland will result in a permanent adverse effect that is significant at up to district/borough level.

- 8.4.16 Construction of a flood attenuation bund, along the M6, and construction of earthworks, west of the M6 for the Yarnfield Lane realignment, will result in the permanent loss of approximately 3.8ha of lowland meadow habitat. The loss of this grassland will result in a permanent adverse effect that is significant at up to district/borough level.

Woodland

- 8.4.17 As well as the effects on ancient woodlands described in the designated sites section, there are a number of other woodlands that are affected by the construction of the Proposed Scheme.
- 8.4.18 Construction of the Stone railhead and associated infrastructure will result in the permanent loss of approximately 3.3ha of NVC W6d *Alnus glutinosa-Urtica dioica* woodland *Sambucus nigra* sub-community wet woodland, a habitat of principal importance, at Pool House Wood LWS. The loss of woodland will result in a permanent adverse effect that is significant at county level.
- 8.4.19 Construction of Swynnerton embankment and a drainage ditch north of the M6 will result in the permanent loss of approximately 1.9ha of NVC W10 *Quercus robur-Pteridium aquilinum-Rubus fruticosus* woodland *Hedera helix* sub-community broadleaved woodland at Lodge Covert (0.1ha of this loss is habitat within the LWS). The wider woodland has supporting value to the LWS and the overall woodland loss at Lodge Covert will result in a permanent adverse effect that is significant at county level.
- 8.4.20 Construction of the Swynnerton North cutting and Hatton embankment will result in the permanent loss of approximately 1.1ha of NVC W10a *Quercus robur-Pteridium aquilinum-Rubus fruticosus* woodland and approximately 2.5ha of mixed plantation woodland. This woodland is in addition to the area of Clifford's Wood that is ancient woodland and designated as a LWS. The loss of lowland deciduous woodland habitat of principal importance, and the buffering effect of the semi-natural and plantation wooded areas of Clifford's Wood on the areas that are ancient woodland/LWS, will result in a permanent adverse effect that is significant at county level.

Hedgerows

- 8.4.21 On a precautionary basis, it is assumed that all hedgerows (approximately 45.7km) within the land required to construct the Proposed Scheme in the Stone and Swynnerton area will be permanently lost and the remaining hedgerow network fragmented. This total, however, includes some hedgerows that are likely to be retained, such as those located within land required for overhead line diversions/realignments and those located within land required for the creation of woodland and grassland habitat. The combined loss and severance of hedgerows within the land required for the Proposed Scheme will have a permanent adverse effect that is significant at district/borough level.

Watercourses

- 8.4.22 The route of the Proposed Scheme will cross Filly Brook via the Filly Brook viaduct, which will allow partial retention of the brook. This watercourse will, however, be permanently realigned for approximately 1.3km via the M6 culvert, through the Stone

railhead/Stone IMB-R site. A further 40m section of Filly Brook and an approximately 660m stretch of a connected minor watercourse will be permanently realigned to allow construction of the Norton Bridge to Stone sidings. This section of the Filly Brook and connected minor watercourse will be temporarily culverted to allow construction of the Norton Bridge to Stone sidings. The realignment of Filly Brook and its tributary will result in the loss of the stream corridor that represents a permanent adverse effect of up to county level.

- 8.4.23 A series of smaller watercourses will also be permanently diverted, realigned or culverted for the Proposed Scheme, severing the habitat corridors that follow these watercourses. This habitat loss and fragmentation will result in a permanent adverse effect that is significant at up to district/borough level.

Water bodies

- 8.4.24 On a precautionary basis, it is assumed that all 78 ponds located within the land required for the Proposed Scheme in the Stone and Swynnerton area will be permanently lost. This total, however, includes some ponds that are likely to be retained, such as those located within land required for overhead line diversions/realignments and those located within land required for the creation of woodland and grassland habitat. Where survey has not been possible, a precautionary approach to the assessment has been applied. The loss of ponds within the land required for the Proposed Scheme could lead to a permanent adverse effect on the conservation status of water bodies that will be significant, in each case, at up to district/borough level.

Ancient and veteran trees

- 8.4.25 It is assumed that four veteran trees recorded within the land required for the Proposed Scheme in the Stone and Swynnerton area will be permanently lost. Ancient and veteran trees are an irreplaceable resource and their potential loss will result in a permanent adverse effect that is significant at district/borough level in each case. Where reasonably practicable, measures will be taken to protect and retain ancient and veteran trees within and adjacent to the proposed works area to reduce the number that will be impacted. On a precautionary basis, ancient or veteran trees are assumed to be lost as a result of:

- works associated with the Swynnerton embankment, which will result in the loss of a veteran oak to the west of the large pool to the south of Sandyford Farm;
- drainage works along Common Lane (Swynnerton), which will result in the loss of a veteran oak next to Common Lane (Swynnerton) and to the north of Hatton, and the loss of a veteran ash off Common Lane (Swynnerton) to the west of Clifford's Wood; and
- works associated with the realignment of the Stone Rural Footpath 32, which will result in the loss of a veteran ash at the edge of an unnamed track to the south of Walton Heath.

Species

Bats

- 8.4.26 The removal or disturbance of habitat features that are utilised by bats during breeding, hibernation or migrating between roosts is considered to have the potential to result in adverse effects on the bat populations or assemblages during construction. However, the point at which such impacts are considered likely to result in adverse significant effects on the conservation status of the population concerned will differ depending on the status of the species concerned.
- 8.4.27 The impact of disturbance on bat populations will generally be localised and limited to the period of construction. Bats utilising retained habitats may be subject to irregular and localised disturbance from lighting, noise and movement during the construction period where works in autumn, winter and spring may be carried out for short periods after dusk or prior to dawn. These impacts would only temporarily deter bats from using foraging and commuting habitats and the implementation measures that are described in the draft CoCP will reduce potential disturbance affects to a level that is not significant.
- 8.4.28 Construction of Swynnerton North cutting and Hatton embankment will result in the loss of woodland, grassland, and the hedgerow network at Clifford's Wood. In addition the construction of Hatton embankment will result in the loss of buildings. These losses will lead to a reduction in suitable foraging habitat, the degradation of dispersal corridors, most notably those offered by Clifford's Wood itself, and the loss of roosting opportunities for the assemblage of bat species associated with Clifford's Wood and adjacent habitats. The direct loss of roosting opportunities and the loss and fragmentation of foraging and commuting habitat will result in a permanent adverse effect on the bat assemblage at Clifford's Wood, which will be significant at the county level.
- 8.4.29 Construction of Swynnerton North cutting, Swynnerton embankment, Tittensor Road overbridge and the diversion of the A51 Stone Road will result in the loss of woodland, ponds, hedgerows and grassland. This will affect the bat assemblage near Stabhill Plantation and Closepit Plantation. Noctule and multiple unidentified bat species roost within trees and buildings in this location and are considered to utilise the habitats for foraging, commuting and roosting. The direct loss of these roots and the loss and fragmentation of foraging and commuting habitat will result in a permanent adverse effect on the bat assemblage associated with Closepit and Stabhill plantations, which will be significant at up to county level.
- 8.4.30 Construction of Swynnerton embankment, Swynnerton South cutting, Meaford North embankment and the M6 Meaford viaduct will result in the loss of woodland, grassland, hedgerow and pond habitats between Lodge Covert and Birchwood that offer good quality foraging habitats for the bat assemblage present in this area. The network of hedgerows linking wooded areas offers dispersal corridors through the landscape that will be severed by the Proposed Scheme. In addition the loss of woodland and scattered trees and the proximity of the Proposed Scheme to buildings is likely to reduce the roosting opportunities for bats within this location. The direct loss of roosting opportunities and the loss and fragmentation of foraging and

commuting habitat will result in a permanent adverse effect on the bat assemblage in the Lodge Covert to Birchwood area, which will be significant at the county level.

- 8.4.31 Construction of Hatton South cutting, Hatton North cutting and the realignment of Dog Lane will result in the loss of grassland and fragmentation of the hedgerow network to the south of Swynnerton Old Park that links roosting sites associated with Swynnerton Old Park and Shelton under Harley to areas of high quality bat foraging habitat to the south of the Proposed Scheme, such as the woodland at Hatton Common and Meece Brook. The loss and fragmentation of foraging and commuting habitat will result in a permanent adverse effect on the bat assemblage, which includes rarer bats such as serotine and Leisler's associated with habitats near Swynnerton Old Park and Hatton Common, which will be significant at the county level.
- 8.4.32 Construction of the Swynnerton North cutting will result in the loss of broadleaved woodland, ponds, hedgerows and grassland, which are used by the bat assemblage near Cash's Pit. While no bat roosts and few trees with bat roosting potential were identified, it is possible that bats are roosting within trees and buildings in this location. The loss and fragmentation of foraging and commuting habitat will result in a permanent adverse effect on the bat assemblage around Cash's Pit, which will be significant at the county level.
- 8.4.33 Construction of the Meaford South embankment, the Stone railhead and associated infrastructure will result in the loss of Pool House Wood, hedgerows, ponds and semi-improved grasslands that are considered likely to be used for foraging, commuting and roosting by the bat assemblage at Pool House Wood. The loss and fragmentation of foraging and commuting habitat will result in a permanent adverse effect upon the bat assemblage at Pool House Wood, which will be significant at up to county level.
- 8.4.34 Construction of Yarlet North cutting and Yarlet embankment will result in the loss of hedgerows, trees, ponds and arable land that are considered likely to be used by the bat assemblage near Pire Hill, including bats of an unidentified species using a farm house to the east of the Proposed Scheme. This roost is located within a landscape of large arable fields, the M6 and industrial margins of Stone, which offer limited foraging opportunities for bats, therefore, the hedgerows, trees and ponds at this location are likely to form an important foraging resource as well as dispersal corridors through the landscape. The loss and fragmentation of foraging and commuting habitat has the potential to impact the viability of the roost and represent a permanent adverse effect on the bat assemblage at Pire Hill, which will be significant at up to county level.
- 8.4.35 Loss of other suitable habitats within the land required for the Proposed Scheme may require some bats to travel further, and expend more energy during day to day foraging and movement throughout their home range for the duration of construction. However, such effects alone are for all species considered unlikely to result in sufficient disturbance of the populations or assemblages concerned to result in a permanent adverse effect on their conservation status.

Amphibians

- 8.4.36 A metapopulation of great crested newts (AMP 3.1) has been identified across a network of 60 ponds that span either side of the M6 to the north of Yarnfield

(connected by culverts passing under the M6). The construction of the Stone railhead and associated infrastructure, M6 Meaford viaduct and Swynnerton embankment, and the realignment of Yarnfield Lane will result in the loss of 11 ponds, two of which are confirmed as supporting great crested newt populations, and hedgerow, woodland and grassland that offer terrestrial habitat opportunities for great crested newt foraging, dispersal and shelter. This will result in a permanent adverse effect on the great crested newt meta-population between Yarnfield and Swynnerton, which will be significant at up to county level.

- 8.4.37 A metapopulation of great crested newt (AMP 3.2) has been identified across a network of 12 ponds on the land between Clifford's Wood and Upper Hatton. Construction of Swynnerton North cutting, Hatton embankment and Hatton South cutting will result in the loss of one pond, and woodland, grassland and hedgerow habitats that are likely to be used by great crested newt for foraging, dispersal and shelter. This will result in a permanent adverse effect on the great crested newt meta-population between Clifford's Wood and Upper Hatton, which will be significant at the county level.
- 8.4.38 A metapopulation of great crested newt (AMP 3.3) has been identified across a network of four ponds south-west of the A519 Newcastle Road and west of the A51 Stone Road. Construction of Swynnerton North cutting will result in the loss of woodland, grassland and hedgerow habitats that are likely to be used by great crested newts for foraging, dispersal and shelter. This has the potential to result in a permanent adverse effect on the great crested newt meta-population south-west of the A519 Newcastle Road and west of the A51 Stone Road, which will be significant at up to county level.
- 8.4.39 Of the 78 ponds within the land required for the Proposed Scheme within the Stone and Swynnerton area, 21 ponds have been assessed as unsuitable for great crested newts, 23 have been accessible for presence/absence survey, and of these, six have been confirmed as supporting great crested newts. In the absence of survey information, the remaining 34 ponds are assumed to support populations of great crested newts. This is highly precautionary and it is likely that a proportion of the un-surveyed ponds do not support great crested newt populations. The loss of any ponds supporting great crested newts would result in a permanent adverse effect on amphibian populations that will be, in each case, significant at up to county level.

Birds

- 8.4.40 Construction of the Meaford North embankment and Swynnerton South cutting will result in the loss of barn owl foraging habitat in the form of large areas of arable fields that are of value to the barn owl population identified at Blakelow. Given the large area of habitat to be lost and territorial nature of barn owl there is the potential for a permanent adverse effect, which will be significant at up to county level.
- 8.4.41 Construction of Swynnerton North cutting and Hatton embankment will result in the loss of barn owl foraging habitats in the form of arable fields, grassland and field margins, and the loss of potential roosting sites within the mature trees lost at Clifford's Wood. This loss represents a permanent adverse effect on the barn owl population identified between Clifford's Wood and Common Lane (Swynnerton), which will be significant at the county level.

- 8.4.42 The realignment of Yarnfield Lane will result in the loss of potential barn owl foraging habitats in the form of semi-improved grasslands and hedgerows and loss of potential nesting sites within mature trees and small woodland blocks. This loss represents a permanent adverse effect on the barn owl population identified using the agricultural land around Yarnfield, which will be significant at up to county level.
- 8.4.43 Construction of Yarlet Central cutting and Yarlet embankment will result in the loss of potential barn owl foraging habitats in the form of semi-improved grassland field margins, arable land and hedgerows, and loss of potential nesting sites within mature trees. This loss represents a permanent adverse effect on the barn owl population identified within the land to the south of Pire Hill, which will be significant at up to county level.

Terrestrial invertebrates

- 8.4.44 Construction of the Stone railhead and associated infrastructure, will result in the loss of Pool House Wood LWS, which includes elm, the larval food plant of white-letter hairstreak. This loss represents a permanent adverse effect on the white-letter hairstreak population near Pool House Wood and Micklow, which will be significant at the district/borough level.

Other mitigation measures

- 8.4.45 This section describes other mitigation measures designed to reduce or compensate for significant ecological effects. These include habitat creation and habitat enhancement.

Habitats

Woodland

- 8.4.46 The Proposed Scheme will result in the permanent loss of approximately 1.9ha of ancient woodland, which is irreplaceable, from Clifford's Wood and Birchwood, which in each case represents a residual adverse significant effect at the county level.
- 8.4.47 In addition, the Proposed Scheme will result in the combined loss of approximately 6.3ha of lowland mixed deciduous woodland at Clifford's Wood, Pool House Wood and Lodge Covert, each of which is significant at the county level. The further loss of approximately 2.5ha of mixed plantation woodland at Clifford's Wood is also significant at the county level.
- 8.4.48 There is a further loss and fragmentation from 15 small woodlands across the Stone and Swynnerton area, including loss of approximately 3.6ha of lowland mixed deciduous woodland and 3.8ha of other woodland habitat as reported within the register of local/parish effects (Volume 5: Appendix EC-016-003). The combined loss and fragmentation of these woodland habitats from these woodlands is significant at the district/borough level.
- 8.4.49 In accordance with the Ecological Principles of Mitigation in the SMR Addendum a route-wide, integrated strategic approach has been developed to compensate for loss of woodland. The planting in this area is required to fulfil the objective of no net loss as far as possible in the local area as well as to ensure that the populations of protected and notable species including bats are maintained. With these objectives in

mind, where reasonably practicable, the areas of woodland planting have been located so as to increase the size of existing higher quality woodland habitat and to increase connectivity.

- 8.4.50 The loss of ancient woodland will be partly compensated through a range of measures, including the planting of native broadleaved woodland as follows:
- approximately 3.3ha of woodland planting directly adjacent to retained ancient woodland, 2.5ha of woodland planting contiguous with retained blocks of planting west of Clifford's Wood and a further 7.8ha of woodland planting at the eastern extent of Clifford's Wood providing new habitat connectivity to The Stretters woodland to the east. This planting, once mature, will buffer The Stretters woodland from adjacent land uses and provide enhanced ecological connectivity between The Stretters and Clifford's Wood. The provision of tree and shrub planting on Swynnerton Estate North green overbridge (greened primarily to provide connectivity for bats on a precautionary basis) and on the approaches to Swynnerton Estate Central underbridge will provide ecological connectivity and reduce the fragmentation effect of the Proposed Scheme on Clifford's Wood LWS and ancient woodland. These measures will partly compensate for the loss of 1.3ha of ancient woodland and the fragmentation of the remaining woodland at Clifford's Wood; and
 - approximately 1.7ha of woodland planting within an area contiguous with the larger area of woodland at Lodge Covert, and 5.7ha of new woodland planting adjacent to the current extent of Birchwood extending onto the slopes of the Meaford North embankment. This is to partly compensate for the loss of 0.6ha of ancient woodland at Birchwood, and also provides compensation for the loss of some of the non-ancient woodlands in the vicinity.
- 8.4.51 Woodland planting to partly compensate for the loss of ancient woodlands will include further measures such as translocation of ancient woodland soil with its associated seed bank where appropriate. Other measures such as planting native trees and shrubs of local provenance and translocation of coppice stools and dead wood will be undertaken in accordance with the Ecological Principles of Mitigation within the SMR Addendum.
- 8.4.52 Within the Stone and Swynnerton area, approximately 22.9ha of further woodland habitat creation will be undertaken to compensate primarily for adverse effects upon non-ancient woodland, at locations including the following:
- approximately 1.1ha of woodland and an associated new hedgerow will be planted adjacent to the woodland at Pirehill (north of) LWS. The proposed woodland planting and associated hedgerows will buffer and provide enhanced ecological connectivity for the habitats within Pirehill (north of) LWS;
 - approximately 3.5 ha of woodland will be planted to be contiguous with new grassland and hedgerow planting, which in combination will improve habitat connectivity with a currently isolated block of woodland to the north of Pool House Wood. Additionally, approximately 2.6ha area of broadleaved

woodland will be created to east of the Stone railhead/Stone IMB-R, adjacent to the current extent of Pool House Wood;

- approximately 0.5ha of woodland will be created across two parcels on the stream corridor that forms the west boundary of Beatty Hall BAS. The planting will enhance connectivity along the stream corridor on which Beatty Hall BAS sits;
- approximately 5.9ha of woodland will be planted in proximity to the woodland lost at Stabhill Plantation and Cash's Pit (as described in register of local/parish level effects in Volume 5: Appendix EC-016-003) and at Lodge Covert, improving connectivity to retained woodland parcels. These new woodland blocks will include approximately 4.8ha either side of the Swynnerton North cutting contiguous with Cash's Pit, and approximately 1.1ha contiguous with The Shrubs woodland to the south of Lodge Covert. This planting, once mature, will buffer The Shrubs woodland from adjacent land uses and provide enhanced ecological connectivity between The Shrubs and Lodge Covert;
- approximately 0.8ha of woodland will be established at Closepit Plantation LWS, which will increase the woodland area at Closepit Plantation by approximately 50%. This woodland habitat creation will connect with approximately 0.5ha of grassland habitat creation, and in combination these semi-natural habitats will reduce the isolation effect of the Proposed Scheme on the woodland habitats at Closepit Plantation;
- approximately 5.8ha of woodland contiguous with Clifford's Wood and the retained blocks of woodland adjacent to Clifford's Wood, as described above, will compensate for the loss of non-ancient lowland mixed deciduous woodland and mixed plantation woodland; and
- Swynnerton Footpath 15 green overbridge (greened primarily to provide connectivity for bats on a precautionary basis) will be designed to be partially vegetated to facilitate ecological connectivity as a result of the fragmentation effect of the Proposed Scheme passing between Swynnerton Old Park LWS and Hatton Common LWS. Woodland planting of approximately 1.3ha will connect Swynnerton Old Park to the overbridge, on the eastern side of Hatton South cutting. Woodland planting of approximately 0.2ha will connect Hatton Common LWS to the overbridge, on the western side of Hatton South cutting.

8.4.53 The target habitat type for woodland planting is lowland mixed deciduous woodland habitat of principal importance. The new areas of woodland habitat will connect and help maintain the integrity of remaining areas of woodland. A temporary adverse effect is expected until these woodland areas have become established, after which there will be a permanent beneficial effect on lowland mixed deciduous woodland that is significant at district/borough level.

8.4.54 In addition, there will be further areas of landscape planting of native broadleaved woodland, which will also contribute to habitat creation.

Grassland

- 8.4.55 The Proposed Scheme will result in the combined loss of approximately 10.3ha of lowland meadow at Highlow Meadows, at Filly Brook LWS, within the floodplain of Filly Brook to the east of Pool House Wood LWS, west of the M6 at Yarnfield Lane, either side of Common Lane to the north-west of Clifford's Wood and at Dog Lane, each of which is significant at the county or district/borough level.
- 8.4.56 There will be a further loss of approximately 23.1ha of semi-improved grassland within the Stone and Swynnerton area as reported within the register of local/parish effects (Volume 5: Appendix EC-016-002). The combined loss of semi-improved grassland from these areas is significant at the district/borough level.
- 8.4.57 In accordance with the Ecological Principles of Mitigation in the SMR Addendum a route-wide, integrated strategic approach has been developed to compensate for loss of lowland meadow habitat. The species rich grassland creation in this area is required to fulfil the objective of no net loss as far as possible in the local area as well as to ensure that the populations of protected and notable species including great crested newts and barn owls are maintained. With these objectives in mind, where reasonably practicable, the areas of grassland creation have been located so as to increase the size of existing higher quality habitat and to increase connectivity.
- 8.4.58 Within the Stone and Swynnerton area, grassland habitat creation will be undertaken at locations including the following:
- approximately 1.8ha of species-rich grassland will be created along the retained and realigned sections of the Filly Brook within the western section of the Filly Brook floodplain adjacent to the route of the Proposed Scheme. This will compensate for the loss of approximately 1.4ha of lowland meadow at Filly Brook LWS;
 - approximately 4.4ha of native species-rich grassland will be created directly adjacent and to the south of the re-aligned Filly Brook within the Stone IMB-R site, to compensate for the loss of approximately 1ha of lowland meadow within the floodplain of Filly Brook, to the east of Pool House Wood LWS;
 - approximately 2.8ha of native species-rich marshy grassland will be created within the floodplain directly adjacent to the south of Highlow Meadows LWS, and an additional 5.5ha of grassland will be created adjacent to the M6 and Meaford North embankment. This will mitigate for the loss of 1.2ha of lowland meadow with marshy grassland character at Highlow Meadows LWS and 3.8ha of lowland meadow at Yarnfield Lane; and
 - approximately 8.8ha of native species-rich grassland will be created to the north-west of Clifford's Wood. This will compensate for a number of grassland losses in the Stone and Swynnerton area, including the loss of 0.2ha of lowland meadow at Dog Lane and 2.7ha of lowland meadow either side of Common Lane north west of Clifford's Wood.
- 8.4.59 The target habitat type for grassland habitat creation is lowland meadow habitat of principal importance. A temporary adverse effect upon grassland habitats within the Stone and Swynnerton area is expected until grassland creation areas have become

established, after which these measures will reduce the overall effect on grassland to a level that is not significant.

Hedgerows

- 8.4.60 New hedgerows will be planted as replacement for those lost as a result of the Proposed Scheme. Approximately 34.1km of new hedgerows will be planted and the species composition will be characteristic of the surrounding area. This represents a net loss in hedgerow of approximately 11.6km after mitigation, which represents a residual adverse effect that is significant at the district/borough level. However, opportunities will be sought to retain or replace hedgerows within the land required for the Proposed Scheme for temporary works only. Reinstatement of existing hedgerows within the land required for temporary works would provide approximately 19.6km of hedgerow in addition to the mitigation described.

Watercourses

- 8.4.61 The realigned sections of Filly Brook and its tributary through the land required for the Stone railhead and Stone IMB-R, and the other smaller watercourses including the tributaries of the Meece Brook and River Trent, which will be realigned or diverted, will be naturalised with a profile to promote the establishment of marginal vegetation and pools. Once the vegetation has developed, the adverse effect on these watercourses will be reduced to a level that is not significant. The temporary culverting of a realigned 40m section of Filly Brook and a 660m stretch of a tributary of a connected minor watercourse will result in a residual adverse effect that is significant at district/borough level until the works are complete and the temporary culvert is removed from the realigned section of this watercourse. Once works are complete, it is anticipated that any adverse effect on the watercourse will be reduced to a level that is not significant.

Water bodies

- 8.4.62 At least one pond will be created for every pond lost within the Proposed Scheme. New ponds will be established in accordance with the Ecological Principles of Mitigation in the SMR Addendum. Once established, it is anticipated that any adverse effect on pond habitats will be reduced to a level that is not significant.

Ancient and veteran trees

- 8.4.63 Where practicable, measures will be taken to protect the four impacted ancient or veteran trees. Where loss is unavoidable, the trees will be soft felled and sections placed within retained habitats to provide a continued deadwood resource. Ancient and veteran trees are irreplaceable and the loss of each of these trees represents a residual adverse effect that is significant at the district/borough level.

Species

Bats

- 8.4.64 To replace roosts that will be lost to construction, artificial roosting provision will be provided across the Proposed Scheme in accordance with the Ecological Principles of Mitigation within the SMR Addendum. The habitat creation measures detailed above for mitigation of habitat loss, including creation of areas of grassland, hedgerows, new

ponds, and semi-natural woodland, will compensate for those bat foraging habitats lost within the land required for the Proposed Scheme as detailed below.

- 8.4.65 The loss of foraging habitats used by the bat assemblage associated with Clifford's Wood will be addressed by provision of new woodland, hedgerow, grassland and pond habitats contiguous with retained sections of Clifford's Wood and other woodlands on either side of Swynnerton North cutting and Hatton embankment. The loss of potential bat roosting sites within the trees lost at Clifford's Wood will be addressed by provision of artificial bat roosts within the retained sections of the wood and within the new woodland planting described above once this has established. Construction of Swynnerton North cutting and Hatton embankment will result in adverse habitat fragmentation effects on bats. Swynnerton Estate North green overbridge is greened primarily to provide connectivity for bats on a precautionary basis. It is designed to support vegetation that will connect to areas of retained and newly created habitat on either side of the Proposed Scheme and will provide a safe crossing point for bats over the route of the Proposed Scheme. Swynnerton Estate Central underbridge will also be provided at Clifford's Wood and will provide space for the passage of wildlife, including bats. Planting at either end of the underbridge, connected to both retained and newly created habitats either side of the Proposed Scheme, will guide species through it. Following implementation of these measures, the adverse effect on the bat assemblage associated with the habitats at Clifford's Wood will be reduced to a level that is not significant.
- 8.4.66 The loss of foraging habitats used by the bat assemblage associated with Stabhill Plantation and Closepit Plantation will be addressed by provision of new woodland, directly adjacent to retained sections of these woods, and areas of grassland and pond habitats directly adjacent to Closepit Plantation, on the eastern side of Swynnerton North cutting. The loss of bat roosts within trees at Stabhill Plantation and within the hedgerow network around Closepit Plantation will be addressed by the provision of artificial bat roosts within retained woodland at Closepit Plantation and the new woodland planting described above, once it has established. Following implementation, the adverse effect on the bat assemblage associated with habitats at Stabhill Plantation and Closepit Plantation will be reduced to a level that is not significant.
- 8.4.67 The loss of foraging habitats used by the bat assemblage between Lodge Covert and Birchwood will be addressed by the provision of new woodland planting connecting the remnant of Lodge Covert, on the western side of Swynnerton embankment, to The Shrubs, a large area of woodland to the west of Lodge Covert. An additional area of new woodland will be created extending on to the Meaford North embankment, as well as areas of new grassland and hedgerows alongside Swynnerton South cutting. The loss of the pipistrelle bat roost within a tree at Birchwood and disturbance to building roosts at Blakelow will be addressed by provision of artificial bat roosts within retained sections of woodland at Lodge Covert and within the new areas of woodland planting described above, once it has established. To address the fragmentation of dispersal corridors new hedgerows will be established along the Swynnerton South cutting to connect the areas of woodland planting at Lodge Covert and adjacent to Meaford North embankment. The Swynnerton Estate South underbridge, within Lodge Covert, will provide space for the passage of wildlife, including bats. Planting at either end of the underbridge, connected to both retained and newly created habitats

either side of the Proposed Scheme, will guide species through it. Following implementation the adverse effect on the bat assemblage between Lodge Covert and Birchwood will be reduced to a level that is not significant.

- 8.4.68 The loss of foraging habitats used by the bat assemblage between Swynnerton Old Park and Hatton Common will be addressed through the provision of a belt of woodland linking on either side of Swynnerton Footpath 15 green overbridge. In addition, an area of grassland will be created adjacent to a retained pond to the north of Hatton South cutting. To address the fragmentation effect of the construction of Hatton South cutting between Swynnerton Old Park and Hatton Common the Swynnerton Footpath 15 green overbridge is greened primarily to provide connectivity for bats on a precautionary basis. It is designed to support vegetation that will connect to areas of retained and newly created habitat on either side of the Proposed Scheme and will provide a safe crossing point for bats over the route of the Proposed Scheme. Woodland and hedgerow planting along Hatton South cutting will be designed to provide continuous corridors of vegetation from the overbridge that link to the wider hedgerow network, that in turn link to Swynnerton Old Park and Hatton Common. Following implementation the adverse effect on the assemblage associated with the habitats between Swynnerton Old Park and Hatton Common will be reduced to a level that is not significant.
- 8.4.69 The loss of foraging habitats used by the bat assemblage around Cash's Pit will be addressed by the provision of an extensive belt of woodland planting and hedgerows alongside Swynnerton North cutting contiguous with the planting around Closepit Plantation. To address the loss of potential bat roosting opportunities within Cash's Pit woodland and trees within the associated hedgerow network, artificial roosts will be provided within retained trees on the hedgerow network associated with Cash's Pit and within the new area of woodland planting described above, once it has established. Following implementation the adverse effect on the bat assemblage at Cash's Pit and associated habitats will be reduced to a level that is not significant.
- 8.4.70 The loss of foraging habitats used by the bat assemblage near Pool House Wood will be addressed by the provision of a network of woodland planting, grassland, ponds and hedgerows connecting to the existing retained hedgerow network to the east of the Stone railhead/ Stone IMB-R site. To address the loss of bat roosting opportunities within trees at Pool House Wood LWS and trees within the associated hedgerow network, artificial roosts will be provided within trees and retained trees on the hedgerow network contiguous with those lost and within the new area of woodland planting described above, once it has established. Following implementation the adverse effect on the bat assemblage near Pool House Wood LWS will be reduced to a level that is not significant.
- 8.4.71 The loss of foraging habitats used by the bat assemblage near Pire Hill will be addressed by the provision of new woodland, ponds, and associated grassland directly adjacent to Black Plantation connected to Pirehill (north of) LWS. New hedgerow planting will provide connectivity between these new habitats to the existing hedgerow network and habitats within the wider landscape. To address the potential loss of the bat roost identified within a farm house at Pire Hill and loss of potential tree roosts at Pire Hill, artificial roosts will be provided within retained hedgerow trees and the new woodland planting described above, once it has established. Following

implementation the adverse effect on the bat assemblage associated with the habitats near Pire Hill will be reduced to a level that is not significant.

- 8.4.72 HS2 Ltd will seek to continue to survey within the vicinity of the proposed Swynnerton Estate North green overbridge and Swynnerton Footpath 15 green overbridge locations during the period up to construction, and if it is demonstrated that any of the above measures are not required to maintain connectivity and/or the conservation status of target species, then the mitigation provision may be revised accordingly.

Amphibians

- 8.4.73 Provision of ponds, species-rich neutral grassland and broadleaved woodland will be designed to compensate for the loss of breeding sites, foraging habitat and places of shelter used by great crested newts and other amphibian species. Compensation will be provided within the ecological habitat creation areas at: Walton Heath; Micklow; off Yarnfield Lane; Swynnerton; Highlow Meadows; Pire Hill; south of Lodge Covert; west of Clifford's Wood; off Bent Lane; and Closepit Plantation. Ponds, grassland and woodland will be established in accordance with the Ecological Principles of Mitigation within the SMR Addendum. Following implementation, the adverse effect on the amphibian populations in the Stone and Swynnerton area will be reduced to a level that is not significant. HS2 Ltd will continue to survey ponds for great crested newt populations, where it is confirmed that populations are absent then pond and terrestrial habitat provision will be re-assessed.

Birds

- 8.4.74 Habitat creation measures to address the adverse effects on barn owl in the Stone and Swynnerton area including the provision of grassland creation at Highlow Meadows, west of Clifford's Wood, north-west of Yarnfield Lane, and near Walton Heath and woodland and hedgerow planting between Blakelow and Birchwood, around Clifford's Wood, and near Pire Hill, will provide foraging and nesting opportunities for barn owl populations in the Stone and Swynnerton area. Once the habitats have become established, the adverse effect resulting from the loss of foraging habitat and potential nesting sites on barn owl populations within the Stone and Swynnerton area will be reduced to a level that is not significant.

Terrestrial invertebrates

- 8.4.75 Extensive areas of woodland will be provided within proximity to that lost at Pool House Wood. In accordance with the Ecological Principles of Mitigation within the SMR Addendum, woodland and hedgerow planting will include species of local provenance to reflect that loss, this will include an equivalent proportion of elm. This will provide new habitat for the white-letter hairstreak butterfly and following implementation the adverse effect on the loss of foraging habitat will be reduced to a level that is not significant.

Badger

- 8.4.76 Although there will be no significant effects on badger populations in this area, mitigation measures to address the potential disturbance of badgers will be provided in accordance with the Ecological Principles of Mitigation within the SMR Addendum.

This will include the provision of badger proof fencing and replacement setts where necessary.

Summary of likely residual significant effects

- 8.4.77 This section describes anticipated significant residual ecological effects during construction, taking into account the mitigation and compensation proposed.
- 8.4.78 Ancient woodland is irreplaceable and the loss of 1.9ha of this habitat will result in a permanent adverse residual effect upon ancient woodland that is significant at the county level.
- 8.4.79 New woodland planting at several sites within the Stone and Swynnerton area will increase the area of broadleaved woodland and enhance connectivity between retained woodlands and other semi-natural habitats. This will result in a permanent beneficial residual effect at the district/ borough level.
- 8.4.80 On a precautionary basis, it is assumed that there will be a net loss in hedgerow of approximately 11.6km, which will result in a permanent adverse residual effect that is significant at the district/borough level. However, restoration of land required only for the construction of the Proposed Scheme to its current use, offers potential for reinstatement of a further 19.6km of existing hedgerow. The provision of the majority of this reinstated hedgerow would reduce the residual effect to a level that is not significant.
- 8.4.81 The culverting of Filly Brook during construction of the Norton Bridge to Stone sidings represents a temporary adverse residual effect for the duration of these works that is significant at up to county level.
- 8.4.82 The assumed loss of four veteran trees will result in a permanent adverse residual effect that is significant at district borough/level in each case.

Cumulative effects

- 8.4.83 No cumulative effects on ecological receptors have been identified in the Stone and Swynnerton area.

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 will avoid or reduce impacts on features of ecological value during operation:
- Filly Brook viaduct will provide ecological connectivity under the route of the Proposed Scheme to adjacent habitats. Ecological connectivity beneath the route of the Proposed Scheme will be maintained for a length of 449m of viaduct in the Stone and Swynnerton area. This will reduce habitat fragmentation, allowing free passage of wildlife at these locations;
 - Swynnerton Estate North green overbridge and Swynnerton Footpath 15 green overbridge will support vegetation to provide ecological connectivity adjacent habitats. This will reduce habitat fragmentation by providing a

wildlife movement corridors over the route of the Proposed Scheme at these locations;

- Swynnerton Estate South underbridge and Swynnerton Estate Central underbridge will provide ecological connectivity to adjacent habitats. This will reduce habitat fragmentation by providing a wildlife movement corridor beneath the route of the Proposed Scheme at this location;
- a further five overbridges and four underbridges will maintain farm access and/or public access on footpaths or bridleways across or beneath the route of the Proposed Scheme. These structures will be of a sufficient size to also allow for the passage of a range of wildlife species, and their primary purpose will not discourage use by most wildlife species. These overbridges and underbridges will facilitate wildlife movement across the Proposed Scheme; and
- where the route of the Proposed Scheme crosses a watercourse a culvert or dry tunnel will be provided to allow passage of for mammal such as otter and water vole.

Assessment of impacts and effects

- 8.5.2 Significant effects arising during operation at the district/ borough level or above are described below. Significant effects on ecological features at the local/parish level are listed in Volume 5: Appendix: EC-016-003.

Species

Bats

- 8.5.3 The operation of the Proposed Scheme has the potential to result in a variety of impacts on bat populations including those as a result of collision with passing trains, turbulence and noise. The point at which such impacts are considered to result in a significant adverse effect on the conservation status of the population concerned will differ between species. As a consequence, the following assessment of operational impacts takes into account the differing character and nature of the bat populations and/or assemblages concerned in determining the likely effects of the Proposed Scheme on each of these receptors.
- 8.5.4 Due to the large areas over which bats forage it is likely that any loss of, or displacement from, suitable foraging habitat in the vicinity of the Proposed Scheme will in itself amount to only a small proportion of the wider available resource. However, the impact of any such disturbance or displacement could be greatly increased if bats are hampered in moving between breeding sites, hibernation sites and other roosts that they commonly utilise.
- 8.5.5 Noise, vibration and lighting associated with passing trains have the potential to disturb bat species foraging and commuting within habitats close to the Proposed Scheme. Understanding of the impact of noise on bats caused by passing trains is limited. Research suggests that gleaning bats, such as brown long-eared, will have reduced foraging success within areas where there is persistent noise from busy

roads⁹³. However, noise generated from passing trains will be regular but temporary and as such will differ from that resulting from a busy road.

- 8.5.6 Where the route of the Proposed Scheme bisects, or is located in proximity to existing features known to be utilised regularly by foraging or commuting bats, there is an increased risk that bats could be killed or injured as a result of collisions with passing trains or associated turbulence. The significance of any such effect will be dependent on both the flight height range of the species and the vertical alignment of the Proposed Scheme (i.e. is the railway in cutting, at grade or on embankment) at the point the impact occurs.
- 8.5.7 Woodland planting to the south-west of Lodge Covert will connect to the area of woodland known as The Shrubs encouraging bats to utilise the foraging habitats in this location. Bats flying north towards the Proposed Scheme will be encouraged, by planting along the route of the Proposed Scheme, to cross beneath the route of the Proposed Scheme at Swynnerton Estate South underbridge and the M6 Meaford viaduct. At Clifford's Wood new woodland planting will provide improved connectivity to The Stretters woodland which forms a substantial area of woodland to the north-east of the Proposed Scheme. Bats will be encouraged, through the provision of landscape woodland belts and hedgerows along the route of the Proposed Scheme to cross the route of the Proposed Scheme at Swynnerton Estate Central underbridge and Swynnerton Estate North green overbridge. Further north a substantial belt of woodland will be established from the southern tip of Swynnerton Old Park woodland connecting to the vegetation on the Swynnerton Footpath 15 green overbridge, which will connect to woodland planting on the northern edge of Hatton Common. This will be combined with hedgerow and tree belts along this stretch of the Proposed Scheme to encourage bats to cross at the Swynnerton Footpath 15 green overbridge.
- 8.5.8 Although it is possible that there may be infrequent incidental mortality of individual bats, due to the avoidance measures described above and the availability of alternative foraging and commuting habitat on either side of the Proposed Scheme, this is unlikely to result in a significant adverse effect on the conservation status of the bat assemblages present in the Stone and Swynnerton area.

Birds

- 8.5.9 The majority of bird species that are known to be present in the area are not considered to be particularly vulnerable to collision with trains. However, barn owls hunt low over the rough grassland habitats that are associated with railway embankments and are slow moving, and therefore, subject to likely collision with high speed trains. Four pairs of barn owls breeding in the vicinity of the Proposed Scheme will be affected, at Clifford's Wood, Yarnfield, Pirehill and Blakelow. Research undertaken by the British Trust for Ornithology on behalf of HS2 Ltd suggests that there may be effects on barn owls up to 3km away⁹⁴. This means that the more barn owls are likely to be affected than those in the vicinity of the Proposed Scheme

⁹³ Schaub, A., Ostwald, J. & Simeers, B.M. (2008), Foraging bats avoid noise. *Journal of Experimental Biology*, **211**, 3174-3180.

⁹⁴ Pringle, H., Siriwardena, G. & Toms, M. (2016), Research Report 692, Informing best practice for mitigation and enhancement measures for Barn Owls. British Trust for Ornithology, Thetford

identified above. This would result in a permanent residual adverse effect that will be significant at the county level.

Other mitigation measures

- 8.5.10 HS2 Ltd will seek to identify opportunities to provide barn owl nesting boxes and enhance barn owl habitat at least 3km from the Proposed Scheme in consultation with local landowners. A barn owl action plan will be prepared to identify the measures that can be implemented to help offset the effects. As the availability of nesting sites is a limiting factor for this species the implementation of these measures would be likely to increase numbers of barn owls within the wider landscape and thus offset the adverse effect.

Summary of likely residual significant effects

- 8.5.11 The mitigation, compensation and enhancement measures described above are likely to reduce the residual ecological effects during operation to a level that is not significant, except for barn owl. Train strike is likely to result in the loss of barn owls that nest within 3km of the route resulting in a residual significant effect at the county level. However, provided the proposed mitigation measures for barn owl are implemented through liaison with landowners, the residual effect on barn owl would be reduced to a level that is not significant.

Cumulative effects

- 8.5.12 No cumulative effects on ecological receptors have been identified in the Stone and Swynnerton area.

Monitoring

- 8.5.13 Volume 1, Section 9 sets out the general approach to environmental monitoring during operation of the Proposed Scheme.
- 8.5.14 There are no area-specific requirements for monitoring ecology and biodiversity effects or mitigation during the operation of the Proposed Scheme in the Stone and Swynnerton area.

9 Health

9.1 Introduction

- 9.1.1 This section identifies the communities within the Stone and Swynnerton area that will 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, where these effects are considered to be consequential.
- 9.1.2 Engagement with key public health bodies has been undertaken to inform the health assessment process. The assessment also draws on health related information and views expressed in consultation responses from Staffordshire County Council (SCC), the parish councils of Stone Rural, Stone Town and Swynnerton.
- 9.1.3 This section deals specifically with impacts at a local level within the Stone and Swynnerton area. Health effects across the Proposed Scheme as a whole are assessed in Section 8 of Volume 3: Route-wide effects.
- 9.1.4 Further details of the health assessment, including the application of assessment criteria supporting the conclusions presented in this section, are contained in Volume 5: Appendix HE-001-003 Health assessment matrix.
- 9.1.5 Maps showing the location of the key environmental features (Map Series CT-10), construction features (Map Series CT-05), and key operational features (Map Series CT-06) of the Proposed Scheme can be found in the Volume 2: CA3 Map Book.
- 9.1.6 In addition, the community health profile for the Stone and Swynnerton area is set out in Background Information and Data (BID)⁹⁵, (BID-HE-002-003).

9.2 Scope, assumptions and limitations

- 9.2.1 The scope, assumptions and limitations for the health assessment are set out in Volume 1 (Section 8) and the Scope and Methodology Report (SMR)⁹⁶.
- 9.2.2 As set out in the SMR, the health assessment is based on a broad understanding of health, consistent with the World Health Organization (WHO) definition of health as 'a state of complete physical, mental and social well-being and not merely an absence of disease or infirmity'⁹⁷. An individual's health is mostly determined by genetics and lifestyle factors, but for a large enough population many other factors, or 'health determinants', are known to be important, and these factors may be affected by the Proposed Scheme.
- 9.2.3 The assessment has considered the impacts of the Proposed Scheme on a range of environmental and socio-economic health determinants, which could result in adverse or beneficial effects on health and wellbeing. This process is documented in the health assessment matrices in Volume 5: Appendix HE-001-003. Based on this a professional

⁹⁵ HS2 Ltd (2017), High Speed Two (HS2) Phase 2a (West Midlands - Crewe), Background Information and Data, Available online at: www.gov.uk/hs2

⁹⁶ Volume 5: Appendix CT-001-001, Environmental Impact Assessment Scope and Methodology Report.

⁹⁷ World Health Organization, 1948: Constitution of the World Health Organization Basic Documents, 45th edition supplement. Available online at: www.who.int/governance/eb/who_constitution_en.pdf

judgement has been made to identify those effects on population health and wellbeing that are sufficiently important to report within the health assessment sections found in this report and Volume 3: Route-wide assessment.

- 9.2.4 The health determinants of relevance to the assessment within the Stone and Swynnerton area are:
- impacts during construction (temporary and permanent):
 - neighbourhood quality;
 - access to green space, recreation and physical activity;
 - social capital; and
 - services; and
 - impacts during operation (permanent):
 - neighbourhood quality.
- 9.2.5 The geographic extent of the health assessment covers those areas where impacts on health determinants are predicted to occur.
- 9.2.6 The health assessment methodology is based, in part, on a review of published evidence showing how impacts on health determinants are linked to health 'outcomes' (i.e. effects in a large population). The evidence varies in its strength, for example, the evidence linking physical activity to health outcomes is strong, whereas the evidence linking social capital with health outcomes is moderate. The strength of evidence does not necessarily determine the importance of the health effect, but is an indication of the level of certainty in the assessment. Additionally, there is greater certainty in the prediction of an impact on a health determinant than the consequent effect on health.
- 9.2.7 There is no established or widely recognised framework for assessing the significance of health effects caused by a development proposal. The SMR sets out a methodology for describing the impacts on health determinants in terms of the magnitude and duration of the change and the extent of the population exposure to this change. It also draws attention to the strength of evidence that links a change in health determinant with health effects. This framework permits the assessment to describe the impacts on determinants in a largely qualitative manner, with some structure to the relative scale of these impacts to give a sense of the importance of the potential health effects. However, this does not provide a definitive basis for drawing conclusions as to whether a health effect is likely to be 'significant'.

9.3 Environmental baseline

Existing baseline

Demographic and health profile of the Stone and Swynnerton area

- 9.3.1 The Stone and Swynnerton area extends over approximately 13.5km of the Proposed Scheme in Staffordshire, from approximately 1km north-west of Yarlet to Shelton

under Harley. The route will also pass near the settlements of Cold Norton, Stone and Walton, Yarnfield and Swynnerton.

- 9.3.2 The area is predominantly rural, made up of small settlements with limited community facilities. In general, the majority of community facilities, such as GP surgeries, schools and community meeting places, are located within the larger settlement of Stone. There are some smaller services within the village centres of Yarnfield and Swynnerton.
- 9.3.3 The Stone and Swynnerton area has a relatively small population, commensurate with the rural nature of the land use. Data provided by the Office of National Statistics⁹⁸ and the Association of Public Health Observatories⁹⁹ show that this population across all five wards is, by comparison with national (England) averages, generally in good health and experiences low levels of deprivation.
- 9.3.4 The population in this area is considered to be more resilient than the national average with regard to changes in the relevant health determinants, and with relatively few vulnerabilities. One vulnerability in this population is a slightly higher than average proportion of older people (the 65 – 84 years' category) across the Stone and Swynnerton area. The area to the south of Stone is ranked within the 10% most deprived for access to affordable housing and good quality services, in common with many other rural areas in the country.
- 9.3.5 The available data permit a profile to be made of the whole population in the Stone and Swynnerton area and provides detail down to ward level. The description of the whole population and the populations within wards does not exclude the possibility that there will be some individuals or small groups of people who do not conform to the overall profile. Detailed community profile data for the Stone and Swynnerton area are presented in Background Information and Data: BID-HE-002-003, Community health profile.
- 9.3.6 For the purposes of the health assessment, the Stone and Swynnerton area has been divided into two communities, as described below.

Description of communities in the Stone and Swynnerton area

Yarnfield and surrounds

- 9.3.7 This area comprises rural farmland to the east of where the Proposed Scheme will cross the M6, with numerous small clusters of residential properties. The village of Yarnfield, located to the south-west of the route of the Proposed Scheme, has approximately 530 residential properties and includes community and recreational resources, such as the Wellbeing Park, Springfield First School, Yarnfield Park Sports Centre and the Stone Circles Challenge, which is a promoted public right of way (PRoW). The joint settlements of Stone and Walton, with a combined total of approximately 7,500 residential properties, lie to the north of the Proposed Scheme.

⁹⁸ 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.

⁹⁹ Public Health Observatories (PHOs) are part of Public Health England. They produce information, data and intelligence on people's health and health care for practitioners, commissioners, policy makers and the wider community. Available online at <http://www.apho.org.uk/>

These settlements contain a wide variety of community and recreational resources, which serve the rural communities in the vicinity of the Proposed Scheme.

Swynnerton and surrounds

- 9.3.8 This area comprises mainly rural farmland between the area where the Proposed Scheme will cross the M6 and Shelton under Harley. The area includes the village of Swynnerton, to the west of the M6, with approximately 210 residential properties, two places of worship, a public house and a convenience store. To the north of Swynnerton there are numerous small clusters of residential properties, such as the hamlet of Hatton Manor with approximately 30 residential properties and the hamlet of Shelton under Harley with approximately five residential properties, linked to Shelton under Harley Farm.

Future baseline

- 9.3.9 A future baseline profile of the Stone and Swynnerton area has been established to forecast the changing demographic characteristics and potential health needs of local communities. The population in the Stafford area, which includes the Stone and Swynnerton community area, is expected to grow by 5% between 2012 and 2021 with significant growth in people aged 65 and over (23%) and in particular those aged 85 and over (37%)¹⁰⁰. By 2021, the proportion of the Staffordshire population aged 16-64 is expected to decline by between 3 and 5 percentage points¹⁰¹. The ageing population may put pressure on certain areas of the health service; for example, the prevalence of dementia is forecast to increase from 1,980 cases in 2015 to 3,330 by 2030¹⁰². A detailed review of future baseline data is presented in Background Information and Data: BID-HE-002-003, Community health profile.

Construction (2020)

- 9.3.10 Volume 5: Appendix CT-004-000 provides details of committed developments in the Stone and Swynnerton area that are assumed to have been implemented by 2020.
- 9.3.11 The committed developments that materially affect the baseline conditions in this area and form part of the future baseline assessment of the effects during construction and operation are listed in Table 16.

Table 16: Committed developments relevant to health

Map book reference ¹⁰³	Planning reference	Description
CA3/5	Policy Stone 2 - West and South of Stone – Employment	Allocation for 18 hectares of new employment south of Stone Business park.
CA3/15	14/20854/OUT	Up to 92 dwellings and associated development including access, open space, landscaping, balancing pond and earthworks.

¹⁰⁰ Stafford and Surrounds Health and Wellbeing Group; Stafford Enhanced Joint Strategic Needs Assessment, 2014; <http://www.staffordbc.gov.uk/live/Documents/Environmental%20Health/Health%20and%20Wellbeing/Stafford-EJSNA-2014.pdf>.

¹⁰¹ Staffordshire County Council; Staffordshire and Stoke-on-Trent Economic Review, 2016; <http://www.staffordbc.gov.uk/live/Documents/Forward%20Planning/Examination%20Library%202013/E15-STAFFORDSHIRE-AND-STOKE-ON-TRENT-ECONOMIC-REVIEW-2013.pdf>;

¹⁰² Staffordshire Partnership; Staffordshire Joint Strategic Needs Assessment, 2013; <https://www.staffordshirepartnership.org.uk/Health-and-Wellbeing-Board/Staffordshire-E-JSNA-2013-FINAL.pdf>.

¹⁰³ Volume 5 Map Book: Maps CT-13-109b to CT-13-113a-L1.

Map book reference ¹⁰³	Planning reference	Description
CA3/17	13/19002/OUT	Residential development including new access, open space, landscaping and associated infrastructure.
CA3/20	15/21734/FUL	25 residential dwellings.
CA/19	09/12911/OUT	Up to 300 dwellings and associated infrastructure, including access, parking and sports pavilion.

Operation (2027)

- 9.3.12 Volume 5: Appendix CT-004-000 provides details of committed developments in the Stone and Swynnerton area that are assumed to have been implemented by 2027.
- 9.3.13 No further committed developments have been identified in this area that will materially alter the baseline conditions in 2027 for health determinants.

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 insofar as reasonably practicable through mitigation measures incorporated into the design of the Proposed Scheme to reduce adverse effects on people.
- 9.4.2 The mitigation measures incorporated into the design of the Proposed Scheme in the Stone and Swynnerton area include:
- the offline construction of the Yarnfield Lane realignment, maintaining access throughout the construction of the Proposed Scheme, and mitigating impacts from a loss of access between nearby communities;
 - the inclusion of planting and/or landscape earthworks to reduce visual and acoustic impacts at: residences to the south of Walton; isolated residential properties west of the M6; over the existing section of Yarnfield Lane to the west of the M6, between White Moor Farm and the Yarnfield Lane realignment; Sandyford Farm; The Rowe and Yew Tree Park residential properties; and residential properties in Shelton under Harley;
 - a change in the realignment of Stone Rural Bridleway 0.1135 to reduce impacts on residential properties at North Pirehill Farm;
 - provision of a new section of bridleway to direct users of Swynnerton Bridleway 54 onto Stab Lane from the diverted Tittensor Road and along a separate bridleway alongside the A51 Stone Road, to maintain connectivity of the Staffordshire Cakes and Ale Trail, Hanchurch Hills Circular Walk and the Stone Circles Challenge; and
 - the provision of overbridges and underbridges to maintain connectivity, including Swynnerton Footpath 15 overbridge, which will maintain pedestrian access to Hatton Common from the north.

- 9.4.3 HS2 Ltd will require its contractors to comply with the environmental management regime for the Proposed Scheme, including the Code of Construction Practice (CoCP), which provides a general basis for route-wide construction environmental management. 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.
- 9.4.4 The CoCP will require the nominated undertaker and its contractors to produce and implement a community engagement framework and provide appropriately experienced community relations personnel to implement this framework, to provide appropriate information and to be the first point of contact to resolve community issues. The nominated undertaker will take reasonable steps to engage with the community, particularly focusing on those who may be affected by construction impacts, including local residents, businesses, landowners and community resources, and the specific needs of protected groups (as defined in the Equality Act 2010).

Assessment of impacts and effects

Neighbourhood quality

- 9.4.5 The term 'neighbourhood quality' is used in this assessment to describe a combination of factors that have the potential to affect residents' feelings about their local environment. If these factors are altered to a sufficient degree, there would be effects on mental health and wellbeing. The Proposed Scheme will affect the quality of neighbourhoods through environmental changes resulting from the presence of construction sites, construction activities and construction traffic on local roads. This section assesses how changes to neighbourhood quality may influence people's level of satisfaction with their local environment and perceptions about issues such as personal safety and security.
- 9.4.6 A review of published research evidence linking neighbourhood quality with health and wellbeing can be found in Volume 5: Appendix HE-003-000. The evidence linking the individual aspects of neighbourhood quality with health outcomes ranges from moderate to strong. The environmental effects of the Proposed Scheme related to this section are assessed in Section 5, Air quality, Section 11, Landscape and visual, Section 13, Sound, noise and vibration and Section 14, Traffic and transport.
- 9.4.7 The assessment of neighbourhood quality is guided by the findings from other assessments, but does not rely on significance thresholds used in these assessments since these do not relate specifically to health; rather it assesses qualitatively how the Proposed Scheme is likely to alter local amenity and perceptions about neighbourhood quality, and consequently may affect health and wellbeing.
- 9.4.8 A review of the pathways through which construction of the Proposed Scheme may impact on neighbourhood quality, and the potential for health effects, is documented in Volume 5: Appendix HE-001-003. As the air quality assessment shows that, following mitigation, impacts on air quality (including dust) resulting from the construction and operation of the Proposed Scheme will be very small and are not expected to affect health and wellbeing adversely, air quality impacts are not considered to contribute to any impacts on neighbourhood quality in this area.

- 9.4.9 This assessment has, therefore, considered temporary, and where applicable, permanent impacts including:
- noise emissions, affecting local amenity;
 - visual impacts affecting residents' satisfaction with their living environment and 'sense of place'; and
 - construction traffic on local roads, causing disturbance and concerns about safety.
- 9.4.10 The construction of the Proposed Scheme will have temporary and permanent impacts on neighbourhood quality at residential properties in rural areas close to construction sites. Impacts on neighbourhood quality have the potential to affect the wellbeing of residents adversely during the construction phase, by giving rise to negative feelings in relation to quality of life and the local environment, and potentially changing behaviours, such as deterring the use of outdoor space.
- 9.4.11 The construction of Yarlet embankment and Yarlet North cutting will be visible from residential dwellings at Pirehill Cottage Farm, North Pirehill Farm, Walton House Farm and Walton Heath Farm. Construction traffic, including HGVs, will be present on Pirehill Lane, and noise from traffic and construction activities will be noticeable at residential properties in the area. The Stone railhead will be visible from residential dwellings along Yarnfield Lane and at the north-eastern edge of Yarnfield. Construction traffic, including HGVs, will be present on the B5026 Eccleshall Road and Yarnfield Lane, and residential properties will be affected by construction traffic noise.
- 9.4.12 The construction of Meaford North embankment and Swynnerton South cutting will be visible from residential dwellings at Blakelow Farm, Grange Cottages and Swynnerton Grange. The construction of Swynnerton embankment will be visible from residential dwellings along Tittensor Road and Sandyford Farm. Construction noise will be noticeable at these properties and construction traffic, including HGVs, will be present on Tittensor Road and the A51 Stone Road. The construction of Swynnerton North cutting will be visible from residential dwellings at and around Swynnerton Heath Farm.
- 9.4.13 Residents of these rural properties are likely to experience these features of the Proposed Scheme as changing the quality of their neighbourhoods and to regard these changes as adverse, in terms of reducing the sense of rural character and tranquillity. The presence of construction traffic, including HGVs, on rural roads is likely to give rise to concerns about road safety, which may affect perceptions of neighbourhood quality.
- 9.4.14 In Shelton under Harley, the construction of the Hatton North cutting, Stableford South embankment, Bent Lane (North) diversion, demolition works and utility connections will be visible from residential dwellings in proximity to the Proposed Scheme. The properties will also be adjacent to Hatton North cutting satellite compound, Stableford auto-transformer station satellite compound and temporary material stockpiles. These properties will also be affected by construction noise from the proposed works and traffic movements along the site haul routes. Construction traffic, including HGVs, will be present on Bent Lane. Residents living in Shelton under Harley are likely to experience these features of the Proposed Scheme as changing

the quality of their neighbourhood and to regard that change as adverse, in terms of diminishing the amenity of the area, reducing the sense of its rural character and tranquillity and creating a feeling of separation between the remaining properties within the hamlet.

Access to green space, recreation and physical activity

- 9.4.15 There is moderate evidence to show that access to green space contributes to good mental health. There is also moderate evidence to show that environmental factors, such as access to high quality green space, safety and amenity, can influence participation in physical activity. A review of published research evidence linking access to green space, recreation and physical activity with health and wellbeing can be found in Volume 5: Appendix HE-002-000.
- 9.4.16 A review of the pathways through which the construction of the Proposed Scheme may impact on levels of access to green space and physical activity, and the potential for health effects, is documented in Volume 5: Appendix HE-001-003. This has identified the following impacts:
- impacts on PRow, including temporary closures, diversions and loss of amenity, which may deter the use of these routes by walkers, cyclists and equestrians; and
 - the presence of construction traffic, including HGVs, on the local road network, which may deter their use by walkers, cyclists and equestrians.
- 9.4.17 The Proposed Scheme will intersect 10 PRow, including two bridleways, and will affect one further PRow in the Stone and Swynnerton area. Temporary and permanent diversions will be required to enable its construction. Surveys undertaken to inform the traffic and transport assessment (Section 14, Traffic and transport) showed that there were fewer than 10 people a day recorded on most of the PRow in the area. The route with the greatest usage was Swynnerton Bridleway 54, with 30 users observed during the survey day. The presence of construction works is likely to affect the amenity value of PRow in the vicinity of the Proposed Scheme and may detract from their appeal for recreational users, reducing levels of physical activity and associated health and wellbeing benefits.
- 9.4.18 Construction traffic will mainly utilise the site haul routes along the Proposed Scheme alignment. However, some construction traffic, including HGVs, will be present on local roads within the Stone and Swynnerton area. Section 14, Traffic and transport assessment has identified the potential for construction traffic to obstruct or deter pedestrians, cyclists and equestrians.
- 9.4.19 The presence of HGVs is likely to deter some non-motorised users from using the affected routes. In the case of recreational users, it is considered that alternative routes will be available. However, for those using these routes for active travel to work or to access shops and services, there is the possibility that people would choose to travel by car instead, temporarily reducing levels of physical activity and associated health and wellbeing benefits.

Social capital

- 9.4.20 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. The Office for National Statistics defines social capital as follows:
- 9.4.21 'In general terms, social capital represents social connections and all the benefits they generate. Social capital is also associated with civic participation, civic-minded attitudes and values which are important for people to cooperate, such as tolerance or trust'.¹⁰⁴
- 9.4.22 A review of published research evidence linking social capital with health and wellbeing can be found in Volume 5: Appendix HE-003-000. There is moderate evidence for a link between social capital and health and wellbeing outcomes. A decrease in social capital has the potential to reduce the beneficial effects on wellbeing that are gained through social contact and support, social participation, reciprocity and trust. Adverse effects on health from changes in social capital can 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.
- 9.4.23 A review of the pathways through which construction of the Proposed Scheme may impact on levels of social capital, and the potential for health effects, is documented in Volume 5: Appendix HE-001-003. This has temporary and permanent impacts including:
- permanent impacts on local population size as a result of residential demolitions; and
 - temporary impacts from the presence of the construction workforce.
- 9.4.24 The villages along the route support small, well-established communities. Feedback from community consultation indicates that people's levels of trust in their communities and community cohesion are strong. The assessment has identified potential wellbeing effects within these communities associated with the presence of the temporary construction workforce, which will be substantial relative to the size of these communities. The majority of workers will reside at the temporary workers accommodation at the Yarnfield North embankment satellite compound, to the north of Yarnfield Lane. This site will provide temporary accommodation for up to 240 workers for approximately six years. During the day, the workforce will be present on construction sites and compounds throughout the area, including works sites and satellite compounds in the vicinity of Micklow House Farm and residential dwellings along Tittensor Road.
- 9.4.25 The daily average number of workers at each site will range from 10 to 225 at the construction compounds, and the duration of the works at each site will range from

¹⁰⁴ Office for National Statistics- Measuring Social Capital. Available online at:http://webarchive.nationalarchives.gov.uk/20160105160709/http://www.ons.gov.uk/ons/dcp171766_371693.pdf

approximately one year to six years. The presence of construction workers is likely to be very noticeable, with construction vehicles using local roads to access compounds, and workers using facilities within local villages.

- 9.4.26 It is well understood that the introduction of a temporary construction workforce into communities which have the characteristics identified above has the potential to alter people's perceptions about their communities and reduce levels of trust. Such a reduction in social capital has the potential to affect wellbeing adversely, and may influence behaviours that are beneficial to wellbeing such as the use of community facilities.
- 9.4.27 The draft CoCP¹⁰⁵ includes a commitment to produce and implement a community engagement framework and provide appropriately experienced community relations personnel. HS2 Ltd will engage with local authorities and community representatives to identify measures aimed at fostering and maintaining good relationships between the workforce and local communities. Any measures identified will be included within the community engagement framework as appropriate.
- 9.4.28 There is also a potential for the presence of the temporary workforce to have a beneficial effect on local communities through increased use of local services and opportunities for social interaction.
- 9.4.29 The works to enable the construction of Hatton North cutting and the diversion of Bent Lane to create Bent Lane (North) will result in the demolition of two of the five residential properties in the hamlet of Shelton under Harley. This will result in the loss of a substantial proportion of the residents within this hamlet community, resulting in the loss of social capital for the remaining community, which has the potential to adversely affect the wellbeing of people in this small community.

Other mitigation measures

- 9.4.30 In the event of any loss of a community facility, the options for mitigating significant community effects to be explored by HS2 Ltd 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.
- 9.4.31 HS2 Ltd will engage with local authorities and community representatives to identify measures aimed at fostering and maintaining good relationships between the workforce and local communities. Any measures identified will be included within the community engagement framework as appropriate.

¹⁰⁵ Volume 5: Appendix CT-003-000, Draft Code of Construction Practice.

Cumulative effects

- 9.4.32 No cumulative health effects have been identified in the Stone and Swynnerton area during construction of the Proposed Scheme.

9.5 Effects arising from operation

Avoidance and mitigation measures

- 9.5.1 Adverse impacts on health determinants have been reduced insofar as reasonably practicable through mitigation measures incorporated into the design of the Proposed Scheme to reduce adverse effects on people. The mitigation measures incorporated into the design of the Proposed Scheme in the Stone and Swynnerton area include measures to integrate the Proposed Scheme into the landscape and to provide visual and noise screening, including:

- mitigation planting on the southern side of the Norton Bridge to Stone sidings to screen the additional lines from existing and proposed residential properties in Walton;
- planting and a landscape noise bund (with a noise fence barrier on top of the bund) to the south of the sidings to reduce visual and noise impacts on existing and proposed residential properties south of Stone;
- a noise fence barrier along the Yarnfield South embankment and Filly Brook viaduct to reduce noise impacts on Micklow House Farm and proposed residential properties in Walton; and
- a noise fence barrier along the Swynnerton embankment to reduce noise impacts in Swynnerton.

Assessment of impacts and effects

- 9.5.2 This section assesses the health effects of the operation of the Proposed Scheme on the health and wellbeing of communities. Permanent impacts on health determinants resulting from the construction of the Proposed Scheme are assessed as permanent construction impacts above.

Neighbourhood quality

- 9.5.3 Noise and visual impacts from passing trains will result in permanent impacts on neighbourhood quality at residential properties in rural areas close to the Proposed Scheme. These operational impacts will be experienced alongside permanent construction impacts, including the presence of the railway infrastructure within the local landscape. Impacts on neighbourhood quality have the potential to adversely affect the wellbeing of residents during the operational phase, by giving rise to negative feelings in relation to quality of life and the local environment.
- 9.5.4 The Stone IMB-R and associated lighting will be visible from residential dwellings along Yarnfield Lane and at the north-eastern edge of Yarnfield. The Proposed Scheme and passing trains will be visible from residential dwellings at Walton Heath Farm, properties along Yarnfield Lane, Blakelow Farm, Grange Cottages, Swynnerton Grange and Swynnerton Heath Farm and Shelton under Harley. Train noise will also

be noticeable in these areas. Residents of these rural properties are likely to experience these features of the Proposed Scheme as changing the quality of their neighbourhoods and to regard these changes as adverse, in terms of reducing the sense of rural character and tranquillity. It is considered that the effects of wellbeing will lessen over time, as mitigation planting becomes established and as communities become accustomed to the presence of the Proposed Scheme.

Other mitigation measures

- 9.5.5 No further mitigation measures are proposed.

Cumulative effects

- 9.5.6 No cumulative health effects have been identified in the Stone and Swynnerton area during operation of the Proposed Scheme.

Monitoring

- 9.5.7 Volume 1, Section 9 sets out the general approach to environmental monitoring during operation of the Proposed Scheme.
- 9.5.8 No specific monitoring of health effects during the operation of the Proposed Scheme are proposed.

10 Land quality

10.1 Introduction

- 10.1.1 This section of the report presents the baseline conditions along the route of the Proposed Scheme in the Stone and Swynnerton 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, from a scientific, historical, mineral exploitation or mineral resources point of view, including geological sites of special scientific interest (SSSI) and local geological sites (LGS), and areas of designated mineral resources. Consideration is also given to petroleum (gas) prospects and licensing. Mitigation measures are presented and any residual significant effects are summarised.
- 10.1.2 Engagement has been undertaken with the British Geological Survey (BGS), Staffordshire County Council (SCC), Stafford Borough Council (SBC), the Environment Agency, the Food and Environment Research Agency and the Animal and Plant Health Agency. The purpose of this engagement has been to discuss the Proposed Scheme and potential effects, and obtain relevant baseline information.
- 10.1.3 Details of baseline information, conceptual site models (CSM) and risk assessments are outlined in Volume 5: Appendix LQ-001-003, and presented in Maps LQ-01-109b to LQ-01-113a (Volume 5: Land quality Map Book).
- 10.1.4 Maps showing the location of the key environmental features (Map Series CT-10) and the key construction (Map Series CT-05) and key operational (Map Series CT-06) features of the Proposed Scheme can be found in the Volume 2: CA3 Map Book.
- 10.1.5 Land contamination issues are closely linked with those involving water resources and waste. Issues regarding groundwater resources are addressed in Section 15, Water resources and flood risk. Issues regarding the disposal of waste materials, including contaminated soils, are addressed in Volume 3, Route-wide effects (Section 15).

10.2 Scope, assumptions and limitations

- 10.2.1 The scope, assumptions and limitations for the land quality assessment are set out in Volume 1 (Section 8), the Scope and Methodology Report (SMR)¹⁰⁶, and Volume 5: Appendix LQ-001-003.
- 10.2.2 In accordance with the SMR, a risk based approach has been undertaken to identify contamination that may have an impact upon the construction of the Proposed Scheme. To support this, a desk based assessment has been undertaken for the study area, defined as the land required for the Proposed Scheme plus a 250m buffer from the edge of proposed construction activities. In the case of groundwater data, this is increased to 1km.
- 10.2.3 New and diverted utilities will be laid in the boundaries of existing highways within normal road construction layers and natural soils below or land close by. These have

¹⁰⁶ Volume 5: Appendix CT-001-001, Environmental Impact Assessment Scope and Methodology Report.

been considered in the context of the CSM approach, and the lack of contact with nearby potentially contaminated sites, and the absence of sensitive receptors within the roadways reduces the risk of an impact occurring to very low levels. The impact of laying these new and diverted utilities has, therefore, been scoped out of the assessment as they are unlikely to cause any significant land quality effects.

- 10.2.4 Potentially contaminated areas of land have been identified that could affect, or be affected by, the construction of the Proposed Scheme (e.g. contaminated soils may need to be removed or construction may alter existing contamination pathways). Each of these areas has been studied to evaluate the scale of potential impacts caused by existing contamination (if present) and what needs to be done to avoid significant consequences to people and the wider environment.
- 10.2.5 The location of the Proposed Scheme was viewed from points of public access initially. In addition, visits to some key sites have been undertaken to verify desktop information.
- 10.2.6 A CSM approach has been used to provide an understanding of the types of contaminants that may be present, the likely sources and/or pathways by which contamination can spread and the potential receptors (i.e. people and the wider environment) that could be affected. It indicates the types of impacts that existing contamination may be having at present and may have during and after construction.
- 10.2.7 The minerals assessment is based upon the minerals identified in published minerals plans, existing planning or licensed areas. Any inference of the presence of mineral provided by geological maps/reports is excluded (except where these are covered by the Mineral Local Plan (MLP)).
- 10.2.8 The geo-conservation assessment is based upon local geological trust records.

10.3 Environmental baseline

Existing baseline

- 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, Food and Environment Research Agency and the Animal and Plant Health Agency records, as well as web sources such as local geological trusts.
- 10.3.2 Unless otherwise stated, all features described in this section are presented in Maps LQ-01-109b to LQ-01-113a (Volume 5: Land quality Map Book).

Geology

- 10.3.3 This section describes the underlying ground conditions within the Stone and Swynnerton area. Recent changes in lithostratigraphic classifications by the BGS have been incorporated where appropriate¹⁰⁷.

¹⁰⁷ 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>

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10.3.4 Table 17 provides a summary of the superficial and bedrock units underlying the Proposed Scheme in the Stone and Swynnerton area.

Table 17: Summary of the superficial and bedrock units underlying the Proposed Scheme in the Stone and Swynnerton area

Geology	Distribution	Formation description	Aquifer classification
Superficial			
Head	On the fringe of glacial deposits near Swynnerton	Clay, silt, sand and gravel	Secondary undifferentiated
Peat	South-west of Filly Brook (will not be crossed by the Proposed Scheme)	Organic rich clay or humic deposits	Unproductive
Alluvium	Along the valley and tributaries of Filly Brook and Meece Brook, and the dry channel north of Hatton	Clay, silt, sand and gravel	Secondary A
River Terrace Deposits	Along the valley of Meece Brook (will not be crossed by the Proposed Scheme)	Sand and gravel	Secondary A
Glacial Till	Several discontinuous outcrops within 1km of the route. Will be crossed by the Proposed Scheme near Swynnerton and Hatton	Sandy silty clay	Unproductive
Glaciofluvial Deposits – undifferentiated and sheet deposits	Outcrops in the central part of the Stone and Swynnerton area, a small section of which will be crossed by the Proposed Scheme south-east of Swynnerton.	Sand and gravel	Secondary A
Bedrock¹⁰⁸			
Mercia Mudstone Group - Mudstone and Halite Stone	Outcrop covering the southern section of the study area as far north as Swynnerton Grange	Red, less commonly green-grey, mudstone and siltstone with some halite-bearing units, thin beds of gypsum/ anhydrite being widespread	Secondary B
Mercia Mudstone Group – Mudstone	A small outcrop near Swynnerton (will not be crossed by the Proposed Scheme)	Red, less commonly green-grey, mudstone and siltstone with some halite-bearing units, and presence of sandstone	Secondary B
Mercia Mudstone Group - Tarporley Siltstone Formation	Outcrop in the Swynnerton area.	Interlaminated and interbedded siltstones, mudstones and sandstones	Secondary B
Mercia Mudstone Group - Wilkesley Halite Member (Stafford Halite Member)	Small outcrop in the south of the area	Discontinuous lenses and beds of halite mixed with mudstone	Secondary B
Sherwood Sandstone Group - Wilmslow Sandstone (Wildmoor Sandstone)	Outcrop underlying the northern half of the Proposed Scheme in this area	Fine- to medium-grained, bright orange-red to dark brick-red sandstone with subordinate siltstone and mudstone	Principal

¹⁰⁸ Names in brackets refer to previous naming convention.

Geology	Distribution	Formation description	Aquifer classification
Sherwood Sandstone Group - Helsby Sandstone Formation (Bromsgrove Sandstone Formation)	Outcrop in the Swynnerton area	Sandstones, weathering to sand near the surface	Principal
Sherwood Sandstone Group - Chester Formation (Kidderminster Sandstone and Conglomerate Interbedded)	Outcrop in the central area north of Swynnerton	Cross-bedded and pebbly reddish brown sandstone and conglomerate	Principal
Sherwood Sandstone Group - Chester Formation (Kidderminster Formation)	Outcrop in the central area north of Swynnerton	Pebble conglomerate with a reddish brown sandy matrix and pebbles consisting of mainly brown or purple quartzite, with quartz conglomerate and vein quartz	Principal
Butterton-Swynnerton Dykes - Paleogene igneous dykes	Outcrop in the central area north of Swynnerton. Dykes oriented approximately north-west to south-east.	Strong basaltic igneous dyke	Secondary A

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.
- 10.3.6 Farm burial and pyre sites associated with the 2001 outbreak of foot and mouth disease are known to be present within the study area. In addition, older unrecorded sites may be present from the 1967 outbreak. In all cases, the records do not provide an exact location for the burial or pyre sites and other, unrecorded, sites are likely to be present.

Superficial geology

- 10.3.7 Superficial glacial deposits from several glacial phases are present beneath parts of the study area. Post-glacial sediments within this area include head and Peat deposits, Alluvium, River Terrace Deposits, Glacial Till, Glaciofluvial Deposits and Glaciofluvial Sheet Deposits.
- 10.3.8 Glacial Till is present south of Stone (between Pirehill Lane and the B5026 Eccleshall Road), north of Swynnerton (between Sandyford Farm and Long Compton Farm) and west of Beech (between Common Lane (Swynnerton) and Clifford's Wood).
- 10.3.9 Both the glaciofluvial deposits and glaciofluvial sheet deposits with particle sizes ranging from clay to boulders are present to the south-east of Swynnerton (south of Swynnerton Grange).
- 10.3.10 Alluvium possibly overlying River Terrace Deposits are shown in the vicinity of Filly Brook and other unnamed minor water courses, between Swynnerton and Yarnfield.

Alluvium is also found in the vicinity of Common Lane (Swynnerton), near Clifford's Wood.

10.3.11 Peat is present east of Yarnfield.

10.3.12 Head deposits comprising gravel, sand and clay are present to the west of Long Compton Farm, north of Swynnerton.

Bedrock geology

10.3.13 The bedrock geology in this area comprises the Mercia Mudstone Group, the Sherwood Sandstone Group and the Butterton-Swynnerton Dykes.

10.3.14 The bedrock of the southernmost zoom of the Stone and Swynnerton area comprises the Wilkesley Halite Member, which is part of the Mercia Mudstone Group. This consists of mudstone and siltstone with some halite-bearing units and sandstone.

10.3.15 The bedrock further north to Blakelow comprises the Mercia Mudstone Group, described as red, occasionally green-grey, mudstones and subordinate siltstones. Halite, gypsum/anhydrite and sandstones may also be present within the Mercia Mudstone Group.

10.3.16 Dissolution of the halite-rich horizons can give rise to highly saline springs and ground subsidence. Surface depressions formed by the dissolution of halite are typically infilled by Peat or alluvial sediments.

10.3.17 The bedrock between Blakelow and the A519 Newcastle Road comprises the Chester Formation and Tarporley Siltstone Formation. Faulting and/or folding has resulted in a repeating sequence of the Tarporley Siltstone and the Helsby Sandstone Formations outcropping. The Chester Formation and Helsby Sandstone Formation are part of the Sherwood Sandstone Group. The Tarporley Siltstone Formation is part of the Mercia Mudstone Group. Igneous dykes comprising micro-gabbro, known as the Butterton-Swynnerton Dykes, have intruded into these sedimentary rocks.

10.3.18 Between the A519 Newcastle Road and the northern boundary of the Stone and Swynnerton area the bedrock comprises sandstone of the Wildmoor Sandstone Member, part of the Sherwood Sandstone Group.

Radon

10.3.19 Radon is a radioactive gas formed by the radioactive decay of naturally occurring uranium in rocks and soils. The section of the route of the Proposed Scheme north-west of Swynnerton and east of Stableford lies within a radon affected area, as defined on Public Health England's UK Radon online maps¹⁰⁹.

10.3.20 In this area, the maps show that between 1% and 3% of homes have radon levels above the action level of 200 becquerels per cubic metre (Bq/m³) of air for residential properties. For the remainder of the Stone and Swynnerton area, less than 1% of homes are indicated to be above the radon action level.

¹⁰⁹ UK Maps of Radon, Public Health England, www.ukradon.org/information/ukmaps.

Groundwater

- 10.3.21 Five categories of aquifer have been identified within the Stone and Swynnerton area, as defined by the Environment Agency:
- the Sherwood Sandstone Group is classified as a Principal aquifer;
 - the Butterton-Swynnerton Dykes, Glaciofluvial Deposits, Glaciofluvial Sheet Deposits, Alluvium and river terrace deposits are classified as a Secondary A aquifers;
 - the Mercia Mudstone Group is classified as a Secondary B aquifer;
 - Head deposits are classified as Secondary undifferentiated aquifers; and
 - Peat and Glacial Till are classified as an unproductive aquifer.
- 10.3.22 The Environment Agency reports that there are two licensed abstractions from groundwater sources for public water supply protected by groundwater source protection zones¹¹⁰ (SPZ) within 1km of the Proposed Scheme within the Stone and Swynnerton area, both abstracted from the Sherwood Sandstone Group. These are located:
- north of Blakelow and adjacent to the A51 Stone Road (SPZ1 and SPZ2); and
 - approximately 300m north-east of Lower Hatton (SPZ1).
- 10.3.23 There is one further licensed public water source, which is also protected by a SPZ2 located in the Whitmore Heath to Madeley area (CA4). The SPZ extends into the Stone and Swynnerton area and could, therefore, potentially also be affected by the Proposed Scheme in this area.
- 10.3.24 According to local authority (SBC) records, there are six private groundwater abstractions that do not require a permit registered within the study area. Further details are provided in Volume 5: Appendix WR-003-003. The SBC data provided only indicates the location of the taps from which the supply is drawn. Surveys have confirmed that two of these abstractions are from boreholes. The nature of the abstractions for the four remaining tap locations has not been confirmed. Due to the absence of nearby surface watercourses, the water from these taps is assumed to be groundwater from the Mercia Mudstone Group. Unregistered groundwater supplies may also be present that will need to be protected. It should be noted that all abstractions that are used directly or indirectly for human consumption are by default provided with SPZs. In such cases the abstraction point qualifies for a default 10m radius for SPZ1 and 250m radius for SPZ2. There is no default zone 3 for total catchment with respect to this type of abstraction.
- 10.3.25 Further details on the groundwater in the Stone and Swynnerton area can be found in Section 15, Water resources and flood risk.

¹¹⁰ A groundwater SPZ is a defined area within which groundwater is extracted for potable water supply. The area is defined by the Environment Agency on the basis of the length of time taken for groundwater to migrate to the potable source.

Surface water

- 10.3.26 Filly Brook is the only named surface water feature in the study area that will be crossed by the route of the Proposed Scheme, in the vicinity of Pool House Farm approximately 1.5km west of Walton. The main channel of Meece Brook will not be crossed by the route of the Proposed Scheme in the Stone and Swynnerton area, but tributaries of Meece Brook will pass beneath.
- 10.3.27 There are further surface water bodies that are present within the Stone and Swynnerton area. These include the River Trent and its tributaries together with unclassified surface water flowpaths, field drains and numerous ponds. The River Trent will not be crossed by the route of the Proposed Scheme in the Stone and Swynnerton area, but it is located within the study area south of Stonefield and to the north of the A34 Stafford Road/The Fillybrooks.
- 10.3.28 There are four licensed surface water abstractions in the study area. Three are located at Hatton Manor and one is located at Stone Golf Club.
- 10.3.29 There are no registered private unlicensed surface water abstractions located within 250m of the Proposed Scheme. It is, however, possible that unregistered supplies exist. No private water supplies from surface water sources have been identified within the study area.
- 10.3.30 Surface water bodies in the Stone and Swynnerton area are described in more detail in Section 15, Water resources and flood risk.

Current and historical land use

- 10.3.31 Current potentially contaminative land uses within the study area include existing railways (including the West Coast Main Line (WCML)) and a number of farms.
- 10.3.32 Historically, the existing Common Lane Cold War bunkers may have been used by the military. Historical mapping also shows a gasworks within Swynnerton village in 1901, south-west of the Proposed Scheme. A former garage/petrol filling station in Stableford is indicated on the 1994 historical map, south of the Proposed Scheme.
- 10.3.33 There are four historical licensed landfill sites within the study area, and these are detailed in Table 18.

Table 18: Landfill sites located in the study area

Name and area reference¹¹¹	Location	Description
Cold Norton Farm, Eccleshall Road, Cold Norton, Stone, Staffordshire 3-72	Three areas of landfill, two of which are located to the north and one to the south of Eccleshall Road, Cold Norton. Volume 5: Map LQ-01-110	Environment Agency records state that the landfill received household waste. The first input of waste was in December 1960 and the last input was in December 1965. No further information with regards to licence issue and surrender dates is available.
Near Micklow House, Eccleshall Road, Walton, Stone, Staffordshire	Located to the south of Eccleshall Road, Walton. Volume 5: Map LQ-01-110.	Environment Agency records state that the landfill received household waste. The first input of waste was in December 1963.

¹¹¹ The area reference is the unique identifying number for the site, shown on the Volume 5: Land quality Map Book

Name and area reference ¹¹¹	Location	Description
3-50		No further information with regards to the last input date or licence issue and surrender dates is available.
Pool House Farm, Yarnfield Lane, Yarnfield, Stone, Staffordshire 3-132	Located to the south of Yarnfield Lane, Yarnfield. Volume 5: Map LQ-01-110.	Environment Agency records state that the landfill received household waste. The first input of waste was in December 1958 and the last input was in December 1960. No further information with regards to licence issue and surrender dates is available.
Home Farm, Common Lane, Stone, Walton 3-165	Located to the north of Common Lane (Swynnerton) and the south of Eccleshall Road, Walton. Volume 5: Map LQ-01-110	Environment Agency records state that the landfill received household and industrial waste. The first input of waste was in July 1960 and the last input was in January 1974. No further information with regards to licence issue and surrender dates is available.

10.3.34 In addition to the above, a number of former quarries or pits are identified within the study area. It is possible that such features have been backfilled with waste materials.

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

Other regulatory data

10.3.36 The regulatory data reviewed included pollution incidents (major, significant and minor categories), radioactive and hazardous substances consents and environmental permits (previously landfill, Integrated Pollution Control and Integrated Pollution Prevention and Control licences).

10.3.37 There were two significant and three minor pollution incidents reported by the Environment Agency within the study area reported over a three year period between 1996 and 1999. The significant incidents related to the release of organic agricultural waste into a pond in 1997 and the release of oils (diesel) into a watercourse in 1997.

10.3.38 There are nine discharge consents recorded within the study area. All relate to the discharge of sewage. Five discharges are to surface water features and four are to ground.

10.3.39 There is one currently permitted or authorised Local Authority Pollution Prevention and Control activity recorded within the study area for animal feed compounding.

10.3.40 There are no nationally significant ecological designations, as defined in the land quality section of the SMR¹¹², located within the study area.

Mining/mineral resources

10.3.41 SCC is responsible for the overall mineral and waste local plans for the county. The Minerals Local Plan for Staffordshire 2015 - 2030¹¹³ was adopted in February 2017 and sets out the SCC policies aimed at controlling mineral related developments within Staffordshire up to the year 2030.

¹¹² Sensitive ecological receptors are defined as national designations such as SSSIs.

¹¹³ Staffordshire County Council, *New Minerals Plan for Staffordshire (2015-2030)*. Adopted February 2017.

- 10.3.42 Data provided by SCC indicates that there is one mineral safeguarding area (MSA) within the study area for sand and gravel resources. This covers large parts of the study area, including areas to the north-east of Pirehill House, west of Stone, north and east of Yarnfield, west of Burybank, north of Swynnerton (extending north to Beech), north of Lower Hatton and north of Stableford (extending north to Shelton under Harley).
- 10.3.43 There are no proposed Minerals Local Plan Allocations within the study area.
- 10.3.44 Data available on the SCC website indicates that there are no operational mineral sites within the study area.
- 10.3.45 The Proposed Scheme will cross an area underlain by coal at depth. BGS data¹¹⁴ indicates that the coal measures are present beneath the study area at depths of between 50m and 1.2km. This has been extensively mined until recent times. The Coal Authority has confirmed that the Proposed Scheme will not cross any areas of surface coal. The new Minerals Local Plan for Staffordshire 2015 – 2030 identifies the coal reserves as an area of hydrocarbon resource, particularly as a potential source of coal bed methane.
- 10.3.46 Planning permission has been issued for the exploration, testing and appraisal of coal bed methane and the subsequent development and operation of a hub for methane gas production at land on the Swynnerton Estate, near Blakelow. The permission expired in 2013 without being implemented.
- 10.3.47 The Proposed Scheme will also cross a Licence to Search and Bore For and Get Petroleum area on the boundary between the Stone and Swynnerton area and the Whitmore Heath to Madeley area (CA4).

Geo-conservation resources

- 10.3.48 The lower southern slopes of Hanchurch Hills, north of Swynnerton, are within the study area. These are identified as a LGS of local importance at a county level. This is an historically important site associated with Charles Darwin and his recognition of an igneous dyke. The route will cut across the Butterton-Swynnerton Dykes north of Swynnerton.

Receptors

- 10.3.49 The sensitive receptors that have been identified within this community area are summarised in Table 19. A definition of receptor sensitivity is given in the SMR.

Table 19: Summary of sensitive receptors

Issue	Receptor type	Receptor description	Receptor sensitivity
Land contamination	People	Residents at existing properties, schools and study centres	High
		Workers and visitors at nearby facilities	Moderate
		Public using PRow	Low

¹¹⁴ BGS, Geoindex Onshore, <http://mapapps2.bgs.ac.uk/geoindex/home.html>

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Issue	Receptor type	Receptor description	Receptor sensitivity
	Groundwater	Inner Zone 1, outer Zone 2 and total catchment Zone 3 – Groundwater SPZ	High
		Principal aquifer	High
		Secondary A aquifers	Moderate
		Secondary B aquifers	Low to moderate
	Surface waters	River Trent and tributaries of the River Trent, Filly Brook and tributaries of Meece Brook	Moderate
		Ponds and field drains	Low to moderate
	Built environment	Underground structures and buried services	Low
Buildings and property		Low to high	
Impacts on geo-conservation	Natural environment	Butterton-Swynnerton Dykes as they cross the Hanchurch Hills	Moderate to high
Impacts on mining/mineral sites (severance and sterilisation)	Mining/mineral sites	Sand and gravel, bedrock sand mineral safeguarding areas	Medium
		Licensed petroleum areas	Low
		Coal bed methane	Low

Future baseline

Construction (2020)

- 10.3.50 Volume 5: Appendix CT-004-000 provides details of committed developments in the Stone and Swynnerton area that are assumed to have been implemented by 2020
- 10.3.51 The committed developments that materially affect the baseline conditions for land quality in this area and form part of the future baseline assessment of the effects during construction are listed in Table 20.

Table 20: Committed developments relevant to land quality

Map book reference ¹⁴⁵	Planning reference	Description
CA3/17	13/19002/OUT	Up to 500 dwellings residential development including new access, open space, landscaping and associated infrastructure.
CA3/15	14/20854/OUT	Up to 92 dwellings and associated development including access, open space, landscaping, balancing pond and earthworks.
CA3/19	09/12911/OUT	Up to 300 dwellings and associated infrastructure, including access, parking and sports pavilion.

¹⁴⁵ Volume 5 Map Book: Maps CT-13-109b to CT-13-113a-L1

Operation (2027)

- 10.3.52 Volume 5: Appendix CT-004-000 provides details of committed developments in the Stone and Swynnerton area that are assumed to have been implemented by 2027.
- 10.3.53 No further committed developments have been identified in this area that will alter the baseline conditions in 2027 for land quality receptors.

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 will be applied to the construction of the Proposed Scheme and includes requirements to ensure the effective management and control of work in contaminated areas.
- 10.4.2 The requirements in the draft CoCP relating to work in contaminated areas will ensure the effective management and control of the work. These requirements include:
- methods to control noise, waste, dust, odour, gases and vapours (Sections 5, 7, 13 and 15);
 - methods to control spillage and prevent contamination of adjacent areas (Section 5);
 - the management of human exposure for both construction workers and people living and working nearby (Section 11);
 - methods for the storage and handling of excavated materials (both contaminated and uncontaminated) (Sections 7 and 15);
 - management of any unexpected contamination found during construction (Section 11);
 - a post-remediation permit to work system (Section 11);
 - storage requirements for hazardous substances such as oil (Section 16);
 - traffic management to ensure that there is a network of designated site haul routes to reduce compaction/degradation of soils (Section 7);
 - methods to monitor and manage flood risk and other extreme weather events, where reasonably practicable, that may affect land quality during construction (Section 5 and 16); and
 - methods to manage discovery of unknown animal burial pits (Section 6).
- 10.4.3 The draft CoCP 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 will be undertaken in accordance with Environment Agency CLR11¹¹⁶ and British Standards BS10175¹¹⁷ and BS8576¹¹⁸.

10.4.4 Where significant contamination is encountered, a remedial options appraisal will be undertaken to define the most appropriate remediation techniques. Where appropriate, this appraisal will 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 UK¹¹⁹. The preferred option will then be developed into a remediation strategy.

10.4.5 Contaminated soils excavated from within the site, where reasonably practicable, will be treated to remove or render any contamination inactive and re-used within the Proposed Scheme where needed and suitable for use. Treatment techniques could include stabilisation, soil washing and bio-remediation. Contaminated soil removed off-site will be taken to a soil treatment facility, another construction site (for treatment, as necessary, and reuse) or to an appropriately permitted landfill.

Assessment of impacts and effects

10.4.6 Construction of the Proposed Scheme in this area will require earthworks, utility diversions, deep foundations, temporary dewatering and other activities, including the construction of the various viaducts, Stone railhead/Stone IMB-R and road infrastructure works. These aspects of the Proposed Scheme, along with other construction features, are shown on the Map Series CT-05 in Volume 2: CA3 Map Book.

Land contamination

10.4.7 In line with the assessment methodology, as set out in the SMR, an initial screening process has been undertaken to identify areas of current or historical contaminative use within the study area and to consider which of these areas might pose contaminative risks for the Proposed Scheme. Sites that present a low risk have not been taken further in the assessment. Any moderate to higher risk sites have been taken forward to more detailed risk assessments, in which the potential risks are assessed more fully. The areas that have undergone the more detailed risk assessments are historical landfills, infilled pits/ponds, railway infrastructure, historical gasworks, a historical tank, existing concrete bunkers that may have historically been used by the military and a former garage. All areas assessed are shown on Maps LQ-01-109b to LQ-01-113a (Volume 5: Land quality Map Book) and those considered as potentially posing a risk to the Proposed Scheme are labelled with a reference number.

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;

¹¹⁶ Environment Agency, (2004), *CLR11 Model Procedures for the Management of Land Contamination*.

¹¹⁷ British Standard, (2011), *BS10175+A1:2013 Investigation of Potentially Contaminated Sites*.

¹¹⁸ British Standard, (2013) *BS8576 Guidance on investigations for ground gas – Permanent gases and Volatile Organic Compounds (VOCs)*.

¹¹⁹ Sustainable Remediation Forum UK, (2010), *A Framework for Assessing the Sustainability of Soil and Groundwater Remediation*.

- the vertical profile of the route;
- the presence of underlying sensitive groundwater aquifers (Principal, Secondary A or Secondary B) or nearby watercourses; and
- the presence of adjacent residential properties or sensitive ecological receptors.

10.4.9 Clusters of potentially contaminated sites of a similar nature have been grouped, and assessed together, where appropriate.

10.4.10 A summary of the baseline CSM is provided in Table 21. A more detailed assessment of baseline risk is provided in Volume 5: Appendix LQ-001-003. The potential baseline risks presented are those before any mitigation is applied. The assessed baseline risk is based on the information provided at the time of the assessment. Where limited information is available, the assessment is based on precautionary, worst case assumptions and may, therefore, report a higher risk than that which actually exists. A screening assessment of the effects of contamination has been completed by comparing the detailed CSM developed for potential contaminated areas at baseline with construction and post-construction stages.

Table 21: Summary of baseline CSM for sites which may pose a contaminative risk for the Proposed Scheme

Area reference ¹²⁰	Area name	Human health risk	Groundwater risk	Surface water risk	Buildings risk
3-50	Near Micklow House historical landfill site	Low to moderate/low	Low	Very low	Low to moderate
3-70	Existing railway (Norton Bridge to Stone Railway)	Low to moderate/low	Low	Low	Very low
3-118	Historical gasworks Swynnerton	Moderate/low	Moderate/low	Very low	Low
3-123 and 3-124	Common Lane Cold War bunkers and historical tank	Low to moderate/low	Moderate/low	Very low	Low to moderate/low
3-130	Existing railway (WCML)	Low to moderate/low	Moderate	Low	Very low
3-138	Former Stableford garage/petrol filling station	Low to moderate/low	Low	Very low	Very low to low
3-107 and 3-120	Infilled pits and ponds (Calloway Pit and Cash's Pit)	Low to moderate/low	Moderate/low	Very low	Low to moderate/low
3-165	Home Farm, Common Lane historical landfill site	Low to moderate/low	Low	Low	Very low to moderate/low

¹²⁰ Each potentially contaminated site is allocated a unique reference number (See Volume 5: Appendix LQ-001-003 and Land quality Map Book).

Temporary effects

- 10.4.11 In order to identify potential temporary effects, the baseline and construction CSM have been compared to determine the change in level of risk at receptors during the construction stage, and thus to define the level of effect at the construction stage.
- 10.4.12 Where there is no change between the main baseline risk and the main construction risk, the temporary effect significance is deemed to be neutral even if the risk is deemed to be high. For example, this will be the case where the construction of the Proposed Scheme does not alter the risks from an existing potentially contaminated site that is outside the construction boundary.
- 10.4.13 A worsening risk at construction stage compared to baseline will result in a negative effect, and conversely, an improvement will result in a positive effect. The assessment assumes that contamination will be controlled through the general measures in the draft CoCP.
- 10.4.14 All of the sites set out in Table 21 have been assessed for the change in impact associated with the construction stage of the work. The assessment has shown that whilst there are a number of minor adverse and beneficial impacts at the construction stage, none of these would be regarded as significant in line with the methodology set out in the SMR. The details of the full assessment are presented in Volume 5: Appendix LQ-001-004.
- 10.4.15 In the event that that unexpected contamination is encountered during the construction of the Proposed Scheme in this area, this will be assessed and remediated if required as described in the draft CoCP resulting in an overall beneficial effect.
- 10.4.16 Construction compounds (including the Stone railhead) located in the Stone and Swynnerton area will include the storage of potentially hazardous substances, such as fuels and lubricating oils and may also be used for temporary storage of potentially contaminated soils. Mitigation measures set out within the draft CoCP include management of risks from the storage of such materials.

Permanent effects

- 10.4.17 In order to identify potential permanent effects, a screening assessment has been undertaken comparing the baseline and post-construction CSM to assess the permanent (post-construction) effects.
- 10.4.18 All of the sites set out in Table 21 have been assessed for the change in impact associated with the post-construction (permanent) stage of the work. The assessment has shown that whilst there are a number of minor adverse and beneficial impacts at the post-construction stage, none of these would be regarded as significant in line with the methodology set out in the SMR. The details of the full assessment are presented in Volume 5: Appendix LQ-001-003.
- 10.4.19 Additional site-specific permanent remediation measures that could focus on source removal, pathway breakage or receptor protection will be developed during the detailed design stage if required. These measures will ensure that risks to people and property from gas and vapours in the ground will be controlled to an acceptable level.

Mining/mineral resources

- 10.4.20 Construction of the Proposed Scheme has the potential to affect existing mineral resources, proposed areas of mineral exploitation and/or petroleum gas reserves. This could occur by sterilisation of the resource through direct excavation during construction of the Proposed Scheme or through temporary and/or permanent severance¹²¹ or isolation that may occur during the construction phase of the Proposed Scheme, possibly continuing through to its operation.

Temporary effects

- 10.4.21 Temporary adverse effects may occur where construction compounds are proposed 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 will only be a delay in being able to access the resource, and the resource will not be lost permanently.
- 10.4.22 The following compounds fall within the MSAs:
- Meaford North Embankment satellite compound;
 - Swynnerton Embankment satellite compound; and
 - Swynnerton North Cutting main compound.

Permanent effects

- 10.4.23 The Proposed Scheme will intersect the MSA for sand and gravel extraction in nine locations within the Stone and Swynnerton area. These permanent works will sterilise the sand and gravel deposits below the construction footprint with a strip of mineral becoming sterilised. However, as a proportion of the total MSA, this strip is less than 1% of the total, and the effect on the MSA is considered to be minor, and therefore, not significant. Mitigation measures (if any) will be discussed in advance of the works with the Mineral Planning Authority, SCC, and the mineral owner.
- 10.4.24 The route of the Proposed Scheme will cross an area underlain by coal reserves within the Pennine Coal Measures. These have been extensively mined until recent times. The new Minerals Local Plan for Staffordshire 2015 – 2030 identifies the coal reserves as an area of hydrocarbon resources, particularly as a potential source of gas. Construction of the Proposed Scheme may require the sterilisation of a strip of land in which future coal mining could be constrained, but is very unlikely to place a constraint on future exploitation of potential sources of coal bed methane.
- 10.4.25 Planning permission to drill boreholes for the exploration, testing and appraisal of coal bed methane and the subsequent development and operation of a hub for methane gas production was granted for an area of land approximately 1.7km east of Swynnerton in September 2010. The development was permitted to commence within three years of the date of permission. The development has not been implemented and there is no current application to extend the expiry timescale.

¹²¹ 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.

- 10.4.26 The Proposed Scheme crosses a Licence to Search and Bore For and Get Petroleum area on the boundary of the Stone and Swynnerton area and the Whitmore Heath to Madeley area (CA4). It is unlikely that construction of the Proposed Scheme will place a constraint on future exploitation of potential sources of shale gas.
- 10.4.27 Table 22 reports the assessment of permanent effects from construction on the mining and mineral resources identified.

Table 22: Summary of effects for mining and mineral resources

Site name	Status	Description	Sensitivity/ value	Magnitude of impact	Effect and significance (Y/N)
MSA – sand and gravel	MSA	MSA for sand and gravel extraction, defined by SCC	Medium	Minor	Negligible (N)
PEL56	Licensed by UK Oil and Gas Authority	Licence to Search and Bore For and Get Petroleum	Low	Minor	Negligible (N)
Pennine Coal Measures	Unknown	Coal seams	Low	Negligible	Negligible (N)
Coal-bed methane approximately 1.7km east of Swynnerton.	Planning permission granted in 2010 but now lapsed	The drilling of boreholes for the exploration, testing and appraisal of coal bed methane and the subsequent development and operation of a hub for methane gas production	Low	Minor	Negligible (N)

- 10.4.28 There will be negligible effects on mining, mineral and gas resources in the Stone and Swynnerton area, which are not significant.

Geo-conservation sites

- 10.4.29 The Proposed Scheme will be located on the lower southern slopes of Hanchurch Hills north of Swynnerton. The igneous dykes crossing the lower southern slopes of the Hanchurch Hills are identified as an LGS of county value. It is an historically important site associated with Charles Darwin and his recognition of an igneous dyke. It is possible that the construction and operation of the Proposed Scheme would have an impact on the igneous dykes, since the route will cross the igneous dykes through the Swynnerton North cutting between approximately 650m and 1km south-east of Clifford’s Wood. The Proposed Scheme is anticipated to remove less than 1% of the surface exposure of the igneous dykes and this is not considered to result in a significant effect.

Other mitigation measures

- 10.4.30 At this stage, no additional measures are considered necessary to mitigate risks from land contamination during the construction stage beyond those that are set out in the draft CoCP and/or instigated as part of the site specific remediation strategies that will be developed at the detailed design stage if required. These measures will ensure that risks to people, the environment and property from contaminants in the ground will

be controlled such that they will not be significant. For example, measures might include excavation and treatment of contaminated soils or controls to manage movement of landfill gas and leachate.

- 10.4.31 Mitigation of the effects on mineral resources within the MSA could include extraction of the resource, for use within the Proposed Scheme, or elsewhere. Extraction from below the structural footprint of the route of the Proposed Scheme will not occur, as the permanent railway will 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

- 10.4.32 With the application of the mitigation measures detailed above, no likely significant residual effects are anticipated with respect to land quality.

Cumulative effects

- 10.4.33 No significant cumulative temporary or permanent effects during construction with regard to land contamination, mineral resources or geo-conservation sites are anticipated.

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, including the Stone IMB-R, will be in accordance with environmental legislation and good practice. Spillage and pollution response procedures similar to those outlined in the draft CoCP will be established for all high risk activities and employees will be trained in responding to such incidents.

Assessment of impacts and effects

- 10.5.3 The Proposed Scheme within this area will include three auto-transformer stations, located at Yarnfield Lane, Swynnerton and Stableford. 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 will 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, any such leakage or spillage is expected to be very small and unlikely to result in significant contamination.

Other mitigation measures

- 10.5.5 No other mitigation measures are expected to be required beyond what has already been outlined relating to land quality in the study area.

Summary of likely residual significant effects

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

Cumulative effects

- 10.5.7 No cumulative effects during operation on land quality receptors have been identified in the Stone and Swynnerton area.

Monitoring

- 10.5.8 Volume 1, Section 9 sets out the general approach to environmental monitoring during operation of the Proposed Scheme.
- 10.5.9 Requirements for monitoring will be determined as part of the site investigation, treatment and validation of contamination on a site specific basis as part of the detailed design process. Monitoring requirements may include water quality, air quality and/or (landfill) gases, depending on the site being considered.

11 Landscape and visual

11.1 Introduction

- 11.1.1 This section of the report presents the assessment of the likely significant landscape and visual effects within the Stone and Swynnerton area. It summarises the baseline conditions found within and around the Proposed Scheme and describes the likely impacts and significant effects during construction and operation on landscape and visual receptors.
- 11.1.2 The operational assessment section refers not just to the running of the trains, vehicles on roads and associated lighting but also the presence of the new permanent infrastructure associated with the Proposed Scheme.
- 11.1.3 Engagement has been undertaken with Staffordshire County Council (SCC) and Natural England. The purpose of this engagement has been to discuss the assessment methodology, the extent of the landscape and visual study area, the distribution of visual receptor viewpoints and the location of verifiable photomontages.
- 11.1.4 Further details on the landscape and visual assessment, including engagement, baseline information and assessment findings, are presented in the Volume 5: Landscape and visual Map Book and Volume 5: Appendix LV-001-003, which comprises the following:
- Part 1 Engagement with technical stakeholders;
 - Part 2 Landscape character assessment;
 - Part 3 Visual assessment; and
 - Part 4 Assessment matrices.
- 11.1.5 Maps showing the location of the key environmental features (Map Series CT-10) and the key construction (Map Series CT-05) and key operational (Map Series CT-06) features of the Proposed Scheme can be found in the Volume 2: CA3 Map Book.
- 11.1.6 The Volume 2: CA3 Map Book also includes Map Series LV-03 (Construction phase viewpoints), Map Series LV-04 (Operation phase viewpoints) and Map Series LV-01 (Verifiable photomontages), showing viewpoints that will be significantly affected.
- 11.1.7 A separate, but related, assessment of effects on historic landscape character and the setting of heritage assets is reported in Section 7, Cultural heritage.

11.2 Scope, assumptions and limitations

- 11.2.1 The scope, key assumptions and limitations for the landscape and visual assessment are set out in full in Volume 1 (Section 8), the Scope and Methodology Report (SMR)¹²², and the SMR Addendum¹²³.

¹²² Volume 5: Appendix CT-001-001, Environmental Impact Assessment Scope and Methodology Report.

¹²³ Volume 5: Appendix CT-001-002, Environmental Impact Assessment Scope and Methodology Report Addendum.

- 11.2.2 Winter surveys for the landscape and visual assessment were undertaken from January to March 2016 and February 2017 to inform the assessment. Summer field surveys, including photographic studies of landscape character areas (LCA) and visual assessment of viewpoints, were undertaken from July to September 2016. During the baseline survey, there were some areas that were inaccessible (such as private land, commercial premises and residential buildings). In these instances, professional judgement has been used to approximate the likely views from these locations.
- 11.2.3 The extent of the study area has been informed by construction and operational phase zones of theoretical visibility (ZTV). The ZTV have been produced in line with the methodology described in the SMR and SMR Addendum, 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 ZTV, and professional judgement on site visits has been used to further refine the study area to focus on likely significant effects.
- 11.2.4 Tall construction plant (for example cranes and piling rigs) is excluded from the ZTV for the construction phase, as there is a great degree of variability in the extent and timeframes of the visibility of construction activity and plant. Overhead line equipment rarely gives rise to significant effects if it is the only element visible and has, therefore, been excluded from the ZTV to give a better indication of the possible spread of significant effects to aid the assessment. Overhead line equipment is described and taken into account in the assessment of effects on LCAs and visual receptors.
- 11.2.5 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 Walton, Yarnfield and Swynnerton.
- 11.2.6 Professional judgements on landscape value, susceptibility and sensitivity are summarised in the baseline descriptions in the proformas in Volume 5: Appendix LV-001-003, Part 2.

11.3 Environmental baseline

Existing baseline

Landscape baseline

- 11.3.1 The study area extends from the undulating farmlands south of Stone, to Swynnerton and Swynnerton Old Park in the north. It includes the 18th century picturesque, Brownian¹²⁴ parkland of Swynnerton Park, plus the associated planned estate farmland landscape of woodlands, game coverts and assarted¹²⁵ fields of the Stafford Estate around Clifford's Wood, the parklands of Barlaston Hall and the historic hunting woodland of Tittensor Chase. The study area encompasses a lowland riverine landscape associated with the River Trent Valley, north of Stone. Woodland blocks overlaid upon a gently undulating farmed landscape with rectilinear Parliamentary Enclosure fields¹²⁶ and winding rural lanes are characteristics associated with the

¹²⁴ Landscape designed by landscape architect Lancelot 'Capability' Brown.

¹²⁵ Private farmland formed out of common land including woodland.

¹²⁶ Fields that date from the parliamentary enclosure acts, typically of the 18th and 19th century.

tributary valley of Meece Brook Valley. The wooded escarpment of Swynnerton Old Park forms a distinctive and prominent skyline feature on an elevated sandstone outcrop in the north of the study area.

- 11.3.2 A number of historic settlements are connected to a network of rural lanes, notably the towns of Stone and Walton, which is primarily a 19th century extension to Stone, and the villages of Yarnfield and Swynnerton. There are also smaller villages such as Tittensor, a compact nucleated settlement dating back to Domesday. There are more modern forms of development, such as the MoD Swynnerton Training Area. Large linear transport corridors are also a prominent feature of the area, notably the M6, the A34 Stafford Road/The Fillybrooks and the A51 Stone Road, as well as the WCML.
- 11.3.3 The LCAs have been determined as part of an integrated process of environmental characterisation, informed by the outcome from other topics including the historic landscape character and ecological assessments. Use has been made of published landscape character assessments, historic landscape characterisation (HLC) and a wide range of supporting GIS data, aerial photography and Ordnance Survey mapping, plus desk study and fieldwork. Landscape character assessments reviewed include the Staffordshire Landscape Guidelines¹²⁷ and relevant National Landscape Character Area¹²⁸ (NCA Profile: 61 Shropshire, Cheshire and Staffordshire Plain, NE556).
- 11.3.4 For the purposes of this assessment, the study area for Stone and Swynnerton has been subdivided into 11 LCAs. Full descriptions of the 11 LCAs are contained within Volume 5: Appendix LV-001-003, Part 2.

Visual baseline

- 11.3.5 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: CA3 Map Book, Map Series LV-03 and LV-04). They are described and assessed in full in the proformas in Volume 5: Appendix LV-001-003, Part 3. 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: Recreational¹²⁹, 4: Transport, 5: Hotels/healthcare (none within this area), and 6: Employment (none within this area).
- 11.3.6 Residential visual receptors within the area are located within large settlements, including Stone and Walton, villages such as Yarnfield and Swynnerton, a scattering of smaller settlements such as Tittensor, Cold Norton and numerous farmsteads.
- 11.3.7 Views from settlement edges are typically filtered and framed by intervening and field boundary vegetation, which allied to low lying and gently undulating landform, partially restricts open views.

¹²⁷ 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>

¹²⁸ 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>

¹²⁹ Reference to specific civil parish numbers for footpaths is provided where available, otherwise the adjacent road name is used as a reference to the footpath.

- 11.3.8 A range of recreational visual receptors are located at Swynnerton Old Park, the golf course at Barlaston Golf Club plus the extensive public rights of way (PRoW) network.
- 11.3.9 Views from recreational receptors on elevated positions, such as Swynnerton Old Park, include occasional long range views, although these are primarily restricted by dense woodland. Views from the majority of public rights of way (PRoW) in this area are lower lying and restricted by woodland blocks, hedgerows and parkland tree cover.
- 11.3.10 Views for users travelling on the B5026 Eccleshall Road are typically defined by gently undulating landform, whereas views for users of roads such as the A51 Stone Road and the A519 Newcastle Road are typically characterised by parkland shelter belts, mature field boundary vegetation and field trees associated with the Swynnerton Estate, providing a degree of visual filtering and framing.

Future baseline

Construction (2020)

- 11.3.11 Volume 5: Appendix CT-004-000 provides details of the developments in the Stone and Swynnerton area that are assumed to have been implemented by 2020.
- 11.3.12 No committed developments have been identified in this area that will materially alter the baseline conditions in 2020 for landscape and visual receptors.

Operation (2027)

- 11.3.13 No committed developments have been identified in this area that will materially alter the baseline conditions in 2027 for landscape.
- 11.3.14 However, the committed developments in Table 23 have been identified that will introduce new sensitive visual receptors relatively close to the Proposed Scheme, with a similar view to those illustrated by viewpoints already identified in the assessment. These have been included as part of the baseline conditions for assessment of operational effects.

Table 23: Committed developments relevant to landscape and visual

Map book reference ¹³⁰	Planning reference	Description
CA/19	09/12911/OUT	Up to 300 dwellings and associated infrastructure, including access, parking and sports pavilion.
CA3/17	13/19002/OUT	Residential development including new access, open space, landscaping and associated infrastructure.
CA3/15	14/20854/OUT	Up to 92 dwellings and associated development including access, open space, landscaping, balancing pond and earthworks.

¹³⁰ Volume 5 Map Book: Maps CT-13-109b to CT-13-113a-L1

11.4 Temporary effects arising during construction

- 11.4.1 As is commonplace with major infrastructure works, the scale of the construction activities means that works will be visible from many locations and will have the potential to give rise to significant temporary effects that cannot practicably be mitigated. Such effects are temporary and will 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 will take place, including the establishment of compounds, main earthworks and structure works.
- 11.4.2 The effects associated with the peak construction phase in this area are generally considered to be medium-term, based on the indicative construction programme in Section 2.3. The peak civil engineering stage in this area will be undertaken between the start of 2021 and the end of 2024. Effects during other stages of works are likely to be less intensive due to less construction equipment being required at the time and a reduced intensity of construction activity.
- 11.4.3 Section 2.2 sets out the the key permanent features of the Proposed Scheme and Section 2.3 describes the construction compounds and associated temporary works that have been considered in this assessment.

Avoidance and mitigation measures

- 11.4.4 Effects during the construction period may be reduced by establishing planting early in the construction programme. Early planting is proposed at Yarlet North cutting, Yarnfield North embankment, Swynnerton embankment and Swynnerton North cutting main compound and satellite compounds, which will provide additional screening towards the end of the construction period and provide greater integration of the Proposed Scheme into the landscape.
- 11.4.5 Measures that have been incorporated into Sections 12 and 14 of the draft Code of Construction Practice (CoCP)¹³¹ to avoid or reduce landscape and visual effects, where reasonably practicable during construction, include the following:
- avoidance of unnecessary tree and vegetation removal, and protection of existing trees in accordance with BS 5837: Trees in relation to design, demolition and construction¹³²;
 - use of well-maintained hoardings and fencing;
 - prevention of damage to the landscape features adjacent to the construction sites due to movement of construction vehicles;
 - designing lighting to avoid unnecessary intrusion onto adjacent buildings and other land uses; and

¹³¹ Volume 5: Appendix CT-003-000, Code of Construction Practice.

¹³² BS 5837:2012 Trees in relation to design, demolition and construction – Recommendations, 2012, British Standard.

- replacement of any trees intended to be retained which may die as a consequence of nearby construction works.

11.4.6 Implementation of these measures has been taken into account in the assessment of the construction effects.

Assessment of temporary impacts and effects

11.4.7 The most apparent changes to landscape and the views experienced during construction will relate to: presence of construction plant and the Stone railhead; excavation of cuttings; erection of viaducts; construction of embankments; soils and material storage; the removal of existing landscape elements, including trees and hedgerows; and the closure, diversion and realignment of existing roads and PRow. Other key changes include the construction of overbridges and underbridges, property demolitions, and the presence of compounds and transfer nodes.

Landscape assessment

11.4.8 The four LCAs set out in Table 24 will be significantly affected during construction. Full details of effects are described in Volume 5: Appendix LV-001-003, Part 2.

Table 24: Construction phase significant landscape effects

Yarnfield Settled Farmlands	Medium susceptibility and sensitivity
<p>This landscape will be impacted by construction activity and equipment associated with Filly Brook and M6 Meaford viaduct (including the presence of tower cranes), Yarnfield South, Yarnfield North and Meaford South embankments, and a series of overbridges and underbridges. Activity and construction plant associated with the Stone railhead main compound (plus associated lighting in relation to the Stone railhead) and satellite compounds will introduce built form within the largely rural landscape.</p> <p>The landscape will also be impacted by the presence of construction routes and materials stockpiling, substantially altering the open, rural character of the landscape. Together, these elements will introduce a degree of landscape severance, and disturbance to the simple, open landscape pattern.</p> <p>Construction of the Proposed Scheme will result in a high magnitude of change and major adverse effect on this LCA, which is significant.</p>	
Swynnerton Park Sandstone Hills and Heaths	Medium susceptibility and high sensitivity
<p>This landscape will be impacted by construction activity and equipment associated with the M6 Meaford (including the presence of tower cranes), Meaford North and Swynnerton embankments, Swynnerton South and Swynnerton North cuttings, a series of underbridges, and underground utility works for new low voltage power lines. Lighting associated with Stone railhead main compound and the Stone railhead (in the adjacent Yarnfield Settled Farmlands LCA) and satellite compounds will introduce built form within the planned estate landscape.</p> <p>The landscape will also be impacted by the presence of site haul routes and material stockpiling, altering the character of the planned estate landscape and the rural skyline. Together these elements will result in a change to scenic quality, sense of tranquillity and history and character of the undulating, largely intact landscape.</p> <p>Construction of the Proposed Scheme will result in a high magnitude of change and major adverse effect on this LCA, which is significant.</p>	
Swynnerton Village Sandstone Hills and Heaths	Medium susceptibility and sensitivity
<p>This landscape will be impacted by construction activity and equipment associated with Hatton embankment, Swynnerton North, Hatton South and Hatton North cuttings, a series of overbridges and underbridges and road diversions and realignments.</p> <p>The landscape will also be impacted by the presence of construction routes and materials stockpiling, altering the undulating rural landscape. Together, these elements will introduce a degree of landscape severance and removal of the distinctive characteristics, such as a section of Clifford's Wood and the small scale irregular fields assarted from woodland to the north of</p>	

Clifford's Wood. This will alter the scenic, rural character and further impose on the complex land form and land use pattern of this landscape.

Construction of the Proposed Scheme will result in a **high magnitude of change and major adverse effect** on this LCA, which is significant.

Meece Brook Valley Sandstone Hills and Heaths

Medium susceptibility and sensitivity

This landscape will be directly impacted by construction activity and equipment associated with Dog Lane overbridge and the realignment of Bent Lane to form Bent Lane (South). It will also be indirectly impacted by the construction activity within the adjacent Swynnerton Village Sandstone Hills and Heaths LCA, which will impose on the valley landscape and wooded ridges due to its scale and prominence on the higher ground. The works to Bent Lane will include use as a construction traffic route and will require widening, which will be uncharacteristic of the existing rural lane network.

The landscape will also be impacted by the presence of material stockpiles, which will add features that form prominent elements and alter the character of the rural valley landscape. These elements will introduce an intensification of the landscape severance and further degradation of the perception of the rural landscape.

Construction of the Proposed Scheme will result in a **medium magnitude of change and a moderate adverse effect** on this LCA, which is significant.

Visual assessment

Introduction

- 11.4.9 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, will be in leaf. Where residential receptors will experience significant effects at night-time arising from additional lighting, these are also presented in this section. Visual receptors who will experience non-significant effects are reported in Volume 5: Appendix LV-001-003.
- 11.4.10 Where a viewpoint represents multiple types of receptor, the assessment is based on the most sensitive receptor. Effects on other receptor types with lower sensitivity will be lower than those reported.
- 11.4.11 The visual assessment has identified locations where continuous night working and/or overnight working during construction will result in significant effects on residential receptors (summarised in Table 25 and described in detail in Volume 5: Appendix LV-001-003, Part 3).
- 11.4.12 Additional lighting will not give rise to significant effects due to the nature of the construction programme, except at Stone railhead main compound where night working will be required for periods of time.
- 11.4.13 Table 25 describes the construction phase significant visual effects. These are described in detail in Volume 5: Appendix LV-001-003 and shown in Map Series LV-03 in the Volume 2: CA3 Map Book.

Table 25: Construction phase significant visual effects

Views west from Stone Rural Footpath 29

(VPs 014.03.001 and 014.03.002)

Residents and users of the footpath will have medium range views of the construction of Yarlet Central cutting, Stone Rural Footpath 28 accommodation overbridge and Yarlet embankment.

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These works, associated earthworks, construction equipment, movement of construction vehicles and material stockpiles will result in new features that form prominent, incongruous elements in the views across the open rural landscape and interrupt the undulating landform and rural, wooded skyline.

Construction of the Proposed Scheme will result in a **high magnitude of visual change and major adverse effect**, which is significant.

Views west from A34 Stone Road

(VPs 014.04.006)

Users of A34 Stone Road will have partially filtered medium range views of the construction of Yarlet central cutting, Stone Rural Footpath 28 accommodation overbridge and Yarlet embankment.

These works, associated earthworks, construction equipment, movement of construction vehicles and material stockpiles will result in new features that will substantially change the characteristics of the existing views across the rural landscape and interrupt the undeveloped rural skyline.

Construction of the Proposed Scheme will result in a **medium magnitude of visual change and moderate adverse effect**, which is significant.

Views west from residences to the west of Walton

(VPs 015.02.002 and 015.02.004)

Residents will have filtered medium range views of the construction of Yarlet North cutting, Stone Rural Bridleway 0.1135 accommodation overbridge, Stone Rural Footpath 32 accommodation overbridge, B5026 Eccleshall Road overbridge and new low voltage overhead power lines.

Yarlet Embankment satellite compound will also be apparent in the middle ground of the views. These works, associated earthworks, construction equipment, movement of construction vehicles and material stockpiles will result in new features that form prominent, incongruous elements in the views across the large scale pasture landscape and interrupt characteristic hedgerow field boundaries and small woodland blocks and the undeveloped rural horizon. Residents will have filtered views due to intervening vegetation and the sloping land form.

Construction of the Proposed Scheme will result in a **high magnitude of visual change and major adverse effect**, which is significant.

Views west from Walton Heath Farm

(VPs 015.02.009)

Residents will have partially filtered close-medium range views of the construction of Yarlet North cutting, Stone Rural Footpath 32 accommodation overbridge, and the B5026 Eccleshall Road overbridge.

These works, associated earthworks, construction equipment, movement of construction vehicles and material stockpiles will result in substantial change to the views of rural pasture landscape and the wooded shelter belts on the horizon, despite hedgerow field boundaries and field trees partially filtering the views.

Construction of the Proposed Scheme will result in a **high magnitude of visual change and major adverse effect**, which is significant.

The view of the Proposed Scheme from viewpoint 015.02.009 during construction is illustrated on the photomontage shown in Figure LV-01-594 (Volume 5: Appendix LV-001-003).

Views east from B5026 Eccleshall Road in the vicinity of Stafford Motorway Service Area (Northbound) and from Chebsey Footpath 7 near Cold Norton

(VPs 015.04.011 and 015.03.012)

Users of the B5026 Eccleshall Road and users of the footpath will have medium range views of the construction of the B5026 Eccleshall Road overbridge, Yarnfield South embankment, Filly Brook viaduct (including the presence of tower cranes), Yarnfield North embankment, Yarnfield North embankment transfer node and new low voltage overhead power lines.

The Stone railhead main compound will also be apparent in the middle ground of the views. These works, associated earthworks, construction equipment and plant, movement of construction vehicles and material stockpiles will result in a noticeable change to the view across the gently sloping arable landscape, interrupting the horizon and introducing elements that are uncharacteristic and out of scale with the view.

Construction of the Proposed Scheme will result in a **high magnitude of visual change and major adverse effect** for users of Chebsey Footpath 7 (viewpoint 015.03.012), which is significant.

Views for users of B5026 Eccleshall Road (viewpoint 015.04.011) are more filtered due to the rising landform, and therefore, construction of the Proposed Scheme will result in a **medium magnitude of visual change and moderate adverse effect**, which is significant.

View west from Darlaston Grange, Yarnfield Lane

(VP 016.02.002)

Residents will have filtered medium range views of the construction of the B5026 Eccleshall Road overbridge, Yarnfield South embankment, Filly Brook viaduct (including the presence of tower cranes) and Yarnfield North embankment.

Yarlet North cutting satellite compound and Stone railhead main compound (and associated lighting) will also be apparent in the middle ground of the views. These works, associated earthworks, construction equipment, movement of construction vehicles and material stockpiles will result in a noticeable change to the characteristics of the sloping rural landscape and introduce elements that interrupt the rural skyline and foreshorten the long distance views.

Construction of the Proposed Scheme will result in a **high magnitude of visual change and major adverse effect**, which is significant.

The view of the Proposed Scheme from viewpoint 016.02.002 during construction is illustrated on the photomontage shown in Figure LV-01-595 (Volume 5: Appendix LV-001-003).

At night the lighting associated with the Stone railhead main compound will be clearly visible as a distinct element in a predominantly dark night sky. It will noticeably add to the distant sky glow from surrounding settlements and light spill from vehicles on this unlit section of the M6, substantially changing the view at night.

At night the construction of the Proposed Scheme will result in a **high magnitude of visual change and major adverse effect**, which is significant.

Views north east from Swynnerton Footpath 38

(VP 016.03.008)

Users of the footpath will have close range views of the construction of Meaford cutting, Meaford South embankment, M6 Meaford viaduct (including the presence of tower cranes), Meaford North embankment, Swynnerton Footpath 27 accommodation underbridge and installation equipment associated with underground low voltage power lines.

Stone railhead main compound, M6 Meaford viaduct satellite compound and Meaford North embankment satellite compound will also be apparent. These works, associated earthworks, construction equipment, movement of construction vehicles, movement of material and material stockpiles will result in substantial alterations to the view of the pastoral landscape, particularly as the footpath will be used as a site haul route adjacent to the viewpoint location and the existing shelter belt partially screening the M6 will be removed, resulting in open views of the works.

Construction of the Proposed Scheme will result in a **high magnitude of visual change and major adverse effect**, which is significant.

Views north east from Swynnerton Footpath 42, residences at Beech House Stud and from Moss Lane/Yarnfield Lane

(VPs 016.03.012, 016.02.013 and 016.02.014)

Residents and users of the footpath will have medium range views of the construction of Yarlet North cutting, Yarnfield South embankment, Filly Brook viaduct (including the presence of tower cranes), Yarnfield North embankment, Yarnfield Lane realignment, Yarnfield Lane M6 overbridge replacement, Yarnfield Lane underbridge and Meaford cutting.

Stone railhead main compound (and associated lighting) and Yarlet North cutting satellite compound will also be apparent in the middle ground of the views. These works, associated earthworks, construction equipment, movement of construction vehicles, site haul routes and material stockpiles will result in noticeable change to the existing views of the rising landform and interrupt long distance view towards a wooded ridge, despite being partially filtered by intervening vegetation.

Construction of the Proposed Scheme will result in a **high magnitude of visual change and major adverse effect**, which is significant.

For residents at viewpoints 016.02.013 and 016.02.014 at night the lighting associated with the Stone railhead main compound will be clearly visible as a distinct element in a predominantly dark night sky. It will add significantly to the individual property lighting from Beech House Stud, sky glow from Yarnfield, behind the views, and light spill from vehicles on this unlit section of the M6, substantially changing the view at night.

At night the construction of the Proposed Scheme will result in a **high magnitude of visual change and major adverse effect**, which is significant.

Views north east from Swynnerton Footpath 37

(VP 017.03.001)

Users of the footpath will have filtered medium range views of the construction of M6 Meaford viaduct (including the presence of tower cranes), Meaford North embankment, Swynnerton Footpath 27 accommodation underbridge, Swynnerton South cutting, Swynnerton embankment and Swynnerton Estate South underbridge

Stone railhead main compound and Meaford North embankment satellite compound will also be apparent. These works, associated earthworks, construction equipment, movement of construction vehicles and material stockpiles will result in new

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features that form prominent, incongruous elements in the views across the parkland landscape and interrupt the long distance rural views. However, the intervening hedgerow, mature parkland trees and tree groups will filter the views.

Construction of the Proposed Scheme will result in a **medium magnitude of visual change and moderate adverse effect**, which is significant.

Views north east from Grange Cottage on Hall Lane

(VP 017.02.003)

Residents will have close range views of the construction of Meaford North embankment, trenches excavated for underground power lines, Swynnerton Footpath 27 accommodation underbridge, Swynnerton South cutting, Swynnerton embankment and Swynnerton Estate South underbridge.

Meaford North embankment satellite compound will also be apparent in the middle ground. These works, associated earthworks, construction equipment, movement of construction vehicles and material stockpiles will result in new features that form prominent, incongruous elements in the views across the parkland and planned estate, which will foreshorten the background views of the rural landscape and will be in proximity to residences.

Construction of the Proposed Scheme will result in a **high magnitude of visual change and major adverse effect**, which is significant.

View south west from residences at Blakelow on Swynnerton Footpath 27

(VP 017.02.004)

Residents will have close range partially filtered views of the construction of M6 Meaford viaduct, Meaford North embankment, new underground power lines, Swynnerton Footpath 27 accommodation underbridge and Swynnerton South cutting.

M6 Meaford viaduct satellite compound and Meaford North embankment satellite compound will also be apparent. These works, associated earthworks, construction equipment, movement of construction vehicles and material stockpiles will result in substantial changes in proximity to residences, which are incongruous with the existing rural arable landscape and will reduce the visual dominance of the woodland shelter belts associated with Swynnerton Park.

Construction of the Proposed Scheme will result in a **high magnitude of visual change and major adverse effect**, which is significant.

At night, the lighting associated with the Stone railhead main compound will be visible as sky glow above the woodland blocks within a predominantly dark night sky, adding to the light spill from vehicles on this unlit section of the M6. However, this lighting will be filtered by intervening vegetation and will reduce the visual impact of the lighting installation.

At night the construction of the Proposed Scheme will result in a **medium magnitude of visual change and moderate adverse effect**, which is significant.

Views west from Stone Rural Footpath 34 at The Marlings and the A51 Stone Road

(VPs 017.02.005 and 017.04.007)

Residents and users of the A51 Stone Road will have filtered medium range views of the construction of Meaford South embankment, M6 Meaford viaduct (including the presence of tower cranes), Meaford North embankment, new underground power lines, Swynnerton South cutting, Swynnerton embankment and Swynnerton Estate South underbridge.

M6 Meaford viaduct satellite compound and Meaford North satellite compound will also be apparent in the middle ground of the views. These works, associated earthworks, construction equipment, movement of construction vehicles and material stockpiles will result in changes, which will be viewed as one of a series of components in the mid-ground, causing severance of the parkland shelter belts associated with Swynnerton Park on the horizon.

Construction of the Proposed Scheme will result in a **medium magnitude of visual change and moderate adverse effect**, which is significant.

At night the lighting associated with the Stone railhead main compound will be visible, for residents at viewpoints 017.02.005, as sky glow above intervening vegetation within a predominantly dark night sky, adding to the light spill from vehicles on this unlit section of the M6. However, this lighting will be filtered by intervening vegetation and will reduce the visual impact of the lighting installation.

At night construction of the Proposed Scheme will result in a **medium magnitude of visual change and moderate adverse effect**, which is significant.

Views south west from residences at Chase Lane

(VP 017.02.010)

Residents will have filtered medium range views of the construction of Swynnerton embankment, Swynnerton New Bridleway accommodation underbridge, Swynnerton North cutting and Tittensor Road overbridge.

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These works, associated earthworks, construction equipment, movement of construction vehicles and material stockpiles will result in new features in the view within a relatively short distance, which will interrupt the characteristic hedgerow field boundaries and mature parkland shelter belts associated with Swynnerton Park.

Construction of the Proposed Scheme will result in a **medium magnitude of visual change and moderate adverse effect**, which is significant.

Views west from residences at Cumberstone Wood Farm and Swynnerton Footpath 49

(VPs 017.02.011 and 017.03.012)

Residents and users of the footpath will have filtered long range views of the construction of Swynnerton embankment, Swynnerton New Bridleway accommodation underbridge and Swynnerton auto-transformer station.

Swynnerton embankment satellite compound will also be apparent in the background views. These works, associated earthworks, construction equipment, movement of construction vehicles and material stockpiles will result in a notable change to the filtered views of the undulating pasture landscape and interrupt the prominent wooded ridge, however, they will be long distance views.

Construction of the Proposed Scheme will result in a **medium magnitude of visual change and moderate adverse effect**, which is significant.

Views south-west from residences at Sanford Cottage, A51 Stone Road

(VP 017.02.013)

Residents of Sanford Cottage will have filtered close range views of the construction of Swynnerton embankment, Swynnerton New Bridleway accommodation underbridge and Swynnerton North cutting.

Swynnerton embankment satellite compound will also be apparent in these views. These works, associated earthworks, construction equipment, movement of construction vehicles and material stockpiles will result in new features that form prominent, incongruous elements in the views across the rolling rural landscape and will cause visual severance of the parkland shelter belts associated with Swynnerton Park, despite intervening vegetation partially filtering the views.

Construction of the Proposed Scheme will result in a **high magnitude of visual change and major adverse effect**, which is significant.

Views north east from Hall Lane, Stone Circles Challenge and from track towards residences at Lodge Covert Cottage

(VPs 017.03.014 and 017.03.016)

Users of the footpaths will have filtered medium range views of the trenches excavated for the diversion and underground placement of Western Power District overhead power lines. Additionally, there will be filtered medium range views of the construction of Swynnerton South cutting, Swynnerton embankment, Swynnerton Estate South underbridge, Swynnerton New Bridleway accommodation underbridge, Tittensor Road diversion, Swynnerton auto-transformer station, Swynnerton North cutting and Stab Lane road closure.

Swynnerton embankment satellite compound will also be apparent in the middle ground. These works, associated earthworks, construction equipment, movement of construction vehicles and material stockpiles will result in substantial change and new incongruous features in the views across the parkland landscape, albeit filtered by intervening vegetation.

Construction of the Proposed Scheme will result in a **medium magnitude of visual change and moderate adverse effect**, which is significant.

Views north-east from residences on Main Street, Swynnerton

(VP 017.02.017)

Residents will have filtered close range views of the construction of Tittensor Road diversion. There will also be filtered medium range views from the upper floors of the properties on Main Street of construction activity associated with Tittensor Road overbridge, Swynnerton embankment, Swynnerton embankment satellite compound, Swynnerton North cutting, and the A51 Stone Road diversion.

These works, associated earthworks, construction equipment, movement of construction vehicles and material stockpiles will result in noticeable change to the characteristics of the views along the village street bound by vegetation.

Construction of the Proposed Scheme will result in a **medium magnitude of visual change and moderate adverse effect**, which is significant.

Views east from Swynnerton Footpath 23 and Stone Circles Challenge and the residence of Whitehouse north of Swynnerton

(VPs 017.03.020, 018.02.001 and 018.03.003)

Recreational receptors and residents will have close to medium range views of construction of Swynnerton embankment, Tittensor Road diversion, Swynnerton North cutting, Tittensor Road overbridge, the A51 Stone Road diversion and Stab Lane closure.

The Swynnerton embankment satellite compound and Swynnerton North cutting main compound (and associated lighting) will also be apparent in the middle ground of the views. These works, associated earthworks, material stockpiles, site haul routes and the presence of construction equipment and movement of construction vehicles will result in new features that form prominent, incongruous elements in the views across the sloping arable fields. These works will interrupt the characteristic dense woodland, including Closepit Plantation and hedgerow field boundaries, which form the horizon. The construction activity will result in the removal of Cash's Pit and Stabhill Plantation, increasing the prominence of the works.

Construction of the Proposed Scheme will result in a **high magnitude of visual change and major adverse effect**, which is significant.

The view of the Proposed Scheme from viewpoint 017.03.020 during construction is illustrated on the photomontage shown in Figure LV-01-596 (Volume 5: Appendix LV-001-003).

Views east from residences at Swynnerton Heath Farm, Standon Footpath 30 and residents on the A51 Stone Road

(VPs 018.02.002, 018.03.004 and 018.02.006)

Residents and users of the footpath will have filtered views over a range of distances of the construction works associated with Swynnerton North cutting, A51 Stone Road diversion, Bottom Lane road closures, A519 Newcastle Road overbridge and Swynnerton Heath Farm overbridge

Swynnerton North cutting main compound (and associated transfer node and lighting) will also be apparent. These works, associated earthworks, material stockpiles, and the presence of construction equipment and movement of construction vehicles will result in new features that form prominent, incongruous elements in the views. The removal of Cash's Pit, Stabhill Plantation and a section of Clifford's Wood will increase the change to views.

For residents (viewpoints 018.02.002 and 018.02.006) construction of the Proposed Scheme will result in a **high magnitude of visual change and major adverse effect**, which is significant.

For users of the Standon Footpath 30 (viewpoint 018.03.004), due to the long distance views being filtered, construction of the Proposed Scheme will result in a **medium magnitude of visual change and moderate adverse effect**, which is significant.

View south west from Keepers Cottage, Old Lane

(VP 018.02.008)

Residents will have filtered long range views of construction of Hatton embankment, Swynnerton Estate Central underbridge and Swynnerton North overbridge.

These works, associated earthworks, material stockpiles, and the presence of construction equipment and movement of construction vehicles will change the views across the rural landscape of arable fields and woodland shelter belts. The removal of a section of Clifford's Wood will increase the change to views.

Construction of the Proposed Scheme will result in a **medium magnitude of visual change and moderate adverse effect**, which is significant.

Views west from the A519 Newcastle Road, and Swynnerton Footpath 54

(VPs 018.04.009, 018.03.010 and 018.03.013)

Users of the A519 Newcastle Road and the footpath will have filtered medium range views of the construction of Swynnerton North cutting, the A51 Stone Road diversion, Stab Lane and Bottom Lane road closures. The A519 Newcastle Road overbridge, Swynnerton Heath Farm overbridge, Hatton embankment and Swynnerton Estate Central underbridge will also be visible in the middle ground.

Swynnerton North cutting main compound and the Swynnerton North cutting transfer node will also be apparent. These works, associated earthworks, construction equipment, movement of construction vehicles, movement of material and material stockpiles will change the views across the rural undulating landscape. The removal of Cash's Pit and a section of Clifford's Wood will increase the change to views.

Construction of the Proposed Scheme will result in a **medium magnitude of visual change and moderate adverse effect**, which is significant.

The view of the Proposed Scheme from viewpoint 018.03.013 during construction is illustrated on the photomontage shown in Figure LV-01-598 (Volume 5: Appendix LV-001-003).

Views west from Swynnerton Footpaths 13, 14 and 15

(VPs 019.03.002, 019.03.003 and 019.03.004)

Users of the footpaths will have filtered medium to long range views of the construction of Hatton embankment, Swynnerton Estate Central underbridge, Swynnerton Estate North green overbridge, Swynnerton Footpath 52 accommodation underbridge, Hatton South cutting and Swynnerton Footpath 15 green overbridge.

Hatton South cutting satellite compound will also be apparent in the view. These works, associated earthworks, construction equipment, movement of construction vehicles and material stockpiles will change the views across the rural undulating landscape. The removal of a section of Clifford's Wood, will increase the change to views.

For users of Swynnerton Footpath 13 and 14 (viewpoints 019.03.002 and 019.03.003), construction of the Proposed Scheme will result in a **medium magnitude of visual change and moderate adverse effect**, which is significant.

Due to the more open views, for users of Swynnerton Footpath 15 (viewpoint 019.03.004), construction of the Proposed Scheme will result in a **high magnitude of visual change and major adverse effect**, which is significant.

Views west from Dog Lane and a route with public access adjacent to Swynnerton Old Park

(VPs 019.04.006 and 019.03.007)

Users of Dog Lane and the route with public access will have filtered medium range views of the construction of Hatton South cutting, Dog Lane realignment, Dog Lane overbridge, Hatton North cutting, Bent Lane (North) diversion, Bent Lane (South) realignment and alterations to existing overhead power lines and new overhead low voltage power lines.

Hatton North cutting satellite compound will also be apparent. These works, associated earthworks, construction equipment, movement of construction vehicles and material stockpiles will result in new features that form notable, elements in the views across the large scale rural landscape.

Construction of the Proposed Scheme will result in a **medium magnitude of visual change and moderate adverse effect**, which is significant.

Views east from Dog Lane, Chapel and Hill Chorlton Footpath 12, and Bent Lane adjacent to Stableford

(VPs 019.04.009, 019.03.010 and 019.04.011)

Users of Dog Lane, Bent Lane and the footpath will have close to medium range views of the construction of Hatton South cutting, Dog Lane realignment, Dog Lane overbridge, Hatton North cutting, Bent Lane (North) diversion, Stableford South embankment, Bent Lane (South) realignment, Stableford auto-transformer station and alterations to existing overhead power lines and new overhead low voltage power lines. Construction work within Whitmore Heath and Madeley area (CA4) will also be visible including the presence of Meece Brook Viaduct satellite compound and transfer node, and Stableford North embankment.

Hatton North cutting satellite compound will also be apparent in the view. These works, associated earthworks, construction equipment, movement of construction vehicles and material stockpiles will result in a notable change to the views across the rural undulating landscape, albeit in the context of the WCML.

For users of Dog Lane (viewpoints 019.04.009) and Bent Lane (viewpoint 019.04.011), construction of the Proposed Scheme will result in a **high magnitude of visual change and major adverse effect**, which is significant.

Due to the existing dominance of the WCML in views for users of Chapel and Hill Chorlton Footpath (viewpoint 019.03.010) construction of the Proposed Scheme will result in a **medium magnitude of visual change and moderate adverse effect**, which is significant.

Other mitigation measures

- 11.4.14 To 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, including early planting in ecological mitigation sites, which will 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. No other mitigation measures are considered practicable during construction.

Summary of likely residual significant effects

- 11.4.15 The temporary residual significant effects during construction remain as described above. These effects will be temporary and reversible in nature lasting only for the

duration of the construction works. These residual effects will 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.

11.4.16 The following significant effects that will remain after implementation of construction phase mitigation are summarised below:

- major adverse significant effects in relation to three LCAs;
- moderate adverse significant effect in relation to one LCA;
- major adverse significant visual effects at 11 residential viewpoint locations;
- major adverse significant visual effects at eight recreational viewpoint locations;
- major adverse significant visual effects at two transport viewpoint locations;
- moderate adverse significant visual effects at six residential viewpoint locations;
- moderate adverse significant visual effects at 11 recreational viewpoint locations; and
- moderate adverse significant visual effects at five transport viewpoint locations.

Cumulative effects

11.4.17 No significant cumulative effects during construction are anticipated.

11.5 Permanent effects arising during operation

11.5.1 The permanent features of the Proposed Scheme that have been taken into account in determining the effects arising during operation on landscape and visual receptors are presented in Section 2.2 of this report. Permanent changes within the landscape and views caused by the construction are assessed in this section.

Avoidance and mitigation measures

11.5.2 The operational assessment of impacts and effects is based on year 1 (2027), year 15 (2042) and year 60 (2087) of the Proposed Scheme. 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 will 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 (such as Meaford South and Meaford North embankments). Earthworks also consider the relationship to surrounding land uses and management, such as agriculture;

- compensatory woodland planting in areas of loss using the same species composition and planting types, including restored parkland shelterbelts at Lodge Covert and woodland planting at Clifford’s Wood 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 the Proposed Scheme mitigation into the wider landscape character (such as adjacent to Yarlet embankment);
- compensation for loss of field ponds and wetland habitat with new wetlands, ecological ponds and biodiversity wetland features (such as the network of ecological ponds east of the Stone IMB-R);
- design of overbridges (Swynnerton Estate North green overbridge and Swynnerton Footpath 15 green overbridge) on a precautionary basis, to provide ecological connectivity, which will also mitigate severance of landscape character; and
- design of landscape bunds, with associated planting to mitigate views of the Proposed Scheme from sensitive receptors (such as landscape bunds adjacent to the Norton Bridge to Stone sidings and a landscape, noise and flood mitigation bund adjacent the Stone IMB-R and to the west of the M6).

Assessment of permanent impacts and effects

11.5.3 The likely effects on landscape and visual receptors during operation of the Proposed Scheme relate to the presence of new structures and elements in the landscape including viaducts, embankments, overbridges, underbridges, road and PRoW realignments and diversions and the Stone IMB-R (including associated lighting). Other aspects include the presence of overhead line equipment, noise fence barriers, and the presence of auto-transformer stations. Landscape bunds and new planting will also influence how the Proposed Scheme affects landscape and visual receptors.

Landscape assessment

11.5.4 The four LCAs set out in Table 26 will be significantly affected during operation of the Proposed Scheme. Full details of effects are described in Volume 5: Appendix LV-001-003 Part 2.

Table 26: Operational phase significant landscape effects

Yarnfield Settled Farmlands	Medium susceptibility and sensitivity
<p>Year 1:</p> <p>At year 1 of operation, the presence of the Filly Brook and M6 Meaford viaducts and associated overhead line equipment, and the Yarnfield South, Yarnfield North and Meaford South embankments will noticeably change the character of the open rural landscape. This will be accentuated by the presence of a series of overbridges. The presence of the Stone IMB-R and associated lighting will also be a notable and discordant element within the landscape.</p> <p>Operation of the Proposed Scheme in year 1 will result in a medium magnitude of change and moderate adverse effect on the LCA, which is significant.</p> <p>Year 15:</p>	

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By year 15 whilst mitigation planting will provide some landscape integration, the presence of the Stone IMB-R and associated lighting, alongside the presence of viaduct and bridge elements, will still result in a noticeable change to the character of the landscape.

Operation of the Proposed Scheme in year 15 will remain a **medium magnitude of change and moderate adverse effect** on the LCA, which is significant.

Year 60:

By year 60, landscape mitigation planting, which reconnects locally fragmented planting, will have reached maturity. Due to this and allied to the corresponding incremental growth of existing planting there will be increased landscape integration.

Operation of the Proposed Scheme in year 60 will reduce to a **low magnitude of change and minor adverse effect** on the LCA, which is non-significant.

Swynnerton Park Sandstone Hills and Heaths	Medium susceptibility and high sensitivity
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Year 1:

At year 1 of operation, the presence of the M6 Meaford viaduct and associated overhead line equipment, the Meaford North and Swynnerton embankments and the presence of the Stone IMB-R and associated lighting will alter the character of the planned estate landscape.

Operation of the Proposed Scheme in year 1 will result in a **high magnitude of change and major adverse effect** on the LCA, which is significant.

Year 15:

By year 15, whilst mitigation planting will provide some landscape integration, the presence of the highly visible viaduct and embankments, alongside the Stone IMB-R and associated lighting will still alter the character of the landscape.

Operation of the Proposed Scheme in year 15 will remain a **high magnitude of change and major adverse effect** on the LCA, which is significant.

Year 60:

By year 60 as landscape mitigation planting reaches maturity and due to the corresponding incremental growth of existing planting there will be increased landscape integration.

Operation of the Proposed Scheme in year 60 will reduce to **medium magnitude of change and moderate adverse effect** on the LCA, which is significant.

Swynnerton Village Sandstone Hills and Heaths	Medium susceptibility and sensitivity
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Year 1:

At year 1 of operation the presence of the Hatton embankment, a series of overbridges, noise barriers and elevated overhead line equipment will introduce a degree of change to the rural horizon. Combined with the underbridges, cuttings and road alterations, the Proposed Scheme will intensify the landscape severance already experienced within the landscape due to the M6. This will result in the loss of sections of key landscape components including a section of Clifford's Wood. However, the Swynnerton Estate Central underbridge and green overbridges at Swynnerton Estate North and Swynnerton Footpath 15 will partially mitigate the landscape severance.

Operation of the Proposed Scheme in year 1 will result in a **medium magnitude of change and moderate adverse effect** on the LCA, which is significant.

Year 15:

By year 15 mitigation planting will provide some landscape integration and strengthen habitat connections, for example connecting Nursery Common with Hatton Common across Swynnerton Footpath 15 green overbridge. However, the presence of the Hatton embankments and a series of overbridges, will still result in landscape severance and loss of key landscape characteristics.

Operation of the Proposed Scheme in year 15 will remain a **medium magnitude of change and moderate adverse effect** on the LCA, which is significant.

Year 60:

By year 60, despite mitigation planting reaching maturity, the landscape severance and loss of key landscape components caused by the Proposed Scheme will remain.

Operation of the Proposed Scheme in year 60 will remain a **medium magnitude of change and moderate adverse effect** on the LCA, which is significant.

Meece Brook Valley Sandstone Hills and Heaths	Medium susceptibility and sensitivity
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Year 1:

At year 1 of operation the presence of the incongruous landform associated with the Dog Lane overbridge and realignment of Bent Lane, forming Bent Lane (South) will be uncharacteristic of the existing rural lane network. Combined with the indirect impact caused by the presence of the Proposed Scheme in the adjacent LCA, the perception and landscape quality of the valley landscape will be reduced. This is due to the new elements being prominent features on the higher ground, imposing on the character and remaining sense of tranquillity of the valley landscape.

Operation of the Proposed Scheme in year 1 will result in a **medium magnitude of change and moderate adverse effect** on the LCA, which is significant.

Year 15 and year 60:

By year 15 and year 60 the mitigation planting will help integrate the aforementioned elements into the landscape and reduce the indirect impact of the Proposed Scheme in the adjacent LCA, primarily through woodland mitigation planting on the higher ground.

Operation of the Proposed Scheme in year 15 will reduce to a **low magnitude of change and minor adverse effect** on the LCA, which is non-significant. This will remain for year 60.

Visual assessment

Introduction

- 11.5.5 The following section describes the likely significant effects on visual receptors during operation year 1, year 15 and year 60. 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, will be in leaf. Winter and summer scenarios are, therefore, considered for year 1 and summer scenarios of year 15 and year 60, to capture worst case and best case. Likely significant effects on residential receptors from additional lighting at night-time are also identified. Visual receptors experiencing non-significant effects are reported in Volume 5: Appendix LV-001-003.
- 11.5.6 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 will be lower than those reported.
- 11.5.7 Additional lighting is not considered to give rise to significant effects due to the operational nature of the Proposed Scheme. However, as the Stone IMB-R will have continuous working for some periods of time, a night-time visual assessment at winter year 1 of operation only (worst case) is provided for all visual receptors where there will be direct foreground visibility of additional lighting.

Table 27: Operational phase significant visual effects

<p>Views west from Stone Rural Footpath 29, adjacent to residences at Pirehill (VPs 014.03.001 and 014.03.002)</p>
<p>Year 1 winter and summer:</p> <p>Residents and users of the footpath will have partly filtered medium range views of passing trains on the route of the Proposed Scheme, the Stone Rural Footpath 28 accommodation overbridge, Yarlet embankment and overhead line equipment.</p> <p>The operation of the Proposed Scheme will result in new features that are uncharacteristic of the existing views across the open rural landscape and interrupt the undulating landform.</p> <p>Operation of the Proposed Scheme in year 1 will result in a medium magnitude of visual change and moderate adverse effect, which is significant.</p>

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Year 15 and year 60:

Effects will reduce to non-significant for year 15 and remain so in year 60 due to the growth of mitigation planting at Yarlet embankment, integrating the Proposed Scheme into its landscape setting as reported in Volume 5: Appendix LV-001-003.

Views west from Stone Road A34

(VPs 014.04.006)

Year 1 winter and summer:

Users of A34 Stone Road will have partly filtered medium range views of passing trains on the route of the Proposed Scheme, Stone Rural Footpath 28 accommodation overbridge, Yarlet embankment and overhead line equipment.

The operation of the Proposed Scheme will result in new features that are uncharacteristic of the existing views across the rural landscape and interrupt the undeveloped rural skyline.

Operation of the Proposed Scheme in year 1 will result in a **medium magnitude of visual change and moderate adverse effect**, which is significant.

Year 15 and year 60:

Effects will reduce to non-significant for year 15 and remain so in year 60 due to the growth of mitigation planting at Yarlet Central cutting and Yarlet embankment, integrating the Proposed Scheme into its landscape setting as reported in Volume 5: Appendix LV-001-003.

Views west from Walton Heath Farm

(VPs 015.02.009)

Year 1 winter and summer:

Residents will have filtered close to medium range views of Yarlet North cutting, the B5026 Eccleshall Road overbridge and overhead line equipment.

The operation of the Proposed Scheme will result in changes to the view within a relatively short distance, but introduce elements that are characteristic of the view with similarities to the linear infrastructure feature of the M6.

Operation of the Proposed Scheme in year 1 will result in a **medium magnitude of visual change and moderate adverse effect**, which is significant.

The view of the Proposed Scheme from viewpoint 015.02.009 during operation is illustrated on the photomontage shown in Figure LV-01-535 (Volume 5: Appendix LV-001-003).

Year 15 and year 60:

Effects will reduce to non-significant for year 15 and remain so in year 60 due to the growth of mitigation planting at Yarlet North cutting, integrating the Proposed Scheme into its landscape setting as reported in Volume 5: Appendix LV-001-003.

Views east from B5026 Eccleshall Road in the vicinity of Stafford Motorway Service Area (Northbound) and from Chebsey Footpath 7 near Cold Norton

(VPs 015.04.011 and 015.03.012)

Year 1 winter and summer:

Users of the B5026 Eccleshall Road and users of the footpath will have filtered medium range views of the Stone IMB-R and associated lighting, the B5026 Eccleshall Road overbridge, Yarnfield South embankment, Filly Brook viaduct, Yarnfield North embankment, new overhead low voltage power lines and overhead line equipment.

For users of the B5026 Eccleshall Road (viewpoint 015.04.011), the operation of the Proposed Scheme will result in new features that are intermittently visible in the views across the rural landscape.

Operation of the Proposed Scheme in year 1 will result in a **medium magnitude of visual change and moderate adverse effect**, which is significant.

For users of the Chebsey Footpath 7 (viewpoint 015.03.012) the operation of the Proposed Scheme will result in a substantial change to the filtered views across the gently sloping arable landscape, interrupting the horizon and introducing elements that are out of scale with the landscape.

Operation of the Proposed Scheme in year 1 will result in a **high magnitude of visual change and major adverse effect**, which is significant.

Year 15:

For users of the B5026 Eccleshall Road (viewpoint 015.04.011), effects will reduce to non-significant for year 15 and year 60 due to the growth of mitigation planting at Yarlet North cutting, integrating the Proposed Scheme into its landscape setting as reported in Volume 5: Appendix LV-001-003.

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Users of the Chebsey Footpath 7 (viewpoint 015.03.012) will have filtered medium range views of the Stone IMB-R, Filly Brook viaduct, Yarnfield North embankment, new overhead power lines and overhead line equipment. These elements will still result in a noticeable change to the filtered views across the gently sloping arable landscape, albeit more integrated within the landscape due to hedgerow and woodland mitigation planting.

For users of the Chebsey Footpath 7 (viewpoint 015.03.012) the operation of the Proposed Scheme in year 15 will reduce to a **medium magnitude of visual change and moderate adverse effect**, which is significant.

Year 60:

For users of the Chebsey Footpath 7 (viewpoint 015.03.012), the Stone IMB-R, Filly Brook viaduct, new overhead low voltage power lines and overhead line equipment will still be visible despite becoming more integrated within the landscape due to the screening effect of hedgerow and woodland mitigation planting.

Operation of the Proposed Scheme in year 60 will remain a **medium magnitude of visual change and moderate adverse effect**, which is significant.

View west from Darlaston Grange, Yarnfield Lane

(VP 016.02.002)

Year 1 winter and summer:

Residents will have filtered medium range views of passing trains on the route of the Proposed Scheme, the B5026 Eccleshall Road overbridge, Stone IMB-R and associated lighting, Yarnfield South embankment, Filly Brook viaduct, Yarnfield North embankment and overhead line equipment.

The operation of the Proposed Scheme will result in noticeable change to the characteristics of the sloping rural landscape and introduce elements that interrupt the rural skyline.

Operation of the Proposed Scheme in year 1 will result in a **high magnitude of visual change and major adverse effect**, which is significant.

The view of the Proposed Scheme from viewpoint 016.02.002 during operation is illustrated on the photomontage shown in Figure LV-01-536 (Volume 5: Appendix LV-001-003).

Year 1 night-time:

At night the lighting associated with the Stone IMB-R will be clearly visible as a distinct element in a predominantly dark night sky. This will intensify the impact of the distant sky glow from surrounding settlements and light spill from vehicles on this unlit section of the M6 and will substantially change the view at night.

Operation of the Proposed Scheme at night in year 1 will result in a **high magnitude of visual change and major adverse effect**, which is significant.

Year 15:

These elements will become more integrated within the landscape due to hedgerow and woodland mitigation planting. However, the Proposed Scheme will still result in a noticeable change to the characteristics of the sloping rural landscape.

Operation of the Proposed Scheme in year 15 will reduce to a **medium magnitude of visual change and moderate adverse effect**, which is significant.

Year 60:

Effects will reduce to non-significant for year 60 due to the growth of mitigation planting at Yarnfield South embankment and Yarnfield North embankment, integrating the Proposed Scheme into its landscape setting as reported in Volume 5: Appendix LV-001-003.

Views north east from Swynnerton Footpath 38

(VP 016.03.008)

Year 1 winter and summer:

Users of the footpath will have open, close range views of passing trains on the route of the Proposed Scheme, Stone IMB-R and associated lighting, Meaford South embankment, M6 Meaford viaduct, Meaford North embankment and overhead line equipment.

The operation of the Proposed Scheme will result in substantial alterations to the view of the pasture landscape, particularly due to the loss of the existing shelter belt partially screening the M6.

Operation of the Proposed Scheme in year 1 will result in a **high magnitude of visual change and major adverse effect**, which is significant.

Year 15:

These elements will still result in a noticeable change to the view of the pastoral landscape, albeit more integrated within the landscape due to hedgerow and woodland mitigation planting.

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Operation of the Proposed Scheme in year 15 will reduce to a **medium magnitude of visual change and moderate adverse effect**, which is significant.

Year 60:

Users of the footpath will still have close range views of the Meaford South embankment, M6 Meaford viaduct, Meaford North embankment and overhead line equipment, despite mitigation planting reaching maturity.

Operation of the Proposed Scheme in year 60 will remain a **medium magnitude of visual change and moderate adverse effect**, which is significant.

Views east from Swynnerton Footpath 42, residences at Beech House Stud and from Moss Lane/Yarnfield Lane

(VPs 016.03.012, 016.02.013 and 016.02.014)

Year 1 winter and summer:

Residents and users of the footpath will have medium range views of the Stone IMB-R and associated lighting, Yarnfield South embankment, Filly Brook viaduct, Yarnfield North embankment, Yarnfield Lane realignment and Yarnfield Lane M6 overbridge replacement.

For users of Swynnerton Footpath 42 (viewpoint 016.03.012) and residents (viewpoint 016.02.014), these elements will result in a noticeable change to the characteristic views of the rural landscape and wooded ridge beyond.

Operation of the Proposed Scheme in year 1 will result in a **medium magnitude of visual change and moderate adverse effect**, which is significant.

For residents (viewpoint 016.02.013), the loss of woodland screening the M6 will result in more open views of the Proposed Scheme.

Operation of the Proposed Scheme in year 1 will result in a **high magnitude of visual change and major adverse effect**, which is significant.

Year 1 night-time:

For residents (viewpoints 016.02.013 and 016.02.014) at night the lighting associated with the Stone IMB-R will be clearly visible as a distinct element in a predominantly dark night sky. It will add significantly to the individual property lighting from Beech House Stud, sky glow from Yarnfield behind the views and light spill from vehicles on this unlit section of the M6. The addition of the lighting features will substantially change the view at night.

Operation of the Proposed Scheme at night in year 1 will result in a **high magnitude of visual change and major adverse effect**, which is significant.

Year 15:

For users of Swynnerton Footpath 42 (viewpoint 016.03.012) and residents at (viewpoint 016.02.014), effects will reduce to non-significant for year 15 due to the growth of mitigation planting at Yarnfield North embankment and Yarnfield Lane, integrating the Proposed Scheme into its landscape setting, as reported in Volume 5: Appendix LV-001-003.

For residents at Beech House Stud (viewpoint 016.02.013), views of the Stone IMB-R, Yarnfield South embankment, Filly Brook viaduct, Yarnfield North embankment, Yarnfield Lane realignment and Yarnfield Lane M6 overbridge replacement will become more integrated within the view due to hedgerow and woodland mitigation planting at Yarnfield North embankment and Yarnfield Lane. However, these elements will still result in a noticeable change to the visual character of paddock fields and woodland shelter belts.

Operation of the Proposed Scheme in year 15 will reduce to a **medium magnitude of visual change and moderate adverse effect**, which is significant.

The view of the Proposed Scheme from viewpoint 016.02.014 during operation is illustrated on the photomontage shown in Figure LV-01-655 (Volume 5: Appendix LV-001-003).

Year 60:

For residents at Beech House Stud (viewpoint 016.02.013) effects will reduce to non-significant for year 60 due to the growth of mitigation planting at Yarnfield North embankment and Yarnfield Lane, integrating the Proposed Scheme into its landscape setting as reported in Volume 5: Appendix LV-001-003.

Views north east from Swynnerton Footpath 37

(VPs 017.03.001)

Year 1 winter and summer:

Users of the footpath will have filtered medium range views of the Stone IMB-R, M6 Meaford viaduct, Meaford North embankment, Swynnerton embankment and the associated noise barriers and overhead line equipment.

The operation of the Proposed Scheme will result in new features that form prominent, incongruous elements in the views across the parkland landscape.

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Operation of the Proposed Scheme in year 1 will result in a **medium magnitude of visual change and moderate adverse effect**, which is significant.

Year 15:

Users of the footpath will have filtered medium range views of the M6 Meaford viaduct and Meaford North embankment.

These elements will still result in substantial change to the views across the parkland landscape, albeit more integrated within the view due to hedgerow and woodland mitigation planting.

Operation of the Proposed Scheme in year 15 will remain a **medium magnitude of visual change and moderate adverse effect**, which is significant.

Year 60:

Operation of the Proposed Scheme in year 60 will remain a **medium magnitude of visual change and moderate adverse effect**, which is significant.

Views east from Grange Cottage on Hall Lane

(VP 017.02.003)

Year 1 winter and summer:

Residents will have close range views of the Meaford North embankment, Swynnerton Footpath 27 accommodation underbridge, Swynnerton embankment and associated noise barriers and overhead line equipment.

The operation of the Proposed Scheme will result in new features that form prominent, incongruous elements in the views across the parkland and planned estate, which will foreshorten the background views of a rural landscape.

Operation of the Proposed Scheme in year 1 will result in a **high magnitude of visual change and major adverse effect**, which is significant.

Year 15:

Residents will have close range views of the Meaford North embankment, Swynnerton Footpath 27 accommodation underbridge, Swynnerton embankment and associated noise barriers and overhead line equipment.

These elements will still result in substantial change to the views across the parkland landscape.

Operation of the Proposed Scheme in year 15 will remain a **high magnitude of visual change and major adverse effect**, which is significant.

Year 60:

Elements of the Proposed Scheme will still be visible although more integrated within the view due to the screening effect of hedgerow and woodland mitigation planting at Meaford North embankment.

Operation of the Proposed Scheme in year 60 will reduce to a **medium magnitude of visual change and moderate adverse effect**, which is significant.

View south west from residences at Blakelow on Swynnerton Footpath 27

(VP 017.02.004)

Year 1 winter and summer:

Residents will have filtered, close range views of the M6 Meaford viaduct, Meaford North embankment, Swynnerton Footpath 27 accommodation underbridge and overhead line equipment.

The operation of the Proposed Scheme will result in new features that form prominent, incongruous elements in the views across the rural landscape, which will reduce the visual dominance of the woodland shelter belts associated with Swynnerton Park.

Operation of the Proposed Scheme in year 1 will result in a **high magnitude of visual change and major adverse effect**, which is significant.

Year 1 night-time:

At night the lighting associated with the Stone IMB-R will be visible as sky glow above the woodland blocks within a predominantly dark night sky, adding to the light spill from vehicles on this unlit section of the M6. However, this lighting will be filtered by intervening vegetation.

Operation of the Proposed Scheme at night in year 1 will reduce to a **medium magnitude of visual change and moderate adverse effect**, which is significant.

Year 15:

Residents will have filtered, close range views of the M6 Meaford viaduct, Meaford North embankment, Swynnerton Footpath 27 accommodation underbridge and overhead line equipment.

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These elements will still result in substantial change to the views across the rural landscape, albeit more integrated within the view due to hedgerow and woodland mitigation planting.

Operation of the Proposed Scheme in year 15 will reduce to a **medium magnitude of visual change and moderate adverse effect**, which is significant.

Year 60:

Residents will still have filtered, close range views of the Proposed Scheme.

This will result in substantial change to the views across the rural landscape despite the Proposed Scheme becoming more integrated within the view due to mitigation planting reaching maturity.

Operation of the Proposed Scheme in year 60 will remain a **medium magnitude of visual change and moderate adverse effect**, which is significant.

Views west from Stone Rural Footpath 34 at The Marlings and the A51 Stone Road

(VPs 017.02.005 and 017.04.007)

Year 1 winter and summer:

Residents and users of the A51 Stone Road will have filtered medium range views of the Meaford South embankment, M6 Meaford viaduct, Meaford North embankment and overhead line equipment.

The operation of the Proposed Scheme will result in changes, which will be viewed as one of a series of components in the midground causing severance of the parkland shelter belts associated with Swynnerton Park on the horizon.

Operation of the Proposed Scheme in year 1 will result in a **medium magnitude of visual change and moderate adverse effect**, which is significant.

Year 1 night-time:

For residents (viewpoint 017.02.005) at night the lighting associated with the Stone IMB-R will be visible as sky glow above intervening vegetation within a predominantly dark night sky, adding to the light spill from vehicles on this unlit section of the M6. However, this lighting will be filtered by intervening vegetation, which will reduce the visual impact of the lighting installation.

Operation of the Proposed Scheme at night in year 1 will result in a **medium magnitude of visual change and moderate adverse effect**, which is significant.

Year 15:

Residents and users of the A51 Stone Road will have filtered medium range views of the Meaford South embankment, M6 Meaford viaduct, Meaford North embankment and overhead line equipment.

These elements will still result in substantial change to the views, albeit more integrated within the view due to maturing hedgerow and woodland mitigation planting.

Operation of the Proposed Scheme in year 15 will remain a **medium magnitude of visual change and moderate adverse effect**, which is significant.

Year 60:

Effects will reduce to non-significant in year 60 due to the growth of mitigation planting at Meaford South embankment and Meaford North embankment, integrating the Proposed Scheme into its landscape setting as reported in Volume 5: Appendix LV-001-003.

Views south west from residences at Chase Lane

(VP 017.02.010)

Year 1 winter and summer:

Residents will have filtered medium range views of the Swynnerton embankment, Swynnerton auto-transformer station, noise barriers and overhead line equipment.

The operation of the Proposed Scheme will result in new features in the view within a relatively short distance, which will interrupt the characteristic hedgerow field boundaries and mature parkland shelter belts associated with Swynnerton Park.

Operation of the Proposed Scheme in year 1 will result in a **medium magnitude of visual change and moderate adverse effect**, which is significant.

Year 15:

Residents will have filtered medium range views of the Swynnerton embankment, Swynnerton auto-transformer station and overhead line equipment.

These elements will still result in a substantial change to the views within a relatively short distance, albeit more integrated within the view due to hedgerow and woodland mitigation planting at Swynnerton embankment.

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Operation of the Proposed Scheme in year 15 will remain a **medium magnitude of visual change and moderate adverse effect**, which is significant.

Year 60:

Effects will reduce to non-significant for year 60 due to the growth of mitigation planting at Swynnerton embankment, integrating the Proposed Scheme into its landscape setting as reported in Volume 5: Appendix LV-001-003.

View west from Swynnerton Footpath 49

(VP 017.03.012)

Year 1 winter and summer:

Users of the footpath will have open, long range views of the Swynnerton embankment, Tittensor Road diversion, Tittensor Road overbridge, the A51 Stone Road diversion, noise barriers and overhead line equipment.

The operation of the Proposed Scheme will result in substantial change to the views of the sloping pastoral landscape and interrupt the prominent wooded ridge.

Operation of the Proposed Scheme in year 1 will result in a **medium magnitude of visual change and moderate adverse effect**, which is significant.

Year 15:

Users of the footpath will have long range views of the Swynnerton embankment, noise barriers and overhead line equipment.

These elements will still result in substantial change to the views of the sloping pasture landscape, albeit more integrated within the view due to hedgerow and woodland mitigation planting at Swynnerton embankment.

Operation of the Proposed Scheme in year 15 will remain a **medium magnitude of visual change and moderate adverse effect**, which is significant.

Year 60:

Effects will reduce to non-significant for year 60 due to the growth of mitigation planting at Swynnerton embankment, integrating the Proposed Scheme into its landscape setting as reported in Volume 5: Appendix LV-001-003.

Views south-west from residences at Sanford Cottage, A51 Stone Road

(VP 017.02.013)

Year 1 winter and summer:

Residents will have close range views of the Swynnerton embankment, Swynnerton auto-transformer station, noise barriers and overhead line equipment.

The operation of the Proposed Scheme will result in new features that form prominent, incongruous elements in the views across the rolling rural landscape and will cause visual severance of the parkland shelter belts associated with Swynnerton Park.

Operation of the Proposed Scheme in year 1 winter will result in a high magnitude of visual change and major adverse effect, which is significant.

In summer, dense summer growth of existing vegetation partially screens views of the Proposed Scheme.

Operation of the Proposed Scheme in year 1 summer will result in a **medium magnitude of visual change and moderate adverse effect**, which is significant.

Year 15:

Residents will still have close range views of the Swynnerton embankment, Swynnerton auto-transformer station and overhead line equipment.

These elements will still result in substantial change to the views of the rolling rural landscape, albeit more integrated within the view due to hedgerow and woodland mitigation planting at Swynnerton embankment.

Operation of the Proposed Scheme in year 15 will reduce to a **medium magnitude of visual change and moderate adverse effect**, which is significant.

Year 60:

Effects will reduce to non-significant for year 60 due to the growth of mitigation planting at Swynnerton embankment, integrating the Proposed Scheme into its landscape setting as reported in Volume 5: Appendix LV-001-003.

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Views north east from Hall Lane, Stone Circles Challenge and from track towards residences at Lodge Covert Cottage (VPs 017.03.014 and 017.03.016)

Year 1 winter and summer:

Users of the footpaths will have filtered medium range views of the Swynnerton embankment and overhead line equipment. These elements will result in new features that form uncharacteristic changes to the views across the parkland valley landscape. Operation of the Proposed Scheme in year 1 will result in a **medium magnitude of visual change and moderate adverse effect**, which is significant.

Year 15:

For users of Stone Circles Challenge (viewpoint 017.03.014), effects will reduce to non-significant by year 15 due to the growth of mitigation planting at Swynnerton embankment, integrating the Proposed Scheme into its landscape setting.

Users of the track towards Lodge Covert Cottages (viewpoint 017.03.016) will still have filtered medium range views of the Swynnerton embankment and overhead line equipment. These elements will still result in uncharacteristic changes to the views across the parkland valley landscape, albeit more integrated within the view due to hedgerow and woodland mitigation planting.

At viewpoint 017.03.016, operation of the Proposed Scheme in year 15 will remain a **medium magnitude of visual change and moderate adverse effect**, which is significant.

Year 60:

Effects will remain non-significant at year 60 for users of Stone Circles Challenge (viewpoint 017.03.014), as reported in Volume 5: Appendix LV-001-003.

Effects at viewpoint 017.03.016 will reduce to non-significant for year 60 due to the growth of mitigation planting at Swynnerton embankment, integrating the Proposed Scheme into its landscape setting, as reported in Volume 5: Appendix LV-001-003.

Views east from Swynnerton Footpath 23 and Stone Circles Challenge and residences north of Swynnerton (VPs 017.03.020, 018.02.001 and 018.03.003)

Year 1 winter and summer:

Recreational receptors and residents will have close to medium range views of Swynnerton embankment, Tittensor Road diversion, Tittensor Road overbridge, the A51 Stone Road diversion, Stab Lane road closure and overhead line equipment.

The operation of the Proposed Scheme will result in substantial change to the views across the sloping rural landscape interrupting the characteristic dense woodland and hedgerow field boundaries.

For users of Stone Circles Challenge (viewpoint 017.03.020) and users of Swynnerton Footpath 23 (viewpoint 0.18.03.003), the operation of the Proposed Scheme in year 1 will result in a **medium magnitude of visual change and moderate adverse effect**, which is significant.

For residents (viewpoint 018.02.001), due to their proximity, the operation of the Proposed Scheme in year 1 winter will result in a **high magnitude of visual change and major adverse effect**, which is significant.

In summer, dense summer growth of existing vegetation will partially screen views of the Proposed Scheme.

At (viewpoint 018.02.001), operation of the Proposed Scheme in year 1 summer will result in a **medium magnitude of visual change and moderate adverse effect**, which is significant.

The view of the Proposed Scheme from viewpoint 017.03.020 during operation is illustrated on the photomontage shown in Figure LV-01-538 (Volume 5: Appendix LV-001-003).

Year 15 and year 60:

Effects will reduce to non-significant for year 15 and remain so for year 60 due to the growth of mitigation planting at Swynnerton embankment and Swynnerton North cutting, integrating the Proposed Scheme into its landscape setting as reported in Volume 5: Appendix LV-001-003.

Views east from residences Swynnerton Heath Farm, Standon footpath 30 and residents on the A51 (VPs 018.02.002, 018.03.004 and 018.02.006)

Year 1 winter and summer:

Residents and users of the footpath will have filtered views, over a range of distances, of the A51 the Stone Road diversion, the A519 Newcastle Road overbridge, Swynnerton Heath Farm overbridge and overhead line equipment.

The operation of the Proposed Scheme will result in noticeable change to the views across the undulating pastoral landscape.

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Operation of the Proposed Scheme in year 1 will result in a **medium magnitude of visual change and moderate adverse effect**, which is significant.

Year 15:

For users of Standon Footpath 30 (viewpoint 018.03.004) and residents (viewpoint 018.02.006) effects will reduce to non-significant for year 15 due to the growth of mitigation planting at Swynnerton North cutting, integrating the Proposed Scheme into its landscape setting as reported in Volume 5: Appendix LV-001-003.

Residents at Swynnerton Heath Farm at viewpoint 018.02.002 will still have close range views of the A519 Newcastle Road overbridge, Swynnerton Heath Farm overbridge and overhead line equipment.

The operation of the Proposed Scheme will still result in noticeable changes to the views across the undulating rural landscape, albeit more integrated within the view due to hedgerow and woodland mitigation planting.

Operation of the Proposed Scheme in year 15 will remain a **medium magnitude of visual change and moderate adverse effect**, which is significant.

Year 60:

Effects will reduce to non-significant at all viewpoint locations for year 60 due to the growth of mitigation planting at Swynnerton North cutting, integrating the Proposed Scheme into its landscape setting as reported in Volume 5: Appendix LV-001-003.

Views west from the A519 Newcastle Road, and Swynnerton Footpath 54

(VPs 018.04.009, 018.03.010 and 018.03.013)

Year 1 winter and summer:

Users of the A519 Newcastle Road and the footpath will have filtered medium range views of the A51 Stone Road diversion, Bottom Lane road closure, the A519 Newcastle Road overbridge, Swynnerton Heath Farm overbridge, Hatton embankment and overhead line equipment.

The operation of the Proposed Scheme will result in noticeable changes to the views across the rural undulating landscape.

Operation of the Proposed Scheme in year 1 will result in a **medium magnitude of visual change and moderate adverse effect**, which is significant.

Year 15 and year 60:

Effects will reduce to non-significant for year 15 and remain so for year 60 due to the growth of mitigation planting at Swynnerton North cutting, integrating the Proposed Scheme into its landscape setting, as reported in Volume 5: Appendix LV-001-003.

Views west from Swynnerton Footpaths 13, 14 and 15

(VPs 019.03.002, 019.03.003 and 019.03.004)

Year 1 winter and summer:

Users of the footpaths will have filtered medium to long range views of Hatton embankment, Swynnerton Estate Central underbridge, Swynnerton Estate North overbridge, Swynnerton Footpath 52 accommodation underbridge, Swynnerton Footpath 15 overbridge and overhead line equipment.

The operation of the Proposed Scheme will result in substantial change, due to the uncharacteristic features in the views across the sloping pasture landscape, albeit intermittent due to the intervening vegetation.

Operation of the Proposed Scheme in year 1 will result in a **medium magnitude of visual change and moderate adverse effect**, which is significant.

The view of the Proposed Scheme from viewpoint 019.03.004 during operation is illustrated on the photomontage shown in Figure LV-01-543 (Volume 2: CA3 Map Book).

Year 15 and year 60:

Effects will reduce to non-significant for year 15 and remain so for year 60 due to the growth of mitigation planting at Hatton embankment and Hatton South cutting, integrating the Proposed Scheme into its landscape setting, as reported in Volume 5: Appendix LV-001-003.

Views west from Dog Lane and a route with public access adjacent to Swynnerton Old Park

(VPs 019.04.006 and 019.03.007)

Year 1 winter and summer:

Users of Dog Lane and the route with public access will have filtered medium range views of Dog Lane realignment, Dog Lane overbridge, Bent Lane (North) diversion, Stableford South embankment, Bent Lane (South) realignment, new overhead low voltage power lines and overhead line equipment.

The operation of the Proposed Scheme will result in substantial change to the filtered views across the sloping rural landscape.

Operation of the Proposed Scheme in year 1 will result in a **medium magnitude of visual change and moderate adverse effect**, which is significant.

However, for users of the public access route (viewpoint 019.03.007), in summer effects will reduce to non-significant in summer of year 1 due to dense growth of existing vegetation as reported in Volume 5: Appendix LV-001-003.

Year 15:

Users of the public access route at viewpoint 019.04.006 will have medium range views of Dog Lane realignment, Dog Lane overbridge, Bent Lane (North) diversion, Stableford South embankment, new overhead low voltage power lines and overhead line equipment.

The operation of the Proposed Scheme will still result in substantial change in the filtered views across the sloping rural landscape, albeit more integrated within the view due to hedgerow and woodland mitigation planting.

Operation of the Proposed Scheme in year 15 will remain a **medium magnitude of visual change and moderate adverse effect**, which is significant.

Year 60:

Effects will reduce to non-significant for year 60 due to the growth of mitigation planting at Hatton South cutting and Dog Lane overbridge, integrating the Proposed Scheme into its landscape setting as reported in Volume 5: Appendix LV-001-003.

Views east from Dog Lane, Chapel and Hill Chorlton Footpath 12, and Bent Lane adjacent to Stableford

(VPs 019.04.009, 019.03.010 and 019.04.011)

Year 1 winter and summer:

Users of Dog Lane, Bent Lane and the footpath will have close to medium range views of Dog Lane realignment, Dog Lane overbridge, Hatton North cutting, Bent Lane (North) diversion, Stableford South embankment, Bent Lane (South) realignment, Stableford auto-transformer station, new overhead low voltage power lines, Stableford North embankment within the Whitmore Heath and Madeley area (CA4) and overhead line equipment.

The operation of the Proposed Scheme will result in a noticeable change to the views across the rural undulating landscape.

Operation of the Proposed Scheme in year 1 will result in a **medium magnitude of visual change and moderate adverse effect**, which is significant.

However, for users of Hill Chorlton Footpath 12 and Bent Lane (viewpoints 019.03.010 and 019.04.011), in summer effects will reduce to non-significant in year 1 due to dense growth of existing vegetation as reported in Volume 5: Appendix LV-001-003.

Year 15:

Users of Dog Lane (viewpoint 019.04.009) will have close range views of Dog Lane realignment, Dog Lane overbridge, Bent Lane (South) realignment, new overhead low voltage power lines, Stableford North embankment within the Whitmore Heath and Madeley area (CA4) and overhead line equipment.

The Proposed Scheme will still result in noticeable change to the views across the rural undulating landscape, albeit gradually more integrated within the view due to hedgerow and woodland mitigation planting.

Operation of the Proposed Scheme in year 15 will remain a **medium magnitude of visual change and moderate adverse effect**, which is significant.

Year 60:

Effects will reduce to non-significant for year 60 due to the growth of mitigation planting at Dog Lane overbridge and Hatton North cutting, integrating the Proposed Scheme into its landscape setting, as reported in Volume 5: Appendix LV-001-003.

Other mitigation measures

- 11.5.8 The permanent effects of the Proposed Scheme on landscape and visual receptors have been 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 for ecological mitigation sites and compound sites. 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

11.5.9 In many cases, significant effects will reduce over time as the proposed mitigation planting matures and reaches its designed intention. However, the following likely residual significant effects will remain following year 15 of operation:

- major adverse significant effect in relation to one LCA;
- moderate adverse significant effects in relation to two LCAs;
- major adverse significant visual effect at one residential viewpoint location; and
- moderate adverse significant visual effects at seven residential viewpoint locations;
- moderate adverse significant visual effects at seven recreational viewpoint locations; and
- moderate adverse significant visual effects at four transport viewpoint locations.

Cumulative effects

11.5.10 No cumulative effects during operation on landscape and visual receptors have been identified in the Stone and Swynnerton area.

Monitoring

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

11.5.12 There are no area-specific requirements for monitoring landscape and visual mitigation during the operation of the Proposed Scheme in the Stone and Swynnerton area.

12 Socio-economics

12.1 Introduction

- 12.1.1 This section reports on the environmental baseline, likely economic and employment impacts as well as significant effects during construction and operation of the Proposed Scheme within the Stone and Swynnerton area. The assessment considers existing businesses, community organisations, local employment and local economies, including planned growth and development.
- 12.1.2 Engagement with Stafford Borough Council (SBC) and Staffordshire County Council (SCC) has been undertaken as part of the development of the Proposed Scheme. The purpose of the engagement was to increase the understanding of socio-economic characteristics identified through a review of publicly available data.
- 12.1.3 The socio-economic effects on levels of employment at a route-wide level are reported in Volume 3: Route-wide effects (Section 12). Maps showing the location of the key environmental features (Map Series CT-10) and the key construction (Map Series CT-05) and key operational (Map Series CT-06)
- 12.1.4 Features of the Proposed Scheme can be found in the Volume 2: CA3 Map Book.
- 12.1.5 In addition, business and labour market data is presented in Background Information and Data (BID)¹³³, (BID-SE-001-000: Business and labour market data).

12.2 Scope, assumptions and limitations

- 12.2.1 The scope, assumptions and limitations for the socio-economics assessment are set out in Volume 1 (Section 8) and the Scope and Methodology Report (SMR)¹³⁴.

12.3 Environmental baseline

Existing baseline

Study area description

- 12.3.1 The following provides a brief overview in terms of employment, economic structure, labour market and business premises availability within the Stone and Swynnerton area.
- 12.3.2 The Stone and Swynnerton area lies within the administrative area of Stafford Borough within the County of Staffordshire. It also falls within the Stoke-on-Trent and Staffordshire Local Enterprise Partnership (LEP) area¹³⁵ and the West Midlands region.

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

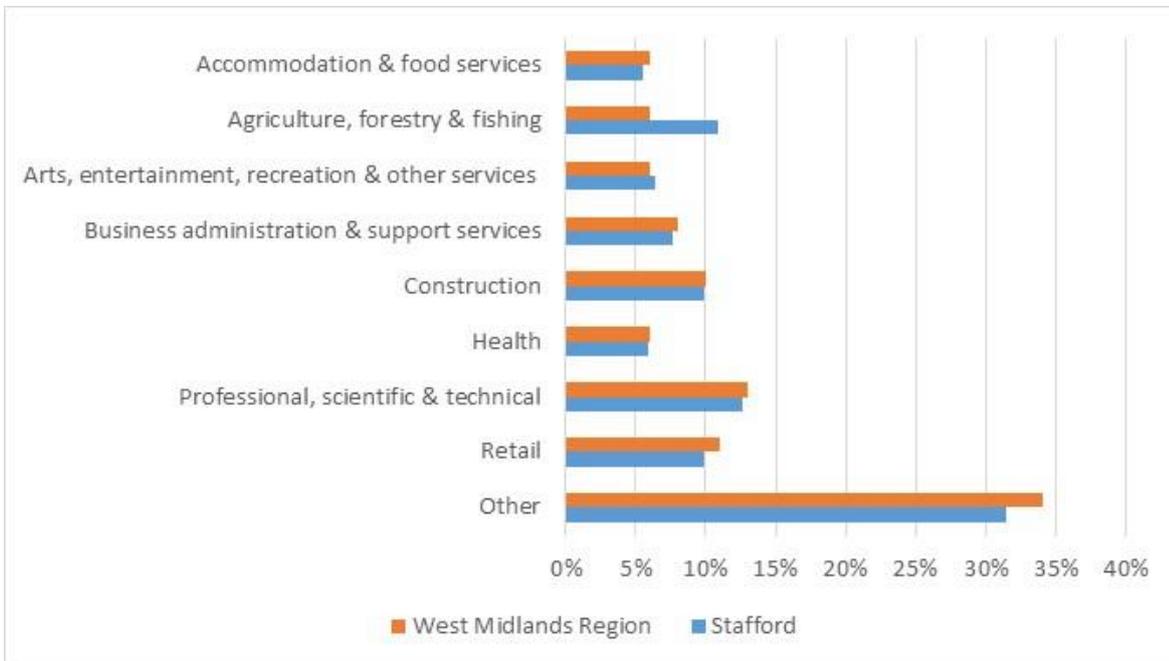
¹³³ HS2 Ltd (2017), High Speed Two (HS2) Phase 2a (West Midlands - Crewe), Background Information and Data, Available online at: www.gov.uk/hs2

¹³⁴ Volume 5: Appendix CT-001-001, Environmental Impact Assessment Scope and Methodology Report.

¹³⁵ Stoke-on-Trent and Staffordshire Local Enterprise Partnership, (2014), *Strategic Economic Plan Summary March 2014*.

the largest proportion of businesses (13%), with agriculture, forestry and fishing the second largest (11%) followed by retail and construction (10% each). This is shown in Figure 9. For comparison within the West Midlands region, the largest sectors were professional, scientific and technical (13%), followed by retail (11%) and construction (10%)¹³⁶.

Figure 9: Business sector composition in SBC area and the West Midlands¹³⁷



12.3.4 In 2015¹³⁸, approximately 57,000 people worked in the SBC area. According to the Office for National Statistics Business Register and Employment Survey 2015, the top five sectors in terms of share of employment in Stafford were: health (16%), reflecting the ageing population; manufacturing (12%); public administration and defence (10%); retail (9%) and accommodation and food services (8%). These compare with the top five sectors for the West Midlands region, which were: health (12%); manufacturing (12%); retail (9%); education (9%) and business administration and support services (8%). This is shown in Figure 10¹³⁹.

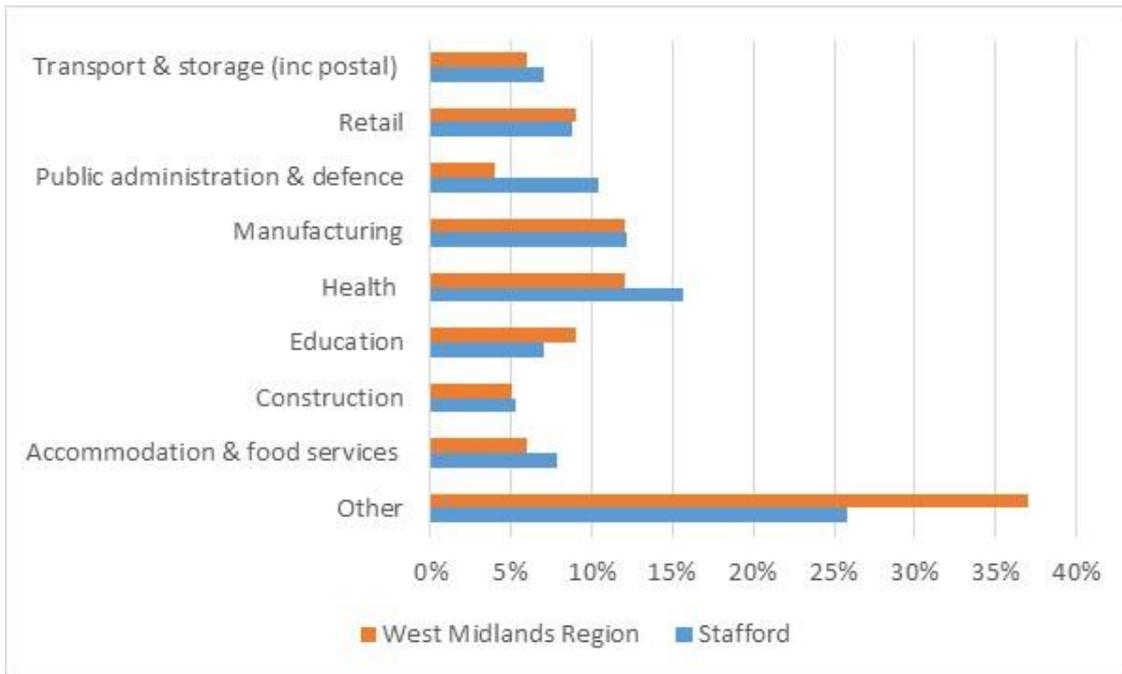
¹³⁶ Office for National Statistics; UK business counts – local units 2015. Available online at: <https://www.nomisweb.co.uk>;

¹³⁷ "Other" includes: motor trades; transport and storage; finance and insurance; public administration and defence; and education sectors).

¹³⁸ Office of National Statistics, (2015) Business Register and Employment Survey; Available online at: <http://www.nomisweb.co.uk>.

¹³⁹ Office of National Statistics, (2015) Business Register and Employment Survey; Available online at: <http://www.nomisweb.co.uk>.

Figure 10: Employment by industrial sector in the SBC area and the West Midlands ¹⁴⁰



- 12.3.5 According to the Annual Population Survey (2016)¹⁴¹, the employment rate¹⁴² within the SBC area was 75% (60,300 people), which was higher than that recorded for both the West Midlands (71%) and England (74%). In 2016, unemployment¹⁴³ in the SBC area was 4%, which was lower than the West Midlands (6%) and England (5%).
- 12.3.6 According to the Annual Population Survey (2016)¹⁴⁴, 46% of SBC residents aged 16-64 were qualified to National Vocational Qualification Level 4 (NVQ4) and above, compared to 31% in the West Midlands and 38% in England, while 7% of residents had no qualifications, which was lower than that recorded both for West Midlands (12%) and England (8%).

Property

- 12.3.7 A review of employment land in 2012¹⁴⁵ identified a need for 8.9ha per year to 2026 for general business land in the SBC area. The importance of developing a range of employment sites to support growth has been highlighted in the LEP Strategic Economic Plan¹⁴⁶.

¹⁴⁰ 'Other' includes retail, construction, wholesale, information and communication, motor trades, public administration and defence, property, financial and insurance and agriculture, forestry and fishing sectors.

¹⁴¹ Annual Population Survey, (2016), NOMIS; <http://www.nomisweb.co.uk>.

¹⁴² The proportion of working age (16-64 year olds) residents that is in employment.

¹⁴³ 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.

¹⁴⁴ Annual Population Survey, (2016), NOMIS; <http://www.nomisweb.co.uk>

¹⁴⁵ Stafford Borough Council (2012) Employment Land Review 2012. <http://www.staffordbc.gov.uk/live/Documents/Planning%20Policy/Further%20Information%20and%20Evidence/Employment/Employment-Land-Review-2012.pdf>. Based on 10 year average build rate projected forward for 2012-2036.

¹⁴⁶ Stoke-on-Trent & Staffordshire LEP (undated), Stoke-on-Trent & Staffordshire Economic Growth Strategy 2012 - 2026, v2.1.

- 12.3.8 The average vacancy rate for industrial and warehousing property in the SBC area in April 2017 has been assessed as 6% based on marketed space against known stock¹⁴⁷.

Future baseline

Construction (2020)

- 12.3.9 Volume 5: Appendix CT-004-000 provides details of the developments in the Stone and Swynnerton area that are assumed to have been implemented by 2020.
- 12.3.10 Implementation of all outstanding development consents and land allocations that can be built could result in approximately 3,030 additional jobs by 2020. The existing composition and numbers of employers, employees and economic sectors in the area is likely to change over time in ways that cannot be accurately forecast. These are considered in the cumulative assessment of the construction phase of the Proposed Scheme.

Operation (2027)

- 12.3.11 Volume 5: Appendix CT-004-000 provides details of the developments in the Stone and Swynnerton area that are assumed to have been implemented by 2027.
- 12.3.12 No additional committed developments have been identified in this area that will materially alter the baseline conditions in 2027 for business receptors.

12.4 Effects arising during construction

Avoidance and mitigation measures

- 12.4.1 The draft Code of Construction Practice¹⁴⁸ (CoCP) includes a range of provisions that will help mitigate socio-economic effects associated with construction within this area, including:
- reducing nuisance through sensitive layout of construction sites (Section 5);
 - consulting businesses located close to hoardings on the design, materials used and construction of the hoarding, to reduce impacts on access to and visibility of their premises (Section 12);
 - applying best practicable means (BPM) during construction works to reduce noise (including vibration) at sensitive receptors (including local businesses), monitor and manage flood risk and other extreme weather events that may affect socio-economic resources during construction (Section 13);
 - site specific traffic management measures including requirements relating to the movement of traffic from business and commercial operators of road vehicles, including goods vehicles (Section 14); and

¹⁴⁷ 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).

¹⁴⁸ Volume 5: Appendix CT-003-000, Draft Code of Construction Practice.

- maintaining access to businesses for the duration of construction works where reasonably practicable (Section 14).

Assessment of impacts and effects

12.4.2 The proposed construction works are assessed for socio-economic effects in relation to:

- premises demolished with their occupants and employees needing to relocate to allow for construction of the Proposed Scheme;
- in-combination effects (e.g. air quality, noise, vibration, construction traffic and visual impacts) and isolation of an area that could affect a business's operations. Any resulting effects on employment are reported at a route-wide level (see Volume 3: Route-wide effects); and
- potential employment opportunities arising from construction in the local area (including in adjacent community areas).

Temporary effects

In-combination effects

12.4.3 No non-agricultural¹⁴⁹ businesses have been identified within the Stone and Swynnerton area that are expected to experience significant in-combination effects as a result of the Proposed Scheme.

Isolation

12.4.4 No non-agricultural businesses have been identified within the Stone and Swynnerton area that are expected to experience significant isolation effects as a result of the Proposed Scheme.

Construction employment

12.4.5 Within the Stone and Swynnerton area, there will be two main compounds (Stone railhead main compound and Swynnerton North cutting main compound) and 10 satellite compounds. These sites could result in the creation of up to 3,660 person years of construction employment¹⁵⁰ opportunities, broadly equivalent to 370 full-time jobs¹⁵¹, which, depending on skill levels required and the skills of local people, are potentially accessible to residents in the locality and to others living further afield. The impact of the direct construction employment creation has been considered as part of the route-wide assessment (see Volume 3: Route-wide effects).

12.4.6 Direct construction employment 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 (see Volume 3: Route-wide effects).

¹⁴⁹ Possible employment loss in agricultural businesses as a result of the Proposed Scheme is being estimated at the route-wide level.

¹⁵⁰ 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.

¹⁵¹ Based on the convention that 10 employment years is equivalent to one full time equivalent job.

- 12.4.7 The resulting effects on employment are reported in aggregate at a route-wide level (see Volume 3: Route-wide effects).

Permanent effects

Businesses

- 12.4.8 Businesses directly affected, comprising those that lie within land required for the Proposed Scheme, are reported in groups, where possible, to form defined resources based on their location and operational characteristics. A group could contain either one or a number of businesses reflecting the fact that a building may have more than one occupier or that similar businesses and resources are clustered together.
- 12.4.9 Six business accommodation units or sites in the study area will be directly impacted upon by the Proposed Scheme. Five of these units form a single resource located at Pool House Farm and include two tool suppliers, a mobile toilet hire business, a distributor of safety netting and a car storage business. An additional unit, a dog training business, is also affected at Brook House.
- 12.4.10 Across all of the employment areas reviewed, an estimated 25 jobs¹⁵² will either be displaced or possibly lost within the Stone and Swynnerton area. There is a reasonable probability that businesses will be able to relocate to places that will still be accessible to residents within the travel to work areas due to the general availability of vacant premises. However, there may be cases where alternative locations are problematic and the businesses may be unable to relocate on a like-for-like basis within the area. The impact on the local economy from the 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 57,000 jobs).

Other mitigation measures

- 12.4.11 Businesses displaced by the Proposed Scheme will be compensated in accordance with the Compensation Code. HS2 Ltd recognises the importance of businesses, displaced from their existing premises, being able to relocate to suitable alternative premises and will, therefore, offer additional support over and above statutory requirements to facilitate this process¹⁵³.
- 12.4.12 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 promotes further economic growth across the UK.

Summary of likely residual significant effects

- 12.4.13 There are no significant effects identified in the assessment that will arise during construction of the Proposed Scheme.

¹⁵² Employment within businesses has been estimated through a combination of sources, for example, surveys of businesses, the Experian employment dataset, employment floor space and the Homes and Communities Agency (HCA) Employment Densities Guide 3rd Edition (2015). The estimate is calculated using standard employment density ratios and estimates of floor areas and may vary significantly from actual employment at the sites.

¹⁵³ HS2 Phase 2a Information Paper C8: Compensation code for compulsory purchase.

Cumulative effects

- 12.4.14 No committed developments have been identified that are considered to interact with the Proposed Scheme.
- 12.4.15 Cumulative effects arise in relation to the accumulation of individual resource based job displacement/losses on a local labour market. These effects are assessed as part of the route-wide assessment (see Volume 3: Route-wide effects).

12.5 Effects arising from operation

Avoidance and mitigation measures

- 12.5.1 No mitigation measures are proposed in relation to business resources during operation of the Proposed Scheme.

Assessment of impacts and effects

Resources with direct effects

- 12.5.2 There are no resources considered likely to experience significant direct socio-economic effects during the operation of the Proposed Scheme.

In-combination effects

- 12.5.3 No businesses have been identified within the area that are expected to experience significant in-combination effects as a result of the Proposed Scheme.

Operational employment

- 12.5.4 Operational employment will be created at the Stone Infrastructure Maintenance Base – Rail (IMB-R) for maintaining the Proposed Scheme. Present plans are that approximately 100 HS2 related jobs will be created at the Stone IMB-R in the Stone and Swynnerton area. Some of these employment opportunities will be accessible to local residents.
- 12.5.5 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.
- 12.5.6 The impact of operational employment creation has been assessed and reported at a route-wide level in Volume 3: Route-wide effects.

Other mitigation measures

- 12.5.7 No further mitigation measures have been identified for socio-economic receptors.

Summary of likely residual significant effects

- 12.5.8 There are no significant effects identified in the assessment that will arise during operation.

Cumulative effects

- 12.5.9 No cumulative effects on socio-economic characteristics have been identified in the Stone and Swynnerton area during operation.

Monitoring

- 12.5.10 Volume 1, Section 9 sets out the general approach to environmental monitoring during operation of the Proposed Scheme.
- 12.5.11 On the basis of there being no significant residual operational effects, there are no area-specific requirements for monitoring socio-economic effects during the operation of the Proposed Scheme in the Stone and Swynnerton area.

13 Sound, noise and vibration

13.1 Introduction

- 13.1.1 This section reports the assessment of the likely noise and vibration significant effects arising from the construction and operation of the Proposed Scheme within the Stone and Swynnerton 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 areas¹⁵⁴; 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'¹⁵⁵.
- 13.1.2 Engagement with Stafford Borough Council (SBC) has been undertaken with respect to the sound, noise and vibration assessment. The purpose of this engagement has been to obtain relevant information regarding residential and non-residential resources and existing baseline sound levels, and to discuss the development of the mitigation to be included in the Proposed Scheme. SBC officers also were invited to attend and witness the baseline sound measurements being undertaken within this area.
- 13.1.3 More detailed information regarding the sound, noise and vibration assessment for the Stone and Swynnerton area is available in the relevant appendices in Volume 5:
- sound, noise and vibration, route-wide assumptions and methodology (Appendix SV-001-000); and
 - sound, noise and vibration baseline, construction and operation assessment (Appendix SV-002-003).
- 13.1.4 Maps showing the location of the key environmental features (Map Series CT-10) and the key construction (Map Series CT-05) and key operational (Map Series CT-06) features of the Proposed Scheme can be found in the Volume 2: CA3 Map Book. Mapping to support the sound, noise and vibration assessment is presented in Map Series SV-05 (Volume 2: CA3 Map Book) and Map Series SV-01, SV-02, SV-03 and SV-04 (Volume 5: Sound, noise and vibration Map Book).
- 13.1.5 The assessment of likely significant effects from noise and vibration on agricultural, community, heritage, ecological and health receptors and the assessment of tranquillity are presented in Section 4, Agriculture, forestry and soils; Section 6, Community; Section 7, Cultural heritage; Section 8, Ecology and biodiversity; Section 9, Health; and Section 11, Landscape and visual, of this report respectively.

¹⁵⁴ '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.

¹⁵⁵ Quiet areas are defined in the Environmental Impact Assessment Scope and Methodology Report as either Quiet Areas as identified under the Environmental Noise Regulations or are resources which are prized for providing tranquillity.

13.2 Scope, assumptions and limitations

- 13.2.1 The approaches to assessing sound, noise and vibration and appropriate mitigation are outlined in Volume 1 (Section 8), the Scope and Methodology Report (SMR)¹⁵⁶, and the SMR Addendum¹⁵⁷.
- 13.2.2 In this assessment, 'sound' is used to describe the acoustic conditions that 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 barriers.
- 13.2.3 Effects can either be temporary from construction or permanent from the operation of the Proposed Scheme. These effects may be direct, resulting from the construction or operation of the Proposed Scheme, and/or indirect, resulting from changes in traffic patterns on existing roads or railways that result from the construction or operation of the Proposed Scheme.

13.3 Environmental baseline

Existing baseline

- 13.3.1 The Stone and Swynnerton area is characterised by a mix of larger settlements, small towns, villages, hamlets and isolated residential properties in a predominantly rural setting. It also includes the Walton Industrial Estate and sewage works. There are several major roads within this area: the M6; the A34 Stafford Road/The Fillybrooks, which runs through Aston-by-Stone; the A51 Stone Road, which runs through Sandon; the A519 Newcastle Road, which connects Eccleshall with Newcastle-under-Lyme; the B5026 Eccleshall Road, which runs east to west through Walton; and Yarnfield Lane, which runs east to west linking Yarnfield and Stone. The M6 is a major contributor to the sound environment for many assessment locations within the Stone and Swynnerton area. In addition, trains on the West Coast Main Line (WCML) contribute to the sound environment, along with other local sound sources. Sound levels close to these main transportation routes are high during the daytime, and with the exception of locations in proximity to the M6, are lower at night.
- 13.3.2 Further information on the existing baseline, including baseline sound levels and baseline monitoring results, is provided for the Stone and Swynnerton area in Volume 5: Appendix SV-002-003.
- 13.3.3 It is likely that the majority of receptors adjacent to the line of route are not currently subject to appreciable vibration¹⁵⁸. The predicted vibration levels at all receptors as a result of the Proposed Scheme has, therefore, been assessed using specific thresholds, below which receptors will not be affected by vibration. Further information is provided in Volume 1 (Section 8).

¹⁵⁶ Volume 5: Appendix CT-001-001, Environmental Impact Assessment Scope and Methodology Report

¹⁵⁷ Volume 5 Appendix CT-001-002, Environmental Impact Assessment Scope and Methodology Report Addendum.

¹⁵⁸ Further information is available in the Sound, noise and vibration methodology, assumptions and assessment report, Volume 5 Appendix SV-001-000, and, Volume 5: Appendix CT-001-001, Environmental Impact Assessment Scope and Methodology Report.

Future baseline

- 13.3.4 Without the Proposed Scheme, existing sound levels in this area are likely to increase slowly over time. This is primarily due to road traffic growth, which may be as a result of local or national trends or due to specific committed developments. Changes in car technology may offset some of the expected sound level increases due to traffic growth on low speed roads. On higher speed roads¹⁵⁹, tyre sound dominates and hence the expected growth in traffic is likely to continue to increase ambient sound levels.
- 13.3.5 Volume 5: Appendix CT-004-000 provides details of the developments in the Stone and Swynnerton area that are assumed to have been implemented by 2020 and 2027. Committed developments involving sound or vibration sensitive uses within the relevant study area have been included within the assessment and are reported for the Stone and Swynnerton area in Volume 5: Appendix SV-002-003. Where applicable, sound, noise or vibration significant effects on these committed developments are discussed in the following sections.

Construction (2020)

- 13.3.6 The assessment of noise from construction activities assumes a baseline year of 2020, which represents the period immediately prior to the start of the construction period. As a reasonable worst case, it has been assumed that no change in baseline sound levels will occur between the existing baseline year of 2016 and the future baseline year of 2020.

Operation (2027)

- 13.3.7 The operational assessment is based upon the predicted change in sound levels that result from the operation of the Proposed Scheme. The assessment initially considered a worst case (that would over-estimate the change in levels) by assuming that sound levels would not change from the existing baseline year of 2016. Where significant effects were identified on this basis, the effects have been assessed using a baseline year of 2027 to coincide with the proposed start of passenger services. The future baseline is the sound environment that would exist in 2027 without the Proposed Scheme. This is presented in Table 14 and Table 15 in Volume 5: Appendix SV-002-003.

13.4 Effects arising during construction

Local assumptions and limitations

Local assumptions

- 13.4.1 The construction arrangements that form the basis of the assessment are presented in Section 2.3 of this report and in Volume 1, Section 8.
- 13.4.2 During certain construction processes, there may be the need to operate fixed construction plant such as generators¹⁶⁰ and water pumps for reasons of safety or

¹⁵⁹ Tyre noise typically becomes the dominant sound source for steady road traffic.

¹⁶⁰ As required by the CoCP. The use of diesel or petrol-powered generators will be reduced by using mains electricity or battery-powered equipment where reasonably practicable.

engineering practicability on a continuous basis. This equipment will be sited, or locally screened to control sound to neighbouring residential premises.

- 13.4.3 A temporary construction railhead (the Stone railhead) will be located on the site of the proposed permanent Infrastructure Maintenance Base-Rail (IMB-R) facility near Stone. This facility will be established and operated during the construction phase of the Proposed Scheme for the movement of construction material deliveries and as an access point for track-laying activities. The Stone railhead will be connected to the conventional rail network, via the Norton Bridge to Stone sidings, so that the movements of materials both into and out of the railhead can be made by trains during the construction period. The movement of trains into and out of the railhead to the conventional rail network will utilise available train paths during the day and night.
- 13.4.4 The following activities have been assumed to be undertaken during the evening and night-time for reasons of safety, engineering practicability or to reduce the impact on existing transport: works in proximity to the M6 and WCML, including construction of the piling platform, pile cap construction and installation of beams and concreting.
- 13.4.5 It is also assumed there will also be some night-time working during road and rail possession periods and it is expected that the noise effects from these works will be limited in duration and are, therefore, not considered to be significant. Any noise effects arising from these short-term construction activities will be controlled and reduced by the management processes set out in the draft Code of Construction Practice (CoCP)¹⁶¹.
- 13.4.6 The assessment takes account of people's perception of noise throughout the day. More stringent criteria are applied during evening and night-time periods, when people are more sensitive to noise, compared to the busier and more active daytime period.
- 13.4.7 Piling and vibratory compaction is likely to result in short-term¹⁶² appreciable ground-borne vibration at a small number of dwellings, situated very close to these activities. These receptors will also be exposed to appreciable noise from the construction of the Proposed Scheme. The significance of the identified vibration effects has been assessed in combination with the airborne noise effects also identified at these receptors. The assessment is presented in Volume 5: Appendix SV-002-003.

Local limitations

- 13.4.8 There are a number of locations in this area where the land or property owners did not permit baseline sound level monitoring to be undertaken at their premises. However, sufficient baseline sound level information has been obtained at neighbouring representative locations to undertake the assessment. Further information is provided in Volume 5: Appendix SV-002-003.

¹⁶¹ Volume 5: Appendix CT-003-000, Draft Code of Construction Practice.

¹⁶² Typically less than 1 month.

Avoidance and mitigation measures

- 13.4.9 The assessment assumes the implementation of the principles and management processes set out in the noise and vibration section of the draft CoCP (Section 13), which are:
- best practicable means (BPM) as defined by the Control of Pollution Act 1974 (CoPA) and Environmental Protection Act 1990 (EPA), which will be applied during construction activities to minimise noise (including vibration) at neighbouring residential properties;
 - 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 will be offered in accordance with the HS2 noise insulation and temporary re-housing policy.
 - lead contractors will seek to obtain prior consent from the relevant local authority under Section 61 of the CoPA for the proposed construction works. The consent application will set out BPM measures to minimise construction noise, 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 will undertake and report such monitoring as is necessary to assure and demonstrate compliance with all noise and vibration commitments. Monitoring data will be provided regularly to, and be reviewed by, the nominated undertaker and made available to the local authorities; and
 - contractors will 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.
- 13.4.10 Noise insulation will be offered for qualifying buildings as defined in the draft CoCP. Noise insulation or where appropriate temporary re-housing will avoid residents being significantly affected by levels of construction noise inside their dwellings. The assessment reported in this section provides an estimate of the buildings that are likely to qualify for noise insulation. None are predicted to qualify for temporary rehousing.
- 13.4.11 Qualification for noise insulation and temporary re-housing will be confirmed, as part of seeking prior consent from the local authority under Section 61 of the CoPA. Qualifying buildings will be identified, as required in the draft CoCP, so that noise

insulation can be installed, or any temporary re-housing provided, before the start of the works predicted to exceed noise insulation or temporary re-housing criteria.

Assessment of impacts and effects

Residential receptors: direct effects – individual dwellings

- 13.4.12 Taking account of the avoidance and mitigation measures set out in the previous paragraphs, the following two residential properties are forecast to experience noise above the eligibility criteria as defined in the HS2 noise insulation and temporary rehousing policy¹⁶³. These residential dwellings are indicated on Map Series SV-03 (Volume 5: Sound, noise and vibration Map Book):
- Camelot Cottage, Shelton under Harley Farm, Shelton under Harley (assessment location reference: 13164); and
 - Honeysuckle Cottage, Shelton under Harley Farm, Shelton under Harley (assessment location reference: 13164).
- 13.4.13 For daytime construction, the trigger level for eligibility for noise insulation is 75dB¹⁶⁴ measured outside.
- 13.4.14 The mitigation measures, including noise insulation for the two residential properties, will reduce noise inside all dwellings such that it does not reach a level where it will significantly affect residents.

Residential receptors: direct effects – communities

- 13.4.15 The avoidance and mitigation measures to be implemented during construction will avoid airborne construction noise adverse effects on the majority of receptors and communities. Residual temporary noise or vibration effects are identified later in this section. With regard to noise outside dwellings, the assessment of temporary effects takes account of construction noise relative to existing sound levels.
- 13.4.16 In locations with lower existing sound levels¹⁶⁵, construction noise effects are likely to be caused by changes to noise levels outside dwellings. These may be considered by the local community as an effect on the acoustic character of the area and hence be perceived as a change in the quality of life for that community. Such effects are considered to be significant when assessed on a community basis taking account of the local context.
- 13.4.17 The assessment of construction noise and vibration indicates that significant direct effects on residential communities are unlikely to occur in this area.
- 13.4.18 The Stone railhead, which will be located north-west of Stone and immediately adjacent to the M6, has been considered within the construction assessment. The Stone railhead will be used during the construction of the Proposed Scheme. There are communities within the study area, but given the high existing ambient noise

¹⁶³ Further information is provided in HS2Phase 2a Information Paper E13: Control of construction noise and vibration.

¹⁶⁴ $L_{pAeq, 0800-1800}$ measured at the façade.

¹⁶⁵ Further information is presented in Volume 5: Appendix SV-001-000, Sound, noise and vibration methodology, assumptions and assessment report.

levels due to the proximity of the M6, no likely significant effects are identified as a result of activities associated with the railhead.

- 13.4.19 Track laying, power system and signalling installation works are unlikely to result in significant construction noise effects, given the short duration close to any communities, and where included in the Proposed Scheme, the presence of the permanent noise fence barriers.

Residential receptors: indirect effects

- 13.4.20 Construction traffic is likely to cause adverse noise effects on occupants of residential dwellings adjacent to Yarnfield Lane (from the route of the Proposed Scheme to the A34 west of Stone) and Dog Lane (from the junction with the A51 at Stableford Bridge through Swynnerton Old Park to the junction with the A519 Newcastle Road). However, when the change in the typical monthly construction traffic noise level and the number of properties adjacent to the route are considered, a likely significant construction traffic noise effect has not been identified.
- 13.4.21 Construction traffic is likely to cause adverse noise effects on residents of dwellings located immediately adjacent to the road along Pirehill Lane/Green Lane between Walton and Whitgreave. Approximately 45 dwellings located immediately adjacent to the road are forecast to experience a change in road traffic noise levels on Pirehill Lane/Green Lane of around 10dB $L_{pAeq, 0700-2300}$ during the peak months (further information on traffic flows is provided in Section 14, Traffic and transport). The overall change in road traffic noise levels when considering the road traffic sound levels from the M6 is approximately 3dB $L_{pAeq, 0700-2300}$. This is considered to be a likely significant effect on a community basis at the residential dwellings on this route, denoted as CSV02-Co6/CSV03-Co1 in Volume 5: Appendix SV-002-003. This temporary adverse effect represents a change in the acoustic character of the area, which may be perceived as a change in the quality of life for that community.

Non-residential receptors: direct effects

- 13.4.22 The assessment of construction noise and vibration indicates that significant direct effects on non-residential receptors are unlikely to occur in the Stone and Swynnerton area.

Non-residential receptors: indirect effects

- 13.4.23 The assessment of construction noise and vibration indicates that significant indirect effects are unlikely to occur on non-residential receptors in the Stone and Swynnerton area.

Summary of likely residual significant effects

- 13.4.24 The proposed avoidance and mitigation measures will reduce noise inside all dwellings from the construction activities such that residents will not be significantly affected¹⁶⁶.
- 13.4.25 The measures will also reduce the construction noise effects on acoustic character in the residential communities in this area such that they are not significant.

¹⁶⁶ Refer to Volume 5: Appendix SV-001-000.

- 13.4.26 Construction traffic on Pirehill Lane/Green Lane between Walton and Whitgreave in this area is likely to cause significant noise effects on adjacent residential properties.
- 13.4.27 HS2 Ltd will continue to seek reasonably practicable measures to further reduce or avoid this significant effect.

Cumulative effects

- 13.4.28 This assessment has considered the potential cumulative construction noise effects of the Proposed Scheme and other committed developments. In this area, it is not anticipated that there will be any developments built of sufficient scale at the same time as the Proposed Scheme and accordingly, construction noise or vibration from the Proposed Scheme is unlikely to result in any significant cumulative noise effects.

13.5 Effects arising from operation

Local assumptions and limitations

Local assumptions

- 13.5.1 The effects of noise and vibration from the operation of the Proposed Scheme have been assessed based upon the highest likely train flows, assuming the service pattern for Monday to Saturday including Phase One and Phase Two services. The expected passenger service frequency for Phase 2a, with both Phase One and Phase Two services operational, are described in Volume 1 (Section 4).
- 13.5.2 Passenger services will start at or after 05:00 from the terminal stations and in this area, with Phase One and Phase Two in operation, will progressively increase to 12 trains per hour in each direction on the main lines with an operating speed of 330kph for 90% of services and 360kph for 10% of services. This number of services is assumed to operate every hour from 07:00 to 21:00. The number of services will progressively decrease after 21:00 and the last service will arrive at terminal stations by 24:00. Further information is presented in Volume 1 (Section 4).

Local assumptions – Stone Infrastructure Maintenance Base-Rail (IMB-R)

- 13.5.3 The Stone IMB-R will be operational 24 hours a day, 7 days a week. The majority of the activities that produce the highest sound levels will occur during the daytime, when the inspection and maintenance trains will be maintained and prepared.
- 13.5.4 In general, it is expected that maintenance materials will be received during the day. However, it is possible that deliveries of maintenance materials could occur by road or rail at any time of the day or night.
- 13.5.5 As soon as possible after the close of passenger service, inspection trains will depart from the Stone IMB-R travelling the length of the Proposed Scheme whilst inspecting the railway infrastructure and equipment. After the departure of inspection trains, trains required for any planned maintenance will depart from the Stone IMB-R to travel to the required maintenance location.
- 13.5.6 Trains required for urgent, unplanned maintenance identified by an inspection will depart from the Stone IMB-R. Inspection and maintenance trains will return to the Stone IMB-R before the start of passenger services.

Avoidance and mitigation measures

- 13.5.7 The development of the Proposed Scheme has sought to keep the route as low as is reasonably practicable and away from main communities.

Airborne noise

- 13.5.8 HS2 trains will be quieter than the relevant current European Union specifications, in line with the assumptions made for the HS2 Phase One Environmental Statement. This will include reduction of aerodynamic noise from the pantograph that otherwise would occur above 186mph (300kph) with current pantograph designs, drawing on proven technology in use in East Asia. Overall these measures will reduce noise emissions by approximately 3dB at 225mph (360kph) compared to a current European high speed train. The track will be specified to reduce noise, as will the maintenance regime. Further information is provided in Volume 5: Appendix SV-001-000.
- 13.5.9 The Proposed Scheme incorporates noise 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 from the outer rail.
- 13.5.10 In the Stone and Swynnerton area, noise barriers have been incorporated into the Proposed Scheme to avoid or reduce adverse effects due to airborne noise at Walton and Swynnerton. The location and height of these noise barriers are shown on Map Series SV-05 (Volume 2: CA3 Map Book).
- 13.5.11 In practice, barriers may differ from this general assumption while maintaining the required acoustic performance. For example, where noise barriers are in the form of landscape earthworks, they need to be higher above rail level to achieve similar noise attenuation to a noise fence barrier, because the crest of the earthwork will be further than 5m from the outer rail.
- 13.5.12 Noise effects will be reduced in other locations along the Proposed Scheme by landscape earthworks provided to avoid or reduce significant visual effects and engineering structures such as cuttings and safety fences on viaducts (where noise barriers are not required). The location of the landscape earthworks is shown on Map Series SV-05 (Volume 2: CA3 Map Book).
- 13.5.13 Significant noise effects from the operational static noise sources, such as line-side equipment, stationary trains or sources such as mechanical plant operated as part of the activities undertaken at Stone IMB-R, will be avoided through their design and the specification of noise emission requirements. Further information is presented in Volume 5: Appendix SV-001-000.
- 13.5.14 Noise insulation measures will be offered for qualifying buildings as defined in the Noise Insulation (Railways and Other Guided Transport Systems) Regulations 1996 (the Regulations¹⁶⁷). 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 will be formally identified and noise insulation offered at the time the Proposed Scheme

¹⁶⁷ Her Majesty's Stationery Office (1996), The Noise Insulation (Railways and Other Guided Transport Systems) Regulations, London.

becomes operational. Where noise insulation is required, as well as improvements to noise insulation of windows facing the railway, ventilation will be provided so that windows can be kept closed to protect internal sound levels.

- 13.5.15 Noise insulation will 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.
- 13.5.16 Where the noise from the operation of the Proposed Scheme measured outside a dwelling exceeds the Interim Target defined by the World Health Organization's (WHO) Night Noise Guidelines for Europe¹⁶⁸, residents are considered to be significantly affected by the resulting noise inside their dwelling. The Interim Target is a lower level of noise exposure than the trigger threshold for night noise in the Regulations, i.e. 55dB equivalent continuous level, $L_{pAeq,23:00-07:00}$ measured without reflection from the front of buildings. The effect on people at night due to the maximum sound level as each train passes has also been assessed¹⁶⁹. In line with these criteria, where night-time noise levels for the use of new or additional railways or altered roads authorised by the Bill are predicted following the methodology set out in the Regulations to exceed 55dB¹⁷⁰, or the maximum noise level as a train passes exceeds the relevant criteria, noise insulation will be offered for these additional buildings.
- 13.5.17 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 will be intermittent and its level will vary as the PRow moves closer to and further from the Proposed Scheme. No significant noise effects have, therefore, been identified on users of PRow within the Stone and Swynnerton area.

Ground-borne noise and vibration

- 13.5.18 Significant ground-borne noise or vibration effects will be avoided or reduced through the design of the track and track-bed.

Assessment of impacts and effects

Residential receptors: direct effects – individual dwellings

- 13.5.19 Taking account of the avoidance and mitigation measures incorporated into the Proposed Scheme, the assessment has identified six residential dwellings where noise levels are predicted to exceed the daytime trigger threshold set out in the Regulations¹⁷¹. It is, therefore, anticipated that these buildings are likely to qualify for noise insulation under the Regulations. These residential dwellings are indicated on Map Series SV-04 (Volume 5: Sound, noise and vibration Map Book):
- Whitemoor Farm, Yarnfield Lane, Yarnfield (assessment location ref.: 13099);

¹⁶⁸ World Health Organization (2010), *Night time Noise Guidelines for Europe*.

¹⁶⁹ 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).

¹⁷⁰ Equivalent continuous level, $L_{pAeq,23:00-07:00}$ measured without reflection from the front of buildings.

¹⁷¹ Equivalent to a daytime the free-field level of 65 dB $L_{pAeq,0700-2300}$, and a night-time free-field level of 60 dB $L_{pAeq,2300-0700}$.

- Blakelow Farm, Blakelow, Swynnerton (assessment location ref.: 13113);
- Sandyford Farm, Sandyford (assessment location ref.: 13125);
- Camelot Cottage, Shelton under Harley Farm, Shelton under Harley (assessment location ref.: 13164);
- Honeysuckle Cottage, Shelton under Harley Farm, Shelton under Harley (assessment location ref.: 13164); and
- Shelton under Harley Farm, Shelton under Harley (assessment location ref.: 13166).

13.5.20 The mitigation measures set out in the previous section, including noise insulation, will reduce noise inside all dwellings such that it will not reach a level where it will significantly affect residents.

Residential receptors: direct effects – communities

13.5.21 The proposed mitigation measures in the Stone and Swynnerton area will avoid or reduce adverse effects due to airborne noise on the majority of receptors and in the following communities:

- Walton;
- Stone;
- Yarnfield; and
- Swynnerton.

13.5.22 Taking account of the envisaged mitigation, Map Series SV-05 (Volume 2: CA3 Map Book) shows the long term 40dB¹⁷² night-time sound level contour from the operation of trains on the Proposed Scheme. The extent of the 40dB night-time sound level contour is equivalent to, or slightly larger than, the 50dB daytime contour¹⁷³. In general, below these levels adverse effects are not expected.

13.5.23 Above 40dB during the night and 50dB during the day the community effect of noise is dependent on the baseline sound levels in that area and the change in sound level (magnitude of effect) brought about by the Proposed Scheme. The airborne noise impacts and effects forecast for the operation of the Proposed Scheme are presented on Map Series SV-05 (Volume 2: CA3 Map Book). The changes in noise levels shown on these maps are likely to affect the acoustic character of the area such that taking account of the local context¹⁷⁴, this may be significant when assessed on a community basis¹⁷⁵.

13.5.24 Approximately 30 isolated properties within the area have been identified as being subject to likely adverse noise effect; these effects are likely to be received as an

¹⁷² Defined as the equivalent continuous sound level from 23:00 to 07:00 or $L_{pAeq,night}$).

¹⁷³ With the train flows described in the assumptions section of this CFA Report, the daytime sound level (defined as the equivalent continuous sound level from 07:00 to 23:00 or $L_{pAeq,day}$) from the Proposed Scheme would be approximately 10dB higher than the night-time sound level. The 40dB contour therefore indicates the distance from the Proposed Scheme at which the daytime sound level would be 50dB.

¹⁷⁴ Further information is provided in Volume 5: Appendix SV-001-000 and Appendix SV-002-003.

¹⁷⁵ Further information is contained in Volume 1.

effect on the acoustic character of the area. However, as the affected properties are spatially remote from larger defined residential areas, are subject to smaller magnitudes of noise effect, or are small in number, the effects are not considered to be significant on a community basis.

- 13.5.25 The assessment of operational noise and vibration, including noise and vibration from the Stone IMB-R, indicates that significant direct effects on residential communities are unlikely to occur in this area.

Residential receptors: indirect effects

- 13.5.26 The assessment of operational noise and vibration indicates that significant indirect effects are unlikely to occur on residential receptors in the Stone and Swynnerton area.

Non-residential receptors: direct effects

- 13.5.27 The assessment of operational noise and vibration indicates that significant direct effects are unlikely to occur on non-residential receptors in the Stone and Swynnerton area.

Non-residential receptors: indirect effects

- 13.5.28 The assessment of operational noise and vibration indicates that significant indirect effects are unlikely to occur on non-residential receptors in the Stone and Swynnerton area.

Summary of likely residual significant effects

- 13.5.29 At individual residences, the mitigation measures, including noise insulation, will reduce noise inside all dwellings such that it will not reach a level where it will significantly affect residents, and therefore, no likely residual significant effects are identified.
- 13.5.30 At the community level, landscape earthworks and noise mitigation, described in this section, and presented in Map Series SV-05 (Volume 2: CA3 Map Book), will substantially reduce the potential airborne sound impacts and noise effects that would otherwise arise from the Proposed Scheme. The assessment of operational noise and vibration indicates that significant operational sound, noise or vibration effects are unlikely to occur on communities in this area.
- 13.5.31 The assessment of operational noise and vibration indicates that significant direct effects on non-residential receptor are unlikely to occur in this area.

Cumulative effects

- 13.5.32 It is not anticipated that there will be any significant cumulative noise effects during operation of the Proposed Scheme.

Monitoring

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

- 13.5.34 Operational noise and vibration monitoring will be carried out at different times during the lifetime of the Proposed Scheme at a combination of carefully selected monitoring locations including: adjacent or attached to moving vehicles; at fixed positions or in the vicinity of individual assets; and locations within the surrounding areas and communities alongside the railway corridor.
- 13.5.35 The expected noise and vibration performance of the Proposed Scheme, operational noise and vibration measurement data, associated asset information, description of corrective actions, results of measured performance compared to expected conditions, and monitoring reports will be shared with the relevant local authorities at appropriate intervals.

14 Traffic and transport

14.1 Introduction

- 14.1.1 This section describes the likely impacts on all forms of transport and the consequential significant effects on transport users arising from the construction and operation of the Proposed Scheme through the Stone and Swynnerton area. The effects on traffic and transport are assessed quantitatively, based on existing baseline traffic conditions and future scenarios.
- 14.1.2 Engagement with Highways England and Staffordshire County Council (SCC) has been undertaken. An important focus of this engagement has been to obtain relevant baseline information.
- 14.1.3 A detailed report on traffic and transport impacts and surveys undertaken within the Stone and Swynnerton area is contained in Volume 5: Appendix TR-001-000: Transport Assessment.
- 14.1.4 Maps showing the location of the key environmental features (Map Series CT-10) and the key construction (Map Series CT-05) and key operational (Map Series CT-06) features of the Proposed Scheme can be found in the Volume 2: CA3 Map Book.
- 14.1.5 Maps showing traffic and transport significant effects during construction (Map Series TR-03) and operation (Map Series TR-04) and construction traffic routes to compounds (Map Series TR-08) can be found in Volume 5: Traffic and transport Map Book.
- 14.1.6 In addition, further traffic survey data is set out in Background Information and Data (BID)¹⁷⁶, (see BID-TR-001-000: Traffic assessment baseline data).

14.2 Scope, assumptions and limitations

- 14.2.1 The scope, key assumptions and limitations for the traffic and transport assessment are set out in Volume 1 (Section 8), the Scope and Methodology Report (SMR)¹⁷⁷ and the SMR Addendum¹⁷⁸.
- 14.2.2 The study area for traffic and transport includes all roads affected by the Proposed Scheme including: the M6 between junctions 14 and 15; the A500 Queensway; the A34 Stafford Road/The Fillybrooks; the A51 Stone Road between Meaford and Stableford; the A519 Newcastle Road between Eccleshall and Hanchurch; the A5182 Trentham Road; the B5026 Eccleshall Road through Stone; and local roads serving the settlements of Swynnerton, Yarnfield and Stableford.
- 14.2.3 The baseline forecast traffic flows for the future years of assessment have been derived using the Department for Transport's (DfT) traffic forecasting tool, Trip End Model Presentation Program (TEMPro), and relevant traffic models (Highways England M6 J13-J15 Smart Motorways Project (SMP) Strategic Model). The

¹⁷⁶ HS2 Ltd (2017), High Speed Two (HS2) Phase 2a (West Midlands - Crewe), Background Information and Data, Available online at: www.gov.uk/hs2

¹⁷⁷ Volume 5: Appendix CT-001-001, Environmental Impact Assessment Scope and Methodology Report.

¹⁷⁸ Volume 5: Appendix CT-001-002, Environmental Impact Assessment Scope and Methodology Report Addendum.

assessment covers the average weekday morning (08:00-09:00) and evening (17:00-18:00) peak periods.

14.2.4 Since it is not possible to forecast how services may change in the future, it has been assumed that bus services for the future years of assessment will be the same as those currently operating.

14.2.5 Forecast future year traffic flows with and without the Proposed Scheme have been based on an approach that does not take account of wider effects such as redistribution and reassignment of traffic. It is unlikely that these wider changes would affect the conclusions drawn in this section.

14.3 Environmental baseline

Existing baseline

14.3.1 Existing conditions in the study area have been determined through site visits, traffic and transport surveys, liaison with Highways England and SCC (including provision of information on public transport, public right of way (PRoW) and accident data) and desktop analysis.

Surveys

14.3.2 Traffic surveys, comprising of automatic traffic counts, junction turning counts and queue surveys, of roads crossing the route of the Proposed Scheme or potentially affected by the Proposed Scheme were undertaken in: November and December 2015; February, March, July and November 2016; and March and April 2017. This data has been supplemented by existing traffic data from other sources where available, including from Highways England and SCC. Assessment of the data indicates that the peak hours in the Stone and Swynnerton area are 08:00 – 09:00 and 17:00 – 18:00.

14.3.3 PRoW surveys were undertaken in May, June, July and September 2016 and April 2017 to establish their nature and usage by non-motorised users (pedestrians, cyclists and equestrians). The surveys included all PRoW and roads that 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.

Highway network

14.3.4 There are two strategic roads that pass through the Stone and Swynnerton area, the M6 and the A500 Queensway. The M6 traverses the centre of the area along a north to south alignment. The Proposed Scheme will intersect the M6 to the west of Stone. Junction 15 of the M6 is located on the northern boundary of the Stone and Swynnerton area, where it forms a junction with the A500 Queensway. The A500 Queensway provides a connection between the M6 and Stoke-on-Trent.

14.3.5 There are four primary 'A' roads that pass through the Stone and Swynnerton area, these are: the A34 Stafford Road/The Fillybrooks, which connects Trentham in the north to Aston-by-Stone in the south; the A51 Stone Road, which connects Stone to Stableford via Swynnerton; the A519 Newcastle Road, which connects Eccleshall with Newcastle-under-Lyme; and the A5182 Trentham Road, which connects the A519

Newcastle Road with the A53 Whitmore Road in the adjoining Whitmore Heath to Madeley area (CA4) to the west. The strategic and primary road network, particularly around Stone, Stoke-on-Trent and Newcastle-under-Lyme, can get busy at peak times and delays can be experienced.

- 14.3.6 The main local roads that will be affected by the Proposed Scheme are: the B5026 Eccleshall Road connecting the settlements of Eccleshall, Norton Bridge and Walton to Stone in the east; and Yarnfield Lane connecting Yarnfield to the A34 Stafford Road/The Fillybrooks and Stone in the east. The local road network in this area 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 three-year period (2012 to 2015¹⁷⁹) has been assessed and any identified clusters have been examined. One accident cluster was identified within the Stone and Swynnerton area, located at the A500 Queensway/A519 Newcastle Road junction (14 accidents over the last three years). In terms of severity, all of these accidents were reported as slight and none involved pedestrians or cyclists.
- 14.3.8 The Proposed Scheme will cross 10 roads and roadside footways within the Stone and Swynnerton area, these are: the B5026 Eccleshall Road; Yarnfield Lane; the M6; Tittensor Road; Stab Lane; the A51 Stone Road; Bottom Lane; the A519 Newcastle Road; Dog Lane; and Bent Lane (part of which is located in the Whitmore Heath to Madeley area (CA4)).

Parking and loading

- 14.3.9 There is no designated parking or loading identified in the Stone and Swynnerton area that is expected to be impacted by the Proposed Scheme. Consequently, this topic is not considered further in this assessment.

Public transport network

- 14.3.10 There are two bus corridors that will cross the route of the Proposed Scheme in the Stone and Swynnerton area. These are the B5026 Eccleshall Road and Yarnfield Lane corridors. Three additional bus corridors are also in the area but do not cross the route of the Proposed Scheme, these are: the A51 Stone Road via Stone and Sandon; the A519 Newcastle Road via Eccleshall and Swynnerton; and the A34 Stafford Road/The Fillybrooks via Walton and Stone.
- 14.3.11 Services on the A34 Stafford Road/The Fillybrooks do, however, cross the route of the Proposed Scheme in the Colwich to Yarlet area (CA2) at the A34 Stone Road. Any effects on these services are considered and reported in Volume 2: Community area 2, Colwich to Yarlet. The services that cross the route of the Proposed Scheme in each corridor are:
- the B5026 Eccleshall Road is served by one bus service, the 13, which provides connections to Stafford, Norton Bridge and Stone; and

¹⁷⁹ Represents the last full year of data available at the time of undertaking the assessment.

- Yarnfield Lane is served by three bus services, the 12, 13A and 14/14A/14B, which provide connections to Stafford, Yarnfield, Stone, Barlaston, Longton, Norton Bridge, Eccleshall and Hanley.

- 14.3.12 There are bus stops located to serve the main built-up areas. Where bus stops are expected to be affected by either the construction or operation of the Proposed Scheme, these are referred to in the relevant assessment sections.
- 14.3.13 The route of the Proposed Scheme will cross the Norton Bridge to Stone Railway to the east of the M6 between the B5026 Eccleshall Road and Yarnfield Lane.
- 14.3.14 Local rail services are accessible via Stone Station and provide onwards connections to the national rail network via interchange at Stafford and Stoke-on-Trent. Stafford Station and Stoke-on-Trent Station provide connections to national destinations including London, Manchester and Birmingham.

Non-motorised users

- 14.3.15 There are pedestrian footways adjacent to many of the roads in the built up areas of Stone, Walton, Yarnfield and Swynnerton. Footways vary in width and condition within these areas. Where there is no formal footway provision adjacent to a road, non-motorised user numbers are generally low.
- 14.3.16 The route of the Proposed Scheme will cross the existing route of 10 PRow including two bridleways in the Stone and Swynnerton area. One further PRow in the area will be affected due to a permanent upgrade for maintenance access to the Proposed Scheme. The surveys undertaken to inform the assessment showed that there were fewer than 10 people a day recorded on most of the PRow in the area. The route with the greatest usage was Swynnerton Bridleway 54 with 30 users observed during the survey day.
- 14.3.17 The Trent and Mersey Canal towpath, which links with Barlaston to the north and Stafford to the south-west, provides an off-road cycle route. There are advisory cycle routes¹⁸⁰ passing through Swynnerton, including on Stab Lane and Cotes Lane. In addition, National Cycle Network Route 5 passes through the area on an off-road route alongside the A34 Stafford Road/The Fillybrooks, although it will not be directly affected by the route of the Proposed Scheme.

Waterways and canals

- 14.3.18 There is one navigable waterway in the Stone and Swynnerton area, the Trent and Mersey Canal. Aston Marina is located approximately 2km to the east of the Proposed Scheme at Aston-by-Stone and has capacity for up to 200 boats.

Air transport

- 14.3.19 There is no relevant air transport in the Stone and Swynnerton area. Consequently, this topic is not considered further in this assessment.

¹⁸⁰ Advisory cycle routes are locally promoted routes for use by cyclists that do not generally have any formal cycle infrastructure provision, such as cycle lanes.

Future baseline

- 14.3.20 The future baseline traffic volumes have been calculated by applying growth factors derived from TEMPro for the future years of 2023, 2027 and 2041. These represent the construction assessment year (2023), the year of opening (2027) and future assessment year (2041). Growth factors from TEMPro have been checked to ensure that committed developments and growth forecasts from the M6 J13-J15 SMP Strategic Model are appropriately reflected.
- 14.3.21 The committed developments at Land at End of Gateway Avenue, Baldwins Gate, Newcastle-under-Lyme (reference: 13/00426/OUT) and Land between Common Lane (Swynnerton) and Eccleshall Road, Stone, Staffordshire (reference: 14/20854/OUT)¹⁸¹ are not included in TEMPro and have consequently been added into the growth forecasts for this assessment.
- 14.3.22 Committed transport schemes are also included in the future baseline. In this area, the only substantial committed change to the transport network is the smart motorway improvements on the M6 between junction 13 and 15 (scheduled start of works March 2018 and scheduled completion of works March 2022).

Construction (2023)

- 14.3.23 Construction of the Proposed Scheme is expected to commence in 2020 with construction activity continuing to 2027 (although activity in 2027 will be limited to testing and commissioning). Construction activities have been assessed against 2023 baseline traffic flows, irrespective of when they occur during the construction period. The year 2023 has been adopted as a common base year and the impact of individual or overlapping activities are considered against this single year. The year 2023 broadly represents the likely peak period during construction of the Proposed Scheme and is therefore considered to be reasonably representative.
- 14.3.24 Future baseline traffic volumes in the peak hours are forecast to grow by an average of 10% by 2023 compared to the baseline year of 2016.

Operation (2027 and 2041)

- 14.3.25 Future baseline traffic volumes in the peak hours are forecast to grow by an average of 13% by 2027 compared to the baseline year of 2016.
- 14.3.26 Future baseline traffic volumes in the peak hours are forecast to grow by an average of 25% by 2041 compared to baseline year of 2016.

14.4 Effects arising during construction

Avoidance and mitigation measures

- 14.4.1 The following measures are proposed to avoid or reduce effects on transport users:

¹⁸¹ Volume 5: Appendix CT-004-000, Planning data.

- new highways (roads and PRow) will be constructed and operational prior to the permanent closure of any existing highways, insofar as reasonably practicable;
- the majority of roads crossing the route of the Proposed Scheme will be maintained or locally diverted during construction to limit the need for diversions of traffic onto alternative routes;
- traffic management measures will be implemented to limit any disruption;
- road closures will be restricted to overnight and weekends, insofar as reasonably practicable;
- temporary alternative routes for PRow will be provided during construction, insofar as reasonably practicable, where either the existing or final proposed route is not available;
- insofar as reasonably practicable, site haul routes will be created adjacent to the route of the Proposed Scheme to transport construction materials and equipment to reduce heavy goods vehicle (HGV) movements on public roads with access taken via the main road network;
- HGVs will be routed, insofar as reasonably practicable, along the strategic and/or primary road network;
- insofar as reasonably practicable, the use of the local road network will be limited to use for site set-up, access for surveys and on-going servicing (including refuse collection and general deliveries to compounds) during construction;
- a temporary railhead will be provided near to Stone to allow construction materials, including excavated materials, and equipment to be transported by the existing rail network. The temporary railhead will include direct access to and from the M6, which will reduce HGV movements on the local road network;
- the reuse of excavated material, insofar as reasonably practicable, along the route of the Proposed Scheme;
- borrow pits in the Fradley to Colton area (CA1), Whitmore Heath to Madeley area (CA4) and South Cheshire area (CA5) will limit the volume of construction traffic on the road network;
- highway measures including junction improvements, passing places and carriageway widening will be provided, as required, to manage the safe passing of construction vehicles on construction HGV routes. These are considered in this assessment and Volume 4: Off-route effects;
- the draft Code of Construction Practice (CoCP)¹⁸² includes the requirement to develop local traffic management plans which will consider the local traffic

¹⁸² Volume 5: Appendix CT-003-000, Draft Code of Construction Practice.

management strategy including consideration of sensitive receptors, such that the effect on safety and accidents is not significant; and

- on-site welfare facilities will be provided to reduce daily travel by site workers.

- 14.4.2 Section 14 of the draft CoCP includes measures whose purpose is to reduce the impacts and effects of deliveries of construction materials and equipment, including where appropriate timing of site operations and timing of traffic movements.
- 14.4.3 The number of private car trips to and from the construction compounds (both workforce and visitors) will be reduced by encouraging alternative sustainable modes of transport or vehicle sharing. This will be supported by an overarching framework travel plan that will require construction workforce travel plans¹⁸³ to be produced that will include 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, general 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 Site staff and workers will generally arrive before the morning peak hour and depart after the evening peak hour. Whilst the railhead near Stone will be operational on a 24 hour, seven days a week basis, workers will mostly arrive and depart outside of the peak traffic hours.
- 14.4.6 Disruption to rail passengers and freight movements on the conventional railway will be reduced insofar as reasonably practicable through the use of 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 and that passenger services are not disrupted; and
 - programming longer closures at the weekend and on bank holidays to reduce, insofar as reasonably practicable, the number of passengers affected.

Assessment of impacts and effects

Temporary effects

- 14.4.7 The following section considers the impacts on traffic and transport and the likely consequential significant effects resulting from construction of the Proposed Scheme.

¹⁸³ Construction and operational travel plans will promote the use of sustainable transport modes as appropriate to the location and types of trip. They will include measures such as: provision of information on and promotion of public transport services; provision of good cycle and pedestrian facilities; liaison with public transport operators; promotion of car sharing; and the appointment of a travel plan coordinator to ensure suitable measures are in place and are effective.

Key construction transport issues

- 14.4.8 The traffic and transport impacts during the construction period within the Stone and Swynnerton area will include:
- road closures and associated realignments and diversions;
 - alternative routes for PRow; and
 - construction vehicle movements to and from the various worksites.
- 14.4.9 The construction assessment has also considered any impacts in the Stone and Swynnerton 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 will include utilities diversions, earthworks, underpasses, viaducts, railhead, bridges and highway construction.
- 14.4.11 Details of construction compounds are provided in Section 2.3. The locations of the compounds and the associated access routes are shown in Map Series TR-08 (Volume 5: Traffic and transport Map Book). Table 28 provides a summary of this along with the transport activity at each compound. For each compound the peak month of activity is the month within which HGV traffic is at its highest for that compound. The busy period is the period during which HGV traffic serving that compound will be greater than 50% of the HGV traffic in the peak month. The average daily combined two-way vehicle trips for the busy period is the lower end of the range shown in the table below. The average daily combined two-way vehicle trips for the peak month is the upper end of the range shown in Table 28.

Table 28: Typical vehicle trip generation for construction sites in the Stone and Swynnerton area

Compound type	Location	Access to / from compound to main road network	Indicative start/set up date	Estimated duration of use (years)	Estimated duration of busy period (months)	Average daily combined two-way vehicle trips during busy period and within peak month of activity	
						Cars/LGV	HGV
Satellite	Yarlet embankment satellite compound	Stone Rural Bridleway 0.1135 for site setup and servicing, followed by site haul route thereafter to the A34 Stone Road	January 2021	Civil engineering - 4 years	3	56-77	82-98
			January 2025	Rail systems - 1 year and 6 months	3	18-30	up to 10
Satellite	Yarlet North cutting satellite compound	B5026 Eccleshall Road for site set-up and servicing,	January 2021	4 years 3 months	1	152-209	171-171

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Compound type	Location	Access to / from compound to main road network	Indicative start/set up date	Estimated duration of use (years)	Estimated duration of busy period (months)	Average daily combined two-way vehicle trips during busy period and within peak month of activity	
						Cars/LGV	HGV
		followed by site haul route to Stone railhead thereafter to the M6					
Satellite	Stone connection satellite compound	Via Stone railhead main compound	October 2021	6 months	3	94-222	up to 10
Main	Stone railhead main compound	M6 and Yarnfield Lane and on to the A34 The Fillybrooks	July 2024	3 years and 3 months	5	258-840	39-135
Satellite	Yarnfield North embankment satellite compound	Yarnfield Lane for site setup and servicing, followed by site haul route to Stone railhead thereafter to the M6	January 2021	4 years 3 months for civils but compound remains further 1 year and 9 months due to worker accommodation	19	264-363	129-189
Transfer node	Transfer node associated with Yarnfield North embankment satellite compound	Yarnfield Lane for site setup and servicing, followed by site haul route to Stone railhead thereafter to the M6	January 2021	4 years 3 months	12	N/A	935-1185
Satellite	M6 Meaford viaduct satellite compound	Yarnfield Lane for site setup and servicing, followed by site haul route to Stone railhead thereafter to the M6	January 2021	4 years 3 months	4	24-33	74-95
Satellite	Meaford North embankment satellite compound	Tittensor Road for site setup, main access via site haul route	January 2021	4 years	2	72-99	101-106
Satellite	Swynnerton embankment	Tittensor Road for site setup, main	Civil engineering	4 years	3	24-33	71-84

Environmental Statement Volume 2: Community area 3, Stone and Swynnerton

Compound type	Location	Access to / from compound to main road network	Indicative start/set up date	Estimated duration of use (years)	Estimated duration of busy period (months)	Average daily combined two-way vehicle trips during busy period and within peak month of activity	
						Cars/LGV	HGV
	satellite compound	access via site haul route	- January 2021				
			Railway systems - July 2024	1 year and 3 months (6 month overlap with civils)	10	57-84	up to 10
Main	Swynnerton North cutting main compound	A519 Newcastle Road and A51 Stone Road for site setup with a limited continued access. Main access via site haul route	January 2021	4 years 3 months	4	400-550	92-103
Transfer node	Transfer node associated with Swynnerton North cutting main compound	A519 Newcastle Road	January 2021	4 years 3 months	5	N/A	245-299
Satellite	Hatton South cutting satellite compound	Dog Lane and Bent Lane (South) for site setup, main access via site haul route	January 2021	4 years	3	48-66	87-110
Satellite	Hatton North cutting satellite compound	Bent Lane (North), Dog Lane to the A51 Stone Road	January 2021	4 years	2	24-33	82-95
Satellite	Stableford auto-transformer station satellite compound	Bent Lane (North)	July 2024	1 year 3 months	10	57-84	up to 10

14.4.12 Information on the indicative construction programme is provided in Section 2.3 and the construction methodology is summarised in Volume 1 (Section 6). This illustrates how the phasing of activities at different compounds will generally be staggered and that construction activities at individual compounds may not occur over the whole duration presented in Table 28.

14.4.13 Where construction routes serve more than one construction compound, the combined vehicle movements during the busiest period for each section of each route have been assessed.

Highway network

Strategic and local road network traffic

- 14.4.14 Temporary road or lane closures and associated diversions will be required in a number of locations including: the B5026 Eccleshall Road; Yarnfield Lane; the M6, Tittensor Road; Dog Lane; and Bent Lane. In most cases, these works will be restricted to short-term overnight and/or weekend closures, and are not, therefore, considered significant. Where works are of a longer duration and/or have a significant effect, these are addressed below.
- 14.4.15 In order to facilitate access to the Stone railhead, slip roads will be included from the M6 northbound and southbound. The provision of the northbound slip road will be temporary. However, the southbound slip road will be retained to form the permanent access to the Stone Infrastructure Maintenance Base-Rail (IMB-R). Whilst the northbound slips will no longer be used by the Stone IMB-R, modified northbound slips will be retained for emergency access. These slip roads mitigate the need for construction traffic to u-turn at the adjacent motorway junctions. The slip roads will not have a significant effect on traffic flows and delays for vehicle occupants during construction. The permanent effects of the southbound slip roads are considered under the operation of the Proposed Scheme.
- 14.4.16 Permanent localised realignment of the southbound lanes of the M6 will be required. To maintain safe operation of the motorway it will be necessary to undertake the works under traffic management. The traffic management will operate for a period of one year and six months over this length of the M6, and will be likely to include temporary speed restrictions for safety, temporary use of the hard shoulder, and reduced lane widths. HS2 Ltd will work with Highways England and local highway authorities to ensure that any traffic management works will be well planned and communicated and will not have a significant effect on traffic flows and delays for vehicle occupants.
- 14.4.17 One weekend closure of the motorway will be required for the demolition and removal of the existing Yarnfield Lane bridge over the M6. The works will also require temporary restrictions, including 10 overnight/weekend lane closures and four weekend carriageway closures (with traffic operating on a contraflow basis) over a two and a half year period. HS2 Ltd will work with Highways England and local highway authorities to ensure disruption to users will be minimised, insofar as reasonably practicable, through good planning and communication (including appropriate advance notice). Given the short term nature of these measures, they will not have a significant effect on traffic flows and delays for vehicle occupants.
- 14.4.18 In order to facilitate the realignment of existing major utilities and for construction of the A519 Newcastle Road overbridge, the A519 Newcastle Road will be diverted temporarily off-line adjacent to the existing alignment. This diversion will maintain capacity on the A519 Newcastle Road and is expected to be required for a period of one year and six months. On completion, the A519 Newcastle Road will be reinstated on its existing alignment, crossing over the route of the Proposed Scheme on the A519 Newcastle Road overbridge. The temporary diversion will not have a significant effect on traffic flows and delays for vehicle occupants.

- 14.4.19 The new alignment of Dog Lane will have a new embankment running along the same road for almost 200m and therefore requires a temporary road diversion during construction for a period of three months. The temporary diversion will not have a significant effect on traffic flows and delays for vehicle occupants.
- 14.4.20 Where site haul routes, created adjacent to the route of the Proposed Scheme, cross the existing road network, traffic control measures will be implemented and could include the provision of temporary signals or roundabouts, which will be removed upon completion of the works. Short term lane restrictions will be required in some locations to implement access points for construction vehicles. These traffic control measures are not likely to have a significant effect on traffic flows and delays for vehicle occupants.
- 14.4.21 Construction of the Proposed Scheme is forecast to result in changes in daily traffic flows due to the movement of excavated or fill material and construction vehicles accessing construction compounds and also temporary diversions.
- 14.4.22 These changes in traffic flow will lead to increases in delays to vehicle users and congestion¹⁸⁴, which are significant, at the following junctions:
- A34 Stafford Road/A51 Stone Bypass/Brooms Road roundabout – major adverse effect;
 - A34 Stafford Road/A34 The Fillybrooks/B5026 Eccleshall Road roundabout – major adverse effect;
 - A500 Queensway/A519 Newcastle Road roundabout – major adverse effect;
 - B5026 Eccleshall Road/Pirehill Lane – major adverse effect;
 - A519 Newcastle Road/A5182 Trentham Road signals – major adverse effect; and
 - A500 Queensway/A34 Stone Road – major adverse effect.
- 14.4.23 Junction assessments have been undertaken against the peak month flows and include robust assumptions on the level of construction traffic in the peak hours. The temporary effects identified are considered to be the reasonable worst case and HS2 Ltd will continue to work with the relevant highway authorities to manage the impacts at these locations.
- 14.4.24 Construction of the Proposed Scheme will result in substantial increases in traffic flows (i.e. more than 30% for HGV or all vehicles) in some locations, which can lead to traffic-related severance¹⁸⁵ for non-motorised users from increases in either all traffic (including Proposed Scheme worker trips, LGV and HGV traffic) or HGV traffic. The

¹⁸⁴ In assessing significant effects of traffic changes on congestion and delays, a major adverse effect occurs where traffic flows on a road link will be beyond or very close to capacity with the Proposed Scheme and the increases in traffic due to the Proposed Scheme will be such as to substantially increase queues and delays on a routine basis at peak times. A moderate adverse effect will occur when traffic flows on a road link will be approaching or at capacity with the Proposed Scheme and modest increases in traffic will increase the frequency of queues and more substantial delays. A minor adverse effect occurs when traffic flows on a road link are not generally exceeding capacity with the Proposed Scheme but the increase in flows will result in occasional queues and delays or small increases in existing delays.

¹⁸⁵ In the context of this Traffic and transport section, severance is used to relate to a change in ease of access for non-motorised users due to, for example, a change in travel distance or travel time or a change in traffic levels on a route that makes it harder for non-motorised users to cross. A reference to severance does not imply a route is closed to access.

effect reported below for each road is the most significant traffic-related severance effect for non-motorised users:

- A51 The Rowe between Common Lane (Swynnerton) and Dog Lane – moderate adverse effect as a result of an increase in HGV traffic;
- A51 The Rowe between the A519 Newcastle Road and Common Lane (Swynnerton) – minor adverse effect as a result of an increase in HGV traffic;
- A51 Stone Road/Bury Bank between the A519 Newcastle Road and the A34 Stafford Road/The Fillybrooks – minor adverse effect as a result of an increase in HGV traffic;
- A519 Newcastle Road between the A51 Stone Road and the A500 Queensway – major adverse effect as a result of an increase in all traffic;
- B5026 Eccleshall Road between the A34 Stafford Road/The Fillybrooks and Pirehill Lane – moderate adverse effect as a result of an increase in HGV traffic;
- Dog Lane between the A51 The Rowe and the Proposed Scheme – moderate adverse effect as a result of an increase in all traffic;
- Bent Lane between the A51 The Rowe and the Proposed Scheme – major adverse effect as a result of an increase in all traffic;
- Tittensor Road between Stab Lane and the A51 Stone Road – moderate adverse effect as a result of an increase in HGV traffic;
- Yarnfield Lane between the Proposed Scheme and the A34 The Fillybrooks – major adverse effect as a result of an increase in HGV traffic;
- Pirehill Lane between the Proposed Scheme and the B5026 Eccleshall Road – moderate adverse effect as a result of an increase in all traffic; and
- Bottom Lane between the A51 Stone Road and the A519 Newcastle Road – moderate adverse effect as a result of an increase in HGV traffic.

14.4.25 Utilities works have been assessed in detail where they are major and where the traffic and transport impacts from the works separately, or in combination with other works, will be greater than other construction activities arising within the area. Minor utilities works are expected to result in only localised traffic and pedestrian diversions, which will be of short-term duration. No additional significant effects from these minor utilities works are expected. Similarly, other minor works will involve a low level of use of local roads. Such use is not expected to give rise to significant construction traffic impacts.

Accidents and safety

14.4.26 The effect of the Proposed Scheme on accident and safety risks will not be significant. At one junction, the A500 Queensway/A519 Newcastle Road roundabout, where there are existing highway safety issues, there will be an increase in traffic flow and congestion. However, the overall change in traffic flow will not be sufficient to raise additional safety concerns.

- 14.4.27 There are no further locations where there are both accident clusters and substantial increases in traffic during construction.

Public transport network

- 14.4.28 The temporary diversion of the A519 Newcastle Road will require the diversion of the existing bus services on the A519 Newcastle Road. However, the increase in journey time and distance is not expected to have any significant effect on public transport delay.
- 14.4.29 The existing Norton Bridge to Stone Railway crosses under the route of the Proposed Scheme at Filly Brook viaduct. The construction of the Proposed Scheme, in particular to allow for construction of the Filly Brook viaduct and construction of the Stone railhead, is expected to require a number of rail possessions over a period of up to four years in this area including six weekend possessions of up to 54 hours. Disruption to rail users will be reduced by limiting possessions, where reasonably practicable, to existing maintenance periods. Where necessary, rail replacement services will be provided. HS2 Ltd will work with Network Rail and the train operating companies to ensure that any need for additional possessions can be reduced with good planning and communication (including appropriate advance notice). As the possessions are likely to be short term in nature, the effect on delay to rail passengers and freight services will not be significant.

Non-motorised users

- 14.4.30 The construction works associated with the Proposed Scheme will require the temporary closure or diversion/realignment of PRow and roads. In most cases, these will be of a short duration and/or distance, and therefore, will not have a significant severance effect on users.
- 14.4.31 However, there will be temporary adverse effects, which are significant, on non-motorised users during construction as a result of severance from increased travel distance and/or hindrances such as substantial changes in levels for non-motorised users due to temporary PRow realignments or diversions at:
- Stone Rural Footpath 28 – minor adverse effect from increase in distance of up to 250m;
 - Stone Rural Footpath 33 – moderate adverse effect from increase in distance of up to 900m;
 - Swynnerton Footpath 15 – moderate adverse effect from increase in distance of up to 1.2km;
 - Swynnerton Footpath 17 – minor adverse effect from increase in distance of up to 200m; and
 - Swynnerton Bridleway 54 – minor adverse effect from increase in distance of up to 200m.
- 14.4.32 With the exception of Stone Rural Footpath 33 and Swynnerton Footpath 15, the changes in travel distance on the PRow realignments or diversion are less than 500m.

Waterways and canals

- 14.4.33 The construction of the Proposed Scheme will not have a significant effect upon navigable waterways or canals in the Stone and Swynnerton area.

Permanent effects

- 14.4.34 Any permanent effects of construction have been considered in the assessment of operation for traffic and transport. This is because the impacts and effects of ongoing increases in travel demand and the wider impacts and effects of the operations phase need to be considered together.

Other mitigation measures

- 14.4.35 The implementation of the draft CoCP, in combination with the construction workforce travel plan will mitigate the transport-related effects during construction of the Proposed Scheme.

Summary of likely residual significant effects

- 14.4.36 The most intensive peak periods of construction for the Proposed Scheme will cause increases in traffic that will from time to time cause significant adverse effects through additional congestion and/or increased delays for road users at: the A34 Stafford Road/A51 Stone Bypass/Brooms Road roundabout (major adverse); the A34 Stafford Road/The Fillybrooks/B5026 Eccleshall Road roundabout (major adverse); the A500 Queensway/A519 Newcastle Road roundabout (major adverse); the B5026 Eccleshall Road/Pirehill Lane (major adverse); the A519 Newcastle Road/A5182 Trentham Road signals (major adverse); and the A500 Queensway/A34 Stone Road (major adverse).
- 14.4.37 During the construction period there will be increases in traffic which will increase traffic related severance for non-motorised users at: the A51 The Rowe between Common Lane (Swynnerton) and Dog Lane (moderate adverse); the A51 The Rowe between the A519 Newcastle Road and Common Lane (Swynnerton) (minor adverse); the A51 Stone Road/Bury Bank between the A519 Newcastle Road and the A34 Stafford Road/The Fillybrooks (minor adverse); the A519 Newcastle Road between the A51 Stone Road and the A500 Queensway (major adverse); the B5026 Eccleshall Road between the A34 Stafford Road/The Fillybrooks and Pirehill Lane (moderate adverse); Dog Lane between the A51 The Rowe and the Proposed Scheme (moderate adverse); Bent Lane between the A51 The Rowe and the Proposed Scheme (major adverse); Tittensor Road between Stab Lane and the A51 Stone Road (moderate adverse); Yarnfield Lane between the Proposed Scheme and the A34 The Fillybrooks (major adverse); Pirehill Lane between the Proposed Scheme and the B5026 Eccleshall Road (moderate adverse); and Bottom Lane between the A51 Stone Road and the A519 Newcastle Road (moderate adverse).
- 14.4.38 There will be temporary adverse significant effects due to increased travel distance during construction on non-motorised users of: Stone Rural Footpath 28 (minor adverse); Stone Rural Footpath 33 (moderate adverse); Swynnerton Footpath 15 (moderate adverse); Swynnerton Footpath 17 (minor adverse); and Swynnerton Bridleway 54 (minor adverse).

Cumulative effects

- 14.4.39 The assessment includes the cumulative effects of planned and committed development during construction by taking this into account with the background traffic growth.
- 14.4.40 The assessment also takes into account Proposed Scheme construction traffic and transport impacts of works to construct the Proposed Scheme being undertaken in neighbouring community areas.

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 will avoid or reduce impacts on transport users:

- reinstatement of 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 considers the impacts on traffic and transport and the likely consequential effects resulting from the operational phase of the Proposed Scheme.

Key operation transport issues

- 14.5.3 The maintenance and operation of the Proposed Scheme will not have any substantial impacts within the Stone and Swynnerton area. Operational traffic will largely be related to the Stone IMB-R. The Stone IMB-R will employ approximately 100 staff who will work in three shifts during each 24 hour period with shift changeover times generally outside of the peak hours. The maximum number of staff on site is likely to be during the night shift at the start and end of the maintenance periods (00:00 to 04:59/07:59 Sunday only) when approximately 30 to 50 people may be at the Stone IMB-R at any time.
- 14.5.4 Main access and egress to and from the Stone IMB-R is via the strategic road network using the southbound slip roads to/from the M6 which will be constructed to access the Stone railhead. However some local worker trips are likely to access the Stone IMB-R via Yarnfield Lane. As the main arrivals and departures will be outside of the peak periods the effect will not be significant. The maintenance of the Proposed Scheme will generate a limited number of vehicular trips and the effect will not be significant.
- 14.5.5 The operational effects are therefore limited to road closures and the permanent diversion and realignment of roads and PRoW.

Highway network

Strategic and local road network traffic

Operation (2027)

- 14.5.6 The Proposed Scheme will require the permanent widening, diversion or realignment of: the M6; the B5026 Eccleshall Road; Yarnfield Lane; the A51 Stone Road; Tittensor Road; Stab Lane; the A519 Newcastle Road; Dog Lane and Bent Lane. The permanent diversions or realignments will increase travel distance for vehicle occupants. The diversions or realignments are less than 1km in length and will not result in any significant effects with regard to increased journey times for vehicle occupants.
- 14.5.7 The Proposed Scheme will require the stopping-up of Stab Lane to the west of the route of the Proposed Scheme. Access and connectivity between Swynnerton and the A51 Stone Road will be maintained via the diverted Tittensor Road.
- 14.5.8 The Proposed Scheme will require the stopping-up of a 450m section of Tittensor Road to through traffic, although access to properties will be maintained. Access between Swynnerton and the A51 Stone Road will be provided via the diverted Tittensor Road. Neither the stopping up of Stab Lane or Tittensor Road will result in any significant increase in travel time or distance for vehicle occupants.
- 14.5.9 The A51 Stone Road will be diverted to the north of its existing alignment, remaining on the eastern side of the route of the Proposed Scheme, connecting to the A519 Newcastle Road at a new roundabout junction approximately 400m north-east of the existing roundabout junction. Vehicles travelling to/from the south or west will use the A519 Newcastle Road to access the existing A51 Stone Road/A519 Newcastle Road roundabout junction and continue their journey. The existing A51 Stone Road will be stopped up approximately 250m east of the existing roundabout junction. The diversion of the A51 Stone Road will not result in any significant effects with regards to increased journey times for vehicle occupants.
- 14.5.10 The Proposed Scheme will require the permanent diversion of Bent Lane, with the diverted route re-named Bent Lane (North). Traffic between Bent Lane and the A51 Stone Road will be diverted via Bent Lane (North) and the realigned Dog Lane. The existing alignment (to be renamed Bent Lane (South)) will be realigned and then permanently stopped-up within the adjoining Whitmore Heath to Madeley area (CA4). The diversion of Bent Lane will not result in any significant effects with regards to increased journey times for vehicle occupants.
- 14.5.11 The Proposed Scheme will require the stopping-up of a short section of Bottom Lane. Access and connectivity between the A51 Stone Road and the A519 Newcastle Road will be maintained via the A51 Stone Road diversion and will not result in any significant effects with regard to increased journey times for vehicle occupants.
- 14.5.12 The southbound lanes of the M6 will be locally realigned to enable the widening of the central reserve in order to place a supporting pillar for the M6 Meaford viaduct in the central reserve. The Proposed Scheme will also include permanent access to the Stone IMB-R from the M6 southbound. The realignment of the M6 and the permanent access to the Stone IMB-R will not result in any significant effects.

- 14.5.13 The stopping-up of Stab Lane will increase traffic at the junction of the A51 Stone Road and the diverted Tittensor Road. However, this junction is forecast to operate within capacity and there will not be any significant effect with regard to delays on vehicle occupants.
- 14.5.14 The new A51 Stone Road/A519 Newcastle Road roundabout junction has been designed to accommodate the forecast demand and there will not be any significant effect with regard to delays on vehicle occupants.
- 14.5.15 The operation of the Proposed Scheme and the permanent diversion or realignment of roads will not substantially change the traffic flows in the area on most roads. However, the stopping-up of Stab Lane will increase traffic flows on the diverted Tittensor Road resulting in a minor adverse effect, which is significant, on traffic-related severance for non-motorised users of the diverted Tittensor Road.
- 14.5.16 The diversion of the A51 Stone Road will increase traffic flows on the A519 Newcastle Road between the new A51 Stone Road/A519 Newcastle Road roundabout junction and the existing A51 Stone Road/A519 Newcastle Road roundabout junction. This increase in traffic will result in a minor adverse effect, which is significant, on traffic-related severance for non-motorised users of the A519 Newcastle Road between the two junctions.
- 14.5.17 The diversion of Bent Lane to form Bent Lane (North) will increase traffic flows on Dog Lane. This increase in traffic will result in a minor adverse effect, which is significant, on traffic-related severance for non-motorised users of Dog Lane.
- 14.5.18 The stopping-up of Stab Lane and Tittensor Road will result in a reduction in traffic on the retained sections of Stab Lane and Tittensor Road. This reduction in traffic will result in minor beneficial effects, which are significant, on traffic-related severance for non-motorised users at both locations.

Operation (2041)

- 14.5.19 The 2041 future operational traffic impacts will not change the effects assessed in 2027 in the Stone and Swynnerton area.

Accidents and safety

- 14.5.20 The effect on accident and safety risk is not significant as there are no locations in the Stone and Swynnerton area where there are substantial forecast increases in traffic due to the operation of the Proposed Scheme.

Public transport network

- 14.5.21 The permanent realignment of the B5026 Eccleshall Road and Yarnfield Lane will increase travel distances for bus passengers. However, as these realignments are less than 1km in length, there will be no significant effects on public transport within this area.

Non-motorised users

- 14.5.22 Stab Lane and Tittensor Road are locally used by equestrians and the stopping-up of Stab Lane and Tittensor Road will affect the continuity of the route. However, the Proposed Scheme includes the creation of two new bridleways, Swynnerton New

Bridleway and Swynnerton New Bridleway 2, which will maintain connectivity for equestrians and all non-motorised users.

- 14.5.23 There will be permanent widening, realignment, diversion or extension of 11 PRoW and 10 roads in the Stone and Swynnerton area that will have an impact on travel distances or introduce hindrances such as substantial changes in levels for non-motorised users.
- 14.5.24 There will be adverse effects, which are significant, on non-motorised users of 14 of these PRoW and roads as a result of severance from increased travel distance and/or hindrances. These are:
- Stone Rural Footpath 28 – minor adverse effect from increase in distance of up to 250m;
 - Stone Rural Bridleway 0.1135 – minor adverse effect from increase in distance of up to 150m;
 - Stone Rural Footpath 32 – moderate adverse effect from increase in distance of up to 550m;
 - Stone Rural Footpath 33 – moderate adverse effect from increase in distance of up to 700m;
 - Swynnerton Footpath 27 – minor adverse effect from diversion via an underbridge;
 - Swynnerton Footpath 17 – minor adverse effect from increase in distance of up to 150m and diversion via an underbridge;
 - Swynnerton Footpath 52 – minor adverse effect from diversion via an underbridge;
 - Swynnerton Footpath 10 – minor adverse effect from diversion via an underbridge;
 - Yarnfield Lane – minor adverse effect from diversion via an underbridge;
 - Tittensor Road – minor adverse effect from increase in distance of up to 400m;
 - A51 Stone Road – minor adverse effect from increase in distance of up to 350m;
 - Stab Lane – minor adverse effect from increase in distance of up to 150m;
 - Bottom Lane – minor adverse effect from increase in distance of up to 250m; and
 - A519 Newcastle Road – minor adverse effect from the new A51 Stone Road/ A519 Newcastle Road roundabout.
- 14.5.25 With the exception of Stone Rural Footpath 32 and Stone Rural Footpath 33, the changes in travel distance on the PRoW and road realignments or diversion are less than 500m.

Waterways and canals

- 14.5.26 The Proposed Scheme will not have a traffic and transport significant effect on the operation of the waterways and canals in the Stone and Swynnerton area.

Other mitigation measures

- 14.5.27 No further mitigation measures are considered necessary during operation of the Proposed Scheme based on the outcome of this assessment.
- 14.5.28 The workplace travel plan for the Stone IMB-R will help to mitigate any operational impacts of traffic and transport movements, including measures to reduce single occupancy car journeys and encourage use of sustainable modes of transport. The impact of the travel plan on reducing traffic has not been taken into account in this assessment. A servicing and delivery strategy for the Stone IMB-R will also be implemented, which will include movement of materials by rail to reduce movement by road.

Summary of likely residual significant effects

- 14.5.29 There will be minor adverse traffic-related severance effects for non-motorised users of the diverted Tittensor Road, the A519 Newcastle Road and Dog Lane.
- 14.5.30 The stopping-up of Stab Lane and Tittensor Road will result in minor beneficial effects on traffic-related severance for non-motorised users at both locations.
- 14.5.31 There will be moderate adverse severance effects due to increased travel distance and/or additional hindrances to travel on the non-motorised users of Stone Rural Footpath 32 and Stone Rural Footpath 33.
- 14.5.32 There will be minor adverse severance effects on the non-motorised users of: Stone Rural Footpath 28; Stone Rural Bridleway 0.1135; Swynnerton Footpath 27; Swynnerton Footpath 17; Swynnerton Footpath 52; Swynnerton Footpath 10; Yarnfield Lane; Tittensor Road; the A51 Stone Road; Stab Lane; Bottom Lane; and the A519 Newcastle Road.

Cumulative effects

- 14.5.33 The assessment includes cumulative effects of planned and committed development during operation, by taking into account background traffic growth in the future baseline.

Monitoring

- 14.5.34 Volume 1, Section 9 sets out the general approach to environmental monitoring during operation of the Proposed Scheme.
- 14.5.35 Operational and maintenance traffic will be very limited and there are no HS2 stations on the route of the Proposed Scheme. The workforce travel plan will detail any monitoring associated with the operation of the proposed IMB-R.

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 Stone and Swynnerton area. The likely impacts and significant effects of the Proposed Scheme's construction and operation on surface water 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, Staffordshire County Council (SCC), which is the Lead Local Flood Authority (LLFA) and Severn Trent Water Limited (the local water and sewerage undertaker). The purpose of this engagement has been to obtain relevant baseline information and to discuss issues and potential effects.
- 15.1.3 Maps showing the location of the key environmental features (Map Series CT-10) and the key construction (Map Series CT-05) and key operational (Map Series CT-06) features of the Proposed Scheme can be found in the Volume 2: CA3 Map Book.
- 15.1.4 Map Series WR-01, WR-02, WR-03, WR-05 and WR-06, showing details of the water features referred to in this section, are contained in the Volume 5: Water resources and flood risk assessment Map Book.
- 15.1.5 Detailed information on the water resources and flood risk issues specific to the Stone and Swynnerton area are contained in the Volume 5 appendices. These comprise:
- Appendix WR- WR-002-003 – Water resources assessment; and
 - Appendix WR- WR-003-003 – Flood risk assessment.
- 15.1.6 Volume 5 also includes a route-wide, stand-alone Water Framework Directive (WFD) compliance assessment (Appendix WR-001-000) and a draft route-wide water resources operation and maintenance manual (Appendix WR-002-000).
- 15.1.7 In addition, detailed hydraulic modelling reports are included in Background Information and Data (BID)¹⁸⁶ (BID-WR-004-008 - Hydraulic modelling report - Meece Brook).
- 15.1.8 Volume 3, Route-wide effects, Water resources and flood risk (Section 16), covers the following at a route-wide level:
- the risk to water resources associated with accidents or spillages from trains during operation of the Proposed Scheme;
 - a summary of how the Proposed Scheme complies with the statutory requirements of the WFD; and

¹⁸⁶ HS2 Ltd (2017), High Speed Two (HS2) Phase 2a (West Midlands - Crewe), Background Information and Data, Available online at: www.gov.uk/hs2

- route-wide flood risk issues related to application of the Sequential Test and Exception Test in the National Planning Policy Framework (NPPF)¹⁸⁷.

15.2 Scope, assumptions and limitations

- 15.2.1 The scope, assumptions and limitations for the water resources and flood risk assessment are set out in Volume 1 (Section 8), the Scope and Methodology Report (SMR)¹⁸⁸ and the SMR Addendum¹⁸⁹.
- 15.2.2 Unless indicated otherwise, the spatial scope of the assessment (the study area) is based upon the identification of surface water and groundwater features within 1km of the centre line of the route of the Proposed Scheme, as described in Section 2.2 of this report.
- 15.2.3 The assessment is based on desk study information, including information provided by consultees and stakeholders, as well as surveys of accessible water features.
- 15.2.4 Where surveys have not been undertaken due to land access constraints, a precautionary approach has been adopted in the assessments of receptor value and impact magnitude.
- 15.2.5 Hydraulic modelling has been undertaken of watercourses and key structures within flood risk areas. This includes modelling of Meece Brook and Filly Brook.
- 15.2.6 Groundwater levels have been inferred from the available Environment Agency groundwater level monitoring boreholes, historic borehole logs and topographic data, as well as from spring and watercourse locations.
- 15.2.7 The assessment is based on existing available water quality information provided by the Environment Agency.
- 15.2.8 Impacts on biological receptors, such as aquatic fauna and flora, which are referred to in the WFD compliance assessment (Volume 5: Appendix WR-001-000) are assessed in Section 8, Ecology and biodiversity.

15.3 Environmental baseline

Existing baseline - Water resources and WFD

Surface water

- 15.3.1 All water bodies in the study area fall within the Staffordshire Trent Valley Catchment of the Humber river basin district (RBD).

¹⁸⁷ Department for Communities and Local Government, National Planning Policy Framework (2015).

¹⁸⁸ Volume 5: Appendix CT-001-001, Environmental Impact Assessment Scope and Methodology Report.

¹⁸⁹ Volume 5: Appendix CT-001-002, Environmental Impact Assessment Scope and Methodology Report Addendum.

- 15.3.2 The river basin management plan¹⁹⁰ identifies the chemical¹⁹¹ and ecological¹⁹² condition of surface water bodies, and the quantitative¹⁹³ and chemical¹⁹⁴ status of groundwater bodies within this RBD.
- 15.3.3 The statutory objective of the WFD 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.
- 15.3.4 Specialist field surveys have been undertaken, where access has been available. This has included the majority of surface water bodies within the study area. Receptor values have been adjusted to reflect the outputs from these surveys in close consultation with the Environment Agency. In the absence of field surveys, surface water bodies, other than minor ponds and ditches, have been identified within this assessment as being of either high or very high value on a precautionary basis.
- 15.3.5 Summary information relating to the surface water bodies crossed by the Proposed Scheme within this study area, including their location, current overall WFD status and future overall status objectives, is provided in Table 29. Table 29 also identifies the receptor values attributed to each individual watercourse based on the methodologies set out in the SMR, the SMR Addendum, and as applied in the WFD compliance assessment (Volume 5: Appendix WR-001-000).

Table 29: Key surface water bodies and their WFD status

Water body name and identification number ¹⁹⁵	Current WFD status ¹⁹⁶	WFD status objective	Watercourse classification	Crossing location (National Grid Reference) ¹⁹⁷	Receptor value
River Trent from Tittensor to River Sow GB104028053272	Bad	Poor by 2027	Main river tributaries:		
			Ordinary watercourse	Pirehill (SJ 89937 30695)	Moderate
			Ordinary watercourse	Filly Brook (SJ 88189 33199)	Moderate
			Ordinary watercourse	M6 Meaford (SJ 87110 34648)	Very high
			Ordinary watercourse	Swynnerton (SJ 85598 36130)	Low

¹⁹⁰ Environment Agency (2015), Water for life and livelihoods Part 1: Humber river basin district: River basin management plan.

¹⁹¹ The chemical status of surface waters reflects concentrations of priority and hazardous substances present.

¹⁹² 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.

¹⁹³ 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.

¹⁹⁴ The chemical status of a groundwater body reflects effects on drinking water protected areas, its general quality, the importance of water quality within the water body for GWDTEs and surface water interactions and whether there are intrusions of poor quality groundwater present.

¹⁹⁵ The Environment Agency has attributed each surface water and groundwater body a unique water body identification (ID) number.

¹⁹⁶ See Volume 5: Appendix WR-001-000, WFD compliance assessment for definitions of WFD status.

¹⁹⁷ This is the location where the Proposed Scheme intersects the watercourse.

Meece Brook from source to Chatcull GB104028053080	Poor	Good by 2027	Main river tributaries:		
			Ordinary watercourse	North-east of Common Lane (Swynnerton) (SJ 83388 37833)	Low
			Ordinary watercourse	Swynnerton Footpath (SJ 81557 39538)	Moderate

Abstractions and permitted discharges (surface water)

- 15.3.6 There are four licensed surface water abstractions in the study area. Three are located at Hatton Manor and one is located at Stone Golf Club. All four have been assessed as high value receptors.
- 15.3.7 Records of private unlicensed surface water abstractions, which comprise those for quantities less than 20m³ per day, have been obtained from the local authorities. This data indicates that there are no registered private unlicensed surface water abstractions within the study area. As there is no obligation to register private water supplies, unregistered private groundwater supplies may be present. Private water supplies are assessed as high value receptors unless details obtained from the owner indicate otherwise.
- 15.3.8 There are 12 consented discharges to surface waters within the study area, with one adjacent to, but outside of, the land required for the Proposed Scheme. These have been assessed as being receptors of low value.

Groundwater

- 15.3.9 The location of abstractions, geological formations and indicative groundwater levels, where available, are shown in Map Series WR-02 in Volume 5: Water resources and flood risk Map Book.
- 15.3.10 The geology of the study area is described in Section 10, Land quality, and the superficial and bedrock hydrogeology is summarised in Table 30. Unless stated otherwise, the geological groups listed will all be crossed by the Proposed Scheme. Table 30 also identifies the receptor values attributed to each groundwater receptor based on the methodologies set out in the SMR, the SMR Addendum, and as applied in the WFD compliance assessment (Volume 5: Appendix WR-001-000).

Table 30: Summary of geology and hydrogeology in the study area

Geology ¹⁹⁸	Distribution	Formation description	Aquifer classification	WFD body (ID) and current overall status	WFD status objective	Receptor value
Superficial deposits						

¹⁹⁸ In recent years the British Geological Survey has revised the nomenclature used to describe the geological materials present in Great Britain, with the publication of a series of lithostratigraphic framework reports. Some of these reports cover an entire geological period e.g. The Carboniferous and others cover a single group e.g. the Triassic Mercia Mudstone. The nomenclature used in these reports supersede the nomenclature introduced in the 1980s, when the Group/Formation/Member classification was adopted by the British Geological Survey,

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Geology¹⁹⁸	Distribution	Formation description	Aquifer classification	WFD body (ID) and current overall status	WFD status objective	Receptor value
Head	On the fringe of glacial deposits near Swynnerton	Clay, silt, sand and gravel	Secondary undifferentiated	Not assessed by the Environment Agency	Not assessed by the Environment Agency	Moderate
Peat	South-west of Filly Brook (will not be crossed by the Proposed Scheme)	Organic rich clay or humic deposits	Unproductive	Not assessed by the Environment Agency	Not assessed by the Environment Agency	Low
Alluvium	Along the valley and tributaries of Filly Brook and Meece Brook and the dry channel north of Hatton.	Clay, silt, sand and gravel	Secondary A	Not assessed by the Environment Agency	Not assessed by the Environment Agency	Moderate
River Terrace Deposits	Along the valley of Meece Brook (will not be crossed by the Proposed Scheme)	Sand and gravel	Secondary A	Not assessed by the Environment Agency	Not assessed by the Environment Agency	Moderate
Glacial Till	Several discontinuous outcrops within 1km of the Proposed Scheme	Gravel in a fine mud matrix	Unproductive	Not assessed by the Environment Agency	Not assessed by the Environment Agency	Low
Glaciofluvial Deposits – undifferentiated, and sheet deposits	Outcrops in the central area, a small section of which will be crossed by the Proposed Scheme south-east of Swynnerton	Sand and gravel	Secondary A	Not assessed by the Environment Agency	Not assessed by the Environment Agency	Moderate
Bedrock						
Mercia Mudstone Group - Mudstone and Halite Stone	Outcrop covering the southern section of the study area as far north as	Mudstone and siltstone with some halite-bearing units, thin beds of gypsum/	Secondary B	Staffordshire Trent Valley - Mercia Mudstone West (GB40402G3	Good by 2015	Moderate

replacing the earlier classification adopted by the pioneer geological surveyors in the 19th century. While some traditional names have been retained by this process, many new names have also been generated, and many geological maps have not yet been updated. Some stratigraphic units have been renamed twice in the last 35 years. To reflect this, the previous name used for geological units (if different) is shown in brackets

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Geology ¹⁹⁸	Distribution	Formation description	Aquifer classification	WFD body (ID) and current overall status	WFD status objective	Receptor value
	Swynnerton Grange	anhydrite being widespread		00400) – Good		
Mercia Mudstone Group – Mudstone	A small outcrop near Swynnerton (will not be crossed by the Proposed Scheme)	Mudstone and siltstone with some halite-bearing units, and presence of sandstone	Secondary B	Staffordshire Trent Valley - Mercia Mudstone West (GB40402G3 00400) – Good	Good by 2015	Moderate
Mercia Mudstone Group - Tarporley Siltstone Formation	Outcrop in the Swynnerton area	Siltstones, mudstones and sandstones	Secondary B	Staffordshire Trent Valley - Mercia Mudstone West (GB40402G3 00400) – Good	Good by 2015	Moderate
Mercia Mudstone Group - Wilkesley Halite Member (Stafford Halite Member)	Small outcrop in the south of the area	Discontinuous lenses and beds of halite mixed with mudstone	Secondary B	Staffordshire Trent Valley - Mercia Mudstone West (GB40402G3 00400) – Good	Good by 2015	Moderate
Sherwood Sandstone Group - Wilmslow Sandstone (Wildmoor Sandstone)	Outcrop underlying the northern half of the route of the Proposed Scheme in this area	Sandstone with subordinate siltstone and mudstone	Principal	The Staffordshire Trent Valley - PT Sandstone Staffordshire (GB40401G3 00500) – Poor	Poor by 2015	High
Sherwood Sandstone Group - Helsby Sandstone Formation (Bromsgrove Sandstone)	Outcrop in the Swynnerton area	Sandstones, weathering to sand near the surface	Principal	The Staffordshire Trent Valley - PT Sandstone Staffordshire (GB40401G3 00500) – Poor	Poor by 2015	High
Sherwood Sandstone Group - Chester Formation (Kidderminster Sandstone and Conglomerate Interbedded)	Outcrop in the central area, north of Swynnerton	Sandstone and conglomerate	Principal	The Staffordshire Trent Valley - PT Sandstone Staffordshire (GB40401G3 00500) – Poor	Poor by 2015	High
Sherwood Sandstone Group - Chester	Outcrop in the central	Pebble conglomerate with a sandy	Principal	The Staffordshire Trent Valley -	Poor by 2015	High

Geology ¹⁹⁸	Distribution	Formation description	Aquifer classification	WFD body (ID) and current overall status	WFD status objective	Receptor value
Formation (Kidderminster Formation – Conglomerate)	area, north of Swynnerton	matrix and pebbles		PT Sandstone Staffordshire (GB40401G3 00500) – Poor		
Butterton-Swynnerton Dykes - Paleogene igneous dykes	Outcrop in the central area, north of Swynnerton. Dykes	Strong basaltic igneous dyke	Secondary A	The Staffordshire Trent Valley - PT Sandstone Staffordshire (GB40401G3 00500) - Poor	Poor by 2015	Moderate

Superficial deposit aquifers

15.3.11 The basis of the receptor values attributed to the superficial deposit aquifers present within the study area, as shown in Table 30, is outlined briefly as follows:

- Alluvium, River Terrace Deposits, undifferentiated Glaciofluvial Deposits and Glaciofluvial Sheet Deposits have all been assessed as moderate value receptors, because they may be capable of supporting water supplies at a local rather than regional scale and may form an important source of baseflow to rivers; and
- deposits of Peat and Glacial Till are classed as unproductive in this area and have, therefore, been assessed as low value receptors in terms of water resources.

Bedrock aquifers

15.3.12 The basis of the receptor values attributed to the bedrock aquifers present within the study area, as shown in in Table 30, is briefly as follows:

- the Sherwood Sandstone Group is classified as a Principal aquifer by the Environment Agency. It has, therefore, been assessed as a receptor of high value, except where it coincides with a groundwater source protection zone (SPZ) 1, in which case it has been designated a very high value receptor; and
- the Mercia Mudstone Group and the Butterton-Swynnerton Dykes are capable of supporting water supplies at a local rather than strategic scale and in some cases form an important source of baseflow to rivers. These are, therefore, considered receptors of moderate value.

WFD status of groundwater bodies

15.3.13 A summary of locations, current overall WFD status, and future overall status objectives associated with the designated bedrock groundwater bodies within the study area is provided in Table 31. The value attributed to each of these receptors is also indicated.

- 15.3.14 The superficial deposits in the study area are not formally part of a WFD groundwater body but may be in hydraulic connection with the WFD bedrock aquifers.

Abstractions and permitted discharges (groundwater)

- 15.3.15 There are two groundwater abstractions licensed for public water supply in the study area, one near Swynnerton and one near Hatton, both of which are protected by SPZs, as shown on Map WR-02-203. A separate SPZ, associated with the public water supply near Whitmore (in the Whitmore Heath to Madeley area (CA4)), extends into the Stone and Swynnerton area.
- 15.3.16 Information obtained from the local authorities indicates that there are six unlicensed private groundwater abstractions registered within the study area. Surveys have confirmed that two of these are from boreholes. Access to confirm the nature and source of the four remaining abstractions has not yet been obtained. However, the absence of nearby surface watercourses suggests that these are likely to be groundwater abstractions from the Mercia Mudstone Group aquifer. Unregistered private groundwater supplies may also be present. Private water supplies have been assessed as high value receptors unless details obtained from the owner indicate otherwise.
- 15.3.17 There are four consented discharges to groundwater within the study area, three of which are within the land required for the Proposed Scheme. These discharges have been assessed as low value receptors.

Surface water/groundwater interactions

- 15.3.18 Desk-based assessment using Ordnance Survey maps identified 27 features within the study area that had potential to be springs. Access was possible to inspect seven of these features: one was confirmed to be an area of marsh, which may be groundwater fed, and six features were confirmed to be land drainage features of low value. The remaining 20 potential spring features are assumed to be high value receptors, pending site inspection.
- 15.3.19 There are 78 ponds within the land required for the Proposed Scheme. The nature and relative value of these features, the magnitude of the impacts that the Proposed Scheme is likely to have on them, and the mitigation proposed, are outlined in Chapter 8, Ecology and biodiversity.

Groundwater dependent terrestrial habitats

- 15.3.20 There are no designated groundwater dependent terrestrial habitats in the study area.

Existing baseline - flood risk and land drainage

- 15.3.21 The Environment Agency's Flood map for planning (rivers and sea)¹⁹⁹ has been used to scope the baseline flood risk for flooding from main rivers and ordinary watercourses. These plans define Flood Zone 2 (land assessed as having between a 1 in 100 (1%) and

¹⁹⁹ Environment Agency, Flood map for planning (rivers and sea). Available online at: <https://flood-map-for-planning.service.gov.uk/>

1 in 1,000 (0.1%) annual probability of river flooding) and Flood Zone 3 (land assessed as having a 1 in 100 (1%) or greater annual probability of river flooding).

- 15.3.22 The updated Flood map for surface water²⁰⁰ has been used to scope surface water flood risks. Infrastructure failure flood risks have been scoped using the Environment Agency risks of flooding from reservoirs national dataset²⁰¹. The British Geological Society national dataset, Areas susceptible to groundwater flooding²⁰², has been used to assess the future risk of groundwater flooding.
- 15.3.23 The following reports were also used to help scope the baseline flood risk within the study area:
- Staffordshire Preliminary Flood Risk Assessment (PFRA) (2011)²⁰³;
 - South Staffordshire, Cannock Chase, Lichfield and Stafford Strategic Flood Risk Assessment (SFRA) (2014)²⁰⁴; and
 - Shropshire and Staffordshire Local Flood Risk Management Strategy (2015)²⁰⁵.
- 15.3.24 River and surface water flood zones are shown in Map Series WR-01 in Volume 2: CA3 Map Book.

River flooding

- 15.3.25 The study area includes substantial areas of floodplain (Flood Zone 2 and 3) associated with Filly Brook, Meece Brook and tributary watercourses. Table 31 shows the watercourses within the study area and the receptors that would potentially be affected by any changes in flood frequency and magnitude. The value of these receptors, based on the definitions in Table 50 of the SMR, is also indicated.

Table 31: River flood risk sources and receptors

Source of flooding	Location (NGR)	Receptor potentially affected	Receptor value
Filly Brook	SJ 87839 33148	M6	High
	SJ90243 33813	Residential properties west of Stone	High
	SJ 88940 33509	Stone Golf Club	Low
	SJ 88953 33512	Surface water abstraction	High
Meece Brook	SJ 82835 37022 & SJ 81692 38778	A51 Stone Road	High
	SJ 82870 37031	Surface water abstraction	High

²⁰⁰ Environment Agency, Flood map for surface water. Available online at: <https://flood-warning-information.service.gov.uk/long-term-flood-risk/map?eastng=402498&northing=282043&address=100070518535>

²⁰¹ Environment Agency, Risks of flooding from reservoirs national dataset. Available online at: <https://flood-warning-information.service.gov.uk/long-term-flood-risk/map>

²⁰² British Geological Society national dataset, Areas susceptible to groundwater flooding. Available online at: <http://www.bgs.ac.uk/products/hydrogeology/groundwaterFlooding.html>

²⁰³ Staffordshire Preliminary Flood Risk Assessment (PFRA) (2011) Staffordshire County Council

²⁰⁴ South Staffordshire, Cannock Chase, Lichfield and Stafford Strategic Flood Risk Assessment (SFRA) (2014) Capita

²⁰⁵ Shropshire and Staffordshire Local Flood Risk Management Strategy (LFRMS) (2015) Staffordshire County Council

Source of flooding	Location (NGR)	Receptor potentially affected	Receptor value
	SJ 82896 37000	Residential properties at Hatton Manor	High
	Various	Agricultural land	Low

Surface water flooding

15.3.26 There are numerous areas that are susceptible to surface water flooding within the study area. These are identified in maps WR-01-104b to 106a in the Volume 5: Water resources and flood risk Map Book. The key sources and receptors with potential to be affected are shown in Table 32. The value of these receptors, based on Table 52 of the SMR, is also indicated.

Table 32: Surface water flood risk sources and receptors

Source	Location (NGR)	Receptor potentially affected	Receptor value
Surface water flow path	SJ 90272 32514	Residential properties in Walton	High
	SJ 90581 32036	Commercial properties in Stone Business Park	Moderate
	Various	Agricultural land	Low

Artificial water bodies

15.3.27 Flooding from artificial water bodies may occur due to the failure of an impounding structure, such as a dam or canal embankment. The flood risk assessment (Volume 5: Appendix WR-003-003) considers the risks associated with artificial water bodies within the study area including the Trent and Mersey Canal, Trentham Lake, Black Lake and Hanchurch Pools. There are no flood risk issues associated with these artificial water bodies.

Groundwater flooding

15.3.28 The formal source of public information related to historical incidents of groundwater flooding in the Stone and Swynnerton area is the South Staffordshire Council SFRA204. This states that there is no history of groundwater flooding within the Stafford Borough.

15.3.29 The Environment Agency's Areas susceptible to groundwater flooding map indicates a potential for groundwater flooding in floodplain areas along the main river network.

Land drainage

15.3.30 Existing topography, soils and land drainage systems within the study area are described in Section 4, Agriculture, forestry and soils. The rivers and watercourses within the area are connected to an extensive network of existing open drains. Subsurface drainage systems are also likely to be present in fields used for agriculture. The land drainage function of these systems, which is important for crop productivity, is potentially sensitive to increases in water levels within the receiving watercourses.

Future baseline

Construction (2020)

- 15.3.31 Volume 5: Appendix CT-004-000 provides details of the developments in the Stone and Swynnerton area that are assumed to have been implemented by 2020.
- 15.3.32 No committed developments or site allocations have been identified in this area that will materially alter the baseline conditions in 2020 for water resources and flood risk receptors.

Operation (2027)

- 15.3.33 Volume 5: Appendix CT-004-000 provides details of the developments in the Stone and Swynnerton area that are assumed to have been implemented by 2027.
- 15.3.34 No committed developments have been identified in this area that will materially alter the baseline conditions in 2027 for water resources and flood risk receptors.

Climate change

- 15.3.35 Detailed analysis of the potential impacts of climate change on the Proposed Scheme has been undertaken and is reported in Volume 3, Route-wide effects (Section 4). In general the design of the Proposed Scheme has adopted a precautionary approach to potential future increase in peak river flows and rainfall intensities, using the latest guidance issued by the Environment Agency in February 2016²⁰⁶.
- 15.3.36 Although no definitive guidance is available, climate change may also affect future surface water and groundwater resources. However, any such changes are unlikely to change the significance of effects identified in this assessment.

15.4 Effects arising during construction

Avoidance and mitigation measures

- 15.4.1 The principal strategy adopted to limit the temporary and permanent effects of the Proposed Scheme is through avoidance of sensitive receptors wherever reasonably practicable. Where receptors could not be avoided, mitigation measures have been incorporated where appropriate and reasonably practicable, to limit the potential effects. Section 16 of the draft Code of Construction Practice²⁰⁷ (CoCP) includes a range of mitigation measures that aim to reduce construction impacts. The avoidance and mitigation measures that are of particular relevance to water resources and flood risk during construction are described in the following sections of this report.

Water resources and WFD

- 15.4.2 The avoidance of sensitive receptors has reduced the risks associated with the Proposed Scheme not complying with the requirements of the WFD. Examples of this avoidance strategy include:

²⁰⁶ Environment Agency (2016) Adapting to Climate Change. Advice for Flood and Coastal Erosion Risk Management Authorities

²⁰⁷ Volume 5: Appendix CT-003-000, Draft Code of Construction Practice.

- avoidance of channels and floodplain areas – the route of the Proposed Scheme will avoid passing along river or stream valleys, such as that of the River Trent and the River Lea, and their associated floodplains. Instead it will pass over the larger watercourses (rivers and streams) on viaducts spanning the floodplain, with piers set back from the channel;
- avoidance, where reasonably practicable, of groundwater dependent terrestrial ecosystems, including natural springs that can play a key role in the hydrology and hydrogeology of such ecosystems; and
- avoidance, where reasonably practicable, of public water supplies and smaller licensed and unlicensed abstractions of surface water and groundwater.

- 15.4.3 The presence of any unregistered private water supplies, their function and the means of protecting or if necessary replacing them will be discussed with any landowners potentially affected by the Proposed Scheme.
- 15.4.4 The temporary works shown on Map Series CT-05 in Volume 2: CA3 Map Book have been informed by a detailed consideration of the water resources constraints and have sought to avoid sensitive features wherever reasonably practicable.
- 15.4.5 Where watercourse diversions and/or realignments are proposed, the aim will be to design these with equivalent hydraulic capacity to the existing channels. The Proposed Scheme will also aim to ensure that field subsurface drainage systems can be adapted to discharge into the new channels. Where such watercourses are natural channels, the design will aim to incorporate appropriate features to retain and, where reasonably practicable, enhance their hydromorphological condition²⁰⁸.
- 15.4.6 For watercourses that are not in their natural condition, the design aim will be to incorporate measures, where reasonably practicable, to improve their hydromorphological condition, provided this is compatible with the watercourses' flood risk and land drainage functions.
- 15.4.7 The draft CoCP includes requirements to protect water bodies and their associated water resources from the potential impacts of pollution from construction site runoff, including where appropriate:
- provision of maps showing sensitive areas and buffer zones where no pollutants are to be stored or used; and
 - preparation of method statements for silt management, site drainage at compounds and satellite compounds, for the storage and control of oils and chemicals and the prevention of accidental spillages, in consultation with the Environment Agency, and if appropriate, the LLFA and other relevant authorities, as part of the approvals process. These method statements will cover, where applicable:

²⁰⁸ "Hydromorphological condition" reflects the degree to which water flow, sediment composition and movement, continuity (in rivers) and the structure of physical habitats departs from that expected of a natural river or stream system. The higher the degree of departure; the worse the condition.

- the avoidance of discharges of site runoff to ditches, watercourses, drains, sewers or soakaways without the prior approval 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.

- 15.4.8 Method statements will be required for all watercourse crossings and channel realignments required by site haul routes. The method statements will describe how potential changes to flood risk, water quality and channel morphology will be safeguarded during the establishment, use and decommissioning of all site haul routes.
- 15.4.9 Permanent culverts proposed on the smaller watercourse crossings within this study area include Pirehill culvert, a land drainage culvert under the Stone IMB-R reception tracks, Swynnerton culvert, Dog Lane drop inlet culvert, Plantation culvert and Shelton culvert. The detailed design of these culverts will be developed in general accordance with Construction Industry Research and Information Association (CIRIA) and Environment Agency guidance and in consultation with the Environment Agency. The design has sought to mitigate the impact on the hydromorphology of the affected watercourses, as follows:
- drop inlet culverts have been avoided wherever reasonably practicable and are proposed on minor headwater channels or ditches only;
 - culvert lengths have been reduced as far as is reasonably practicable; and
 - invert levels will be set below the firm bed of the watercourse to allow a natural substrate to develop along the bed of the culvert.
- 15.4.10 The wider issues associated with these culverts, and how their detailed design will aim to ensure no deterioration in the status of any of the relevant water body's WFD quality elements, are considered within the WFD compliance assessment report (WR-001-000). The mitigation specifically proposed for the ecological effects of these culverts is considered in Section 8, Ecology and biodiversity.
- 15.4.11 Existing groundwater abstraction boreholes or monitoring points will be protected from physical damage, insofar as reasonably practicable, including appropriate decommissioning of abandoned boreholes in order to prevent pollution pathways. If boreholes are to be decommissioned and replaced with alternatives, the contractors will follow the latest good practice. This will 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 relocated.
- 15.4.12 Measures will be introduced, as required 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:

- installation of cut-off²⁰⁹ structures around excavations;
- ensuring cut-off structures are driven to sufficient depths to meet an underlying strata or zone of lower permeability;
- promoting groundwater recharge, such as discharging pumped water to recharge trenches around excavations to maintain baseline groundwater and surface water conditions; and
- incorporating passive bypasses within the design, which could comprise a 'blanket' of permeable material, such as gravel, placed around temporary structures allowing groundwater to bypass the below-ground works, without a rise in groundwater levels on the upstream side.

15.4.13 The exact requirements will be refined and method of mitigation will be designed following ground investigation at cutting locations.

Flood risk and land drainage

15.4.14 The design of the Proposed Scheme will aim to mitigate permanent impacts on flood risk and land drainage as follows:

- the floodplain avoidance strategy adopted will ensure that impacts on flood flows within rivers and streams, and their floodplains, will be limited to those associated with the intermediate pier structures on the viaducts crossing Filly Brook. The Proposed Scheme includes replacement floodplain storage areas to replace losses associated with the piers;
- the temporary works shown on Map Series CT-05 in the Volume 2: CA3 Map Book have been informed by a detailed consideration of the flood risk constraints and have sought to avoid flood zones wherever reasonably practicable;
- provision has been made to pass surface water runoff and land drainage flows beneath sections of raised embankment that will cross surface water flow paths, where reasonably practicable. This will be achieved using perimeter drainage and culverts with inverts set below the likely level of any upstream field subsurface drainage systems;
- in locations where the route of the Proposed Scheme will cross watercourses, the design aim is 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 Agency²¹⁰;
- runoff from the footprint of the infrastructure could occur more rapidly post-construction due to steeper slope angles and the permeability of the newly-created surfaces. The design of drainage systems aims to ensure that there will be no significant increases in flood risk downstream, during storms up to and including the 1 in 100 (1%) annual probability design event, with an allowance

²⁰⁹ Impermeable barrier preventing water flow.

²¹⁰ Environment Agency (2016) Adapting to Climate Change. Advice for Flood and Coastal Erosion Risk Management Authorities

for climate change based on the latest guidance issued by the Environment Agency;

- balancing ponds for highway and railway drainage have been sized on a precautionary basis, pending more detailed information about the permeability and runoff characteristics of existing and proposed ground surfaces;
- where the Proposed Scheme will pass in cutting, drainage will be provided with the aim of preventing surface water flows from entering the cutting and diverting this water into its natural catchment. Where reasonably practicable, runoff from the cuttings will also be drained to the catchments to which this water would naturally drain, avoiding transfer of water from one water body to another, which could increase flood risk or impact on land drainage systems; and
- measures will 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.

15.4.15 The nominated undertaker will, insofar as reasonably practicable, ensure that flood risk is managed throughout the construction period and will require construction contractors to consider flooding issues when planning sites and storing materials. If necessary, temporary provision will be made to reduce the potential for impacts on existing land drainage systems during construction. Some of the specific measures referred to in Section 16 of the draft CoCP, include:

- preparation of flood risk assessments and method statements for temporary works, including main construction and satellite compound drainage, watercourse crossings and realignments and temporary realignments in consultation with the Environment Agency, and where applicable, the LLFA and other relevant regulators;
- location of storage, machinery, equipment and temporary buildings outside flood risk areas;
- construction of outfalls during periods of low flow to reduce the risk of scour and erosion;
- design of temporary watercourse realignments with equivalent hydraulic capacity to the existing channels, ensuring that field subsurface drainage systems can be adapted to discharge into the new channel; and
- having regard to the requirement for construction activities to avoid any increases in flood risk to vulnerable receptors.

15.4.16 In accordance with Section 16 of the draft CoCP, monitoring will also be undertaken in consultation with the Environment Agency, and where applicable the LLFA, to ensure that temporary structures are installed, maintained and removed in accordance with

the relevant environmental approvals and that impact on existing land drainage systems are managed appropriately.

Assessment of impacts and effects

- 15.4.17 This section describes the significant effects following the implementation of the avoidance and mitigation measures. The majority of the potential temporary impacts on the water environment during construction will be avoided or mitigated by the working methods outlined in the draft CoCP. The mitigation embedded into the design has focused on reducing permanent impacts resulting from the presence of the Proposed Scheme to as low a level as is reasonably practicable.

Temporary effects – Water resources and WFD

Surface water

- 15.4.18 Potential temporary impacts on surface water quality, due to site runoff and increased pollution risk, are a key concern during construction and have the potential to affect abstractions and the water environment more generally. However, the practices outlined in the draft CoCP are considered adequate to mitigate any impacts, such that there are unlikely to be any significant effects.

Groundwater

Aquifers

- 15.4.19 Sections of the Proposed Scheme will cross the Sherwood Sandstone Group Principal aquifer, the Mercia Mudstone Group Secondary B aquifer, the Butterton-Swynnerton Dykes Secondary A aquifer and the Head deposits Secondary undifferentiated aquifer in cuttings. Implementation of the measures in the draft CoCP and the drainage measures summarised above will ensure that any impacts on the quality of these aquifers are negligible and any temporary impact on groundwater levels and flow will be minor and localised. No significant effects related to these aquifers are anticipated.
- 15.4.20 Where the impacts of the cuttings on the aquifers could affect additional local receptors that rely on the groundwater resource, for example springs and abstractions, this is reported in the sections below.

Abstractions

- 15.4.21 Construction of cuttings, embankments, balancing ponds and road realignments in the northern sections of the Stone and Swynnerton area has potential to have a temporary impact on the public water abstraction near Whitmore (in the Whitmore Heath to Madeley area (CA4)). The assessment of the effects on this receptor are reported in Volume 2: Community area 4, Whitmore Heath to Madeley.
- 15.4.22 It has been assessed that, due to their distance from the Proposed Scheme, the public water supply abstractions near Swynnerton and near Hatton are unlikely to be affected. However, a monitoring plan for groundwater quality within the SPZ associated with these two supplies will nevertheless be developed in consultation with the Environment Agency and Severn Trent Water.
- 15.4.23 The quality of unlicensed private groundwater abstractions at Walton Heath Farm, Darlston Grange and Darlston Wood Farm have potential to be temporarily impacted

by the Proposed Scheme. Temporary replacement of these abstractions, prior to commencement of construction, with nearby alternatives or a mains supply will be provided and in discussion with the relevant landowners. This will result in no temporary adverse significant effects.

Temporary effects - Flood risk and land drainage

- 15.4.24 Construction of the Filly Brook viaduct and M6 Meaford viaduct over Filly Brook and its associated floodplains will require temporary working within flood zones. Construction sequencing and temporary works design will be carefully considered and assessed in terms of potential impacts on flood risk. Method statements detailing how these works will be undertaken will be produced by the nominated undertaker in consultation with the Environment Agency and the LLFA. It is not anticipated that these temporary activities will result in significant effects related to flood risk and land drainage.
- 15.4.25 The proposed watercourse realignments and culverting operations will require working in existing channels. Implementation of the measures outlined in the draft CoCP will ensure there will be no significant effects on flood risk and land drainage.

Permanent effects – Water resources and WFD

- 15.4.26 Permanent effects are those initially caused by activity to construct the Proposed Scheme, but which will also remain after the Proposed Scheme has been constructed.

Surface water

- 15.4.27 Construction of the Filly Brook viaduct and M6 Meaford viaduct will not prevent the Filly Brook from achieving good ecological status, in line with the WFD objectives in the RBMP. The piers will be set back from the channel and the viaduct will be sufficiently high for any potentially negative shading impacts to be negligible.
- 15.4.28 Approximately 130m of Filly Brook will be permanently culverted as a result of the Proposed Scheme in the vicinity of the Stone IMB-R. However, an approximately 300m long existing culvert on this watercourse will be removed. The net impact of these operations is discussed in the WFD compliance assessment, Appendix WR-001-000, and will not result in permanent significant effects.

Groundwater

Aquifers

- 15.4.29 Implementation of the avoidance and mitigation measures will ensure that there are no permanent significant effects related to the impact of the proposed cuttings on water levels and quality in the aquifers intercepted by the Proposed Scheme. Where the impacts of the cuttings on the aquifers could affect additional local receptors that rely on the groundwater resource, for example springs and abstractions. The impacts on these have been assessed below.

Abstractions

- 15.4.30 The permanent impact of the Proposed Scheme on the licensed public water supply abstraction near Whitmore is assessed in the Volume 2: Community area 4, Whitmore Heath to Madeley (CA4). Potential permanent effects related to the licensed public

groundwater abstractions near Swynnerton and near Hatton have been assessed as unlikely to be significant, although water quality monitoring in the vicinity of these sources will be undertaken on a precautionary basis.

- 15.4.31 If detailed investigations by the nominated undertaker confirm a risk of permanent impacts on the abstractions at North Pirehill Farm, Little Micklow and Micklow House Farm then alternative water supply arrangements would be provided in discussion with the owners. With suitable mitigation measures in place prior to construction commencing, there will be no permanent significant effects related to these supplies.

Permanent effects - Flood risk and land drainage

- 15.4.32 The design of all watercourse and surface water crossings within the study area will ensure that the effects related to construction of the Proposed Scheme will not be significant in terms of flood risk and land drainage. This is reported in Volume 5: Appendix WR-003-003, Flood risk assessment.

Other mitigation measures

- 15.4.33 No requirement for additional mitigation has been identified in this assessment.

Summary of likely residual significant effects

- 15.4.34 No residual significant effects have been identified in this assessment.

Cumulative effects

- 15.4.35 No significant cumulative temporary or permanent effects during construction with regard to water resources or flood risk are anticipated.

15.5 Effects arising from operation

Avoidance and mitigation measures

- 15.5.1 The principal issue of concern during operation of the Proposed Scheme is the potential for accidental spillages to occur that could result in the release of contaminants into the water environment. This issue has been assessed on a route-wide basis in Volume 3: Route-wide effects (Section 16), where the mitigation measures associated with this risk are described. A draft operation and maintenance plan for water resources and flood risk is provided in Volume 5: Appendix WR-002-000.
- 15.5.2 The design takes into account the policies in the NPPF and will aim to ensure that the Proposed Scheme is safe from flooding without increasing flood risk elsewhere, as outlined in the Flood risk assessment, Appendix WR-003-003. Evidence of application of the Sequential Test and Exception Tests in the NPPF is provided on a route-wide basis in Volume 3: Route-wide effects.
- 15.5.3 Sustainable drainage systems will be used where reasonably practicable. These will help to remove any suspended material within runoff from the Proposed Scheme through filtration, vegetative adsorption or settlement. The drainage systems proposed will aim to ensure that the quantity and quality of water draining from the Proposed Scheme during its operational phase will have a negligible impact on the water environment.

- 15.5.4 A route-wide WFD compliance assessment is provided in Volume 3: Route-wide effects. This describes the measures embedded into the design that are specifically designed to ensure that the Proposed Scheme complies with the requirements of the WFD.

Assessment of impacts and effects

- 15.5.5 There are considered to be no significant adverse effects related to water resources and flood risk arising from operation of the Proposed Scheme.

Other mitigation measures

- 15.5.6 There are considered to be no further measures required to mitigate adverse effects on surface water resources, groundwater resources or flood risk.

Summary of likely residual significant effects

- 15.5.7 There will be no residual significant effects on surface water, groundwater or flood risk during operation of the Proposed Scheme.

Cumulative effects

- 15.5.8 A review of the committed developments within the study area has identified no potential for significant cumulative permanent effects in the study area.

Monitoring

- 15.5.9 Volume 1, Section 9 sets out the general approach to monitoring of water resources and flood risk during operation of the Proposed Scheme.
- 15.5.10 There are no area-specific requirements for monitoring water resources and flood risk during the operation of the Proposed Scheme.

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